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Standards of Quality and Performance.

CONSIDERATION of the new I.E.E. Regulations for the electrical equipment of buildings again raises the question of the possibility of establishing a British Bureau of Standards, or Proving House, to which consultants, insurance offices, supply authorities, manufacturers, and users could refer for definite and authoritative information as to whether apparatus or accessories complied with the requirements of safety and efficiency.

It will be remembered that the late Mr. C. H. Wordingham devoted much time and energy to the subject; and a Committee was appointed by the Institution of Electrical Engineers to investigate the matter, but nothing has been heard of it in recent years. There can be little doubt that electrical manufacturing and installation engineers in the British Isles have been for a long time at a disadvantage as compared with engineers in the United States of America. In that country, electrical accessories and installation practice are all more or less rigidly controlled by the National Board of Fire Underwriters, who not only issue a Code of requirements, but also possess an elaborately equipped laboratory and are prepared to test and certify whether any piece of apparatus complies with the Code or not. The approval of the Board is accepted by practically all engineers and supply authorities as an implied guarantee that the goods are suitable for their purpose.*

It is not difficult for an American manufacturer, familiar with the requirements of the Code, to design and manufacture goods secure in the knowledge that once the testing fees are paid, approval is obtained, and the label affixed, his goods will be accepted from side to side and from end to end of the North American Continent. This means that standard articles can be produced without variation, and every advantage can be taken of the economies of large-scale production, with the consequent reduction of costs and prices.

In the British Isles we have no such supreme authority. Each manufacturer, anxious to please some section of the industry, works out his own problems, makes arrangements for his own tests, and evolves patterns which he feels and hopes will please his own limited range of customers, with the certain knowledge, gained by painful experience, that however perfect the product, there will be a considerable number of supply

* A full account of the organisation of the Underwriters' Laboratories (Inc.) was given in a report by Mr. C. Hamilton Wickes to the Board of Trade. See ELEC. REV., January 3rd, 1913.

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authorities and consulting engineers who will require modifications made, entirely outside such regulations as exist, before it meets with their approval. On these lines it is clearly difficult to standardise designs or to take advantage of the economies of large-scale production.

It may be urged that the British freedom of practice has been fruitful of progress in design; possibly it has, but obviously a very large number of variations and quite unnecessary patterns are produced, all of which must in the long run be paid for by the industry, and the lack of an authority on standards of quality has certainly permitted the use of a very large amount of foreign and other accessories of a quality very much below that which would be accepted and marked by any responsible testing authority.

The National Board of Fire Underwriters is financed by the insurance companies, and maintains an elaborately equipped laboratory, which is run on business lines, the testing fees from manufacturers and the sales of the labels defraying most, if not all, of the expenses, in much the same way as in England the fees for the hall-marking of gold and silver wrought plate cover the expenses of the various Assay Offices. It is to be noted that the slogan of the underwriters' laboratories is: "For Service—Not Profit."

As the American National Board has the active support of all the insurance offices, its powers are extensive and peculiar. The labels issued by the Board for affixing to approved apparatus act as a guarantee to the user, and even more important, to the manufacturer, that the goods so marked comply with the code and will be accepted for use upon any installation in the United States of America or in Canada. This is real "service," and as such is, one hopes, willingly paid for by the manufacturers, and eventually by the consumer.

Matters are so arranged that it is almost, if not quite, impossible for a British or other manufacturer to secure the services of the Bureau. It is a little difficult to explain how this exclusion works, but there are several British manufacturers who have had experiences in this direction: some amusing, some painful, but all expensive and futile.

It will be seen, therefore, that the working of the Code and of the Testing Bureau closes not only the whole of the United States, but also the British Dominion of Canada, to British electrical apparatus and accessories —much more so than is possible under mere protective tariffs, however high they may be.

By this somewhat devious course, we come back to the new I.E.E. Rules. It is to be noted that a very large number of supply authorities and insurance companies have "adopted" the Regulations, but one wonders precisely how they are to satisfy themselves that the materials used in installation work under their control comply with them.

For instance, it is apparently not yet realised that Regulation No. 67, Clause "B" (Rule 96, old Rules), if insisted upon by supply authorities and insurance companies, would make obsolete practically all the commercial ironclad switch and fuse gear that is in use, and is at present being manufactured.

One presumes that the Regulation means what it says: that a switch rated by the manufacturer at, say, 100 amperes, 600 volts, must be capable of breaking circuit without flashing to case on a load of 150 amperes, at a pressure of 900 volts, with the case earthed; if so, it is exceedingly doubtful whether much of the gear being sold as suitable for 500- or 600-volt circuits complies with this regulation. (According to the annual report of the I.M.E.A., a Sub-Committee of the B.E.S.A. has decided that the margin of 50 per cent. is much too high.)

In any case, it is one of the weaknesses of the British system that there is no authority empowered to insist upon and certify compliance with any such regulations.

There is evidence that many of the manufacturers of electrical apparatus are protectionist in politics; but it may be suggested that a Proving House, properly supported by supply authorities and insurance companies, would furnish a very much more effective protection of British manufactures against cheap foreign accessories than would any import duties within the realm of practical politics.

Surely it is not beyond the wit of the various interests to devise such a scheme. The embryo is in the new I.E.E. Rules, and there is an actual example successfully working on the other side of the Atlantic. Will anyone who has had experience of the internal working of the American Underwriters' Laboratories please tell us something about them?

Invisible Atmospheric Pollution.

A NEW light is thrown upon the origin of many obscure forms of physical and mental disease and indisposition, which have become increasingly prevalent of recent years, in a highly suggestive monograph by Dr. W. Vernon Sinclair, entitled "Combustion and Atmosphere and their Relation to Disease."*

We are reminded in the foreword that the heating apparatus of greenhouses and hot-houses is always so arranged that no products of combustion can enter the houses, because "every gardener knows that plants wither and die if they are given air to breathe which is impregnated with gas and coke combustion products."

Stress is laid—and we think rightly—upon the incompleteness of the Smoke Abatement Committee's recommendations which, the author points out, "appear to be founded, not on the effects of combustion vapours which are virulently poisonous, but upon visible smoke which may be almost entirely composed of carbon, and therefore non-poisonous, though mechanically annoying and disturbing."

Among the invisible sources of atmospheric pollution, carbon monoxide is, in Dr. Sinclair's opinion, the most deadly. Like carbonic acid, it is tasteless, colourless, and odourless, but whereas carbonic acid acts chiefly by displacing oxygen, and does not form a chemical combination with any constituent of the blood, carbon monoxide is a true and active poison, not only displacing oxygen but entering into chemical combination with the haemoglobin of the blood, so that in continued inhalation, a store of organic poison remains in the *tissues*, and although the *blood* may be re-oxygenated by pure fresh air, muscular exertion will cause the blood to re-absorb carbon monoxide from the tissues, thus bringing about a return of the original symptoms. Hence a long-continued process of interchange between fresh air, blood, tissues, and tissue-cells is unavoidable for complete rehabilitation after breathing, for any length of time, air containing even a weak mixture of carbon monoxide.

In slow-combustion stoves, access of air is purposely restricted, thereby promoting the formation of carbon monoxide which, as Dr. Sinclair rightly points out, passes through hot cast iron with remarkable facility. He considers that the great extension of heating and cooking by gas and warming by slow-combustion stoves is responsible for the vitiation of the air of dwelling places to a degree which has become a menace to national health. Lighting, heating, and cooking by gas are therefore condemned, as well as slow-combustion stoves, unless they are so arranged that the removal of all products of combustion from the house is assured. The almost universal neglect of this necessary precaution has not escaped the notice of the authorities. A report to the Board of Trade on Carbon Monoxide in Public Gas Supplies, made by Mr. W. J. A. Butterfield, one of the Gas Referees, was issued on July 31st, 1924. Mr. Butterfield recommends the elimination from the trade of all types of fittings liable to become unsound after a few years' use, and all flueless "heaters" or other appliances which are apt to evolve carbon monoxide. He also recommends that the Board of Trade shall take steps, if found necessary, to secure to local authorities powers to stop the sale and supply in their

* John Bale, Sons & Danielsson, Ltd. 2s. net.

districts of gas appliances which do not fulfil the requirements as to trustworthiness. The results of lengthy atmospheric tests carried out by Dr. Sinclair in a well-built London house confirm the wisdom of Mr. Butterfield's recommendations.

We are not surprised to find Dr. Sinclair a strong protagonist of electricity for all domestic purposes, because the absence of *any* products of combustion in electric lighting, heating, or cooking appliances precludes the possibility of imperceptible (and therefore all the more dangerous) gradual poisoning by gases which are not detected by the senses.

The monograph is addressed *ad populum*, and although touching at times upon technical matter, will throughout be readily "understanded of the people."

Dr. Sinclair deals with an aspect of hygienics which heretofore has certainly not received the attention it deserves. His work should serve to awaken us to the risks to which we are exposed by the heating and lighting methods referred to, and to emphasise the importance of wider legislative powers to abate, not only *visible* smoke, but also the wholesale discharge into the atmosphere of manufacturing towns and cities, of quantities of *invisible* poison gases.

A Memorial to Michael Faraday.

WE learn with some surprise, from a paragraph in the *Evening Standard*, that no public memorial to Michael Faraday has yet been erected in this country. This statement has been made on the authority of his cousin, the Rev. J. W. Faraday, who knew him personally.

The great apostle of research, who laid the solid foundations upon which the whole superstructure of electrical engineering has been built, made no attempt to exploit commercially his epoch-making discoveries and inventions; for him it was sufficient reward to know that he had explored and opened up new fields, and he presented his priceless treasures to the world in return for a bare subsistence. Of necessity he lived and died in a period when the ultimate value of his gifts could not even be surmised, for there was no electrical industry to do honour to his name. It may be said of him, as of Sir Christopher Wren, that those who seek his monument need only look around; but are we to be content with such a recognition of the life-work of our greatest physicist? It is true that in every country of the world his work is to be seen—but it is not associated with his name.

We cannot believe that the great electrical industry of this country, Faraday's native land, which to-day is prosperous when other industries languish, will suffer the reproach to lie upon it that it failed to place on record in appropriate form its appreciation of his high merits, to which it owes its existence. Nor will the sister industry—that of manufacturing chemistry—which has recently celebrated the centenary of Faraday's discovery of benzene, be backward in remedying this omission. A committee should be set up to raise funds for the purpose of creating a memorial worthy of so great a subject, and we trust that the Council of the Institution of Electrical Engineers, which has already associated his name and portrait with its most honourable award for scientific merit, will hasten to be the first to take action.

Electricity Supply in Paris.

A RECORD of further progress is contained in the annual report of the Compagnie Parisienne de Distribution d'Electricité, which has a monopoly of the supply business in the French capital. The number of consumers, which stood in round figures at 379,000 at the close of 1923, increased during 1924 to 442,000, and the consumption of energy advanced from 300,948,000 kWh to 356,426,000 kWh. In 1924, 152 millions of this total represented the consumption of energy for power purposes, or an increase of 15 per cent. over 1923, while the consumption for lighting purposes rose by 21 per cent., from 168 millions to 204 millions. The maximum power supplied to the Paris network amounted to 225,000 kW, or 32,000 kW in excess of 1923, and in addition about 25,000 kW was purchased from other producing companies. A further development of the demand took place in the first quarter of 1925. The company has proceeded with the execution of the extension programmes approved by the City Council, sanction having been given since the end of 1918 to five programmes representing a total expenditure of 630,000,000 fr., of which 470,000,000 fr. had been expended down to the end of last year. A sixth scheme was presented to the City Council at the end of 1924, proposing an outlay of 156,000,000 fr. in order to bring the transforming and distributing plant on a level with the increased productive capacity of the generating stations. The share of the City in the net profits for 1924 amounts to 21,490,000 fr., while the surplus available to the company is 33,353,000 fr., permitting of the payment of a dividend at the gross rate of 60 fr. per share.

Electricity Supply—1920-1923.

IN our issue of Jan. 16th, 1925, we reviewed a Return compiled by the Electricity Commission, giving full particulars relating to authorised electricity supply undertakings in Great Britain, from the administrative side; we have now received from the Commissioners a companion volume, described as a "Return of Engineering and Financial Statistics" and covering the years 1920-1923. This volume of 628 pages contains a vast store of information and data, correct up to the end of March or middle of May, 1923, for local authorities, and to the end of 1922 for companies. The first questionnaire was issued in November, 1921. We understood that the Commissioners are considering the issue of a further Return as soon as possible, for the two years 1923-24 and 1924-25, and hope afterwards to issue a volume annually.

The present issue (which may be obtained from the Stationery Office, price 15s. plus postage) gives for all undertakings particulars of the system of supply, plant installed, max. demand and load factor, fuel consumption, output (analysed), and other data, for each of the three years covered; it also contains detailed statements of expenditure and revenue, working costs, surplus, and the mode of appropriation. These statistics occupy the bulk of the volume, the remainder being devoted to summary tables and generalised information regarding the technical and financial position of electricity supply undertakings, as well as classification tables, &c. Altogether it is a remarkable production, which will give food for cogitation and deduction in abundance, and whilst we have only been able at the moment to gauge its potentialities, we have no hesitation in congratulating its compilers on a monumental achievement, which reflects upon them the greatest credit.

It is interesting to contrast this huge effort with previous attempts on the part of the Government to compile statistical information regarding the electricity supply industry. The preface states: "A fact which impressed the Electricity Commissioners at the outset of their duties in 1920 was the lack of comprehensive official statistics covering the public supply of electricity in Great Britain as a whole"; no wonder—as far as we can ascertain, the only Returns previously issued were those prepared by the Board of Trade and published in 1901 and 1902, for the years 1899 and 1900. These were White Papers of 8 or 9 pages each, and were very incomplete; they dealt with only 126 local authorities and 63 companies, and cannot have been of much utility. But let us not be too critical of the work of an inadequate staff a long time ago; electricity supply was only a side line with the Board of Trade—it is the whole purpose of the Electricity Commissioners, whose Return will be dealt with more fully in a later issue.

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Low-Frequency Inter-Valve Transformers.

Considerations affecting their Design.

By J. STEVENS.

IT is a curious fact that when any firm of electrical engineers decides to manufacture radio instruments, the first component which seems to receive attention is the l.f. intervalve transformer. Why this should be is hard to understand, since the correct design of such transformers is a very difficult matter requiring extremely careful study and consideration.

In common with power transformers, more widely known and understood in electrical circles, the intervalve transformer consists mainly of three parts: (*a*) iron core, (*b*) primary winding, and (*c*) secondary winding. If a satisfactory instrument is to be the result of our design, it is necessary to study these three main parts both separately and in combination. The design of the iron core is very dependent on the primary winding, so that it would be as well for us to study this winding first of all.

When telephony is being received, the primary of the intervalve transformer receives a current oscillating at frequencies varying from 200 to 3,000 cycles per second, rapid changes in the frequency taking place as the signal, which may be either speech or music, continues. In order to maintain the articulation in its original pure form the primary circuit must be quite free from any conditions which will tend to vary the frequencies or prevent their rapid change. Another desirable feature, from an efficiency standpoint, is that the impedance of the primary winding shall be as low as possible, although when the transformer receives its primary current from a thermionic valve, it is essential that this impedance shall not be less than the anode impedance of the valve to which it is coupled. The capacity of the winding should also be as low as possible in order to avoid resonance or "booming" effects at certain frequencies, while the high-frequency resistance and current-carrying capacity of the wire have also to be given consideration. In order to further avoid resonance effects, the inductance of the primary winding should be as high as possible. This, of course, will bring the natural frequency outside the limits of audibility.

To abbreviate these points, we can say that the desirable features of an intervalve transformer primary winding are:

(*a*) Low impedance, which, however, should not be lower than the anode impedance of the valve.
(*b*) Low self capacity, to avoid resonance effects.
(*c*) High inductance, to bring natural wavelength outside audible limits.
(*d*) Low high-frequency resistance and ample current-carrying capacity of wire.

Thus it will be seen that (*a*) is in itself a sort of compromise, while (*a*) and (*c*) are directly opposed to one another, and our problem seems very intricate even at this stage.

Now, as the winding possesses both capacity and inductance, we can look upon it as an oscillatory circuit, the natural frequency of which can be determined from the formula—

$$n = 5.033 \times 10^6 / \sqrt{CL}.$$

where n = oscillation frequency of circuit in cycles per second,
C = capacity in microfarads,
L = inductance in centimetres.

From this it will be seen that in order to bring the natural frequency outside the limits of audibility, the product LC must be made very small, thus making the natural frequency high.

If the primary of a transformer has a low impedance it follows that it must have a low inductance, and as, therefore, the winding will be small, it will possess a low capacity also, and this appears to meet the condition of having a natural frequency outside audible limits. In practice, however, we are confronted by another trouble in the shape of "howling" or the persistence of high-frequqency oscillation. This can be overcome by bringing the natural frequency of the primary much closer to the audible limit, and to do this we must either increase the inductance or the capacity. It will be realised from the opening remarks that both methods are detrimental, the former from the point of view of impedance, and the latter from that of resonance. The best solution apparently would be to provide an independent condenser across the winding and to keep the inductance as low as possible. With this arrangement the natural impedance and capacity of the coil are kept low, while the natural frequency of the winding combined with the condenser is brought closer to the audible frequency and "howling" eliminated. The shunting condenser will, in addition, tend to improve the power factor and consequently the efficiency.

With regard to the size of the wire to be used in winding the primary, a suitable size can be chosen from tabulated data to suit the range of frequencies. Generally speaking, however, No. 36 S.W.G. seems to best meet the conditions obtaining in the primary winding of an intervalve transformer.

Our next consideration is the iron core and, with the exception that the effects are magnetic, the conditions are the same as in the primary winding. The core receives high-frequency magnetic impulses whose strength is dependent on the ampere turns in the primary winding. For pure transformation it is essential that these impulses shall be in absolute synchronism and have a wave form identical with the current oscillations producing them. Should any form of natural or superposed non-synchronous magnetic impulses be present, or reluctance in the iron to rapid changes of flux, distortion of the wave form will result.

The ideal iron core would have a straight line magnetising and de-magnetising characteristic curve, but, of course, this is a practical impossibility. The degree of magnetism of the iron is also an important factor, as if too little, or too much, ripples will be set up in the wave form.

In the case of an iron core working on the flat portion at the upper end of the magnetising curve, the resultant wave will be flat-topped, and a strong harmonic of three times the fundamental frequency will be produced. This will be impressed upon the fundamental from which it will differ in phase by 180 deg., and will not only distort the wave form, but will also affect the hysteresis of the core in so far that it will now have to handle a secondary flux three times the frequency of the fundamental flux and 180 deg. out of phase with it. This will tend to neutralise the fundamental and produce "woolliness" of articulation. Similar conditions, although less marked, will be obtained if the iron is worked at the flat portion at the bottom of the magnetising curve.

The magnetic inductance of the iron used for the core should be about 3,000 lines per sq. cm., *i.e.*, on the steepest portion of the magnetising curve, at which point very rapid changes in the frequency of the magnetic impulses can be obtained with the minimum of distortion.

An excellent core can be made up from "Stalloy" stampings of "T" and "U" shape, assembled alternately so that no gaps occur due to the overlapping of the pieces. Each lamination should be insulated from its neighbours by paper and arranged so that the "U" section is completely insulated from the

"T" section. It is of the utmost importance when using shell-type laminations that there shall not be a complete circuit of iron round the coil. No rivets should be used to clamp the core, but the laminations should be held together by two clamps, also insulated from the stampings, and so arranged that they do not cross the line of any stray fields, which would set up eddy currents in them.

We must now turn our attention to the secondary winding, but before dealing with this part in detail, a note on the question of the ratio of transformation would not be out of place. Theoretically, the ratio of the turns of an intervalve transformer should equal the square root of the ratio of the secondary load to primary outside impedance. This, however, does not work out in practice, as many difficulties present themselves. Thus, we can only determine the ratio by approximate formulæ which have been founded on practical experience. A good formula for the purpose is—

$$\text{T.R.} = 250{,}000/\text{V.P.}$$

where T.R. = turns ratio,

V.P. = anode impedance of valve to be connected to primary.

The secondary winding of the transformer should in no way unbalance or distort the effects in the primary or iron core. It has a larger number of turns than the primary, as a "step-up" effect in voltage is required, so that we have now to deal with a winding having an inductance many times greater than that of the primary, and whose capacity, owing to the mean diameter of the turns being greater, is comparatively large also. It follows, therefore, that the natural wavelength is large and the frequency low, as nearly as possible within the range of audibility. It is essential that the capacity be reduced, as the natural frequency of the coil must be brought outside the limits of audibility. No reduction of inductance can be made to obtain this end.

Unless the natural frequency of the coil is brought outside the audible limits, considerable booming will take place on any signal having a frequency the same as that of the coil. The capacity of such a winding may be decreased by increasing the number of layers of wire in the coil by winding in sections, or by increasing the distance between the layers, or by using some form of insulation having a low specific inductive capacity between the layers.

From a mechanical point of view, the wires in the secondary windings should be held in spaced relation to each other by some non-resonating material, and this remark also applies to the two main windings themselves.

These few notes will show the technical difficulties which are encountered in intervalve transformer design and, it is hoped, will help engineers desirous of turning their energies in this direction.

A Neglected Instrument of Precision.

The Necessity of a Close Study of Language.

By T. J. MONAGHAN, B.Sc. (Eng.) Hons., M.I.E.E.

ENGINEERING is neither a science nor an art, but a combination of the two; it consists of collecting and classifying facts about those unvarying successions we call the laws of nature, and applying the knowledge so obtained to practical problems. The engineer finds out how things can be done, then does them as they should be done.

Science is based upon experiment, and fundamentally experiment is measurement; the engineer's aim is to carry principles into practice efficiently, and efficiency is rooted in measurement. The two-fold demand for means of measurement, in investigation and in execution, is liberally catered for to-day; the range of choice of instruments for almost every useful measurement is wide; we have available delicate, sensitive apparatus for the laboratory, robust, almost foolproof appliances for industrial use. The modern engineer prides himself on appreciating to the full the importance of accurate measurements, yet too often he neglects the most vital measurement of all, for who among us "always measures the length and breadth of his assertions"?

Now every assertion has two aspects, the thoughts upon which it is founded, and the way in which these thoughts are expressed. No engineer will admit for a moment that he is not a clear thinker, yet it cannot be denied that some engineers neglect to acquire the art of writing a clear, well-balanced statement. The mental attitude of such a delinquent appears to be: "I have done the work and have no time to waste in pretty writing about it. I would rather not write anything, but if I must write, then I will spend only so much time on it as is absolutely essential for putting the results on paper. Then I will get on with my real work." This attitude is quite a wrong one. In the interests of efficiency it is the duty of the engineer to communicate to his fellows any special knowledge he has acquired, for an engineering problem is not completely solved until the solution is available for the world at large; much useful knowledge fails to be circulated because its possessors decline to grapple with the pen. Again, an engineer is often called upon to give the benefit of his technical knowledge to non-technical people; he should, of course, give them the full benefit of his knowledge, and the extent to which he does so depends very largely upon the way in which his report marshalls the facts, draws up the arguments, and states his conclusions. Ability to express one's views and ideas effectively, and to drive home one's arguments convincingly, is, then, so important that a plea may well be urged for the closer study by the engineer of that most flexible and potent instrument for the measurement of assertions—the English language.

A close study of language is essential to all whose work calls for precision of statement. Language is a most important, if, indeed, not an indispensable, instrument of thought; who does not know that uncomfortable condition when ideas he cannot put into words float elusively in the mind, and the feeling of grasp and possession acquired when the ideas are captured by finding for them appropriate words? Language is the sole vehicle for the communication of all but the simplest ideas; through it we are indeed heirs to all the ages; by it we may attain some small share of immortality, if, perchance, records of our work lessen the labours of those who shall take up after us the search for engineering truths.

Language is used to convey our thoughts, and for our present purpose may be defined as combinations of words; we must consider, then, first words, and afterwards their combinations.

Words in many respects resemble money. Money is a medium of exchange; its value as money is exactly what we agree it shall have, and if the parties to a transaction involving a transfer of money have different ideas as to its worth, then before they can do business they must agree upon a rate of exchange. Now words are the currency of ideas, and there is often a rate of exchange between users of words, though unfortunately this may not be appreciated by the parties to the transaction. To the user a word means what *he* intends it to mean, to the hearer the word means what *he* thinks it means, and unless user and hearer attach the same significance to the word, confusion arises. The careful

writer will, therefore, endeavour to ensure that the words he uses to carry his ideas shall convey them without modification, by using ordinary words in their generally accepted senses, and where, as often happens, quite ordinary words have several meanings, he will make clear which of them he has in mind. Cultivate the habit of looking up in a good dictionary all words of whose meaning you are at all doubtful, and soon you will be referring to it for words the meanings of which you once were sure you knew perfectly. Technical terms are intended to express quite definite ideas, but with the rapid growth of scientific knowledge technical language is falling into arrears, and, as a result, some technical terms have more than one meaning, so that almost as much care is needed here as with ordinary language, to see that your words carry your exact meanings. You can take a horse to water but you cannot make him drink, but if you don't take him to the water he won't have a chance of drinking; so that while you cannot ensure that your readers will grasp your meaning, you can at least ensure that the responsibility for failure to do so does not rest on you.

Alive to the importance of selecting his words carefully, the writer now enters upon the task of forming them into proper combinations. We are not concerned here with correctness of grammatical structure, of which a reasonable standard is relatively easy to attain, but with combinations of words in a wider sense. What is the real aim of all professional writing? Surely it is to carry conviction, to bring others round to our point of view, to persuade them to adopt the course we advocate; in short, to carry our point?

If we are to have any opportunity of doing this, what we write must be read, and being read must be understood. To ensure that it shall be read we must make it interesting; to ensure that it shall be understood we must make it clear. But while different people may be interested in the same thing, they are not all interested in the same aspects of it. The technician is interested in why a thing happens, how a result may be attained, how a difficulty may be overcome; the business man is interested in when a thing can be done, how much it will cost and how much it will save; so that it is necessary first to ascertain the view point of the particular audience we wish to convince. Having decided the general method of treatment which will be best for our special appeal, the next point to decide is the method of approach. If the information we have to convey is such as the audience is prepared to believe if clearly laid before it, then an orderly straightforward method of explanation is best. But it often happens that our findings are likely to be unwelcome to the audience, and considerable care is necessary in such cases. The obnoxious statements should not be made until arguments have been adduced that will convince the audience that the statements must be accepted. When dealing with sceptical audiences there is a natural temptation to let oneself go in demolishing the opposition, but it is wiser merely to show that we are prepared to meet all objections to our arguments; our object is not to compel our audience to admit that its former views were wrong, but to persuade it to admit that our view is correct.

Facility in writing is not to be attained without diligent practice and the cultivation of a spirt of severe self-criticism. No matter how skilful one may be, it is useful in all important cases, if time permits, to put the completed report aside for a while, and to come back to it when the enthusiasm of composition has evaporated. If you do not find much that you will wish to amend, many obscurities where you thought all was crystal clear, you are indeed gifted.

And always remember that what your readers do not understand is useless. There are varieties in methods of expression. There is that of which no man can grasp the author's meaning, that from which an intelligent and persevering reader can unravel some shreds of the author's meaning and that the proud author of which can boldly "deny the ingenuity of man to give to our words any other meaning than that which we ourselves intend them to express." Strive diligently after this last!

Indian Electrical Trade.

(From our Indian Correspondent.)

For the last two or three years Indian electrical trade has shown a steady decline. During the first quarter of 1925, however, a slight tendency towards improvement was recorded. The imports of electrical machinery during January, February, and March amounted to 62½ lacs, as against 60 lacs during the corresponding period of the preceding year. In the case of electrical instruments and apparatus, an increase has also been recorded, the imports amounting to 62 lacs, as against 58 lacs in the first quarter of 1924, an increase of 7 per cent. In electrical machinery, a large increase of 11 lacs was recorded under miscellaneous kinds, while all other heads considerably declined, leaving a balance on the total of 2½ lacs of increase. Control and switchgear declined from 12½ to 11 lacs, generators and dynamos from 8 to 7 lacs, and meters from 14½ to 11½ lacs. The share of the United Kingdom in the total was 54½ lacs, as against 48½ lacs, an increase of 6 lacs. The United States also increased her share from 5 to 5½ lacs, but Germany's share, which is already small, declined from 1½ lacs to 1 lac.

In the trade in electrical instruments the share of the United Kingdom increased from 44 lacs to 46 lacs, not an insignificant improvement considering that during 1924 the imports from the United Kingdom considerably decreased. The share of the United States remained almost stationary at about 4½ lacs, but the share of Germany actually increased from 4 to 6 lacs The imports of fans remained unchanged at about 9 lacs, but wire and cables increased from 21 to 28 lacs. The share of the United Kingdom in the latter case increased from 20 to 23 lacs, and in fans from 4 lacs to a little over 4½ lacs.

Socialism and Electricity.—Alderman Herbert Morrison, L.C.C., spoke on the subject of "Socialism and Electricity" at a meeting held recently under the auspices of the Hackney Independent Labour Party. In the course of his speech the alderman said that it was a vital and urgent question both in the Parliamentary and municipal fields whether British electricity supply and distribution was to be a public service run for the public good, or whether it was to be a private monopoly run for the purpose of securing profits to individuals, rather than securing prosperity to the people as a whole. The greater part of London was going to be handed over to a private electrical trust until 1971, but he hoped that before that time came there would be a Socialist Government in office again, with a Socialist Parliament behind it, and that they would undo the contract now being made by the present Government and the L.C.C., with private interests. In Greater London, the municipal supply had proved itself to be more enterprising and more economical than private ownership. They were still in the habit of saying that electricity was in its infancy. It had got beyond its infancy: it was being used for an increasing variety of purposes—not as an experiment, but as a practical part of everyday industrial life, and increasingly in domestic life.

Concrete Hardening and Waterproofing Compound.—We have received some interesting particulars concerning "Cemenfortis," a product of the Harvie Corporation, Ltd. It is a liquid chemical compound used for the hardening and waterproofing of concrete by virtue of its property of effecting complete combination of the concrete constituents. It is added to the gauging water, and carried through the mass of mixed concrete regardless of a variation in the size of the component materials. It combines chemically with the free lime of the cement, and with the particles of silica in the aggregate, forming hydrated calcic-silicate; and the voids in ordinary cement are filled with this cement solution. At the same time it is said to crystallise, forming a hard insoluble mass. The chemical combination brought about renders the concrete extremely hard and impervious to water under pressure. After adding "Cemenfortis" to cement, mortar and concrete, they become "fatty" compounds, giving a firm and yet cohesive workable mass ideal for trowelling. Another useful property of this compound is that it prevents concrete from freezing at the ordinary freezing temperature and it is claimed that it will permit of perfect hydration at 13 deg. F. This useful substance has been applied to many uses, including the construction of concrete water tanks and the treatment of damp walls.

The International E.H.P. Conference.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

(*Continued from page* 1009. Vol. XCVI.)

The Papers.

This biennial conference is taken very seriously, and a large number of papers are dealt with. Together with reports—they numbered over 112—a marked increase on the 89 originally anticipated. They were discussed in three main groups: (I) The production and transformation of energy; (II) The construction and insulation of transmission lines; (III) The development of the transmission.

A conference such as this affords an opportunity for reviewing the general situation at the present day and also for estimating future progress. It is here proposed to consider the more important points raised in the papers, in the order given above.

Group (I) was subdivided as follows:—Boilers; construction of alternators; interconnection of power stations; operation in parallel; oils for transformers and switches; testing of generators and transformers; substations.



2 1 3

1, The President, M. Doumergue; 2, M. Legouez (President of the Conference); 3, Dr. C. O. Mailloux (President of Honour of the Conference).

On the left in the second row are the British delegates, Messrs. S. C. Bartholomew, H. E. Midgley, A. Page, P. V. Hunter, W. B. Woodhouse (Vice-president), and R. B. Matthews.

Reception of the Principal Delegates by the President of the French Republic.

Boiler-house Matters.—As the president of the first section remarked in the summarised report of its work, boiler-house matters would seem a little outside the scope of the section; however, the papers presented by Mr. E. Lafon and Dr. W. Lulofs were of some importance in this connection. A plea was made for the chimney as against the blower, it being claimed that present-day design could increase the efficiency by as much as 50 per cent. Dr. Lulofs gave the results of his experience with powdered fuel. He prefers the unit system (one boiler, one powdering plant) as compared with the American practice of a central system. One advantage is that the mills can take hot air from between the double walls of the combustion chamber; altogether it is claimed that as efficient results can be obtained from the unit system as from the central system, while the former has many more advantages.

The construction of alternators was examined in three papers, which gave the latest phases of technical construction (Messrs. E. Roth, M. Langlois, and E. Wilczek). Mr. Roth pointed out the necessity, in the case of turbo-alternators feeding lines having a large capacity, for designing the armature reaction to be sufficiently weak to assure stability of running under all conditions of operation and to avoid self-excitation. In order to retain the instantaneous value of the short-circuit current within permissible limits, the armature leakage must be artificially increased, *e.g.*, by leakage slots. Langlois described in detail the design of a 15,000-kW alternator for operation at either 25 or 50 cycles in a Paris station, which supplies at both frequencies. This was accomplished by connecting the machine so that it could either be used as a 4-pole or a 2-pole unit. However, the problem did not end at this point, and the author gave further particulars of the solution. Dr. Wilczek gave some results obtained by the firm of Ganz, of Budapest, in the construction of high-speed alternators (3,000 r.p.m.), wherein an attempt had been made to greatly improve the characteristics of true sinusoidal wave-form, overload, single-phase short-circuit, &c.

Interconnection of Networks and Parallel Working.—Sartori drew attention to the work of Prof. Donati, of Bologna University, in applying the principle of reciprocity to the calculation and operation of large networks. This work should do much to facilitate the mathematical analysis of the current distribution in the large distribution systems that have come into being of late years.

The problem of the exchange of energy between linked stations was dealt with in several papers, which caused considerable discussion. Unfortunately the problem seems to be as yet a long way from complete solution. The principal points brought forward were: The calculations of the networks; the phenomena of auto-excitation; and selective protection against short-circuits. In connection with the question as to the employment of inductances, the opinion seemed to prevail that they should be eliminated and replaced by fuses, for the latter assure a security at least as great and are much cheaper. However, it appeared that the use of inductances between machines should be retained. Another interesting statement was that it was now feasible to connect networks of different frequencies. This possibility is, of course, of great interest to those countries where the frequency is not as yet standardised.

(*To be continued.*)

The World Power Conference of 1924.

A Review of the "Transactions."

SUFFICIENT time has probably not yet elapsed for a general appreciation to be formed of the far-reaching importance of the first World Power Conference, which was held in connection with the British Empire Exhibition at Wembley in June and July, 1924. There can be no question, however, that apart from their great number, the exhaustive character of the papers submitted to the Conference cannot fail to have an important bearing upon future electrical progress. It is therefore a matter of the highest importance that the work of the Conference has been collated for the benefit of future generations in the form of four volumes, some idea of the extent of which may be gathered from the fact that, apart from a large number of double sheets of illustrations and tabular statements, they comprise no fewer than 6,423 pages, and that not only is the full text of the various papers given, but also a verbatim report of the ensuing discussions.*

From this it will be appreciated that the task of reviewing the "Transactions," as they are officially styled, is by no means an easy one, and, in view of the limitations of space, it will be impossible for us to do more than briefly summarise the various volumes, drawing attention to some features of each that appear to be of particular importance.

The World's Resources.

Volume 1, which is devoted to the subject of "The Power Resources of the World—Available and Utilised," opens with a preface by the Organising Director of the Conference, Mr. D. N. Dunlop, in which he pays a tribute to the Council of the British Electrical and Allied Manufacturers' Association—which by ensuring the necessary financial support made the far from easy task of organising a World Conference possible—and to the distinguished scientists, engineers, and leaders in all parts of the globe who, by their efforts, both directly and indirectly, assisted in its unquestionable success. From the Preface we may perhaps jump to a reference to the Appendix, which gives full particulars of the opening ceremony by the Prince of Wales, the speeches at the inaugural banquet, the names of the members of all the Organising Councils and Committees, and a complete list of the delegates to, and members of, the Conference. This indicates that, apart from Great Britain, delegates were present from no fewer than a dozen different parts of the British Empire, and from twenty-nine foreign countries—literally from "China to Peru." Thus, in view of the exhaustive character of the work—and here a tribute may be paid to those who have been responsible for the editing of the "Transactions," necessitating as it did a technical knowledge of many languages, as well as to the printers and publishers—it would be ungracious to criticise, even if such were necessary.

Turning now to the papers included in Vol. I, these, as already indicated, all relate to the Power Resources of the World. There is hardly a country or State that is not dealt with, and while a good deal of space is devoted to hydro-electrical resources, the equally important ones, for many countries, of coal, lignite, peat, mineral oil, and power alcohol, are all treated in a manner, the exhaustive character of which has never previously been attained. Although it is almost invidious to particularise, we regard the information given in the papers referring to the power resources of Australia, India, Russia, Esthonia, and several others as yet not fully-developed countries as extremely valuable as affording much information that may prove useful to British electrical engineering and financing undertakings in the quest for new opportunities of enterprise. In the case of Esthonia, in a written contribution to the discussion, Mr. Alfred Dickinson, of Birmingham, considers that that country possesses some of the most important possibilities for water-power development in Europe, and, after an inspection of the site, he expresses the opinion that the scheme for the establishment of hydro-electric plant at Narwa, capable of yielding a continuous minimum of 60,000 h.p., is sound from both the engineering and the commercial aspects.

The Production of Energy.

The second volume is allotted to the papers submitted under the comprehensive headings of "Water Power Production," "Preparation of Fuels," and "Steam Power Production," the subjects being dealt with from all aspects—physical, technical, and financial. In the first category there are no fewer than about 42 papers, grouped into sub-divisions of General, Civil, and Mechanical Engineering and Operation. Every aspect of the subject is dealt with by the experts of all the principal countries of the world, thus affording in a compact form information as to the latest practice in hydro-electrotechnics that cannot fail to be of material value to all interested in this class of work. Special attention may be drawn to the exhaustive papers by Dr. H. J. Acres, the chief hydraulic engineer of the Hydro-Electric Power Commission of Ontario, on "The Generation of Hydro-Electric Power in Canada," that of Mr. A. Westerlind, the director of the Swedish Bureau of Hydraulic Construction, on "Recent Practice in Swedish Water Power Engineering," and that of Ing. L. Mangiagalli on "Dam Construction in Italy."

In a written contribution to the discussion on Water Power Production, Col. B. C. Battye, superintending engineer of the Punjab Hydro-Electric Circle, points out that it has been the custom for many years in India to use the expression "cusec" for cubic-feet-per-second as the unit of flow, and suggests that this should be made an international unit—at least among those nations using foot-pound-second units—and also that the unit of storage for power purposes be standardised in the future as a "cusec-day." In numerous reports submitted to the Conference, all sorts of different storage units were quoted, from gallons to cubic feet, acre-feet, cubic metres, &c., and in this connection we may venture the suggestion that prior to the next Conference a schedule of all these, and their equivalents in both metric and English measures, might be prepared for circulation among the various National Committees, so that in the preparation of the papers a uniform basis of dimensions and quantities might be adhered to.

The second section of Vol. II deals with "The Preparation and Utilisation of Fuels," this being divided into a trio of sub-sections—"Fuels Generally and Coal," "Preparation of Fuels," and "Utilisation of Fuels." In the first category coal takes a leading position, and in view of its importance from the British industrial point of view it is not unnatural to find a larger proportion of papers by British experts than is the case in the hydro-electric division. The subject is dealt with in the usual exhaustive manner, it being made clear that everything is being done to conserve the known coal resources of the world by utilising them in the most efficient manner. In the section dealing with the Preparation of Fuels, in addition to coal, attention is devoted to peat, shale oil, and the utilisation of wood waste, the latter having assumed considerable importance in such countries as Sweden. In the Fuel Utilisation section, the principal subjects dealt with are those of the use of coke and pulverised coal for the firing of steam boilers.

The concluding portion of this volume is allotted to

*The *Transactions* of the First World Power Conference. Four volumes. London: Percy Lund, Humphries & Co., Ltd. Price £12, or £3 10s. per volume. (Index Vol. £2 net.)

the papers on the subject of Steam Generation and Utilisation. It is with regret that we can do no more than point out that they deal with the latest steam boiler, turbine, and engine practice in all parts of the world, the information making it clear that much useful work is being done in the direction of utilising steam at very much higher pressures than has hitherto been the rule.

Internal-combustion Engines and Power Transmission.

Various branches of the Conference's work are embraced in Volume III. The first is that of "Internal Combustion Engines," in which the progress of Diesel-engine design and construction, particularly in Italy, Sweden, and Germany, is dealt with at great length. One paper also deals with large gas engines—a branch of power engineering to which great attention is being devoted in Germany, whose experts claim that they are able to turn out gas-operated engines for central-station work that show a financial economy over steam turbines. In a subsequent section are four papers dealing with various aspects of gas for power and illuminating purposes, while under the omnibus heading of "Power from Other Sources" are several papers relating to the use of wind motors, especially in Denmark and Holland, to alcohol as a source of power, and to the existence and use of natural steam in Italy.

The interest of electrical engineers in this volume will, however, be mainly centred on the three subdivisions of "Power Transmission and Distribution," "Power Station and Transmission Lines," and "Cables and High-voltage Direct-current Systems." There are close upon fifty papers on these subjects, in the course of which modern practice in all the principal countries of the world is set out in full detail. Special attention may be drawn to the great electrical development which is apparently taking place in Soviet Russia, despite the fact that international trading relations with that country have not, since the war and the subsequent political upheaval, been re-established; to the papers on the parallel working of generating stations in Holland and Italy, and to high-voltage transmission progress in France, Italy, and the United States.

M. G. Darrieus, the engineer to the Compagnie Electro-Mecanique, of Paris, in a written contribution to the discussion on the paper by Messrs. J. S. and W. E. Highfield on "High-Voltage Direct-Current Generation and Distribution of Electrical Energy," which appears in this section, and which includes a description of the "transverter" jointly invented by Messrs. J. E. Calverley and W. E. Highfield, points out that the system of conversion adopted in the transverter was invented more than twenty-five years ago, and that a number of machines have been built on this principle, some of them having been working quite recently on the French Northern Railway and in certain of the Paris districts. M. Darrieus, however, adds that this does not detract from the great credit due to Messrs. Calverley and Highfield for overcoming considerable difficulties, and accomplishing the improvement of the crude apparatus of 1898 into the powerful high-pressure machine we all admire to-day.

The remaining portion of Volume III is devoted to "Research," "Standardisation," and "Illumination." Although in the first of these divisions only four papers were presented, dealing mainly with what is being done in Austria and Sweden, they gave rise to one of the longest and most interesting discussions. In the case of "Standardisation," accounts are given of the position in Austria, the Dutch East Indies, Germany, Norway, and Sweden, while two papers deal with the question of international standardisation. In the "Illumination" section the principal contribution was that of Mr. C. W. Sully, presented on behalf of the Electric Lamp Manufacturers' Association of Great Britain.

Power in Industry and Transport, Economics, &c.

The final volume of the "Transactions" (No. IV), as might be expected, is devoted to a wide range of subjects. First, there is a collection of no fewer than 29 papers on "Power in Industry," one of the most exhaustive of which is the series collated by Mr. P. T. Davies, A.M.I.E.E., the president of the Canadian Electrical Association; it deals most thoroughly with all the varied applications of electric power in the Dominion from the largest industry down to domestic requirements. Many of the papers, while dealing mainly with the use of electricity in agriculture and rural industries in Denmark, Germany, Holland, and Norway, and other countries, also refer to other industries, and are consequently included in this section. We mention this, as otherwise it might appear that, with only four papers, the "Power in Domestic Uses and Agriculture" section had been somewhat neglected. Two of the papers in this category—those by Dr. H. Wallem, of the Siemens-Schuckertwerke, Berlin, and Mr. R. Borlase Matthews, M.I.E.E., both of whom have made a special study of electro-farming—are especially worthy of mention. Half-a-dozen papers record the progress made in "Electro-Chemistry" in Austria, Scotland, Norway, Sweden, and the United States, while there are four devoted to "Electro-Metallurgy." That veteran, Col. R. E. Crompton, figures as the author of one of the five papers on "Power for Road and Air Transport," after which we come to the "Power for Rail Transport" section, in which, in view of the importance of the subject, it is not surprising to find no less than fourteen papers, notable contributions being those of Mr. Roger T. Smith on "Electric Railways in Great Britain," and Sir Philip Dawson on "The Financial Aspects of Main Line Electrification." Other authorities deal with the progress of electric railways in Austria, Java, Germany, Holland, Hungary, Italy, Norway, Sweden, and the United States; the only country which has made great strides in railway electrification work, but of which no detailed information was presented to the Conference, is Switzerland, the only reference thereto being in the "Water Utilisation" section.

Passing over the "Power for Water Transport" division of the volume, in which out of the fifteen papers presented only one—that read by Mr. W. J. Belsey, of the British Thomson-Houston Co., Ltd., on "Electric Transmission of Power for Propelling Machinery"—calls for mention, we come to the record of the work done in what we regard as one of the important sections of the Conference—"The Economic Aspect of Power Resources." The subject is treated from many angles and also from the point of view of various countries, thus providing much matter for careful study by all—even Royal Commissions and Government Committees—interested in the extension of electricity supply in the United Kingdom.

It was perhaps somewhat daring of a Belgian engineer—M. A. Heinemann, of Brussels—to present a paper on "Electricity in the Region of London," but it is always well "to see ourselves as others see us," and the author's remark that the cost of energy supply in the County of London in 1921 was more than double that of the average in the United States, should not pass unnoticed. Two other important papers in this section were that by Mr. George Balfour, M.P., M.I.E.E., on "Financial Considerations of Hydro-Electric Development, with special reference to Great Britain," and that by Major-General Sir Philip A. M. Nash on "The Economics of World Power." As indicating the outstretching character of the Conference, it was satisfactory to find that the Labour movement was embraced in it, Mr. J. P. Noonan, the president of the International Brotherhood of Electrical Workers, contributing a paper on "Labour's Part in Power Production," while equally useful were the contributions on "Industrial Welfare and Vocational Psychology" emanating from Austria and Holland. In the Publicity Section, Mr. J. W. Beauchamp, M.I.E.E., the director of the British Electrical Development Association, dealt at length with the object and work of that body, the subject eliciting in the subsequent discussion some useful information regarding American methods.

The last division of the volume is by no means the least important, dealing as it does with the question of "Technical and Commercial Education," and a study of the various papers can be commended not only to the managers of large electrical engineering undertakings, but to education authorities in all parts of the United Kingdom, and particularly to the principals of polytechnics and technical institutes. In particular we would refer to the paper on "Co-operation of Industry with Technical Schools," by Prof. Dr. Conrad Matschoss, director of the German Society of Engineers, Berlin.

Conclusion.

As to the value of the Conference, we cannot do better than quote a few of the remarks made by Mr. O. C. Merrill, the Executive Secretary of the United States Federal Power Commission, at the closing ceremony. "What we have accomplished here," said Mr. Merrill, "I consider too great both in its amount and in its value to be encompassed within the terms of any resolution that we would be prepared to discuss to-day. We have brought together here the leading technical experts from all over the world, and we have brought together in the papers presented to the Conference the greatest contribution, in my judgment, on the subject of power that has ever been brought together—a series of contributions that will serve as text books for engineers for many years to come."

Mention has already been made of the numerous plates of illustrations and maps and sheets of tabular information which, together with the large number of illustrations in the text pages, add materially to the value of the Transactions, inasmuch as some of these were not included in the papers at the time they were read or presented. The Transactions are also of value by reason of the fact that in response to a general invitation at the Conference many who were unable owing to time and other reasons to add their quota to the discussions have since submitted their remarks and many helpful suggestions to the organising secretary, who has included them in their respective places.

Each volume is provided with its own index of the titles and names of the authors of the papers, while to render them of value to foreign as well as to English-speaking engineers, a *résumé* in French follows all papers in English and, *vice versa*, an English *résumé* is given of all papers in French. In addition, many of the Italian papers have been completely translated into English. Thus, almost everything possible has been done to render the information contained in the Transactions available to engineers throughout the whole world, no matter what their nationality. There is no doubt that the language difficulty was a serious hindrance to securing the full advantage of the first Conference, and following the result of the recent Congress in Paris, it may be that in the case of future Conferences, Esperanto will become the official language not only for the papers but for the discussions.

At the request of many subscribers, a complete and comprehensive index to the Transactions has been prepared, and is available at a cost of £2 net. It consists of a volume of 600 pages, uniform in size with those of the Transactions, and comprises no fewer than 40,000 references, so that notwithstanding the variety of the matters touched upon in the papers and the subsequent discussion, it will be possible by means of the index volume quickly to locate any desired information.

The cost of the four volumes is £12. The publishers are also prepared to offer each one singly, and no doubt this will be of service to those who are only interested in certain aspects of power development and utilisation. A suggestion that we have to make, although perhaps a minor one, is that the year "1924," which is given on the title page of each volume, might also usefully be added to the gold lettering on the binding.

The International Railway Congress.

A Review of some of the Electrical Features.

The tenth International Railway Congress was opened in London by H.R.H. the Duke of York on June 22nd, and was continued until July 2nd, when the delegates left London and visited various parts of the country, including Darlington, where the centenary celebrations of the introduction of steam railways by George Stephenson were held. The International Railway Congress Association was formed in 1885 and holds its congresses at intervals of a few years in various countries; the last held in Great Britain was 30 years ago. The Association is composed of State railway administrations and has its headquarters at Brussels; the membership now consists of 235 administrations, representing 300,000 miles of line.

The Congress was divided into five sections, one of which dealt with electric locomotives, and three sessions were devoted to the consideration of reports from various parts of the world. The various sectional meetings were held in the buildings of the Institutions of Civil and Mechanical Engineers, the reports presented for discussion numbering over 50. The delegates numbered over 800 and came from every important country in the world, with the exception of Russia and Germany. Among the social events were a banquet at the Crystal Palace on June 25th, a reception on behalf of the British Government at Lancaster House, London—where the guests were received by the Minister of Transport (Col. W. W. Ashley) and Mrs. Ashley—and a concert at the Queen's Hall on June 26th, in addition to numerous excursions to works and places of interest in and around London, Canterbury Cathedral, Oxford, Brighton, and elsewhere. Subsequently the delegates were to visit Leeds, Harrogate, Darlington, Edinburgh, Glasgow and the Trossachs.

The Duke of York was thanked for opening the Congress by M. Foulon (president of the Permanent Commission of the Congress), and the Congress was addressed by the Minister of Transport, who referred to the fact that electric traction was now being recognised as the most efficient method of dealing with the conveyance of millions of workers of the great cities of the world and, considered in relation to its application to long-distance trains, was a subject of the greatest interest at the present time.

The Congress was also welcomed by Viscount Churchill (chairman of the Great Western Railway Co., who was elected president of the Congress), and after the opening ceremony, delegates proceeded to Whitehall, where a wreath was placed at the foot of the Cenotaph.

The presidents of the five sections were respectively:—

Mr. E. F. C. Trench, engineer-in-chief of the London, Midland and Scottish Railway (Section 1; ways and works).

M. M. Weiss, engineer-in-chief of the Swiss Federal Railways (Section 2; locomotives and rolling stock, including electric locomotives).

M. du Castel, director of railways to the French Ministry of Public Works (Section 3; railway working).

Dr. J. H. Parmelee (United States), (Section 4; general railway questions).

Signor G. Semenza (Italy), (Section 5; light railways and colonial railways).

On June 24th and 25th, the various sections devoted themselves to the consideration of questions not connected particularly with electrical matters, and joint meetings of sections were held in cases where the particular matter under discussion was of interest to both. A matter of general interest was the practicability of the eight-hour day on railways, and resolutions were put forward in which the necessity for taking into consideration the special circumstances attaching to various railways was emphasised. After two days' discussion of the matter, however, no final decision was come to, and the discussion was resumed on the Thursday morning, when the matter was disposed of by the passing of a resolution which expressed the opinion that, after full statements by the representatives of the different countries, a rigid application of the eight-hour day was not possible.

Signalling: Electric Lighting.

On June 25th a great deal of attention was paid by Sections II and III to signals and signalling systems. The reporters on these subjects were:—Mr. W. H. Elliott, signal engineer to the New York and New Haven Central Railroad; Mr. W. J. Thorrowgood, signal and telegraph superintendent to the

Southern Railway, England; Mr. Carlo de Benedetti (chief signal engineer to the Italian State Railways), who dealt with Italy, Belgium, and Holland; Mr. T. Hard (Stockholm), who dealt with Denmark, Norway, and Sweden; and M. Laigle (Paris), who dealt with other countries. After discussing the position and colour of the light of fixed signals and similar matters it was recommended by the reporters that where electrical energy was available, its use should be substituted gradually for the oil lamps almost universally in use, preferably by using lamps with parallel filaments at the focus and comprising, for each main signal, one lamp lighted and another as a standby, with an indicator showing the extinction of each lamp and provision for the automatic lighting of the standby lamp. Lamps should be supplied with electricity from some source other than batteries of accumulators, even in the case of isolated signals.

Dealing with the track-circuit system of signalling, it was remarked that it was possible to work track circuits either by d.c. or a.c. on lines operating steam traction; alternating current cost more in the first instance, on account of the power transmission line, but it was less expensive to maintain on account of the absence of track and line batteries. Moreover, the a.c. track circuit was not affected by stray currents, which fact was of importance owing to the extension of inter-urban trolley lines, and the a.c. feeders which supplied the signals and track circuits could serve equally well for other uses, such as lighting a station, for example.

The applications of the automatic block, particularly in America and France, showed that this system completely met the requirements for working the traffic; it worked regularly and maintenance did not offer any special difficulties. The increased cost of labour during recent years, indeed, rendered the adoption of the automatic block system worthy of consideration from the point of view of economy not only in the equipment of new lines, but also for the transformation of the manual block system. The improvements that had been made in batteries and motors had rendered this operation easy by enabling the manual block signals to be retained.

The arguments in favour of the method of working with track normally open or track normally closed had been studied by the reporters, but they were of the opinion that the arguments either way were not sufficiently conclusive to enable a definite decision to be come to as to the advantages of the one system over the other. The main advantages of the closed track were greater safety and economy in maintenance, whilst the claim for the open track was reduced cost of installation. It was an account of the simplicity of the installation that the A.P.B. system, with track normally open, had been installed in America on single tracks, because this system enabled a large number of trains to be run.

In the course of the discussion on these reports, Mr. Thurrowgood expressed the opinion that a double-filament lamp was preferable to two single lamps, and he suggested one filament for ordinary use and one reserve filament having about 40 per cent. of the intensity of the ordinary filament. After further discussion, the paragraph in the reports relating to the substitution of electricity for oil in light signals, was modified to read as follows:—

"If suitable current is available, it might be advisable to substitute electric lighting gradually for the mineral-oil lamps almost universally in use; the technical measures on the systems which have adopted this method of lighting are in general that, in case of the lamp being extinguished, a standby and as far as possible a system of control shall be in operation."

Another suggestion made by the reporters was discussed, *viz.*, "Luminous signals having been brought to such a state of perfection as to give great efficiency and a great measure of safety, their use is to be recommended in areas in which an electricity supply is available, and particularly for use on lines worked by electric traction, in tunnels, in large stations, and on approaching stations." It was suggested by one of the French representatives that the wording of the above sentence was too strong, because the introduction of this system of signalling might, in certain circumstances, be very expensive. Another French delegate, on the other hand, spoke of the beneficial results which had followed the adoption of luminous signals and thought it advisable to consider the possibility of their use in those districts where electric power was obtainable, more especially on electrified lines.

The Banquet.

On the Thursday evening, June 25th, a banquet was given to the delegates at the Crystal Palace at which Sir Guy Granet (chairman of the Congress) presided, and was supported by Sir Philip Cunliffe-Lister (president of the Board of Trade), Lieut.-Col. Wilfred Ashley (Minister of Transport), and many other representatives of Government Departments and railways throughout the world, the company numbering some 1,500. There was nothing of direct electrical interest in the proceedings, the outstanding point being the emphasis laid upon the manner in which railways could develop the trade of a country and, by their inter-working, assist in the promotion of friendly relations between the nations of the world.

(*To be continued.*)

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The "Electrical Review" Index.—The Index for the last half-yearly volume of the ELECTRICAL REVIEW (January to June, 1925), will shortly be published. Copies will be forwarded post free to those requiring them for binding or for reference purposes, if they will make application to the Publisher, ELECTRICAL REVIEW, 4, Ludgate Hill, E.C.4.

Mullard Window Dressing.—We have received from the Mullard Radio Valve Co., Ltd., a picture of a window display at the premises of Mr. A. J. Selby, of Burton-on-Trent. This is a very effective piece of window dressing arranged with the aid of the company's publicity service.

Electrical Work at Wembley.—MESSRS. G. W. ROBINSON inform us that they have supplied the whole of the lighting equipment at the Burma Pavilion, for Messrs. Schweppes, Ltd., and are using similar reflectors to those used in the Ideal Home Exhibition gardens. These reflectors give an artificial sunlight effect. The firm has also supplied the whole of the water heating apparatus in this building, and has contributed to the flood lighting of the grounds. The large self-contained electric fountain, 6 ft. in diameter, which is fitted in the centre of the Australian Pavilion, was also provided by Messrs. Robinson, as well as the portable electric floor fountains at the Co-operative Wholesale Society's stand in the Palace of Industry and the fountain at the entrance of the Canadian Pacific Railway building.

Inquiries on Overseas Commercial Matters.—The Department of Overseas Trade desires to remind United Kingdom exporters requiring information on overseas commercial matters that it is always desirable to approach the Department rather than to write directly to the representative in the market concerned. Frequently the information desired is already available in the Department, and direct application to the Department thus results in the saving of much time. Where the information is not so available, the Department takes immediate steps to secure it and to forward it to the inquirer. It is particularly emphasised that the methods sometimes adopted of addressing the same inquiry simultaneously to the Department and its overseas officers leads to unnecessary duplication of work and to delay.

Staff Salaries at Glasgow.—The Glasgow Corporation Conditions of Service Committee, as an outcome of correspondence between the General Manager of the Electricity Department and the Electrical Power Engineers' Association, has decided that in cases of promotion under the schedule of salaries of the E.P.E.A., the increase in salary shall be made immediately, and not in three increments, as was the method in the original agreement with the E.P.E.A., and that this decision shall be given effect to in two cases submitted.

Radio Exhibition at Glasgow. — An exhibition of radio apparatus will be held in Glasgow in connection with the Housing and Health Exhibition which opens in the Kelvin Hall on September 23rd. The National Association of Radio Manufacturers and Traders is organising the exhibition, which will be all-British in its composition.

Electricity Workers' Wages.—In a recent letter to its constituents the District Industrial Council for the Electricity Supply Industry (West Midlands area) stated that in consequence of changes in the average cost of living index figures there would be a reduction of ½d. per hour in the wages of adult employés as from July 1st; and also a corresponding decrease in the pay of youths and apprentices.

E.D.A. Activities.—In the latest pamphlet published by the British Electrical Development Association the dangers of dust are emphasised and it is pointed out that sweeping and beating carpets are very insanitary methods of cleaning them. The obvious alternative—an electric vacuum cleaner—is suggested.

An Eiffel Tower Advertisement.—A striking departure in the realm of advertising is the lease for eighteen months of the Eiffel Tower by the French firm of motor-car manufacturers known as Citroen. The firm is now engaged in fitting the well-known tower with electric light cables for a gigantic illumination of the tower on a groundwork of electric stars. The word "Citröen" will be marked in red flames of light 1,000 feet in length. The top of the tower which is 1,000 feet high, will be crowned with a huge red light which will be flashed over Paris every night.—*Financial Times.*

An "Exide Service" Convention.—On June 23rd and 24th over 240 representatives of "Exide" battery service agents took part in a convention at Hendon. Such subjects as constant potential charging, the repair of celluloid batteries, and the new Home Office regulations applicable to battery-repair shops were dealt with by experts to the visitors' advantage and consequently to that of their customers.

Trade Mark Registration in Japan.—The Department of Overseas Trade informs us that in accordance with a new Japanese ordinance it is now possible to renew a "pre-earthquake" registration at any time upon payment of a small fee, although the original period laid down for such re-registration terminated on April 30th last. The amendment is therefore tantamount to an indefinite extension of the original period.

Trade Announcements.—The Sun Electrical Co., Ltd., states that all communications relative to its business in the Midland area should in future be addressed to the head office. The branch agency for Birmingham and district, held for several years by the County Engineering and Lighting Co., has been terminated.

The firm of Bastian & Allen, water heating specialists and manufacturers of the Bastian geyser, has now amalgamated with the Bastian Meter Co., Ltd., thus combining the two firms started by the late Mr. C. Orme Bastian. The central offices of the concern will be 58, Haymarket, S.W.1, and all correspondence should be addressed there.

Messrs. John M. Henderson & Co., Ltd., makers of hoisting and transporting machinery, have removed their London office to Amberley House, 12, Norfolk Street, Strand, W.C.2. Telephone: Central 8927. Telegrams: "Needreba, Estrand, London."

Messrs. Peter Brotherhood, Ltd., have opened a branch office at 324, Harrogate Road, Leeds, from which Mr. E. Markham will represent them in Yorkshire, Durham, Northumberland, and the Grimsby area.

The address of Walker Vehicles, Ltd., is now Clare House, Kingsway, W.C.2. Telephone: Gerrard 6954; telegrams: "Walkveco, Westcent, London."

Bankruptcy Proceedings.—W. R. Grigsby, electrical factor, 184, Grays Inn Road, W.C., trading as the Wenham Lighting Corporation.—The first meeting of creditors under this failure was held on June 23rd at Carey Street, W.C. The receiving order was made on the petition of Drake & Gorham Wholesale, Ltd. The Official Receiver reported that it appeared that debtor took over the business, which was insolvent at the time, paying the creditors a composition of 5s. in the £. After the armistice the debtor devoted most of his attention to the electrical side of the business, but he was unable to make a success of it. In 1924 he made a heavy loss on the sale of goods to Mr. J. W. Clark, who had secured a contract for lighting at Wembley. He entered into a partnership deed with that gentleman's wife, it being agreed that they should share the profits equally, and that he should supply Clark with goods for the contract in the usual way of business and allow him extended credit. Mr. Clark was, however, unable to pay for the goods supplied to him by the debtor. The latter had further stated that he had been held liable for goods supplied to Clark by the petitioning creditors, who obtained judgment on the ground that he was Clark's employer and as a result instituted those proceedings. A further cause of his trouble was that a traveller left his employ and started on his own account, taking away some of his customers. A private meeting of the creditors was held in April last, when an offer of a composition of 10s. in the £ was rejected and a deed of assignment was executed in favour of a trustee who had since employed the debtor as manager. No statement of affairs was lodged, but the debtor returned £1,300 as due to cash creditors, and a like amount to the trade; he valued his assets at £940 and attributes his failure to bad debts, depreciation of stock, and to the loss of the action brought by the petitioning creditors. Mr. E. H. Hawkins, I.A., 4 Charterhouse Square, E.C., was appointed trustee.

D. D. Rayner, 6, Wilson Street, Derby, engineer.—The public examination of this debtor was held on June 23rd at the Court House, Derby. The statement of affairs showed liabilities of £539, against assets of £101. It appeared that in 1919 debtor started trading on his own account as an electrical engineer, with borrowed capital. In conjunction with another he took premises in Duke Street, Derby, and in the first nine months between £4,000 and £5,000 was advanced by the gentleman who had lent debtor his capital, the idea being that a company should be formed. The company was floated in November, 1919, with £10,000 capital, debtor being appointed managing director, and during the latter end of the boom period the company was successful. In September, 1922, the debenture holders took possession, debtor continuing as manager for a year at £600 without commission. In September, 1923, his wife started business with debtor as manager, and electrical motors were assembled, the sum of £200 being borrowed by his wife from relatives, and £600 from debtor's sisters. In March, 1924, another gentleman provided £250 and became a limited partner. The examination was closed.

J. E. Cracknell, High Street, Manningtree, Essex, photographer and wireless supplies dealer.—The first meeting of the creditors of the above was fixed to be held on June 23rd at 9, Arcade Street, Ipswich. The statement of affairs showed gross liabilities of £499, of which £497 was unsecured, against net assets of £195, leaving a deficiency of £302. Debtor attended for his public examination at Colchester Bankruptcy Court on June 25th before Mr. Registrar Bridgeman. He stated that he commenced business in 1922 with a capital of £15, and £37 which he borrowed, and later took up the radio business. His trade last year averaged from £15 to £20 a week, on which the profit was 25 per cent. At the end of January last trade fell off and left him with heavy stock, the value of which declined. His expenses increased, and the more business he did the worse off he became financially. The examination was formally adjourned to July 13th.

Nathan Abraham Ludwin, trading as N. A. Ludwin & Co., export merchants, &c., 122, Bunhill Row, E.C.—The first meeting of creditors herein was held on June 25th at the London Bankruptcy Court before Mr. E. Parke, Official Receiver. The debtor was neither present nor represented, and it was stated that he was under remand on a charge of conspiracy. The Official Receiver reported that, according to the debtor's statements, he came to this country from Russia in 1914, and started business five years later on his own account. He took the Bunhill Row premises two years ago, and in April, 1924, being short of capital, his brother sent him £1,000 worth of electrical goods. The debtor roughly estimated his liabilities at £12,000, against assets valued at £800, and he attributed his failure, among other causes, to depreciation in the value of radio goods and trade depression. A resolution was passed for Mr. E. H. Hawkins, I.A., 4, Charterhouse Square, E.C., to act as trustee and administer the estate in bankruptcy. The following are creditors:—

	£		£
J. Flower	145	F. H. Palmer	447
Igranic Electric Co., Ltd. ...	488	A. J. Stevens & Co. (1914), Ltd.	314
L. A. McAllister	110		

J. A. Refoy, trading as the Varley Radio Co., 178, Ancona Road, Plumstead, S.E.18, Kent, dealer in radio apparatus.—The public examination of this debtor was held recently at the Court House, Greenwich. The statement of affairs showed liabilities of £1,119, against assets of £34. Debtor stated that he commenced business in partnership with another in October, 1922, but the partnership was dissolved in May, 1924. He took over the business, although he knew it was in financial difficulties, as he hoped to be able to pull it round. He removed to his present address and his wife advanced him considerable sums to carry on. He attributed his failure to bad management and bad trade. He stated that he made a guaranteed offer of 10s. in the £ to be paid by his wife, but this was not accepted. The examination was adjourned.

Radio Cash Stores, 371, Upper Street, Islington; also at Leeds and Nottingham.—The accounts under this failure, particulars of which appeared in our issue of June 12th (p. 931), show liabilities of £1,111 and no assets. The following are among the creditors:—

	£		£
Pressland Electric Supplies, Ltd.	126	H. Jacobi & Co., Ltd.	38
Holttmin & Green, Ltd.	38	South Wales Wireless Co., Ltd.	26
Nottingham City Council ...	91	W. Bullen	27
John Bull Radio Supplies Co. ...	20	A. Lee & Co.	66
J. R. Morris	21	Marconiphone Co., Ltd.	56
McLeod & McLeod	24	Wellington Electric	20
E. A. Wood	58	C. McIntosh & Co., Ltd. ...	26
Wholesale Fittings Co., Ltd. ...	25	Swansea Borough Council ...	39

J. R. Pattison, 15, Goldsmith Street, Nottingham, electrical supplies factor.—The first meeting of creditors was held on June 26th at the Official Receiver's offices, Nottingham. The statement of affairs showed gross liabilities of £2,707, of which £2,266 was expected to rank, against assets of £280, leaving a deficiency of £1,936. Debtor attributed his failure to buying on a falling market, bad debts, keen competition, and the pressure of creditors. The sales for the past year were estimated at £2,787, on which a gross profit of £437 had been made, while the working expenses totalled £436. Debtor became aware of his position in 1923, and for some time had been pressed by creditors. The matter was left with the Official Receiver as trustee of the estate.

The C. C. S. Trading Co., 30, Western Mail Chambers, Cardiff, electricians.—The first meeting of the creditors of the above was held on June 26th at Cardiff. No statement of affairs had been filed, and the failure was attributed to bad trade and heavy working expenses. The matter was left in the hands of the Official Receiver as trustee of the estate.

C. B. Maurice, cable suppliers, late of Windsor House, Victoria Street, S.W.—First meeting, July 7th; public examination, October 6th, both at Carey Street, W.C.

S. C. Rapson, C. L. Burrill, and A. J. Heffer (Suburban Electrical & Maintenance Co.), electricians, 2, Plough Yard, Shoreditch, E.—Trustee Mr. W. A. J. Osborne, Balfour House, Finsbury Park, E.C., appointed June 19th.

A. W. Bould, electrician, 29, High Street, Skipton.—Trustee, Mr. W. Durrance, Official Receiver, 12, Duke Street, Bradford, released June 17th.

C. K. Wallis, electrical engineer, 51, Mons Avenue, Bognor.—Trustee, Mr. G. H. Acheson, Official Receiver, 12a, Marlborough Place, Brighton, released June 18th.

H. P. Tucker, electrician, Empire Bungalow, Ellacombe, Torquay.—Trustee, Mr. S. V. Upham, 23, Fleet Street, Torquay, released May 27th.

G. E. Harris, plumber and electrical engineer, 14, North Street, Emsworth, Hants.—Trustee, Mr. H. B. Morris, 20, Pearl Buildings, Portsmouth; released June 4th.

E. Downing (lately carrying on business in co-partnership with E. J. Mills, as manufacturers of electrical conduit fittings and general electricians, at 143, Butts Road, Walsall), Osborne House, Regent Street, Willenhall.—First and final dividend of 13s. in the £, payable at the Official Receiver's office, 30, Lichfield Street, Wolverhampton.

E. W. J. WHITELOCK, electrical engineer, 4, Leagrave Road, and 7, Cheapside, Luton.—Trustee, Mr. T. Keens, 11, George Street West, Luton, released March 17th.

C. BINNS (United Electric Co.), electrical engineer, 55, Low Briggate, Shipley.—Last day for proofs for dividend, July 10th. Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford.

H. W. W. ALFORD, wireless engineer, 18, Goldsmith Street, and 261, High Street, Exeter.—First and final dividend of 1s. 10¾d. in the £, payable at the Official Receiver's offices, 67, High Street, Exeter.

J. E. BYRNE, electrical contractor, 3, Wells Yard, Waterworks Street, Kingston-upon-Hull.—First and final dividend of 2s. 2d. in the £, payable July 3rd, at the Official Receiver's office, 37, Scale Lane, Hull.

Company Liquidations.—IMPERIAL MOTOR INDUSTRIES, LTD., 11, Denmark Street, Charing Cross Road, W.C.2.—A meeting of the creditors of this company was held recently; the chair was occupied by Mr. T. J. Bond, of Messrs. Cole, Bond & Co., C.A. The chairman stated that the company had appointed him to act as liquidator in the voluntary liquidation of the company, in conjunction with Mr. C. Latham, of the Automobile Trades Guardian Association. A statement of affairs was submitted, as at June 4th, which disclosed liabilities of £39,440. The assets amounted to £16,839 from which had to be deducted £1,732 for preferential claims, leaving net assets of £15,107, or a deficiency, so far as the creditors were concerned, of £24,332. The company was formed in 1917 with an authorised capital of £4,000, all of which was issued for cash, and took over as a going concern an existing business. For the first three or four years of the company's existence reasonably good profits were made. The losses for the years to July 1922 and 1923, were considerable, but at July, 1924, although a loss was incurred, it was very substantially reduced, and the directors were hopeful that the corner had been turned. Mr. Bond added that the directors backed their optimism by loaning to the company large sums of money, in respect of which no debenture was taken, and subject to the voluntary liquidation going through, they were prepared to forego their interest on the amounts loaned as from July, 1922. Since their appointment, the liquidators had continued to carry on the business on a somewhat modified basis in the hope of being able later to dispose of it as a whole.

It was decided to confirm the voluntary liquidation of the company, with the present liquidators, and an advisory committee, consisting of representatives of Lodge Plugs, Ltd., Three Star Accumulators, Ltd. Tangyes, Ltd., Acme Electrical, Ltd., and Rankin Bros., was appointed.

The following are creditors:—

	£		£
Lodge Plugs, Ltd.	551	Heilbronn, Felix	130
Three Star Accumulators, Ltd. ...	526	General Electric Co., Ltd. ...	121
Robinhood Engineering Works...	476	Autovac Mfg. Co.	121
Tangyes, Ltd.	418	Sphinx Sparking Plug Co., Ltd.	106
Acme Electrical, Ltd.	369	Sun Electrical Co., Ltd.	82
Vandervell, C. A., & Co., Ltd....	272	British Thomson-Houston Co., Ltd.	51
Obermer, S.	218		
Champion Sparking Plug Co. ...	209	Park Bros.	71
Powell & Hanmer, Ltd.	198	Butlers, Ltd.	66
Lucas, Jos., Ltd.	170	Lake & Elliott, Ltd.	60
Stephens, R., & Sons, ...	168	Benjamin Electric, Ltd.	55

BROTHERTON EDISWAN TUBES & CONDUITS, LTD.—A meeting of members is called for July 27th at the Victoria Hotel, Wolverhampton, to hear an account of the winding up from the liquidator, Mr. R. H. Johnston.

KEARNEY HIGH-SPEED RAILWAY CO., LTD.—First meeting of creditors and contributories, July 7th, at Carey Street, W.C.

Private Arrangements. — BASIL EDWARD CROW, trading as Crow, Toogood & Co., electrical and wireless supplier, 18, Charing Cross Road, W.C.2, and at Eastbourne and Bournemouth.—A meeting of the creditors of the above was held on June 23rd, at the London Chamber of Commerce when Mr. P. Houstoun, who represented one of the principal creditors, was elected to the chair. Mr. W. M. Whyte reported that a deed of assignment had already been executed by the debtor. The latter commenced business in 1920, and at the outset a fair profit was made. During 1924, however, trade was very bad and at the end of that year there was a deficiency of £2,180. The debtor then borrowed sums aggregating £850, which were put into the business in the hope that trade would revive. Unfortunately, that had not been the case, and the debtor finally came to the conclusion that the best thing to do in the interests of all concerned was to assign his assets to a trustee. The statement of affairs showed liabilities of £5,238, there being 135 trade creditors whose claims aggregated £2,881, and there were cash creditors for £2,357. The assets were estimated to realise £1,255, less £119 for preferential claims, leaving net assets of £1 136, or a deficiency of £4,102. Mr. Whyte added that probably £950 would be available as net assets, or 3s. 6d. to 3s. 8d. in the £ for the creditors. A number of creditors had assented to the deed. A creditor asked when Mr. Toogood retired from the business, and it was stated that there was a dissolution last March, when the debtor took over the assets of the business and agreed to discharge all the liabilities. Subsequently a further deed of dissolution was entered into. When Mr. Toogood left the partnership he commenced a similar business on his own account, which he had since disposed of. Mr. Toogood did not receive anything when he left the partnership.

The debtor was called into the room, and in answer to questions said that when the dissolution of partnership took place a notice of the fact was sent to the ELECTRICAL REVIEW and to the Business Names Registry. So far as he knew the creditors were not advised of the dissolution. When the business was commenced, money was advanced by certain gentlemen under an agreement which provided that they should receive 10 per cent. per annum interest and a varying share of the profits. The chairman said that if that statement was correct then his view was that the creditors who advanced money under the agreement could not rank in competition with the other creditors. The liabilities would have to be reduced accordingly. In answer to further questions, the debtor said that he recently borrowed £100, and as security gave a bill of sale on his furniture. That money was required as the Sheriff was in possession at London and Bournemouth. Asked what the drawings of the partners had been, the debtor said that they each received £10 a week, although latterly the amount had been reduced. It was decided that the matter should be dealt with under a deed of assignment to Mr. W. A. J. Osborne, of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C., as trustee, failing which the estate should be dealt with in bankruptcy.

HUGH MCTAGGART, trading as H. McTaggart & Co., 4, Edward Terrace, Cardiff, wholesale distributor of electrical and radio goods.—A meeting of the creditors of the above was held recently at the offices of Messrs. Jones, Robathan & Co., Cardiff Docks, when a statement of affairs was submitted which disclosed liabilities of £3,527, of which £3,397 was due to the trade and £130 to the bank. The assets were estimated to produce £2,753; from this had to be deducted £19 for preferential claims, leaving net assets of £2,734, or a deficiency of £793 It was reported that the debtor commenced trading in February, 1924. He had previously been associated with a well-known company in the trade. He applied to be admitted as a member of the N.A.R.M. in order that he might obtain the wholesale terms, but it was not until the beginning of the current year that his application was granted. It appeared that purchases to the extent of something like £1,300 from members of the N.A.R.M. had to be disposed of at cost price, and no profit or special discount was obtained. When he was admitted to the N.A.R.M. one of the conditions was that he immediately purchased stock to the value of £500, of which about 50 per cent. was still unsold. During the first three months the debtor expended a substantial amount in advertising, and the sales had shown a steady increase. The debtor attributed his present position to the loss of the special discounts from the N.A.R.M. members, to general bad trade in South Wales, bad debts, and to over-estimating the amount of stock required to carry on the business. During the fourteen months to March last the debtor's turnover was between £9,000 and £10,000. It was decided to appoint a committee to consider a scheme for the payment of the debts in full.

Bankruptcy Order Annulled. — E. A. THORN, house decorator and electrical engineer, carrying on business at 22, Mossbury Road, Clapham Junction, S.W. Adjudication and receiving order of July, 1910, annulled June 18th, 1925; debts, costs, charges and expenses of the bankruptcy having been paid in full.

Deed of Arrangement.—HAROLD PETERS, 5, York Road, Colwyn Bay, trading as the Peters Electric Co.—The trustee under a deed of arrangement, Mr. P. W. Aston, Colwyn Bay, reports that the net realisations totalled £322. A dividend of 2s. 1d. in the pound has been paid on an amount of £1,598.

Dissolution of Partnership.—SAXTON & WELLS, mechanical and electrical engineers, Dawson Street, Hyde, Chester.—Mr. R. Saxton and Mr. W. C. Wells have dissolved partnership. Mr. Wells will attend to debts and continue the business under the same style.

Catalogues and Lists.—THE LONDON ELECTRICAL CO., LTD., 1, Sherborne Lane King William Street, E.C.4.—A net trade price list of electrical materials and accessories, and an illustrated catalogue of domestic appliances.

MESSRS. J. HOPKINSON & CO., LTD. Britannia Works, Huddersfield.—List No. 1,830, describing a number of the company's "all-metal" draught gauges.

AUTOVEYORS, LTD., 84, Victoria Street, S.W.1.—A series of illustrated and priced pamphlets, giving particulars of "Clix" connectors, loop aerials, condensers, and many other radio accessories.

THE STEAM FITTINGS CO., LTD., West Drayton, Middlesex.—Two illustrated pamphlets dealing respectively with the "Drayton" automatic temperature regulator and steam-pressure reducing valves.

THE ELECTRICAL EQUIPMENT & CARBON CO., LTD., Bank Buildings, 109-111, New Oxford Street W.C.1.—List No. R3, illustrating and describing "Telwave" condensers, jacks, switches and other radio components. Priced.

THE MARCONIPHONE CO., LTD., Marconi House, Strand, W.C.2.—A well-illustrated brochure dealing with the company's speech and music amplifying service for large public gatherings.

MESSRS. EVERSHED & VIGNOLES, LTD., Acton Lane Works, Chiswick, W.4.—List No. D158, illustrating and describing a traction recorder for electric railway working.

PERFECTION ELECTRIC HEATERS, Hillside Works, Bard Street, Sparkhill, Birmingham.—A folder containing illustrations and prices of the company's irons, kettles grills, &c.

MESSRS. H. E. ASHDOWN (BIRMINGHAM), LTD., Perry Barr, Birmingham.—A priced catalogue of cabinet radio receiving sets, condensers, loud speakers, &c.

Messrs. Belbin & Bowden, Ltd., 3, Finsbury Square, E.C.2.—A leaflet giving prices of "Bow Bells" incandescent electric lamps.

The Hart Accumulator Co., Ltd., Stratford E.15.—List No. 164, describing the Hart "Magno" accumulator for use with dull-emitter radio valves. Priced.

The New Italian Art Association, Ltd., 28, Newman Street, W.1.—A priced and illustrated catalogue of English and Italian alabaster bowls and fittings.

Messrs. A. J. Stevens & Co. (1914), Ltd., Walsall Street Branch, Wolverhampton.—A novel showcard, representing a number of the firm's radio receiving sets and a loud-speaker, in attractive colours.

Venner Time Switches, Ltd., 45, Horseferry Road, S.W.1.—Lists Nos. 22 to 26, dealing with shop-window and street-lighting time switches, oil-break time switches, an automatic electric buoy lamp, and other switching apparatus.

The Stirling Boiler Co., Ltd., 32 and 33, Farringdon Road, E.C.4.—A well-illustrated brochure containing descriptions of the company's "tri-drum" boilers and their employment.

British Insulated & Helsby Cables, Ltd., Prescot, Lancs.—Pamphlet P190, describing the company's corrosion-proof armoured cables.

Messrs. Pritchett & Gold & E.P.S. Co., Ltd., 50, Grosvenor Gardens, S.W.1.—A series of photographic views of "Dagenite" battery plates after severe tests in comparison with a foreign battery over a period of 18 months.

Book Notices. — "Illumination Engineering Nomenclature, and Photometric Standards."—The eighth edition of the complete nomenclature adopted by the American engineering societies in accordance with American Engineering Standards Committee procedure. This edition was approved as an American standard, April 29th, 1925.

The Brown Boveri "Review."—Vol. XII, No. 6. June, 1925. London: The British Brown Boveri Ltd.

"Annali dei Lavori Pubblici gia Giornale del Genio Civile." Vol. LXIII, No. 4. April, 1925. Rome: A. de Gaetani.

"Jahrbuch der Elektrotechnik," by Dr. K. Strecker. Munchen: R. Oldenbourg.

"Science Abstracts" A and B. Vol. XXVIII. Part 6. July 25th, 1925. London: E. & F. N. Spon, Ltd. Price 3s. each.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIV, No. 6. June, 1925. New York: The Institute. $1.

"Time Standardisation of Workshop Operations," by T. Pilkington. Pp. x+253; figs. 91. London: Sir Isaac Pitman and Sons, Ltd. Price 16s. net.

"Electrical Machinery Erection," by T. Croft. Pp. ix+314; 334 figs. London: McGraw Hill Publishing Co., Ltd. Price 15s.

"The Broadcasting Time Table and Reception Log," compiled by R. Grierson. Fourth edition. 32 pages. London: Chapman & Hall, Ltd. Price 2s. 6d. net.

"Memoirs of the College of Engineering," Kyoto Imperial University, Japan.—Vol. II, No. 7, "Theory of Distortionless Alternators," "Theory of Two- and Three-phase Generators" and "Theory of Single-phase Generators"; Vol. III, No. 5, "Formula for the Strength of Struts, &c."; Vol. III, No. 6, "On the Age-hardening of Aluminium-rich Al-Zn Alloys," &c.; Vol. III, No. 7. Published by the University.

"The Selected Papers from the *Journal* of the Institute of Electrical Engineers of Japan."—No. 1, The electromagnetic induction and the effective self-inductance of a rectilinear transmission line with earth return, and the potential difference of the earth surface; No. 2, On the continuity of vector power in an alternating electric and magnetic current field; No. 3, On the induction synchronous motor characterised by automatic transition; No. 4, Transient phenomena in a short-circuited alternator. Tokio: The Institute of Electrical Engineers of Japan.

"Power Switchboard and Switching Equipment Handbook," 1st edition, May, 1925.—Issued by the Electric Power Club, B. F. Keith Building, Cleveland, Ohio, U.S.A. Price 50 cents. Contains the Club's instructions for the installation, operation and care of switchgear; definitions, abbreviations and symbols relating to switchgear; and the adopted standards, safety standards and practices of the club. "Instructions for Care and Operation of Transformers," 3rd edition, May, 1925. Issued by the Electric Power Club. Price, 25 cents.—Contains the club's instructions dealing with the handling, storage installation and operation of both power and distribution transformers.

Scientific Papers of the U.S.A. Bureau of Standards.—No. 502, "An Improved Type of Wavemeter Resonance Indicator." (5 cents.)

Quarterly *Bulletin* of the Institution of Engineers, Australia. Vol. II, No. 6. April, 1925. Sydney: The Institution.

Indian Railway Developments.—In the course of a report on trade conditions in India, *Reuter's Trade Service* states that the Madras and Southern Mahratta Railway has in hand the construction of a marshalling yard at Tondiarpet, increased lighting arrangements, renewal of rails, girders and engines, and the elimination of level crossings. The Nizam's Guaranteed State Railway has in hand a big scheme for overhauling the old workshops at Lalaguda and remodelling them for the requirements of the next ten to fifteen years. It is estimated that the provision of suitable cranes, and pneumatic and electrical equipment alone will amount to nearly Rs. 5 lacs. Mr. G. R. G. Huddleston is in charge of this remodelling scheme.

Social Events.—On June 20th, the staff and employés of Messrs. J. & W. B. Smith, Ltd., held their first annual outing, sports meeting, and social evening, the *venue* being "Ye Old Rye House." The sports programme proved very enjoyable and at its conclusion a "meat tea" was served, at which Mr. Sloper proposed the toast of "The Firm and Directors," Mr. A. H. Miller, managing director, responding. Mrs. A. H. Miller presented the sports prizes and a concert and dance were then held concurrently.

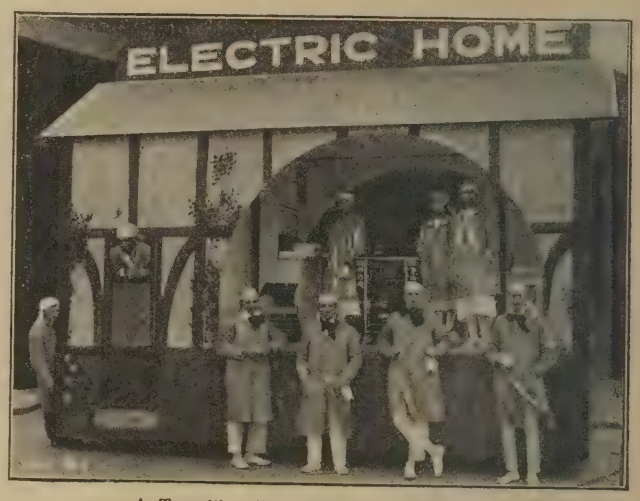
Some 130 members of the Blackpool Tramways Employés' Institute held their annual trip on June 25th, when Ambleside was visited.

The annual summer outing of the staff and employés of the Ayrshire Electricity Board took place recently, the party numbering 160.

Over fifty members of the staff of the Engineering Department of the Blackpool Corporation tramways journeyed by motor coach to York for their annual outing last week.

Mexican Railway Electrification.—At the recent annual meeting of the Mexican Railway Co., Ltd., the chairman (Mr. V. W. Yorke), said that the work of electrification had been considerably delayed by the revolution, and it had not been possible to commence the services until October last. Since that time their experience had proved that the system was absolutely efficient and would result in reduced expenditure.

A Travelling Electric Home.—An effective tableau was arranged by the Grimsby Corporation Electricity Works (engineer, Lt.-Col. W. H. Vignoles), in connection with a recent fancy dress parade in aid of the Grimsby Hospital. This took the form of an "electric home" mounted on an electric



A Travelling Electric Home at Grimsby.

vehicle. As will be seen from the accompanying illustration, prominence was given to electric cooking. The attendants were dressed in powder-blue and white costumes and the display was justly awarded a prize.

Peace in Industry.—An extraordinary general meeting of the Industrial League and Council was held on June 24th under the presidency of Sir Ernest J. P. Benn, Bart., and the amalgamation of that body with the National Alliance of Employers and Employed was unanimously agreed upon. The agreement of the National Alliance had already been registered at its annual general meeting in May. With the exception of the necessary formal ratification and the settlement of minor details, the fusion is now complete. The programme of the new organisation will be a complete combination under a single control of all branches of activity hitherto pursued by both the old societies. New and far-reaching developments are in contemplation. The control will be vested in joint committees on which representatives of employers and trade unionists will be in equal numbers. As hitherto, associate membership is open to all individuals who accept the principles and constitution.

A French Company's Activities. — The Compagnie Electro-Mécanique reports that the results for 1924 (no dividend) were due to the unfavourable situation of the market. In the steam turbine branch the machines for 35,000- and 60,000-kW sets ordered last year were in course of erection, and the company also booked orders for turbines and turbo-generator sets of all powers up to 16,000 kW. The 150,000-V installations for the Southern Railway Co. and those at 120,000-V for the Société Hydro-Electrique de Lyon and the Forces Motrices du Rhône were put into operation. Orders have been booked for two new alternators of 10,000 kW at 16,000 V, while the production of small alternators is being developed to meet the large demand for rural electrification.

Copper, Lead, and Rubber Prices.—Messrs. F. Smith and Co. report, June 30th:—Copper (electrolytic) bars £64, 2s. 6d. increase; ditto ditto sheets, no change; ditto ditto wire rods, £74, 2s. 6d. increase; ditto ditto h.c. wire, 9¼d., 1/16d. decrease. Messrs. James & Shakespeare report, June 30th:—No change in the prices for copper bars (best selected), sheet and rod, and English pig lead.

Messrs. E. Till & Co. report, June 30th:—India rubber, Para, fine, 2s. 9½d., 2½d. increase.

New Belgian Company.—A new company has lately been formed in Liége with a capital of 1,500,000 fr., and the title La Société de Halage Electrique to establish a system of electric haulage on the Liége-Maestricht canal.

British Trade Mark Applications. — The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from the dates mentioned below. In the case of foreign applications, the names and addresses of the British representatives are also given :—June 10th.—

Brandes (lettering and design). No. 455,642. Class 8. Radio receiving apparatus and parts thereof.—Brandes, Ltd., 296, Regent Street, W.1.

C.S.-Eones (lettering and design). No. 457,080. Class 8. Apparatus for use in radio-telegraphy and telephony.—C. F. Smith and R. Craik, trading in co-partnership, 41, Allen Street, Goswell Road, E.C.1.

Russell's genuine hertzite crystal (lettering and design). No. 457,997. Class 8. Hertzite detector crystals for use in radio-telephony.—L. G. Russell, 1-7, Hill Street, Birmingham.

Tropaformer. No. 458,379. All goods in Class 8.—R. A. Rothermel, Ltd., 24-26, Maddox Street, W.1.

Wunderway. No. 458.574. Class 8. Instruments and apparatus and parts thereof for use in radio-telephony and telegraphy.—Steels & Busks, Ltd., Ariel Works, Temple Road, North Evington, Leicester.

Ethodyne. No. 458,601. Class 8. Receivers for use in radio-telephony and telegraphy.—Burndept Wireless, Ltd.

X-Ray. No. 453,833. Class 13. Shades and reflectors of ordinary metal for use in connection with electric lighting.—British Thomson-Houston Co., Ltd.

June 17th.

Hermitic. No. 454,469. Class 8. Electric condensers.—Thomas Hougn, 62, Glengall Road, S.E.15.

Bico (lettering and design). No. 457,486. Class 8. Instruments and apparatus and parts thereof for use in radio-telephony and telegraphy.—The Briscoe Importing Co., Ltd., 9, Aston's Quay, Dublin.

Romar. No. 458,174. All goods in Class 8.—Joseph Perkins & Sons, Ltd., Albion Works, Astwood Bank, Redditch.

Superdyne. No. 458,602. Class 8. Receivers for use in radio-telephony and telegraphy.—Burndept Wireless, Ltd.

Seva (lettering and design). No. 458,111. Class 13. Electric soldering irons.—E. O. Johansson, 6, Rorstrandgatan, Stockholm (C. W. Cedervall, Swedish Chamber of Commerce, 14, Trinity Square, E.C.3).

June 24th.

Electrad (lettering and design). No. 456,036. Class 8. Apparatus for radio-telegraphy and telephony.—Electrad, Inc., 428-430, Broadway, New York (White, Langner, Stevens & Parry, Jessell Chambers, 88-90, Chancery Lane, W.C.2).

Palaphone. No. 456,177. Class 8. Apparatus for use in radio-telegraphy and telephony.—T. Morch, 67, Mount Pleasant Lane, Upper Clapton, E.5.

Izon. No. 456,529. Class 8. Apparatus for use in radio-telegraphy and telephony.—W. Watson & Sons, Ltd., 313, High Holborn, W.C.1.

Red Diamond (lettering and design). No. 457,318. Class 8. Apparatus for use in radio-telegraphy and telephony.—Jewel Pen Co., Ltd., 76, Newgate Street, E.C.1.

Red Seal (lettering and design). No. 457,909. Class 8. Instruments and apparatus for use in radio-telephony.—D. B. Tippetts, The Spinney, Grange Road, Dorridge, Warwickshire.

C. G. H. Mellowtone (lettering and design). No. 458,366. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Midland Radiotelephone Manufacturers, Ltd., Brettel Lane Works, Stourbridge.

Superbalite. No. 458,293. Class 50. Electrical insulating material.—Società Moriti & Martini, 51a, Via Bergamo, Milan, Italy (Mewburn, Ellis & Co., 70-72, Chancery Lane, W.C.2).

A British Company and Mexican Taxation.—The *Financial News* states that it is reported from Orizaba that the Mexican Light, Power and Traction Co. under the tax revision must pay 25,000 pesos bi-monthly, increasing the total taxes to 375,000 pesos yearly, whereas the income of the company is given as 250,000 pesos. It is also reported that the company will be placed under an embargo for non-payment of taxes, but the report is not credited by the British Consul, Mr. King.

Business Opportunities in Czecho-Slovakia.—In a recent report the British Commercial Secretary at Prague states that there are openings for many classes of British goods in Czecho-Slovakia. One of the classes specially mentioned is electrical machinery, although in this direction, it is stated, Switzerland and Germany are serious rivals.

For Sale.—Taunton Corporation Electricity Department, owing to change of system, invites offers for surplus generating plant, including two 150-kW generating sets, alternators, transformers, &c. The Section Engineer, N. Section, Met. Power District, Mount Pleasant, invites offers for surplus generating plant. (See our advertisement pages to-day.)

German Cable Orders.—It was stated at the recent annual meeting of the Felten and Guilleaume Co. that the company had just received an order for a multiple-conductor lead telephone cable for laying between Holland and England. Negotiations were on the point of being concluded with the German Atlantic Telegraph Co. for the delivery by the Nordenheim works of a submarine cable to be laid between Emden and the Azores.

United States Electrical Exports. — The preliminary statistics of exports of electrical goods from the United States during April show that their total value was $7,817,184, an increase of almost $400,000 upon the April, 1924, figures, and of $100,000 upon the preceding month's total. Comparing April, 1925, with the same month of the previous year, it is seen that there was a large decline in the shipments of generators, steam turbo-generator sets, and parts; power and distribution transformers; large motors; switch and fuse-gear; and electric locomotives. Smaller decreases occurred in the cases of fans, telephone apparatus, ignition apparatus, and carbon products. The principal increases were in respect of self-contained generating sets (62 per cent.) batteries, converters, switchboards, meters (81 per cent.), motor starting and controlling equipment, lamps, flashlamps and searchlights, and domestic appliances. Radio apparatus experienced a phenomenal rise—from less than $300,000 in April, 1924, to over $850,000 in April last. Smaller increases occurred in the export of wiring supplies, porcelain, and insulated copper wire.

The Burden on Industry.—In the course of his speech at the annual meeting of Ruston & Hornsby, Ltd., on June 22nd, Mr. J. S. Ruston referred to the heavy burdens which industry had to bear whether it was making a profit or not. He said that unemployment and health insurance cost the company £25,000 a year and the new proposals would add a further £6,000. On the top of that the poor and district rates amounted to £31,000 per annum, making a total of £60,000 a year. In dealing with the company's productions, Mr. Ruston said that it had supplied a further number of the largest excavating machines ever constructed, both steam and electrically operated. The boiler works was fully occupied. A large number of electric power stations had adopted the company's vertical oil engines of sizes up to 1,100 h.p. In spite of any cheapening of electrical power they hoped still to obtain orders in direct competition.

Low-Temperature Distillation Plant.—International Combustion, Ltd., informs us that its American associated company has obtained a contract for installing a large low-temperature distillation plant for the Milwaukee Electric Light & Power Co.

Unemployment.—There was a fall of 10,490 in the number of registered unemployed in the week ended June 15th, the total at that date being 1,280,700.

Chinese Notes.—The *Chinese Economic Bulletin* states that a number of capitalists are organising an electric lighting company at Tsangchow, Chihli province. A temporary office has been opened at Ta Mo Chang, Peking.

The Chinese Commercial Association, Shanghai, promoted by the president of the Shanghai Chamber of Commerce and directors of other Chambers of Commerce with a view to developing China's commerce, has completed its organisation.

Both the Shanghai Electric Construction Co., Ltd., which operates trams in the International Settlement and the company which runs trams in the French concession, raised their fares in April last on account of the depreciation of the copper coinage.

The Shansi authorities have recently drawn up a plan for the establishment of generating plants in Taiyuan and 14 other districts. The Taiyuan plant is to have an initial capacity of 1,500 kVA in one unit and will cost $560,000 (including the provision of $100,000 working capital). The other stations will each have an initial installation of one 500-kVA generator and the necessary auxiliaries and will cost $210,000 ($50,000 working capital). Thus the total initial outlay will be $2 940,000.

A company composed of local business men has inaugurated a generating plant at Ichowfu, Shantung province.

A small hydro-electric plant has been started up at Luchow and another site 55 li from Chengtu has been studied for the erection of a similar station.

The Wuchang Electric Light Co. is issuing capital stock to the extent of $1,150,000. The proceeds will be devoted to the purchase of new machinery and equipment.

The Shanghai Mutual Telephone Co., Ltd., which operates in the International Settlement and the French Concession, has raised its capital to Tls. 2,500,000, new shares to the value of Tls. 500,000 having been allotted to the existing shareholders.

The South Manchurian Railway Co. has instituted a tram service between Shahochen, China, and Hsin Wiju, Korea.

A number of additional telephone services are being established in the Kongmoon district.

It has been decided to install a long-distance telephone service between Ningpo and Hangchow. The wires are to be strung on existing telegraph poles.

The Chinese Electric Power Co., Ltd., which operates tramways in the part of Shanghai under Chinese administration, has decided to erect two car depôts. Tenders for the steelwork, &c., have been invited.

The Tientsin radio station, owned by the Tientsin Telephone Administration, was put into operation in April. The station works on a wavelength of 1,000 metres, and a charge of 0.5 fr. per word is made for all messages.

Calendar.—BROOKHIRST SWITCHGEAR, LTD., has sent us calendar cards for July, August, and September, each of which bears an interesting pencil drawing of old Chester.

New Municipal Showrooms.—The Chester Corporation's new electrical showrooms were officially opened by the Mayor on July 1st.

Boiler Contracts.—The Vickers-Spearing Boiler Co., Ltd., has recently received contracts from the Bloemfontein Municipal Electricity Department, the Calcutta Electric Supply Corporation, Ltd., and the Bristol Municipal Electricity Department. The last contract is for the complete equipment of the boiler-house extensions, including buildings, two boilers, mechanical stokers, economisers, pipe work, &c.

Italo-American Agreement.—The *Electrical World* reports that the General Electric Co. (America) has concluded an agreement with the Società Italiana Pirelli, of Milan, for working in the United States the Italian company's patents relating to paper-insulated cables, joints and fittings, together with the use of manufacturing and research information with regard to this type of cable.

Uruguayan Tariff Reduction.—Electrically-driven pumps which have been subject to a duty of 31 per cent. of the official valuation, plus surtaxes when imported into Uruguay, are now classed as "industrial machinery" and are accordingly subject only to a duty of 5 per cent., plus surtaxes.

Electricity Supply Commercial Association.—From Saturday, July 4th, the address of the Association will be "Beaulieu," Bean Road, Bexley Heath.

Lighting and Power Notes.

Aylesbury.—Electricity Supply.—The Town Council has received a Special Order for extending its area of supply in certain parts of the counties of Buckinghamshire, Hertfordshire, and Oxfordshire. A loan of £3,000 has been applied for to meet the costs of a converter and switchgear at the works of Hazell, Watson & Viney.

Barking Town.—Electricity Supply.—At a recent meeting of the Electricity Committee it was reported that the Electricity Commissioners were in favour of a bulk supply being obtained from the cheapest source, and it was decided to obtain quotations from the County of London Electric Supply Co., Ltd., and the West Ham Corporation. The Committee also decided in favour of the principle of using the land at the rear of the existing station for electricity purposes, and asked the engineer to prepare specifications and invite tenders for the necessary transformer plant and prepare plans for the buildings required.

The annual report of the electricity undertaking for the year ended March 31st last shows that the net profit was £2,660, as compared with £5,758 for the previous year, the reduction being due to reduced electricity charges.

Bedford.—Electric Cookers.—The Electricity Committee has recommended to the Town Council that 50 electric cookers be purchased at a cost of £700, to be let out on hire.

Bingley.—New Sub-Station.—The new sub-station which is now almost completed will be formally inaugurated by Mr. T. Snowden, chairman of the Lighting and Tramways Committee, on July 2nd. The station has been erected in connection with the supply for Keighley Corporation and will be capable of carrying three times the load of the old station.

Croydon.—Loans Sanctioned.—The Electricity Committee has received sanction to borrow £1,060 for laying a h.p. feeder main, and £2,000 for the installation of electrical plant at Beddington sewage farm.

Dover.—Year's Working.—The accounts of the Corporation electricity undertaking (engineer, Mr. H. D. Munro), for the year ended March 31st last record a total revenue of £52,817, as compared with £49,914 in 1923-24. Working expenses amounted to £28,415, as against £19,542, leaving a gross profit of £24,402 (£30,372). After deducting capital charges there was a net surplus of £4,023; this has been dealt with as follows:—Extinction of debit balance from previous year, £674; set aside for depreciation of investments, £2,000; carried forward, £1,349. The capital expenditure during the year amounted to £15,239, and the total expended on the undertaking now stands at £282,321. The electrical energy sold increased from 2,339,394 to 3,233,777 kWh, and the average price per kWh obtained fell from 4.83d. to 3.92d.

Eastbourne.—Year's Working.—We have received from Mr. J. K. Brydges, borough electrical engineer, a copy of his report and statement of accounts on the working of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £80,274, and working expenses were £49,554, leaving a gross profit of £30,719. The figures in the preceding year were—revenue, £79,033; working costs £52,639; gross profit, £26,394. After deducting capital charges there was a net surplus of £6,744, as compared with £1,695 in 1923-24. A contribution of £4,000 was made to the borough fund. The capital expenditure, which included £23,483 for mains and services, amounted to £38,120. The sales of electrical energy increased from 4,921,769 to 5,614,602 kWh and the average price per kWh obtained fell from 3.56d. to 3.29d. The maximum supply demanded rose from 3,251 to 3,638 kW. During the year a new 2,500-kW turbo-alternator and boiler were formally inaugurated.

Gateshead.—"All-Electric" Houses.—The Corporation has decided to equip a further 138 houses on "all-electric" lines.

Glasgow.—Electrical Development.—The Corporation Electricity Committee has reported that during May 151 houses were wired, bringing the total to date to 982 and that 157 applications for the hire of domestic appliances were dealt with, bringing the total to 7,128.

Gloucester.—Extension of Supply.—At a special meeting on June 24th, the City Council decided to make an application for a Special Order for the extension of its area of electricity supply, adding thereto the rural district of Gloucester. The electrical engineer (Mr. F. H. Carson) explained that the proposal was to lay underground mains generally in the city and in its immediate vicinity, and to supply the outlying districts by means of overhead lines. The cost of the underground lines would be about £15,000, overhead lines about £8,100, and l.p. mains about £20,000, and the total would be approximately £51,600.

India.—Development in Central Provinces.—The Nagpur Electric Light and Power Supply Co. has completed the work of extending mains into the city. The B.N. Railway and the G.I.P. Railway Companies have also entered into an agreement for a bulk supply, the latter railway guaranteeing to take a supply of 60,000 kWh per annum. A licence for the supply of electrical energy to the town of Wardha has already been granted and materials for the overhead lines have been ordered and the construction of the power house commenced. Licences for the towns of Hinganghat and Amraoti have been issued and the schemes are making progress. Jubbulpur will also soon have a public supply of electricity; the licence has recently been issued and orders have not yet been placed for materials. There are three coal mines using electrical power at present in the Central Provinces, *viz.*, Mohpani, Ballarpur and Rajura.

Irish Free State.—Granard (Co. Longford).—The Urban District Council has sanctioned the installation of plant in the town for generating electricity.

Lexden and Winstree.—Electricity Supply.—The Rural District Council has appointed a Committee to consider the question of a proposed extension of the electricity supply from Colchester into its area.

London.—Hammersmith.—The Electricity Committee has recommended to the Borough Council that an agreement be entered into with the Barnes Urban District Council to furnish a bulk supply of electricity in the Barnes area, upon terms and conditions to be approved by the Committee.

St. Marylebone.—The Electricity Committee proposes to provide transformer stations at Morley House and Marcol House, Regent Street, and the Langham Hotel, Portland Place, at an estimated cost of £13,535, and has recommended that application be made for sanction to the borrowing of this sum for the purpose.

The Education Committee has obtained sanction to loans of £2,869 for switchgear, &c., in connection with the supply of electricity to the L. & N.E.R. premises in the borough, and of £13,112 for cables and switchgear in connection with the bulk supply of electricity from the Central Electric Supply Co., Ltd.

Hackney.—The conversion of 208 street lamps from gas to electricity in the Clapton Park district having been successfully carried out, the Finance Committee has recommended that the scheme proposed by the Electricity Committee for the conversion of the remainder of the street lamps in the borough from gas to electricity be proceeded with.

Fulham.—In view of the additional plant recently installed at the electricity works, the undertaking has been raised from class D to class F, with corresponding increases in the salaries of the technical staff.

The Electricity and Lighting Committee has recommended that the Granville sub-station be refitted with new apparatus at a cost of £1,280.

Electricity Supply Bills.—The Special Committee on London Electricity Supply has reported to the L.C.C. that consideration has been given to the question of procedure to be followed in the event of the passing into law of the London Electricity Supply Bills, and the approval of the London and Home Counties Electricity District Order, as regards the fixing of the standard prices for the various companies by the Council, and states that in this connection it will be necessary to ascertain the value of the existing assets of the companies. Owing to the urgency of the matter, the Committee states that it is desirable that preliminary work should be put in hand without delay, and has recommended that the services of Mr. W. Cash, F.C.A., who assisted in drawing up the sliding scale, and Mr. J. H. Rider, who was engaged in connection with the drawing up of the technical scheme, be secured. The Committee has also recommended that a supplemental maintenance estimate of £1,500 be approved to cover expenditure.

Northern Ireland.—Lucan.—Since the closing down in January last of the Dublin and Lucan Electric Railway, electrical energy has been supplied, as before, to about 80 private houses, churches, hotels and institutions along the line of route. The service, however, has been carried on at a loss and it is now to be terminated.

Armagh.—Mr. J. McClinaghan, Lisbien, having withdrawn his offer to light the city by electricity, a proposal has been made that the City Council should promote a scheme of its own.

Palestine.—Rutenberg Scheme.—According to *The Times*, the Haifa electric power station—the second stage of the Rutenberg scheme—was opened on June 24th by Sir Herbert Samuel, the retiring High Commissioner for Palestine. The station is larger than the similar one at Jaffa, and the engines have all been bought from British firms. The attitude of the local Arabs is doubtful, but the Arab quarter of the town is being lighted for 15 days "on approval."

Plymouth.—Proposed Water-power Scheme.—The Didworthy Sanatorium Committee has requested the Water Committee to instruct the water engineer to gauge the flow of the River Avon by the sanatorium lands and, if satisfactory, to obtain a report from a firm of engineers as to the possibility and cost of installing a plant for generating electricity by water power.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Huddersfield.—Three-phase supply: From 25 per cent., to 12½ per cent., above the pre-war charge; minimum net price per kWh on scale reduced from .65d. to .6d.; tramway supply, .1d. per kWh; lighting, from 4½d. to 4d. per kWh.

Accrington.—Heating and domestic purposes: From 1¼d. to 1d. per kWh. Rateable value system: The "unit" charge from 1¼d. to 1d. The discount of 5 per cent., for prompt payment of accounts is increased to 10 per cent.

YORK.—Lighting: From 5½d. to 4¾d. per kWh. Power: A reduction of approximately 10 per cent.

SWINTON AND PENDLEBURY.—Electricity for all purposes to be reduced from 50 to 33⅓ per cent. above the pre-war rate.

WEST HAM.—Lighting: 4½d. per kWh; in factories to the extent of 10 per cent. for quarterly accounts and 15 per cent. for monthly accounts, of consumption for power, 3½d. per kWh. Power: First 40 kWh per h.p. installed per quarter, 3¾d. per kWh; all energy in excess 1½d. per kWh. Heating and cooking: 1½d. per kWh. Arc lamps: 4½d. per kWh. All accounts subject to a discount of 5 per cent., for prompt payment.

Rawtenstall.—ELECTRICITY CHARGES.—At a recent conference between the Rawtenstall and Bacup Corporations, the following scale of charges to the Bacup Corporation were adopted as from July 1st next to June 30th 1926:—First 10,000 kWh per month, .9d. per kWh; next 10,000 kWh, .85d.; next 30 000 kWh, .8d.; next 50,000 kWh, .75d.; all additional energy, .7d. The following scale of charges to consumers in both boroughs has been adopted as from July 1st next:—Lighting: First 100 kWh per quarter, 6d. per kWh; all energy in excess, 5½d. per kWh. Power: Small consumers, varying from 2½d. to 1d. per kWh, according to quantity consumed; large consumers, varying from .9d. to .75d. per kWh, according to amount consumed.

ELECTRICITY EXTENSIONS.—In view of the increasing demand for electricity, the Corporation Electricity Committee is considering the advisability of extending the electricity works at Hareholme, and has instructed the electrical engineer to prepare a scheme, with an estimate of the expenditure involved.

Salford.—INAUGURATION OF NEW POWER STATION.—The Corporation's new power station at Agecroft is nearing completion and will be formally inaugurated by the Mayor on September 23rd. Provision has been made for the accommodation of plant with a capacity of 50,000 kW, comprising four sets of 12,500 kW each, and the water-circulating system and coal-handling plant will be capable of dealing with a capacity of twice this amount. The station has been designed by Mr. J. A. Robertson, consulting engineer, of Manchester, and has been constructed under his supervision. The cost of the station, when completed, will be £710,000.

Skipton.—YEAR'S WORKING.—At the June meeting of the Urban District Council it was reported that the first year's working of the electricity undertaking, which ended on March 31st last, resulted in a loss of £627. It was stated that overhead charges had increased the initial charge of 1d. per kWh to 7d., and that the average loss per kWh was 1d. The extension of the use of electricity for street lighting was urged. With regard to recent breakdowns, it was reported that they were all on the Keighley portion of the supply line and the Yorkshire Electric Power Co., in response to the Council's complaint stated that the breakdowns were due to faults on the Keighley Corporation mains.

Southend-on-Sea.—LOAN.—The Town Council is applying for sanction to a loan of £20,000 for feeder and distributing mains.

South-East Lancashire Electricity Board.—The Board has had under consideration data supplied by the Councils of Billinge, Orrell and Upholland, and the results of investigations by the Lancashire Electric Power Co. and the Wigan Corporation, and has come to the conclusion that the demand for electricity in the areas in question is not such as to indicate a reasonable prospect of the supply being remunerative. The Board has expressed its willingness to support the development by the Wigan Corporation of the portions of Orrell in the neighbourhood of the Wigan boundary, under the Fringe Order procedure.

Special Orders.—The Minister of Transport has confirmed an Order made by the Electricity Commissioners for the supply of electricity by Leeds Corporation in the township of Alwoodley and part of the township of Adel-cum-Eccup. The Commissioners have submitted to the Ministry for confirmation an Order for the supply of electricity by the Somerset Electric Supply Co., Ltd., in the city of Wells, the borough of Glastonbury, and a number of urban and rural districts in the County of Somerset.

Stoke-on-Trent.—"ALL-ELECTRIC" HOUSES.—The Corporation Housing Committee has voted a subsidy of £100 per house in respect of four "all-electric" houses to be erected by the Electricity Committee.

Wortley.—ELECTRICITY FOR HOUSING SITE.—The local Council has requested Sheffield Corporation to extend its cables to the Council's new housing site at Mortomley.

Tramway and Railway Notes.

Barking Town.—YEAR'S WORKING.—The Urban District Council reports a loss of £8,232 on the tramways for the year, compared with a loss of £6,139 in the previous year.

Birmingham.—NEW CARS.—At a recent meeting of the City Council, a recommendation of the Tramways Committee to borrow £66 000 for the purchase of 30 new tram-cars was approved. It was stated that the contract for the supply of the electrical equipment of these new cars had been secured by a Birmingham firm, but that the Corporation had neither the accommodation nor the plant to build the bodies.

Bury.—THROUGH-RUNNING.—According to the *Electric Railway and Tramway Journal*, the provision of a through service of tramcars between the town and Manchester has been considered by the Tramways Committee, which has instructed the town clerk and tramway manager to enter into preliminary negotiations with the Salford Corporation Tramway Department with regard to the introduction of a service between Bury and Deansgate. If the negotiations are successful, and a scheme is adopted, the necessity for changing cars at Whitefield will be removed. The through service of tramcars between Bury and Rochdale will be resumed on Monday, July 13th. This will restore the pre-war service.

Continental.—BELGIUM.—The Commercial Secretary of the Department of Overseas Trade at Brussels reports that the Société des Tramways Electriques du Pays de Charleroi is about to make the following extensions to its tramway system:—The Montigny-sur-Sambre-Charleroi line to be extended to La Neuville; the Charleroi-Couillet line to be extended to Chatelet; the Charleroi-Gilly line to be extended to Vieux-Campinaire.

Croydon.—MOTOR-'BUSES.—The Town Council has decided to accept the offer of the L.G.O. Co. to enter into negotiations for a service of motor-'buses in Addiscombe Road before coming to a decision upon the question of relaying the present tramway track or running railless cars in the Addiscombe district.

Iraq.—BAGHDAD.—Mr. Stanley, representing the Baghdad Tramways & Electric Lighting Syndicate, Ltd., is negotiating with the Government for the modification of the electric tramway concession for Baghdad, which was granted before the war to Mahmood Shabandar, and subsequently bought for about £40 000. It is thought that an agreement is improbable, and that Mr. Stanley will resort to arbitration in accordance with the provisions of the Lausanne Treaty respecting pre-war concessions.

Light Railways.—EXTENSION OF TIME.—The Minister of Transport has sanctioned the extension of time for the completion of light railways under the West Manchester Light Railways Order, 1906, and the Stretford Light Railways Order, 1906, to June 15th, 1926.

Northern Ireland.—BELFAST.—The annual report and statement of accounts of the Corporation tramway undertaking (general manager, Mr. S. Carlisle), for the year ended March 31st last, shows a total income of £603,818, as compared with £594,855 in 1923-24. Working expenses amounted to £390,383 as against £404,856, and expenditure on Bellevue recreation ground charged to revenue account amounted to £5,752, making a total of £396,135. The gross profit was therefore £207,683, and after deducting capital charges there was a balance of £126,962, which was carried forward to appropriation account. This was dealt with as follows:—Redemption contributions, £46,891; annual payment to depreciation or renewals fund, £25,000; surplus carried forward £55,071. The surplus brought forward from the previous year was £31,651. The capital expenditure during the year was £215,343 the chief item being £167,335 on permanent way reconstruction. The number of car miles run increased from 6,857,046 to 7,451,549, and the passengers carried from 94,237,313 to 101,476,902. The revenue per car mile fell from 20.82d. to 19.45d. During the year the system was extended from Woodvale Road to Glencairn Road and the overhead work in connection with the Dundonald and Chichester street extensions was completed. Reconstruction of permanent way was carried out on several routes, the total being about 10½ miles.

Sheffield.—YEAR'S WORKING.—The report and statement of accounts of the Corporation tramway undertaking (general manager, Mr. A. R. Fearnley), for the year ended March 31st, shows a total income of £878,383, as compared with £845,447 in 1923-24. Working expenses amounted to £633 887, as against £617,845, leaving a gross surplus of £244,496 (£227,602). Capital charges absorbed £125,068, and there was a net profit of £119,427, as compared with £106,229 in the preceding year. The sum of £89,902 was expended on permanent way repairs and renewals during the year. Extensions and doubling of track were carried out in various parts of the city, and 25 double-deck tramcars of improved design were put into service. The rolling stock now consists of 392 tramcars, 64 motor-omnibuses, and 27 miscellaneous vehicles.

Thornaby.—TRAMWAY IMPROVEMENTS.—With a view to relieving local unemployment next winter, the Council has under consideration a scheme for doubling the tramway track in Middlesbrough Road.

United States.—PETROL-ELECTRIC 'BUSES.—Albany, N.Y., is the third citiy in America to adopt petrol-electric 'buses, Philadelphia and Atlanta having already begun to use this kind of equipment. The Albany vehicles were selected after the trial use of one 'bus since March 1st, so that both winter and summer transportation problems have been encountered. Trolley and petrol 'buses have been previously used by the operating company the Capitol District Transportation Co., a subsidiary of the United Traction Co. The new type of drive, introduced last autumn, consists of a petrol engine, connected direct to an electric generator that, in turn, drives two electric motors which, through worm gears, in special Timken housing, with full floating axles, transmit the power to the road wheels. The nineteen Fageol 'buses will be equipped with Hall-Scott six-cylinder engines and American General Electric generators and motors. The advantages claimed for the petrol-electric drive include greater comfort for passengers, more rapid acceleration without jerking, higher schedule speeds, elimination of skidding, and reduction of maintenance costs.

Telegraph and Telephone Notes.

Italy.—Telephone Concession.—The company which is to handle the telephone concession in the South of Italy that has been obtained by, among others, the Swedish L. M. Ericsson Co., is to have a capital of 50,000,000 lire, of which 27,500,000 lire, or 55 per cent. is said to have been paid, while the remainder will be called for as required. The majority of the capital, in accordance with the terms of the concession, will be held by Italians. The activity of the company was to begin on July 1st, when the network was to have been taken over from the State.

Radio at Sea.—New Ships' Outfits.—The s.s. *Chitral*, of the P. & O. Steam Navigation Co., has been equipped by the Radio Communication Co., Ltd., with a main installation comprising a 1½-kW spark transmitter with a daylight range of 800 miles and a c/w transmitter with a daylight range of 1,500 miles, while an emergency spark set, worked from a battery of accumulators, is provided for use in case of possible breakdown. A direction finder is also fitted and the new Board of Trade regulations in respect of radio equipment for lifeboats have been complied with by the provision of a ¼-kW set.

The Cork Harbour Commissioners have ordered from the Marconi International Marine Communication Co. Ltd., an installation for their pilot boat. The equipment will consist of a standard quenched-spark transmitter and a five-valve directional receiver which can be used with the boat's main aerial for "all-round" reception, or by means of a switch a frame aerial is brought into use in conjunction with the main aerial, and the receiver can be used for direction-finding. The transmitter has a minimum range of 80 miles.

Mission Ship's Outfit.—The s.s. *Strathcona II*, belonging to the Royal National Mission to Deep Sea Fishermen, has been equipped with Marconi apparatus; she is the only ship belonging to the Mission to be fitted with a transmitter, though other ships carry receivers. The vessel will undertake the duties of tender to the hospital stations on the shores of Newfoundland and Labrador. The transmitter is the standard Marconi ½-kW quenched-spark installation, and the receiver has been specially constructed to receive on all wavelengths up to 26,000 metres, thus covering all transmissions of meteorological bulletins, time signals, &c., which will be of especial value to the fishing fleets. Only one valve is employed in the receiver, and inductive coupling is used, which makes the tuning very selective.

The Telephone Service.—Public Kiosks.—The new type of telephone kiosk designed by Sir Giles Gilbert Scott will shortly be put up in the large towns by the Post Office. They will be a yard square inside, with large windows of 18 panes on three sides, and have improved ventilation. The number of road kiosks in England increased from 931 at the beginning of the year to 1,129 at the end of April, and the rate of progress is being maintained. London's kiosks have increased from 52 to more than 120 this year, and 45 more are being built. Negotiations are in progress with 160 provincial towns for the building of street telephone boxes, says the *Daily Mail*. More kiosks are to be erected in the residential suburbs of Greater London, where, on early closing days, considerable difficulty is often experienced in obtaining access to a telephone call box. The advantage of the kiosk is that it is open day and night throughout the week, including Sunday.

Anglo-Dutch Service.—The Postmaster-General announces that the facilities for telephonic communication between Great Britain and Holland have recently been considerably increased. Additional circuits are now working, and communication between this country and Amsterdam, Rotterdam, The Hague, and the principal towns in Holland can be obtained (with the exception of the period between eleven and twelve noon) practically without delay.

Radio Notes.

Aerials. — Height Restriction. — The Coulsdon Town Council recommends that radio receiving aerial poles on housing estates should not be allowed to exceed 25 ft. in height.

Germany.—Rhineland Prohibition Relaxed.—The Rhineland Commission is considering the possibility of rescinding to some extent the prohibition of broadcasting in the occupied area. The use of wireless apparatus is to be permitted for certain business and educational purposes, says *The Times*, and the final decision regarding permits is to be left to the responsible Army Generals of the respective districts.

Labrador.—Radio Outfit.—The Moravian Mission boat *Harmony*, which recently left the London Docks on her annual visit to Labrador, is taking out a four-valve wireless set which has been specially made for use in the Mission boarding school for Eskimos and the children of settlers at Makkovik. The set is a present from listeners who heard Captain Jackson speak about the mission work in Labrador from 2LO. He hopes that the Makkovik school will be able to get American stations like Schenectady regularly, and be kept in touch with "home" through the news bulletins from Chelmsford.

Meteorological Forecasts.—Ships' Service.—On and after July 1st the British Broadcasting Co. will co-operate with the Mercantile Marine Department of the Board of Trade, the Meteorological Department of the Air Ministry, and the Post Office in extending to smaller coastal vessels gale, fog, and other shipping warnings. Since the beginning of last year broadcast warnings to shipping have been sent out by the Air Ministry on a continuous w-t wave (4,100 metres) twice a day, and from June 1st of this year, for the benefit of vessels not fitted to receive the long wave, warnings have been sent on the 600-metre spark from the Cullercoats, Niton, Seaforth and Valentia radio-telegraph stations. It was in order to reach the smaller craft, says *The Times*, that the assistance of the British Broadcasting Co. was invited and immediately accorded. Its high-power station (5XX) will broadcast each morning at 10.30 a.m. (summer time) on a 1,600-metre wave the weather inference specially for shipping from Chelmsford and later on from the new station at Daventry, Northamptonshire. In the evening, between 10.20 and 10.35 p.m. (summer time), the service will be taken up by three local stations—Liverpool for the West Coast, Bournemouth for the South, and Newcastle for the East.

Radio in Hospitals.—Advisory Council Fund.—A meeting of the Advisory Council of the Wireless for Hospitals Fund was held on June 22nd in the board room of the British Broadcasting Co. Lord Knutsford presided. According to *The Times* the resources of the fund in money and material now amount to more than £14,000. A standard specification of hospital equipment drawn up by the technical members of the Council was submitted and approved. A report on the progress made in the equipment of the hospitals already approved was placed before the meeting. These include the London, St. Bartholomew's, and the Royal London Ophthalmic. Application for equipment has been made to the Council by a large number of hospital authorities in London. It was decided as a general principle that the largest hospitals, that is, those containing the greatest number of beds, should be equipped first, and among those approved by the Council are the following:—St. Thomas's, Guy's, Middlesex, St. George's, University College, St. Mary's, Paddington, King's College, Royal Free, Charing Cross, Westminster, Royal Northern, and London Temperance.

Wave-Length.—Geneva Conference.—An international conference will be held at Geneva on July 6th and 7th under the auspices of the newly established International Radiophone Bureau, of which Mr. A. R. Burrows is director, to try to secure agreement upon a wave-length system enabling European stations to operate without risk of mutual interference. A memorandum on the subject, including a scheme for future working, was recently drawn up by Capt. Eckersley, chief engineer of the British Broadcasting Co., and will form the basis for discussion. So that there shall be no delay in putting the recommendations of the Conference into operation, it has been timed to precede the Council meetings of the International Radiophone Union, which will meet at Geneva on July 8th and 9th.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—Sydney.—September 9th. New South Wales Railway Commissioners. One electric travelling jib crane and maintenance for 12 months. (A.X. 2,120.)*

July 27th. Municipal Council. One 5,000-kVA, 5,000/33,000-V step-up transformer; supply of gasfilled lamps. Specifications from the office of the Construction Engineer, Electricity Department, Town Hall, Sydney.

Melbourne.—August 3rd. Electricity Commission of Victoria. Switchgear and accessories.

September 14th. 3,000-kVA transformers and spares. Particulars from the Purchasing Section of the Commission, William Street, Melbourne.

Belgium. — July 15th. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Telephone cable, with accessories for Waremme, Hannut, Libramont, Bastogne, Saint Vith, and Theux.

July 16th. Municipal authorities of Schaerbeek, Brussels. Three h.p. automatic switches, two 3-phase transformers. Particulars from Service de l'Electricité, Hotel Communal, Place Colignon, Schaerbeek.

Bridgend.—July 31st. Penybont Rural District Council. Kenfig Hill electricity scheme. L.p. underground and overhead mains, transformers, switchgear, meters, and house wiring. (June 26th.)

Cupar (Fife).—July 8th. County Council. Electric lighting installation at new police buildings. Specifications from Mr. C. R. Douglas, surveyor, 15, East Street, Dunfermline.

Dundee.—July 17th. Electricity Department. Steam and exhaust pipes. (June 26th.)

(Continued on page 23.)

The I.M.E.A. Convention.

The New President.

THE election of Mr. R. B. Mitchell, M.I.E.E., engineer and manager of the Glasgow Corporation Electricity Department, to the office of president of the I.M.E.A. for the current year, is a timely recognition of outstanding merit. We naturally—and rightly—associate with the name of Glasgow the idea of sound and sagacious municipal government, a reputation which cannot be maintained without the support of a highly competent permanent staff; and in that respect the electricity undertaking has never fallen below the standard set by the city's traditions.

Mr. R. B. Mitchell was born and bred in Glasgow, and his career has been spent almost wholly in the service of the city. In 1898 he was appointed shift engineer in a battery station; he was promoted to shift work in the Waterloo Street works, when it was a generating station, and later was in charge of a shift at the Port Dundas electricity works, where after three years he was made resident engineer.

Mr. Mitchell's next move was to the mains department; he was appointed superintendent of mains, and for 12 years had sole charge of the transmission and distribution sides of the undertaking. Thus he acquired an all-round experience which eminently fitted him to become, in 1917, Deputy Chief Engineer and Superintendent of Stations; from that post it was an easy step to the position of Chief Engineer and Manager in 1920. Mr. Mitchell is fortunate in possessing in the highest degree the confidence of the Corporation which he has served so long, and in his personal acquaintance with every aspect of the great undertaking which he controls. He now stands at the head of a department which is in the front rank in respect of its efficiency and good management, and which is well equipped with plant to meet all requirements.



Photo by [*Ralston.*

Mr. R. B. Mitchell, President of the I.M.E.A.

Mr. Mitchell is a member of the Institution of Electrical Engineers, Past Chairman of the Scottish Local Centre of that Institution, a Vice-President of the Institution of Engineers and Shipbuilders in Scotland, and a member of the American Institute of Electrical Engineers. As a member of Council of the Incorporated Municipal Electrical Association he has been assiduous in the performance of his duties, having been present with his chairman, Dr. Dewar, at every one of the 11 meetings held during the past year, and it is certain that as President he will not spare himself, but will, like his predecessors loyally serve the Association to the utmost of his capacity. As one of the youngest heads of departments of the Glasgow municipality, he has, we hope, many years of active work before him, and in his hands neither the Association nor the Corporation need fear that its interests will be neglected or that its prestige will be allowed to fade.



Mrs. Atkinson, with Messrs. W. A. Brown and H. A. Nevill.



Mr. C. E. Newton, Ald. Taylor, and Mr. H. F. G. Woods.



The New President and Dr. Ferranti.



Mr. and Mrs. A. J. Fuller and Mr. and Mrs. A. J. Hedgcock.



Starting from the Grand Hotel for Eastbourne.



The President, Mr. W. C. P. Tapper, having a look round.



At the Kemp Town Sub-station, Brighton.

F

The Electric Drive in Carpet Mills.

Messrs. Stewart Brothers' Eskbank Mills.

THE textile industry has ranked for many years as one of the leading industries in this country, and whilst much has been written on most of its branches, it is surprising that so little has been said about the carpet branch.

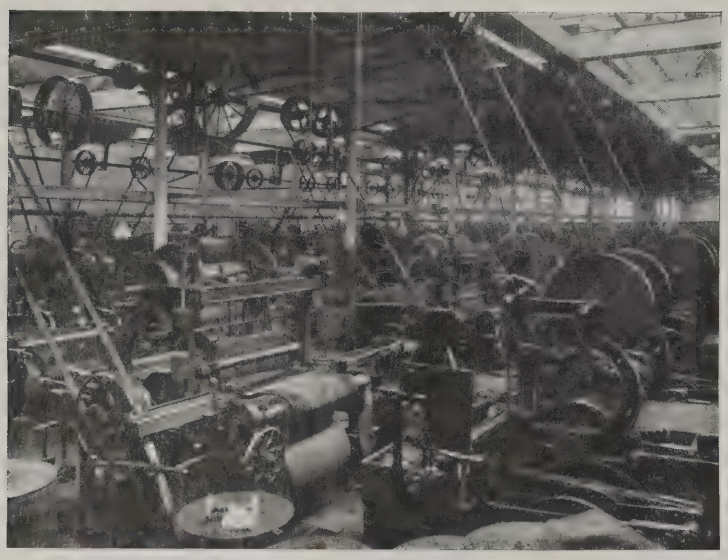


Fig. 1.—General View of Carpet-weaving Shed.

About 1540 an effort was made to manufacture carpets in this country, but it was not until 1600 that the industry was successfully established, mills being erected at Mortlake, in Surrey. It is interesting to record that, owing to the lack of skilled English labour, weavers had to be brought over from France to carry out the weaving operations.

The carpet industry is a highly specialised one, and for that reason it is of paramount importance that manufacturers should adopt the best machinery and most efficient means of driving it in order to meet the severe competition experienced from foreign countries, and the success of the electric drive as applied to the industry is a sure indication of the many advantages to be derived from it. New mills are being electrified throughout, and many of the older ones that have been converted have effected a considerable saving in cost, both with regard to running expenses and repairs, coupled with the superior convenience, improved quality of the product, safety, and other no less important merits of the electric drive.

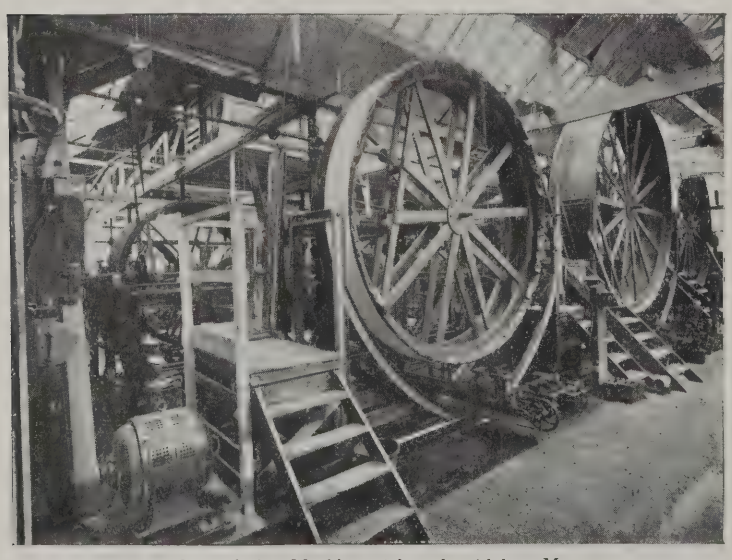


Fig. 2.—Printing Machines driven by 4-b.h.p. Motor.

An interesting example of the conversion from steam and gas to electric driving is the Eskbank carpet mills of Messrs. Stewart Bros., who produce tapestry and velvet pile classes of carpet by the method Mr. Whytock, of Edinburgh, invented in 1832 of printing the colours on the warp threads. The progressive order of the process is: Scouring the yarn, stoving, steeping in cold water, dyeing, winding on to bobbins, printing, steaming and drying, winding for the setters, setting, beaming, and weaving.

This Midlothian mill was originally driven by a steam engine and one gas engine, the shafting throughout the mill being driven through at least eight sets of bevel gears, which required constant lubrication and attention. The lighting was by gas with incandescent mantles. The boiler plant originally installed was condemned for the pressure for which it was designed, but it could still be used for producing the lower-pressure steam required for process work in the mill. Bearing the fact in mind that it was impossible to install new steam power plant without radical alteration of the mill buildings, it was decided to purchase electricity in bulk from the Lothians Electric Power Co. at 11,000 volts, 50 cycles, 3 phase, and adopt electric driving throughout.

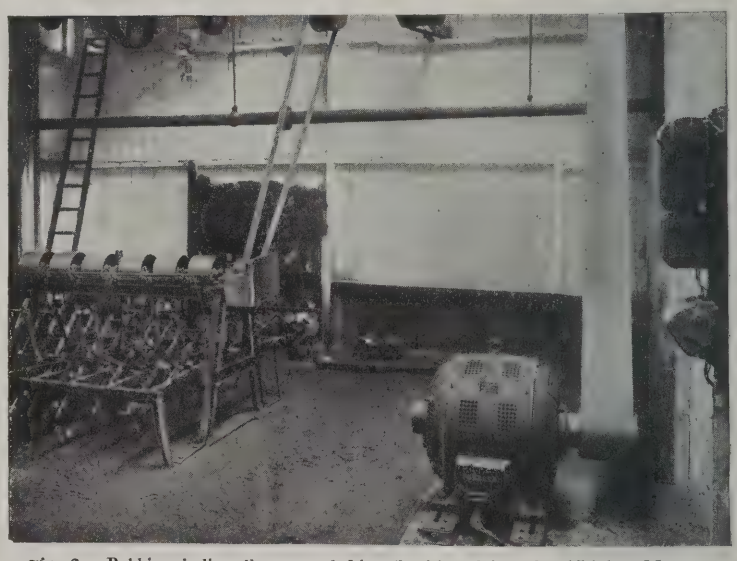


Fig. 3.—Bobbin-winding Frame and Line Shafting driven by 15-b.h.p. Motor.

A transformer house was erected near by, in which a 200-kVA Johnson & Phillips transformer is installed for reducing the voltage from 11,000 to 400 volts. The transformer is of the oil-immersed self-cooled type, and a sheet-steel cubicle has been installed for controlling the h.p. supply; another sheet-steel cubicle contains three kW-hour meters and three Hill-Shotter maximum-demand indicators, both cubicles being of Erskine Heap manufacture.

Operating in parallel on the low-pressure side of the transformer is a 125-kVA oil-immersed static condenser with auto transformer stepping up the l.p. from 400 to 600 volts and controlled by a Ferguson Pailin floor-mounted switch pillar. The object of this piece of apparatus is to improve the power factor of the system and, in order to prevent the condenser from supplying wattless current to the mains of the electricity

supply company when the mill is lightly loaded and thus increasing the maximum demand kVA; it is further controlled by a special automatic circuit breaker with jamming relay made by the Igranic Electric Co., which automatically cuts out the condenser when the load falls below a predetermined figure and inserts it again when the load rises above a certain figure.

The l.p. supply from the transformer is controlled by distribution switches and fuses, there being one set

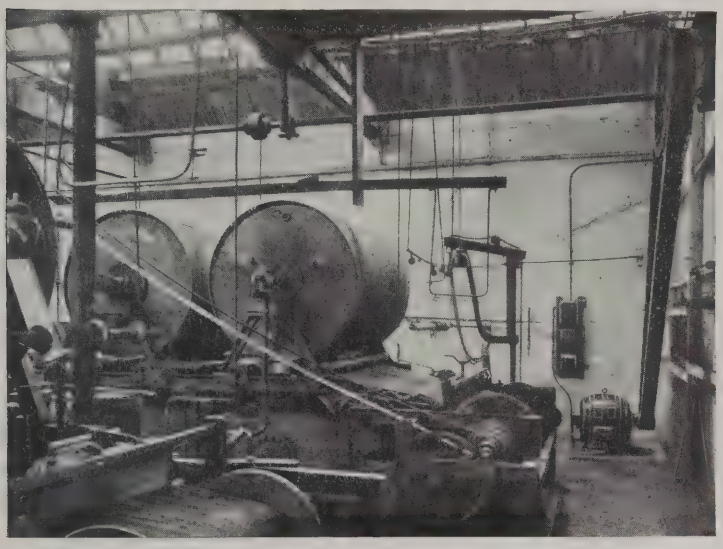


Fig. 4.—Dressing Drums driven by 7½-b.h.p. Motor.

for each department in the mill. From the distribution board, three-core armoured cables are run to sub-distribution boards throughout the mill and from the latter to sub-distribution ironclad fuseboards, whence the circuit wiring in tubing is run to the various motors and control gear.

The motors, which were manufactured by Messrs. Bruce Peebles & Co., Ltd., of Edinburgh, are of the squirrel-cage induction type, fitted with textile enclosing covers, the construction of which is such that any fluff which may gather round the apertures can be easily wiped off. The advantages in favour of this type of motor are its extreme flexibility as regards pressure, steady running, and small speed variation from no load to full load.

Fig. 1 is a general view of one of the weaving sheds, which is driven on the subdivided group system by three 10-b.h.p., 472-r.p.m., Peebles induction motors, while fig. 3 depicts a 15-b.h.p., 475-r.p.m., motor

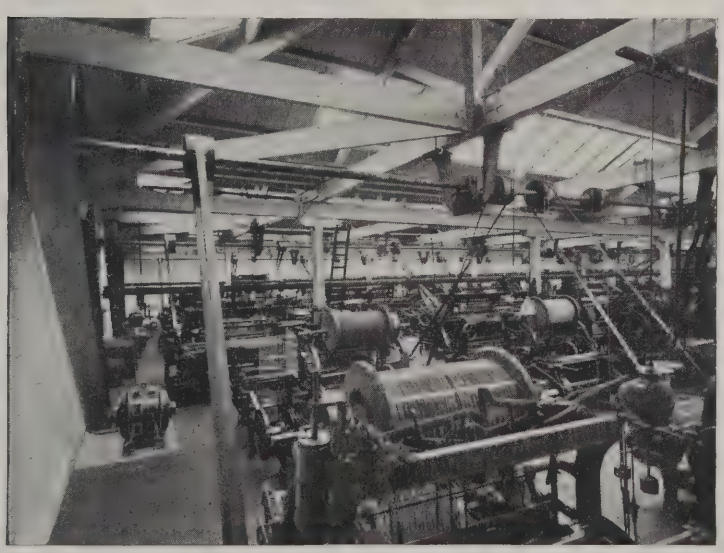


Fig. 5.—Weaving Shed, Group-driven by three 15-b.h.p. Motors.

driving bobbin-winding frames and line shafting; the star-delta starting switch is clearly shown on the wall on the right of the picture. Fig. 2 illustrates the printing machines, driven by a 4-b.h.p., 567-r.p.m. motor, which are of particular interest.

An examination of the illustration will show that the construction of these printing machines is very simple, each merely consisting of a large lightly-constructed drum, a part of the periphery of which is collapsible to allow of the yarn being removed after printing, and a movable wheeled dye-trough situated underneath the drum. On the operators' platform a printers' board will be seen suspended by a cord, the respective colourings of the warp threads being indicated on this board by suitable colour signs which correspond to the figuring on the edge of the drum.

White yarn is run on to the drum of a length corresponding to the length of five or six pieces of carpet, according to the number being run off; the trough is next charged with a dye of the required colour, and the printing process begins. The trough, which is mounted on a small railroad, is fitted with a roller having its periphery formed of vulcanite, and this roller revolves partly in and partly out of the trough, somewhat after the fashion of a lawn marker. The trough is set in motion, moving in the direction of the axis of the drum, and in doing so the roller leaves an impression on the warp threads of a width corresponding to the width of one elongated stitch; the drum is then moved



Fig. 6.—Three 10-b.h.p. Motors driving Weaving Shed shown in Fig. 1.

round to a position indicated by the printers' board, and the process repeated. When a change of colour is required it is only necessary to replace one trough by another, a number of which are allocated to each machine. When the run of yarn has been completely printed in the required colours, it is removed and forms one thread of the warp of five or six pieces of carpet according to the length. Fresh white yarn is now run on and dyed, thus forming the second thread of the warp.

After leaving the printing machines the warp threads are steamed and dried, this process ensuring that the dyes fully enter the pores of the yarn; fig. 4 shows the dressing drums, which are driven by a 7½-b.h.p., 472-r.p.m. motor. The warp threads are next placed on setting frames, the various threads being arranged in relation to one another according to the design; when this is being done, the pattern may be seen taking form. The warp being now set, it is wound on beams or rollers and is ready for the weavers. Fig. 5 depicts one of the

weaving sheds, driven by three 15-b.h.p. motors, whilst fig. 6 shows three 10-b.h.p. motors driving the weaving shed shown in fig. 1.

Illustrations 7 and 8 are two views of the drying drums and brushing machine, driven by a 10-b.h.p. motor, used for cleaning and drying the surface of the carpets. All the motors are sufficiently protected by substantial metal guards which, having been removed so as not to obscure the photographs, are not shown in the illustrations.

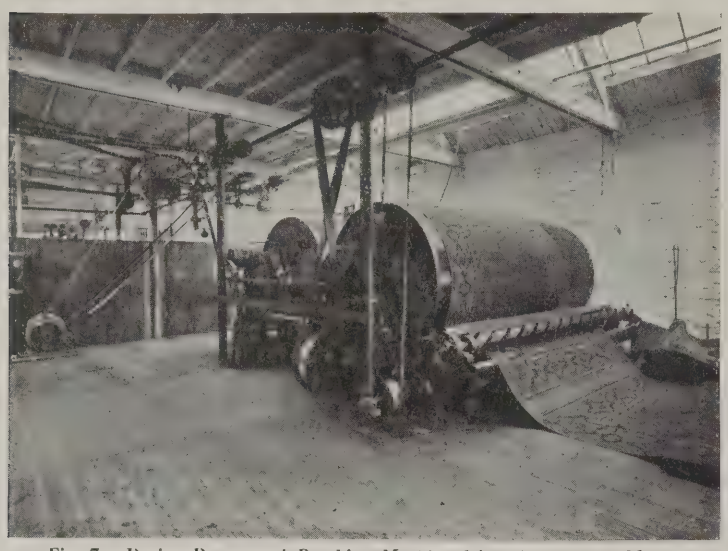


Fig. 7.—Drying Drums and Brushing Machine driven by 10-b.h.p. Motor.

The arrangement of group driving throughout the mill was adopted to avoid alteration to existing driving arrangements, and it is interesting to note that the change-over to electricity was effected without any reduction in the working time of the mill. To enable this to be done, the whole electrical equipment was installed before the steam and gas power was cut off and, group by group, the change-over was effected during meal hours and one or two evenings, it being only necessary in many instances to remove the bevel pinions.

The lighting of the mill, of course, is by electricity; supply is obtained from the neutral point and each of the phases of the low-pressure side of the transformer, the voltage obtained between the neutral point and any one of the phases being 230 V. The lighting load is divided as equally as possible between the three phases, and the three lighting boards control the circuits to sub-distribution boards throughout the mill, and they are connected by twin armoured cables. The connections from the sub-distribution boards to the lighting switches are run in tubing. The lighting is worthy of note in that an effort has been made to illuminate individually each process and to provide uniform light throughout in so far as it is possible to do so in such mills. At a recent social gathering the chairman of the Workers' Committee expressed his view to the management that nothing so beneficial in the history of the company had been done for the workers to compare with the new lighting.

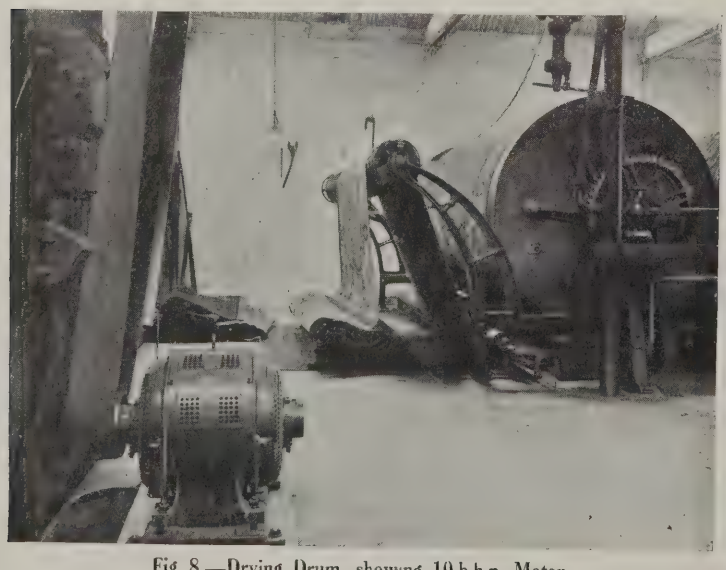


Fig. 8.—Drying Drum, showing 10-b.h.p. Motor. (Note Starting Switches on Wall.)

Summarising briefly the various advantages resulting from the electrification of a carpet mill, it may be said that any portion of the mill not in use may be shut down without interfering with the rest of the plant, thereby effecting a considerable saving in power, which would otherwise be wasted in running idle line shafting. Moreover, a mechanical or electrical breakdown would be entirely confined to its own section, all other sections proceeding as usual while repairs were being carried out. Individual sections of the mill can be run on overtime without that waste of power which is brought about by running the whole mill for the sake of a few machines, while power costs may be checked at any desired moment.

The introduction of machinery into the carpet-making industry, and the increased production consequent thereon, has had the effect of considerably reducing the cost of carpets, thus bringing them within the means of everyone. Many mills are still driven by antiquated steam engines, although the cost of converting a mill to electric driving is more than compensated for by the saving in running expenses and other advantages which accrue from electrical operation. In view of what the use of electricity has done in other branches of the textile industry, carpet manufacturers should have no difficulty in appreciating its merits as the most efficient means of driving factory machinery. When considered in conjunction with the more healthy, clean, and less noisy conditions under which the employés are enabled to work, the day would seem to be not far distant when those facts will be generally recognised, not only in all branches of the textile trade, but in every industry that makes use of power-driven machinery.

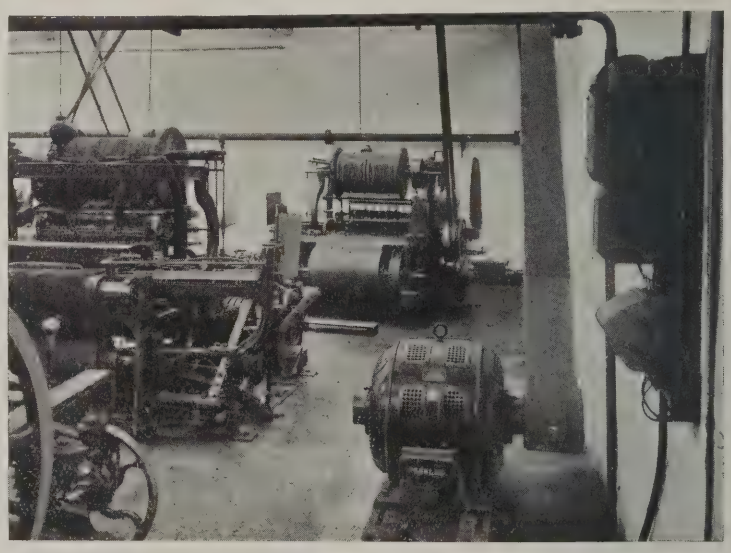


Fig. 9.—A 15-b.h.p. Motor driving Carpet Looms.

In conclusion, it should be mentioned that the complete electrical installation described above was carried out by the agents of Messrs. Bruce Peebles & Co., Ltd., Messrs. Mitchell, Graham & Son, Ltd., of Edinburgh, who were responsible for the execution of the whole of the work.

Contracts Open and Closed

(*Continued from page 18.*)

Open.

Colchester.—July 10th. Education Committee. Installation of electric lighting at St. John's Green Council school. Specification from the Borough Electrical Engineer (Mr. Wm. Frisby).

Edinburgh.—July 9th. Education Authority. Electric lighting installation at three schools. Schedules from the Executive Officer, Education Offices.

July 13th. Electricity Department. Installation of electric lighting at the public wash-house, Abbeymount, Edinburgh. Specifications from Engineer, Dewar Place.

Egypt.—CAIRO.—July 9th. Director of the Section of Local Municipalities and Commissions (Savoy House), Cairo. Supply and installation of an electrical system at Zifta.

Inspecting Engineer in London. 3,000 metres submarine cable, underground cables, 10 tons line wire, bolts and nuts, &c.—*Reuter's Trade Service* (Cairo).

Fife.—July 6th. Education Authority. Electric lighting work in connection with the addition to Leslie Public School. Schedules from Master of Works, Fife Education Authority, Kirkcaldy.

Grimsby.—July 4th. Electricity Department. 15,000 yd. p.i.l.c. l.p. cables. (June 19th.)

Hemsworth.—July 6th. West Riding Education Committee. Electric lighting at Council School. Specifications, &c., from Education Department, County Hall, Wakefield.

India.—SIMLA.—July 20th. Indian Stores Department. Diesel-engine alternator sets, water-cooling units, oil fuel storage tank oil-purifier equipment, 10-ton overhead crane, switchboard, cables, transformers, e.h.p. feeder cables, &c.*

Littleborough.—July 8th. Urban District Council. 6,600-V cables, roadwork, &c., transformer, switchgear, and cable connections for new sub-station. (June 19th.)

London.—H.M. OFFICE OF WORKS.—July 9th. One 110-V, 3,500-Ah secondary battery for the National Physical Laboratory, Teddington. (June 26th.)

BATTERSEA.—July 21st. Electricity Department. One 10,000-kW turbo-alternator, with condensing plant, switchgear, and two 65,000-lb. per hour boilers, with pipework and ash-handling plant. (June 19th.)

STEPNEY.—July 8th. Board of Guardians. Electrical fittings for two months. Forms of tender from Mr. F. J. Tootell, Guardians' Offices, 74, Vallance Road, Whitechapel, E.1.

LEWISHAM.—July 6th. Board of Guardians. Installation of electric clocks at the Hospital, High Street, Lewisham, S.E. (June 26th.)

Loughborough.—July 9th. Poor Law Institution. Installation of electric lighting at the Institution. Plans and specifications from Mr. E. G. Phillips, consulting engineer, Queen's Chambers, King Street, Nottingham.

Lymm.—July 13th. Urban District Council. Electrically-driven centrifugal pump. Particulars from Mr. N. Holt, clerk to the Council, Council Offices.

Manchester.—July 9th. Board of Guardians. Electrical equipment, comprising rotary converters, transformers, and control panels at Booth Hall Infirmary, Charlestown Road, Blackley. Particulars from Mr. E. Hargreaves, superintendent of works, Union Offices, All Saints, Manchester.

July 16th. Electrically-driven booster pumping plant at Booth Hall Infirmary. Particulars from Mr. E. Hargreaves, Union Offices.

July 20th. Electricity Department. Electric cooking ranges and switches and cut-outs for 12 months. (See this issue.)

New Zealand.—WELLINGTON.—July 21st. Public Works Department. Two electrically-operated water-level indicators.*

August 18th. Posts and Telegraph Department. Switchboard plugs.*

INVERCARGILL.—Electricity Department. 2,200 ft. .1 sq. in. 11,000-V cable; 80 ft. .3 sq. in. 3,300-V cable and spares.*

August 17th. Four 667-kVA single-phase transformers.*

Skipton.—July 10th. Electricity Department. L.p. cable. (June 26th.)

Stoke-on-Trent.—July 7th. Electricity Supply Department. Two 25-kVA transformers and electrically-driven grab crane. (June 19th.)

Switzerland.—July 11th. Swiss Federal Railway authorities, Berne. Installation at the Vernayaz hydro-electric station of two 250-kVA single-phase transformers and two of 75-kW capacity. Particulars for 10 fr. from Abteilung für Elektrification, Dienstgebaude, Zimmer 164, 43, Mittelstrasse, Berne.

Tunbridge Wells.—July 8th. Electricity Committee. One 3,000-kW turbo-alternator, with condenser, piping, and cables, one cooling tower, steam piping, &c. (June 5th.)

Uruguay.—MONTEVIDEO.—July 28th. State Electricity Supply Works. 15 equipments (switchboard, feeder cubicle, &c.) for transformer sub-stations.*

West Ham.—July 20th. Education Committee. Wiring of eight schools. (June 26th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—SYDNEY.—City Council. Electricity Committee. Split-conductor feeder panels (£2,236); h.p. switch panels for 5,000-V and 10,000-V sub-stations (£10,745).—Ferguson, Pailin, Ltd.

Rubber insulated cables.—Nine tenders were received, all quoting the same price (£2,400). The Committee recommended the Council to eliminate from the list the names of the Australian General Electric Co. Ltd., and the British General Electric Co., Ltd., and that the general manager be authorised to accept the most suitable tender from the remaining offers.

50-ton electrically-operated travelling crane.—Andrew Thompson and Scougall.

L.p. oil-switch transformer panels (£3,738).—Metropolitan-Vickers Electrical Co., Ltd. —*TENDERS.*

Belgium.—Five Belgian and one British concern (the British Insulated & Helsby Cables, Ltd., Prescot) submitted tenders last week to the Société Nationale des Chemins de Fer Vicinaux, Brussels, for the supply and laying of a quantity of underground h.p. cable. The quotations ranged from 316,372 to 400,258 francs, the lowest being that of the Société des Cableries et Corderies du Hainaut, of Dour.

Bournemouth.—Tramways Committee. Accepted:—

Generating and condensing plant (£11,248).—W. H. Allen & Co., Ltd.
Supply and erection of cooling tower (£3,260).—Premier Cooler and Engineering Co.
Two water-tube boilers (£8,680).—Babcock & Wilcox, Ltd.

Brighton.—Lighting Committee. Accepted:—

Cable.—(£2,621), Siemens Bros. & Co., Ltd.; (£269), W. T. Henley's Telegraph Works Co., Ltd.; (£3,499), Macintosh Cable Co., Ltd.

Tramways Committee. Accepted:—

Three single turnouts (£155, £149 and £162).—Hadfields, Ltd.

Burslem. — Territorial Army Association. Recommended:—

Electric light fittings for the drill hall, &c.—Blackburn, Starling & Co.

Dorchester.—Lighting Committee. Recommended:—

Feeder cable (£721).—Johnson & Phillips, Ltd.
Feeder panel.—General Electric Co., Ltd.

Glasgow.—Health Committee. Recommended:—

Electric lighting work at Mearnskirk Sanatorium (£2,723).—Andrew Hutcheson, Ltd.

Corporation Tramways Committee. Recommended:—

Trolley wire.—R. Johnson & Nephew, Ltd.
Block nuts.—P. & W. MacLellan, Ltd.
L.c. cable.—Western Electric Co., Ltd.
Armature-banding lathe.—Midland Dynamo and Motor Repairs Co., Ltd.
Steel tires.—Steel Co. of Scotland.

Halifax.—Tramways and Electricity Committee. Recommended:—

Tenders in connection with the Halifax-Huddersfield linking-up scheme:—

Switchgear (£3,024).—British Thomson-Houston Co., Ltd.
E.h.p. cable, pilot and telephone cables (jointly with Huddersfield Corporation).—British Insulated & Helsby Cables, Ltd.

London.—LONDON COUNTY COUNCIL.—Accepted:—

4 arc-welding plants (E.L. type) for the Tramways Department.—Equipment and Engineering Co.
Six months' supply of dry cells.—Edison Swan Electric Co., Ltd.

METROPOLITAN ASYLUMS BOARD.

The following tenders were received for installation of electric light at High Wood Hospital for Children:—

Smethurst & Co. (London), Ltd.	£2,589
C. F. Williams	2,920
Coley & Swinnerton, Ltd.	3,000
T. Clarke & Co., Ltd.	3,100
A. Hawkins & Sons	3,100
Read & Partners, Ltd.	3,153
Power Contracts, Ltd.	3,431
W. H. Gaze & Sons, Ltd.	3,511
Griggs & Son	3,625
G. A. Weston	3,995
W. E. Heath & Co.	7,750

GENERAL POST OFFICE. Accepted:—

One special double-output 2-kW generating set, with twin-cylinder vertical gas engine, for the automatic telephone exchange at Oughtibridge, near Sheffield.—Stuart Turner, Ltd.

Manchester.—The Corporation Tramways Committee last week decided to recommend the Council to sanction the acceptance of the tender of the United Steel Products, Ltd., at £4,800 for special track material; the figure, it is stated, is about £200 less than the lowest British tender. According to the *Daily Dispatch*, there was some opposition at the meeting of the Tramways Committee to the contract going outside the country, but there was only a small attendance of members.

Electricity Committee. Accepted :—

Cable.—British Insulated & Helsby Cables, Ltd.; Macintosh Cable Co., Ltd.; F. Smith & Co.; Callender's Cable & Construction Co., Ltd.
Pipes and flanges for soot blowers.—Wellington Tube Works, Ltd.
E.h.p. cables linking the Barton station with supply area.—Callender's Cable & Construction Co., Ltd.

Central Purchasing Committee. Accepted :—

Incandescent electric lamps.—Metro-Vick Supplies, Ltd.; Edison-Swan Electric Co., Ltd.; British Thomson-Houston Co., Ltd.; Siemens and English Electric Lamp Co., Ltd.; British Insulated & Helsby Cables, Ltd.; General Electric Co., Ltd.; Stella Lamp Co., Ltd.

Housing Committee. Accepted :—

Electric light installation at Blockley housing estate.—J. Armstrong and Co., Ltd.

Plymouth.—Electric Committee. Accepted:—

Motor converter and switchgear for Newport Street (£7,450).—General Electric Co., Ltd.

Portsmouth.—Board of Guardians. Accepted :—

Electrical fittings.—General Electric Co., Ltd.

Salford.—Electricity Committee. Accepted :—

Removal of the d.c. lighting and power board at Frederick Road power station, including new rotary panels (£1,870).—Bertram Thomas.
Cable (£2,674).—W. T. Glover & Co., Ltd.

South Africa.—CAPE TOWN.—Electricity Committee. Recommended :—

Six tons copper wire (£525); cable (£157).—Telegraph Mfg. Co., Ltd.
Seven transformers (£1,225).—General Electric Co. of America.
Circulating-water equipment (£126).—Griffin Engineering Co.
Two Ferranti transformers (£150).—Rice & Wiethelm, Ltd.
Cables (£2,040).—W. T. Henley's Telegraph Works Co., Ltd.

Stoke-on-Trent.—Electricity Committee. Accepted :—

Three switchgear panels at Hanley sub-station (£300).—A. Reyrolle and Co., Ltd.

Sunderland.—River Wear Commission. Accepted:—

Two sets of hydraulic pumps, with electric motors, automatic, electric, and hydraulic control gear (£2,042).—Fullerton, Hodgart & Barclays, Ltd.

Forthcoming Event.

Faraday Society.—Monday, July 6th. At Burlington House, W. At 5.15 p.m. Annual general meeting.

Notes.

The United States and Canadian Water Power.—Sir Adam Beck, chairman of the Hydro-Electric Power Commission of Ontario, has made a strong protest against the proposed leasing of a water-power site at Carillon on the Ottawa River to American interests. He states that Ontario is faced with the prospect of a severe power shortage and consequently needs every water-power that can be developed. Although it is stated that the potentiality of the Carillon project is only 200,000 h.p., permission is sought for the export of twice this amount of power. Sir Adam states that at present the Canadian people have a safeguard in the matter of exported power; notices are served annually on users of Canadian-produced power, pointing out that the power is only being exported until such times as it is needed in Canada. He avers that the concession seeks to destroy this safeguard.

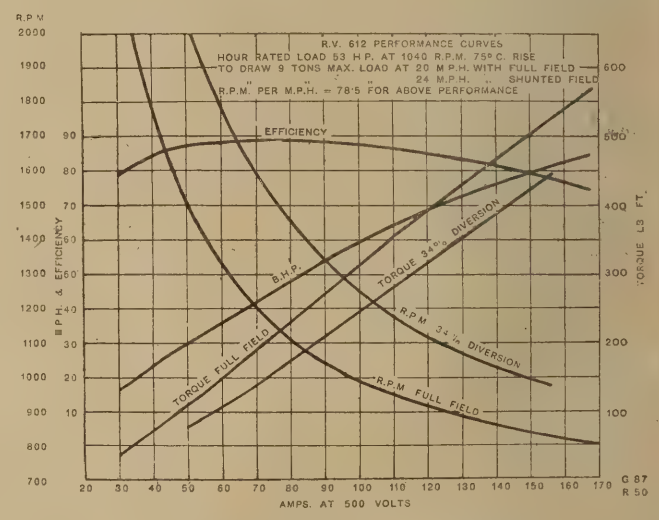
The Aurora Spectrum.—Prof. McLennan recently announced, at the Royal Society, that he had determined the conditions that give rise to the peculiar green line found in the spectrum of the Aurora Borealis. This knowledge may be of the greatest value in elucidating the problem of the transmission of "wireless" waves around the world. Photographs of the spectrum of the Aurora Borealis have been taken by numerous workers, and in the spectra obtained there has always been a green line amongst the bands at a definite point. Lord Rayleigh identified the bands with the spectrum of nitrogen, but the green line remained a puzzle, having never been reproduced in the spectrum of any element, nor in the spectra of compounds of elements in laboratory experiments. The green line was obtained recently at Toronto by the Professor and his co-worker, Dr. Shrum, in the spectrum of oxygen and helium, with the latter in excess. One peculiarity of the green line was that it could be obtained on almost any night from the light of a cloudless sky. Prof. McLennan now shows that the green line spectra ordinate in highly rarefied oxygen, and that the intensity is gradually enhanced when helium is added to the oxygen. The Aurora light comes from a region some 60 or 100 miles above the earth, and the origin of the green line indicates that at this height the atmosphere contains 20 to 30 times as much helium as oxygen.—*Morning Post.*

The Electrical Engineers' Ball.—We are pleased to learn that owing to the success of the Electrical Engineers' Ball, held in February, the Committee has been able to distribute out of the surplus funds the sum of £70 each to the I.E.E. Benevolent Fund and the Electrical Trades Benevolent Fund.

Electric Transmission from Norway to Denmark.—Dealing with this oft discussed problem, Mr. Angelo, manager of the North Jutland Electricity Supply Works, before the annual conference of the Danish Electricity Works Association held in Copenhagen on June 16th, put forward six alternative schemes, each of which would involve an expenditure of about 50,000,000 kronor. One project suggested the construction of two high towers in the Sound for the suspension of the aerial conductors. The transmission by means of submarine cables would result in a lesser outlay, but the author stated that some of the power would thereby be lost. In his opinion the former scheme, although it might be delayed many years, would be carried out eventually. The expenditure should not be borne solely by Denmark, but also shared by Norway and Sweden.

Deterioration of Fibrous Insulating Materials.—We have received details of experiments carried out at the the Institute of Physical and Chemical Research, Tokio, on some fibrous insulating materials in order to determine the effect of temperature on the deterioration of such materials. The rate of deterioration of the insulating materials by heat was measured by the amount of decomposed gases, or by the weight decrease of the material, which is commonly known as the thermal decomposition or carbonisation. Curves plotted from the results of the experiments show that with cotton the weight of material fell to 90 per cent. in 1,250 hr. at 165 deg. C., and to 35 per cent. in 200 hr. at 205 deg. C.; with filter paper to 90 per cent. in 550 hr. at 165 deg. C., and 30 per cent. in 70 hr. at 223 deg. C.; with linen to 90 per cent. in 1,000 hr. at 165 deg. C., and 45 per cent. in 80 hr. at 215 deg. C.; with manila paper to 95 per cent. in 700 hr. at 145 deg. C., and 34 per cent. in 6 hr. at 265 deg. C.; with silk to 97 per cent. in 1,350 hr. at 125 deg. C., and 60 per cent. in 4 hr. at 265 deg. C.; and with empire cloth to 97 per cent. in 460 hr. at 105 deg. C., and 60 per cent. in 16 hr. at 265 deg. C.

Trolley 'Buses for Shanghai.—We have been informed, subsequent to the publication of the article, "Trolley 'Buses for Shanghai," in our columns of June 12th, that the curves shown in fig. 1 of the article represent the performance of a 9-ton vehicle; and it should be made quite clear that they are not the performance curves of the Shanghai vehicle. The 9-ton vehicle is driven by a single "Bull" motor, the performance of which is shown in the accompanying curves. The motor is rated at 53 h.p. at 1,040 r.p.m., with 75 deg. C. rise in temperature; it will draw 9 tons maximum load at 20 m.p.h.



Performance Curves for "Bull" Driving Motor.

with full field, and 24 m.p.h. with the field shunted, the r.p.m. per m.p.h. being 78.6 for this performance. It should also be noted that the acceleration of 2.5 m.p.h. per sec. referred to in the article is the starting acceleration of the 9-ton vehicle.

The London Electrical Engineers.—27TH A.A. BATTALION R.E. (T.A.). Honorary Colonel, Col. R. E. B. Crompton, C.B.; Officer Commanding Lieut.-Col. C. H. S. Evans, O.B.E., A.M.I.E.E. The following orders have been issued for July :—

304th Company (Major W. H. Merrett, T.D., A.M.I.E.E.).—Mondays, 7 p.m. to 9.30 p.m. H.Q., Royal School of Mines, and Hyde Park. Musketry, Rainham Ranges, July 12th, 12 noon.

305th Company (Major A. W. Mawby, O.B.E., A.M.I.E.E.).—Tuesdays, 7 p.m. to 9.30 p.m. H.Q., Royal School of Mines and one mobile station. Musketry, Rainham Ranges, July 12th, 3.30 p.m.

306th Company (Major F. C. Clarke, A.M.I.E.E.).—Fridays, 7 p.m. to 9.30 p.m. H.Q., Hyde Park and Royal School of Mines. Musketry Rainham Ranges, July 26th, 12 noon.

Two officers and detachment of twelve lights at Wembley throughout the month.

Railway Station Lighting.—Trains on a south-western United States railroad, upon approaching certain of the very small stations, actuate an electrical relay by touching a mechanical device on the track and thereby light the station lamps. As they reach a certain distance in departing from the station, they turn the lights out.

New Process for Platinum Extraction.—According to the *Financial News*, a Pietersburg man has invented plant for the extraction of platinum and the treatment of refractory ores, which, it is claimed, has satisfied prominent mining men as to its practicability. It is reported that tests prove that platinum, iridium, gold, silver and base metals, can be completely dealt with. The cost of the treatment is estimated at 2s. per ton, exclusive of technical and labour costs. Tests with Lydenburg and Waterberg platinum ores have given good results, and there are prospects of an improvement of the process which will be within the reach of small capital.

Since the discovery of platinum-bearing reefs in the Lydenburg district, there have been a number of reports of occurrences of this valuable metal or of the rocks in which it has recently been found, at widely separated points in Southern Africa.

It is interesting to note that these reports all refer to areas which lie fairly close to the same meridan, and are, therefore, parallel to what remains of the western scarp of the Rift Valley. If this is not merely a coincidence, platinum-bearing rocks may yet be found still further to the north in Northern Rhodesia and Tanganyika Territory, and possibly in other Central African territories as well.

The I.E.E. in China.—We have received from Mr. C. S. Taylor, the honorary secretary and treasurer of the China Centre of the Institution of Electrical Engineers, a recent photograph of the members of the Centre; this is reproduced herewith. The occasion was a conference which was held in Shanghai on May 1st and 2nd. A number of technical matters were discussed and the conference closed with a dinner at which the chairman, Mr. T. H. U. Aldridge (chief engineer of the Shanghai Municipal Electricity Department), gave an interesting address upon the failure, in 1923, of a 20,000-kW turbine in the power station which is under his supervision. He also spoke of the effect of superheated steam upon the casings of two 18,000-kW turbines at the same station. Among other matters dealt with in the address were questions relating to turbine design, particularly with regard to investigations made into the "fluttering" of turbine wheels.

The following is a key to the members who appear in the photograph :—

Back row : A. J. Percival, N. Denison, H. J. Moysey, R. A. E. Denton, T. Oliphant, H. J. Gwyther, G. Finlay, O. L. Ilbert, A. D. Buchanan, R. L. Evans, L. Beaumont, S. Y. Chang, V. Rose, A. S. Phillips, J. E. M. Barnes.

Front row : E. A. Mills, P. H. Cole, F. S. Heys J. S. S. Cooper (vice-chairman), T. H. U. Aldridge (chairman), F. R. Scott (guest), C. S. Taylor (honorary secretary and treasurer), C. M. Perrin, Dr. H. Chatley (guest).



A Conference of Electrical Engineers at Shanghai.

Civil Service Commission.—FORTHCOMING EXAMINATIONS FOR ASSISTANT ENGINEER AND FOR INSPECTORS IN THE ENGINEERING DEPARTMENT OF THE GENERAL POST OFFICE.—The latest date for the receipt of application forms for assistant engineer is July 30th, and for inspectors in engineering August 27th. Particulars and forms of application can be obtained from the Secretary, Civil Service Commission, Burlington Gardens, W.1. (See our advertisement pages to-day.)

E.A.W. Showroom Visit.—On Friday afternoon, June 26th, a large party of members of the Electrical Association for Women visited Mazda House, Oxford Street London, where a keen interest was displayed in the domestic cookers, washing machines, and also the wireless apparatus. Short talks were given by members of the B.T.-H. staff on the "Domestic Application of Electricity" and "Battery Charging," after which the members were entertained to tea.

Artificial Waterfall for Hydro-Electric Scheme.—*Power* says that a project for supplying the north-eastern provinces of Spain with electric power, originally planned and financed by Mr. Pearson, a Canadian banker who perished on the *Lusitania*, provides for the construction of a large artificial waterfall at the town of Mequinenza on the River Ebro. The big artificial lake will also be used for an irrigation system in the surrounding districts.

International Tramway Congress.—The third congress of the International Tramways and Light Railways Union was held in Budapest from June 21st to 25th. In connection with the congress an exhibition of appliances, &c., was held and delegates paid a visit of inspection to the electrified portions of the State railways.

Modern Stage Lighting.—On June 23rd, members of the Illuminating Engineering Society paid a visit to Drury Lane Theatre, by the courtesy of Sir Alfred Butt, and Mr. H. Mather, the electrical engineer in charge, demonstrated the lighting arrangements. The very large stage at Drury Lane receives illumination by many methods and lamps of historic interest are used side by side with those of the latest pattern. Thus, the overhead lighting could be furnished by the conventional battens of coloured lamps; but in addition gasfilled lamps in concentrating reflectors, equipped with gelatine screens giving a varied series of colours are in use. Spotlight projectors at the side are likewise furnished with rotating screens equipped with coloured diaphragms, and in the wings limelight projectors are still used and give a powerful light, though projectors using electric incandescent lamps are being experimented with as well. Arrangements have also been made for the more recent form of projection of light, from arcs above the gallery. Other special units for the illumination of scenery were shown in operation an interesting feature here being the use of batteries of cylindrical fittings, each provided with tubular gasfilled lamps specially constructed for the purpose.

Following the visit members adjourned to Magnet House, by the invitation of the General Electric Co., Ltd., where a discussion on "Stage Lighting" took place. Major A. Klein pointed out the great possibilities of modern methods, involving the use of colour and the projection of pictures, alluding to such devices as the recent accompaniment of concerts by the Clarilux colour-organ, and the spectacular effects contrived by Mr. A. Samoiloff at the London Hippodrome. As soon as managers realised the possibilities of modern apparatus they would be willing to make the necessary expenditure, but at present this presented one of the chief difficulties in getting new methods taken up. Other speakers referred to the need for co-operation between the manager, the actor, and the illuminating engineer, and Mr. L. Gaster, in returning thanks to the General Electric Co. for its hospitality, recalled that Mr. Fagan, in a paper read before the Society some years ago, had emphasised the important part played by lighting on the stage. The Society was anxious to do everything possible to promote co-operation between the producer and the lighting expert and he agreed that the stage presented a great opportunity for the services of the illuminating engineer.

Electrification of Sicilian Sulphur Mines.—According to *Chemical and Metallurgical Engineering*, an important electric power development is expected to have government encouragement, as induced by the intensive production policies of Signor Mussolini, in connection with the Sicilian sulphur industry, in which, hitherto, few progressive methods have been employed. The industry covers an area of approximately one-fifth of the island, and employs about 20,000 workers.

An Electrically-operated Open-Pit Coal Mine.—What is claimed to be the first completely electrified open-pit coal mine in the United States at the new town of Colstrip, approximately 35 miles south of Forsyth, Montana, with a coal bed about 180 acres in extent and 25 ft. deep, is owned by the North-western Improvement Co., and is being worked by Messrs. Foley Brothers, general contractors, of St. Paul, Minnesota. The coal is sub-bituminous with a heat content of 11,000 B.th.u., and will be used for the locomotives of the Northern Pacific Railroad in Montana. In order to utilise electricity in mining the coal, an extension of the Montana Power Co.'s 55,000-volt transmission line was made to supply the electrical equipment for stripping the overburden from the coal, mining the coal itself, and hauling. The equipment consists of a Marion model No. 360 electric shovel with a 155-ft. boom and six-yard bucket, used as a drag-line excavator for stripping; a Bucyrus model No. 175-B coal-loading shovel, and two 60-ton electric storage-battery locomotives. The locomotives are the largest storage-battery units which the General Electric Co. has built. They are equipped with Exide ironclad lead batteries of a special size and include a motor generator in the cab of each for charging. During the time spent at the shovel while the cars are being loaded, a flexible cable from a bank of transformers on the shovel is plugged into the locomotive for charging. While coal is being mined from one strip, the overburden is being removed from the next and is cast into the excavation resulting from the removal of the coal.

"Wireless" Motion Pictures.—According to Press reports from America, motion pictures of a windmill in action were projected, with the aid of radio, on a screen five miles away. The inventor, Mr. Francis Jenkins, of Washington, predicted that his apparatus would be sufficiently refined in a year's time to make wireless motion pictures practical for commercial use.

Appointments Vacant.—Plumber-jointer, for Harwich Corporation electricity department; shift engineers, for the Penang Municipal Commission ($325 per month+; dollar= 2s. 4d.); second clerk in Borough of Colne electricity and tramways department. Junior technical assistant (£279) for the R.A.E.S., Farnborough. (See our advertisement pages to-day).

Imperial College of Science and Technology.—The Appointments Board of the College invites employers requiring men who have received a thorough training in the principles of engineering and who have obtained the diploma of the City and Guilds (Engineering College) to make use of the services of the Board. (See our advertisement pages to-day.)

Electricity Representation at Motor Exhibition.—The accompanying illustration is of a 2-ton electric lorry which the Glasgow Corporation Electricity Department had fitted up to represent a house as an exhibit in a parade of motor vehicles held in Glasgow on June 6th. The imitation brickwork foundation of the house was in red, and was overprinted with advertising matter relating to a hire-purchase scheme of wiring houses which the Glasgow Corporation has adopted. The exhibit proved a success.



Glasgow Corporation Exhibition Vehicle.

Sir David Salomons's Bequests. — According to the *Daily Telegraph*, the late Sir David Salomons, Bt., under his will, to which brief reference was made last week, left £5,000 to Gonville and Caius College, Cambridge, for extending the college buildings, and £1,000 in augmentation of the Salomons Scholarship Fund to enable the College to give this scholarship more frequently or for longer terms of tenure. To the Royal Institution he left his large magnet (designed by him and known as the Broomhill Magnet), and all the apparatus belonging to it, which enables the magnet to be used, amongst other things, as a polariscope, and for other purposes. His tube of radium and any other capsules of radium are bequeathed to his widow. Subject to his widow's interest, he left to the University of Cambridge all his scientific instruments and medical apparatus properly belonging to the workshops or laboratories and theatre, his collection of crystals and other apparatus used for polariscope work, &c.

Electricity for Air Compressors on Ships.—According to *Power*, the Ford Motor Co. is having the *East Indian*, one of the Shipping Board's steam propelled boats, converted to Diesel propulsion for transporting Ford automobiles overseas. The propelling units will consist of two sets of Sun-Doxford opposed piston solid-injection engines, each having 4 cylinders, 21½-in. bore, and a combined stroke of the opposing pistons of 85 in. These engines, when turning at 85 r.p.m., will develop 2,500 b.h.p.

There will also be installed two 225 h.p. Worthington-Diesel engines of the two-cycle solid-injection type, direct coupled to electric generators for supplying three-stage air compressors which will furnish compressed air for manœuvring the ship, and also for supplying the electrical auxiliary equipment on the ship.

Institution Notes.

Institution of Electrical Engineers.—MODEL FORM OF GENERAL CONDITIONS OF CONTRACT (EXPORT).—The Institution of Electrical Engineers has issued the two following additional sets of model conditions of contract for the supply of plant and materials (excluding cables) and the execution of work connected therewith:—B1. Conditions recommended for use in connection with export contracts (delivery f.o.b.); B2. Conditions recommended for use in connection with export contracts (including complete erection or supervision of erection). Copies of each may be obtained from the Secretary of the Institution, or from the publishers, Messrs. E. & F. N. Spon, Ltd., price 1s., post free.

Junior Institution of Engineers.—On Saturday, June 20th, members and friends of the Sheffield Branch of the Institution paid a visit to the works of the D.P. Battery Co., Ltd. Bakewell, where they saw the latest developments in the manufacture of storage batteries of all descriptions, from small portable cells suitable for wireless and other purposes, to submarine cells weighing nearly ½ ton each. Particular interest was taken in the casting of the special grids for Kathanode plates and also the machines for casting the multifarious types of plates developed by the company. On behalf of the visitors the president, Professor J. Husband, expressed their appreciation of what they had seen.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

At the close of the annual general meeting of the Electrical Contractors' Association (Inc.), held at 15, Savoy Street, W.C.2, on Thursday, June 18th, Mr. LEONARD G. TATE, the General Secretary, was presented with a silver salver and a cheque. Mr. Walter Riggs, the President, stated that Mr. Tate's connection with the Electrical Contractors' Association dated back to 1902, when he first became a member. He was appointed to the Council of the Association in 1904; he was elected first as hon. secretary of the London Branch, then as honorary general secretary in 1905. In 1918 he was appointed general secretary. Mr. Tate had, therefore, completed 21 years' active service with the Association, and he (Mr. Riggs) considered that a very opportune occasion to mark the esteem held for him by the whole of the membership throughout the country. The assiduity with which Mr. Tate had looked after the interests of electrical contractors since the formation of the Association was extremely gratifying, and his marked ability in all difficulties with which contractors were confronted, was appreciated by the whole of the membership. Mr. H. Willoughby-Ellis, as chairman of the London Branch of the Electrical Contractors' Association associated himself with this mark of esteem, and expressed the hope that Mr. Tate would for many years to come continue to be of such service to the whole industry. Further expressions of appreciation were voiced by Mr. W. A. Shaw (as representing the Manchester Branch, and as one of the early presidents of the Association), Mr. R. Robson (as secretary of the Northern Section and a member of the first Council of the Electrical Contractors' Association), Mr. H. J. Miles (as chairman of the Southern Section and on behalf of the Sussex Branch), Mr. E. M. Parsons (as chairman of the Northern Section), and Mr. T. E. Alger (the President of the Electrical Contractors' Association for the ensuing year), who spoke on behalf of the Western Section. Mr. W. R. Rawlings, the first President of the Association, referred to his long association with Mr. Tate, stating that he considered that the best thing the Association had ever done was to persuade Mr. Tate to relinquish his business in 1918, and so be able to devote the whole of his attention to the benefit of electrical contractors. The presentation salver, which was then handed to Mr. Tate, bore the following inscription:—"Presented to Leonard G. Tate, M.I.E.E., by the members of the Electrical Contractors' Association (Incorporated), as a token of esteem and mark of appreciation for the valuable services rendered by him on their behalf during the first 21 years. July, 1925." Mr. Tate, who was obviously touched by the many expressions of goodwill and appreciation expressed his thanks to everyone concerned, and stated that if what he had tried to do for the Association had been appreciated by the members, this was sufficient reward in itself.

At a recent meeting of the Lancaster Town Council, a recommendation of the Electricity Committee to increase the salary of the borough electrical engineer (Major G. C. MILNES) by £75 immediately and by a further £85 next year, was discussed. The chairman of the Committee said that the proposed additions were in accordance with the I.M.E.A. scale; the increase would be a fair recognition of Major Milnes's ability and the increased output at the new works. He considered that Major Milnes had saved the undertaking thousands of pounds. An amendment to refer the matter back to Committee was put forward on the ground that it was no time to increase salaries having regard to the prevalent unemployment. This amendment was carried by a small majority.

MR. G. P. SHALLCROSS, the Birkenhead electrical engineer, is due to retire on July 30th on reaching the age of 65 years, but the Electricity Committee recommends the retention of his services for a further 12 months.

Mr. GEORGE PATON, who for the past 2½ years has been in charge of the London radio sales department of the British Thomson-Houston Co., Ltd., has now taken up his new appointment as assistant manager to the Radio Department of the company at Coventry. Mr. A. E. MOODY has succeeded to his late position.

MR. T. P. PASK has been appointed chief electrical engineer of the South African Railways and Harbours Board.

The Blackburn Council has rejected a proposal to increase the salary of the manager of the tramways (Mr. J. H. COWELL) from £800 to £1,000 per year.

MR. ANDREW GARDNER, of Linlithgow, is to take charge of the interests of Callender's Cable and Construction Co., Ltd., in New York.

MR. S. F. BICKELL, A.M.I.E.E., has left the Prompton and Kensington Accessories Co., Ltd., to take up the post of manager and designer of the Heating and Cooking Department of the Cable Accessories Co., Ltd.

The Llandudno Urban District Council has approved a recommendation of the Electricity Committee to increase the salary of Mr. MORTON, the electrical engineer, from £413 to £500 per annum.

Mr. H. C. LAMB, M.I.E.E., M.I.Mech.E., who has been appointed chief engineer and manager of the Manchester Corporation electricity undertaking, to succeed Mr. S. L. PEARCE, who is now one of the Electricity Commissioners, is 47 years of age. His experience of the Manchester system extends over some 23 years, for he joined the staff of the department as an engineer-in-charge at the generating stations in 1902. He was appointed resident engineer at the Stuart Street generating station in 1913, and he has acted as deputy to Mr. Pearce during the last 6½ years, including, of course, the latter's period of absence in Australia. As our readers are aware, Mr. Lamb is at present chairman of the North-Western Centre of the Institution of Electrical Engineers. Glancing back at his pre-Manchester days we may note that he obtained his early training with Messrs. George Clarke, Ltd., marine engineers, of Sunderland, and with Messrs. Scott & Mountain, electrical engineers of Newcastle-on-Tyne. He received his technical education at the Rutherford College and the Durham College of Science. He served on the staffs of the Electric Supply Co. at Preston and the Wigan Electricity Department, before going to Manchester.

The recommendation of the Manchester Corporation Establishment Committee respecting Mr. Lamb's appointment reads as follows:—"That Mr. H. C. Lamb (now Deputy Chief Engineer at the remuneration of £1,330 per annum) be appointed Chief Engineer and Manager in succession to Mr. S. L. Pearce,



Lafayette [*Manchester.*

Mr. H. C. Lamb,

the new Chief of the Manchester Electricity Undertaking.

as and from August 1st, 1925, at a salary of £2,500 per annum, which includes all fees and emoluments for the completion of the Barton Power Station." It was also recommended:—"That Mr. H. A. Ratcliffe (now Superintending Electrical Engineer at the remuneration of £950 per annum) be appointed Deputy Chief Engineer at an inclusive salary of £1,300 per annum, rising to £1,500 per annum, as follows:—From August 1st, £1,300; from August 1st, 1926 £1,400; from August 1st, 1927, £1,500."

We reproduce herewith a portrait of Mr. THEODORE STRETTON, who has been elected president of the Association of Mining Electrical Engineers. Mr. Stretton, who was born in 1876, was educated at St. Edmund's College, London, the Regent Street Polytechnic, and Cardiff University College, subsequently serving an apprenticeship with Messrs. Brown, Lenox and Co., Pontypridd. He then became assistant engineer with Messrs. Robert Blackwell & Co., Ltd., afterwards going to Dublin as engineer-in-charge of the Ringsend power station.



H. J. Whitlock & Sons [*Cardiff.*

Mr. Theodore Stretton, M.I.E.E., M.I.Mech.E.

President of the Association of Mining Electrical Engineers.

Upon leaving Dublin he was appointed engineer in the South Wales district and superintended the carrying out of several of the earliest tramway and overhead transmission contracts in that area. In 1906 he entered into partnership with Mr. S. B. Haslam and is now joint managing director of Messrs. Haslam & Stretton Ltd., electrical and mechanical engineers. Mr. Stretton is a member of the Institutions of Electrical and Mechanical Engineers, the Iron and Steel Institute, and the South Wales Institute of Engineers. He has had a great deal to do with the standardisation of colliery apparatus, being a member of the B.E.S.A., and he was the principal patentee of the "Thor" miner's lamp.

The *Surrey Advertiser* reports that the Epsom Urban Council has given three months' notice to terminate his appointment to its electrical engineer, Mr. A. C. GILLING, and granted him leave of absence for the period in question. The assistant electrical engineer, Mr. H. J. EVANS, has also been given one month's notice, and granted one month's leave of absence. The post of electrical engineer has been advertised.

Wolverhampton Corporation Electricity Committee has appointed Mr. W. N. GORDON commercial secretary to the Electricity Department at a salary of £355 per annum, plus bonus.

The erection of the power station buildings in Hibernia Street, George Cape Province, has been commenced, and Mr. A. S. CHAMERS, of Alice, has been appointed resident electrical engineer.

Obituary.—MR. W. ARNOT.—The death took place on June 24th of Mr. William Arnot, one of the best-known electrical engineers in Glasgow. The first electrical engineer to be appointed by the Corporation, he took up his duties in 1890 and was responsible for the erection of the first municipal electrical installation in the city. On the completion of the Port Dundas and St. Andrew's Cross stations Mr. Arnot retired from the Corporation, and in 1898 set up in private business. He had been a member of the Institution of Electrical Engineers since 1891.

Wills.—The late Mr. JOHN SAMPSON (of Dick, Kerr & Co., Ltd.) left £75,412 gross and £66,567 net personalty.

The gross value of the estate of Mr. E. B. ELLICE-CLARKE (Edison Swan Electric Co., Ltd., and other companies) was £47,331, and the net personalty £46,614.

The late Sir W. M. ACWORTH left £26,960 gross and £19,478 net personalty.

New Companies Registered.

Electric Development Syndicate of Northern Ireland, Ltd. (N.I. 255).—Private company. Registered June 19th in Belfast. Capital, £100 in £1 shares. Objects: To promote or assist in promoting Bills in Parliament of Northern Ireland to grant permission for the supply of electrical energy for any purpose to any town, place, &c. The first directors are:—F. A. Heron, Maryfield, Holywood, D.L.; and A. S. Merrick, 32, Wellington Park, Belfast, solicitor. Solicitor: A. S. Merrick. Registered office: 7, Wellington Place, Belfast.

Horstmann, Ltd. (206,853).—Private company. Registered June 25th. Capital, £10,000 in £1 shares. Objects: To carry on the business of motor, electrical, mechanical and general engineers, carriers, transport agents, &c. The first directors are:—S. A. Horstmann, Onega Lodge, Upper Bristol Road, Bath; W. S. Butler, West Lodge, Englescombe Lane, Bath; J. W. Rooke, Westfield House, Upper Weston Road, Bath; E. H. Horstmann, Widcombe Crescent, Bath; and E. J. White, Beckford, Bathwick, Bath. Qualification, £500. Remuneration as fixed by the company. Solicitors: E. J. White & Co., 24, High Street, Bath.

Electro-plating (1925), Ltd. (206,821).—Private company. Registered June 24th. Capital, £2,500 in £1 shares. Objects: To acquire the business of electro-plating and lacquering in all its branches carried on by G. Morrison at Blackpool, and St. Annes, Lancs. The permanent directors are:—G. Morrison, 1, Mersey Road, Blackpool, electrical engineer; and E. W. Hough, 2, Harley Road, Blackpool, secretary. Qualification, £250. Solicitor: S. O. Taylor, 19, Birley Street, Blackpool. Registered office: 30, Birley Street, Blackpool.

Hulton & Hinchliffe, Ltd. (206,823).—Private company. Registered June 24th. Capital, £500 in £1 shares. Objects: To acquire the business of electrical and general engineers carried on by W. W. Hulton and H. Hinchliffe at Oldham as "Hulton & Hinchliffe." The permanent directors are:—W. W. Hulton, 83, Waterloo Street, Oldham, electrical engineer; and H. Hinchliffe, 42, Bottom o' th' Moor, Oldham, electrical engineer. Qualification: £100. Remuneration as fixed by the company. Secretary: H. Hinchliffe. Solicitor: R. O. Mellor, 7, Church Lane, Oldham.

Falconar, Cross & Co., Ltd. (206,875).—Private company. Registered June 26th. Capital, £7,000 in £1 shares (3,500 5 per cent. cumulative preference and 3,500 ordinary). The objects are: To adopt an agreement with O. L. Falconar and W. Cross, and to carry on the business of electrical engineers and contractors formerly carried on by them at Newcastle-upon-Tyne, and that of manufacturers of and dealers in wireless apparatus and appliances, motor cars, &c. The first directors are:—O. L. Falconar, 44, Sanderson Road, Jesmond, Newcastle-upon-Tyne, electrical engineer; W. Cross, 22, Gowan Terrace, Jesmond, Newcastle-upon-Tyne, electrical engineer. Qualification, £100. Remuneration as fixed by the company. Solicitors: Sutton, Cheshire & Thompson, 12, Moseley Street, Newcastle-upon-Tyne. Registered office: 7 and 9, Ridley Place, Newcastle-upon-Tyne.

Belgravia Electrical Co., Ltd. (206,694).—Private company. Registered June 18th. Capital, £2,000 in £1 shares. Objects: To carry on the business of engineering contractors, general engineers, mechanical, constructional, marine, and civil engineers, manufacturers of, and dealers in electrical, magnetic, or galvanic engines and motor engines of all kinds, and all parts, accessories and things requisite and capable of being used in connection with the above or in connection with electrical engineering, wireless telephony and telegraphy, electric lighting, heating, carpentry, &c. The first directors are:—H. S. Marquand, "Northwood," Woodcote Road, Leigh-on-Sea, electrical and marine engineer (permanent); H. C. Garland, 40, Crusoe Road, Mitcham, company secretary. Qualification, 10 ordinary shares. Remuneration as fixed by the company. Secretary: H. C. Garland. Solicitor: W. Scott, Jamaica Buildings, St. Michael's Alley, Cornhill, E.C.3. Registered office: Adams House, 23, Old Queen Street, Westminster, S.W.1.

Electricity (Hull), Ltd. (206,763).—Private company. Registered June 20th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of, contractors for and dealers in wires, lamps, fittings, accumulators, batteries, dynamos, motors, magnetos, indicators, bells, switches, controls, valves, telephonic and telegraphic instruments and apparatus, and wireless goods, appliances and accessories, electrical, mechanical, and general engineers, &c. The permanent directors are:—W. Hancock, 127, Alliance Avenue, Hull, fruit merchant (chairman); G. A. Allenby, 162, Chanterlands Avenue, Hull, electrician (managing director); C. W. Foster, 37, Wolfreton Road, Anlaby, near Hull, locomotive driver. Qualification, £50. Secretary: C. W. Foster. Solicitors: Middlemiss, Pearce and Miller, Hull.

Fada Radio, Ltd. (206,768).—Private company. Registered June 20th. Capital, £500 in £1 shares. Objects: To acquire the trade mark "Fada," No. 438,626, and to carry on the business of manufacturers, exporters, importers, and distributors of, and dealers in radio, electrical, and scientific apparatus, installations, accessories, &c. The subscribers (each with one share) are:—W. J. Roche, 451, East 22nd Street, Brooklyn, New York, U.S.A., clerk; E. S. Daniells, "Waconsta," The Bishop's Avenue, N.2, merchant. The first directors are:—F. A. D'Andrea (permanent governing director and chairman), address not stated; W. J. Roche; and E. S. Daniells. Qualification, £1. Remuneration (except managing directors, if any), as fixed by the company. Solicitors: R. C. Partlett & Co., 44, Bedford Row, W.C.1.

Pearl Electrical Co., Ltd. (206,808).—Private company. Registered June 22nd. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of, and dealers in electrical goods and accessories, &c. The first directors are:—G. W. Cavell, 168, Cambridge Street, Belgravia, S.W.1, electrical engineer; J. A. Hansen, 36, Tennyson Street, Battersea, S.W.11, foreign correspondent. Solicitors: Lawson & Lawson, 181, Queen Victoria Street, E.C.4. Registered office: Edinburgh Mansions (Howick Place), Victoria Street, S.W.1.

A. F. Yarnold, Ltd. (206,867).—Private company. Registered June 26th. Capital, £2,000 in £1 shares (500 7 per cent. cumulative preference and 1,500 ordinary). Objects: To carry on the business of electrical engineers, electrical constructors, contractors, dealers in, and agents for electrical plant, supplies, lamps and bells, telephone contractors, &c. The directors are:—A. F. Yarnold, 132, Gleneagle Road, Streatham; B. W. Oakley, 33, Conyers Road, Streatham; F. H. Campbell, 42, Hillcourt Road, East Dulwich; C. J. Bennett Ashby, 29, Riggindale Road, Streatham, S.W. Qualification, £10. Remuneration, £10 each per annum. Secretary: F. H. Campbell. Solicitor: G. A. Martin, 6, Guildhall Chambers, 31, Basinghall Street, E.C. Registered office: 19, Shrubbery Road, Streatham, S.W.

Wireless and Radio Trades Guardian Association, Ltd. (206,919).—Registered June 27th as a company limited by guarantee and not having a share capital with 500 members each liable for 5s. in the event of winding up. The income and property of the Association shall be applied solely towards the promotion of its objects, and no portion shall be paid or transferred by way of dividend, bonus, or otherwise by way of profit to the members, provided that the company shall not be prevented from paying remuneration to any officer or servant of the company or to any member or other person in return for any services rendered. The objects are: To provide an organisation for uniting the signatories and any other persons, firms, associations, or companies engaged in or connected with wireless telephony or telegraphy, including television, or any business allied thereto, to disseminate legal and other information, to protect members against persons unworthy of credit, to collect debts for members, &c. The subscribers are:—C. Latham, 15, Eastcheap, E.C., certified accountant; H. Hodson, Lytham Villa, Park Road, E.12, clerk; A. Middleditch, 20, Copland Road, Wembley, clerk; H. Turner, 9, Oakmead Road, S.W.12, clerk; A. V. Hunter, 6, The Shrubberies, S. Woodford, clerk; J. H. Long, 47, Felixstowe Road, Lower Edmonton, N., clerk; F. S. Gardner, 69, Tachbrook Street, S.W.1, clerk. The management is vested in an executive committee, the first members of which are not named. C. Latham, F.L.A.A., is secretary and accountant to the company.

Norman Radio, Ltd. (206,947).—Private company. Registered June 29th. Capital, £1,000 in £1 shares. Objects: To carry on the business of makers and workers of, and dealers in private and other telephones and telegraphs of all kinds, electricians, &c. The directors are:—J. Portwine, "Three Gates," College Road, Dulwich, S.E.21 (director of Solidite Manufacturing Co., Ltd.); C. W. Rooke, 17, Rusthall Avenue, Bedford Park, W.4, chartered accountant. Secretary: H. W. Bramley, "Shalimar," Central Avenue, Rochford, Essex. Registered office: 133a, Upper Street, Islington, N.1.

X.L.O. Co., Ltd. (206,906).—Private company. Registered June 27th. Capital, £1,000 in £1 shares. Objects: To acquire the business of the X.L.O. Co. as electrical engineers carried on at 48, Strand, W.C., and 122, Pentonville Road, N.1, and to carry on the business of wireless contractors, manufacturers, importers and exporters, &c. The subscribers (each with one share) are:—O. R. C. Sherwood, 122, Pentonville Road, N.1, electrical engineer; S. B. White, 122, Pentonville Road, N.1, engineer. The first directors are not named. Solicitors: Cochrane & Cripwell, Balfour House, 119, Finsbury Pavement, E.C. Registered office: 122, Pentonville Road, N.1.

Official Returns of Electrical Companies.

Boston Wireless and Electrical Co., Ltd. — Debenture dated June 12th, 1925, to secure £500 charged on the company's property, present and future, including uncalled capital. Holder: Mrs. G. L. Bostandji, Coniston Villa, Burnage Lane, Levenshulme, Manchester.

General Radio Co., Ltd.—Particulars filed of £3,000 debentures authorised May 28th, 1925, charged on the company's property, including uncalled capital, the amount of the present issue being £1,500.

Will Smith, Ltd. — Particulars filed of £400 debentures authorised May 25th, 1925, charged on the company's undertaking and property, present and future, including unpaid capital, the amount of the present issue being £200.

British Arc Welding Company (Bristol Channel), Ltd.—Mortgage on freehold land, hereditaments and premises at Hope Street, Cardiff, dated June 8th, 1924, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

Charles Coton & Co., Ltd.—Satisfaction in full on June 6th, 1925, of mortgage dated October 21st, 1906, securing £1,600.

Receptors, Ltd.—Particulars filed of £20,000 debentures authorised May 14th, 1925, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £500.

Grierson Ledway Co., Ltd. — Mortgage debenture dated June 13th, 1925, to secure £3,000 charged on the company's property, present and future, including uncalled capital. Holder: R. Hannah, 115, Abbey Road, Barrow-in-Furness.

Acme Electric Lamp Co., Ltd.—First debenture and second debenture, both dated May 28th, 1925, to secure £1,400 and £1,151 respectively, charged on the company's undertaking and property, present and future. Holders: Mrs. M. Tyler, 47, Rudloe Road, Balham; and H. S. Tyler, 2 and 3, Station Road, Balham.

L. Jacobs (London), Ltd.—Debenture dated May 22nd, 1925, to secure £2,500 and moneys due or to become due under guarantees given at the request of the company, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: W. Rose, "Stonington," Station Road, Hendon, N.W.

Rheostatic Co., Ltd.—Mortgage dated May 29th, 1925, constituting a specific charge on 31, Mackenzie Street, Slough, and all other, if any, hereditaments and premises comprised in an indenture of the same date and a floating charge on the company's undertaking and property, present and future, including uncalled capital, to secure all moneys due or to become due from the company to the District Bank, Ltd.

Pope's Electric Lamp Co., Ltd.—Satisfaction in full on June 16th, 1919, of Land Registry Charge dated April 16th, 1909, securing all moneys due or to become due from the company to the London City and Midland Bank, Ltd. (Notice filed June 10th, 1925.)

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Globe Telegraph & Trust Co., Ltd.

The annual meeting was held on June 23rd, Sir John Denison-Pender, C.B.E., presiding. In presenting the report and accounts (see ELEC. REV., June 19th, p. 989), the chairman said that the results were again satisfactory, the net income having increased by £5,098, in spite of lower receipts from the American holdings due to the rise in the value of the pound sterling. Their income from the Submarine Cables Trust was diminishing owing to the drawing of the bonds but the proceeds were being reinvested. The amount thus received during 1924 had been invested in the Commercial Cable Company's 4 per cent. debenture stock, which gave a lower return but was a sound investment. The investment in the French Telegraph Company had been written off, that company having gone into liquidation with liabilities exceeding the assets. They had again been able to transfer a considerable sum to reserve, making it £105,000. The invested reserves of the cable companies comprising their holding amounted to a large figure and the companies were therefore able to provide any new cables which were required to meet developments. The value of the company's holdings at May 31st last showed an appreciation of £2,167,881 over cost.

Aron Electricity Meter, Ltd.

Mr. Harry Kahn presided at the annual meeting on June 23rd, and in presenting the report and accounts (*vide* ELEC. REV., June 19th p. 989), said that the value of goodwill and patents, including shares and interests in subsidiary companies, was given as £50,106 in the balance sheet, but the value of shares and interests alone was greater than this figure. The sum carried forward was subject to additional income tax, regarding which the company had a dispute with the authorities with reference to the incidence of taxation during the war. Any amount paid in excess of the reserves would have to come out of the current year's profits; shareholders should, therefore, not be too sanguine about a large ordinary dividend next year. Both the London and Vienna branches showed an increased turnover, especially the latter, but in view of the difficulties with which Austria had to contend the maintenance of the increase was problematical. They had had to increase their London accommodation and had purchased the lease of the present factory and two adjacent buildings.

Delhi Electric Tramways and Lighting Co., Ltd.

The accounts for the past year record gross receipts of £24,935 for the tramway undertaking and £68,894 for the electricity supply undertaking, representing increases of about 4½ and 9¾ per cent. respectively. The combined undertakings show a net revenue of £41,429, as against £36,840 in 1923. After charging debenture interest and London expenses, there remains a profit of £38,410, to which is added £1,304 brought forward, making £39,714. Depreciation absorbs £16,000; the reserve for taxation £4,000; and the renewals reserve £5,000. It is proposed to pay a dividend of 10 per cent. upon the preferred and participating shares, and one of 9.448 per cent. on the ordinary shares, leaving £12,740 to be carried forward. Additions to plant costing £17,743 were made during the year; this was chiefly Diesel plant, switchgear and mains. Further extensions of sub-stations and mains are in progress. It is hoped to complete an agreement during the current year for a bulk supply from the Government generating station. The meeting was held on Tuesday last.

Waygood-Otis, Ltd.

The company's annual meeting was held on June 26th, Mr. H. C. Walker (chairman) presiding. Mr. Walker said that the development of the Falmouth factory was still being proceeded with, and economies in manufacture would result. Developments in Australia and New Zealand had increased the item "Investments and loans." The lift contracts secured during the year were greater in number and value than those of the preceding year, and an increasing number of orders were coming in from overseas. The "Micro-drive" self-levelling lift continued to gain favour, and the sales of that type had considerably increased. The exchange by shareholders of the company's ordinary shares for common stock of the Otis Elevator Co. had resulted in a closer union of the two concerns.

French Companies.

The *Constructions Electriques de France*, after setting aside 3,200,000 fr. for depreciation in 1924, has decided to carry forward a balance of 1,534,000.

The *Compagnie des Lampes*, which is a subsidiary of the Compagnie Générale d'Electricité and the Société Thomson-Houston reports net profits of 11,576,000 fr. for 1924, as against 9,979,000 fr. in the previous year. The dividend is at the rate of 8 per cent., as in 1923.

The directors of the *Forges et Ateliers de Constructions Electriques de Jeumont* state that despite the disturbed economic situation in 1924, the order books were well supplied. Owing, however, to the depreciation of the franc and the increase in the cost of raw materials, the directors had judged it expedient to employ most of the net profits, which amounted to 5,996,000 fr., in augmenting the floating capital necessary for working so as to avoid having recourse to an increase of the capital, the rate of dividend consequently being reduced to 15 fr. per share for 1924.

The *Constructions Electriques de France* records gross profits amounting to 5,789,000 fr. After placing 3,200,000 fr. to depreciation, the balauce has been carried forward.

The *Compagnie d'Entreprises Electro-Mécaniques* reports an increased turnover in 1924, the gross profits and balance forward amounting to 127,000 fr. After applying 115,000 fr. to depreciation, the balance has been carried forward.

The *Compagnie L'Electro-Entreprise* reports gross profits of 1,441,000 fr. for 1924, and after making provision for depreciation, &c., the net sum available amounts to 925,000 fr. The rate of dividend is increased from 6 to 7 per cent.

A liquidator has been appointed by the *Société Industrielle d'Appareillage et de Constructions Electriques* (*Anciennement Société d'Appareillage Téléphonique Industriel et Sonneries*), of Paris.

The *Société Electro-Métallurgique de Dives* is increasing its capital from 40 to 45 million francs with the object of taking over the works and business of the Société Hydro-Electrique et Métallurgique du Palais.

Swiss Companies.

The directors of *Brown, Boveri and Company* have resolved to pay a dividend at the rate of 6 per cent. for 1924, and to place 500,000 fr. to reserve.

The *Alioth Electricity Company*, of Basle, which is associated with the above company, reports net profits of 352,000 fr. for 1924, and a dividend at the rate of 5 per cent. as in 1923.

County of London Electric Supply Co., Ltd.—At an extraordinary meeting held on June 29th, Sir Harry Renwick, K.B.E., moved resolutions providing for the increasing of the company's capital to £7,000,000 by the issue of 2,000,000 preference and 2,000,000 ordinary shares of £1 each. He stated that the main object of the issue was to provide for the repayment of 5½ per cent. one-year notes (£1,500,000), which matured in September. The holders of the notes would be given an opportunity of exchanging them for new preference shares. Apart from the Barking undertaking, the company held controlling interests in certain progressive undertakings south of the Thames which were now ripe for profitable development. The resolutions were adopted.

Stock Exchange Notices.—The undermentioned securities have been ordered to be officially quoted:—

Clyde Valley Electrical Power Co.—600,000 ordinary shares of £1 each, 10s. paid, Nos. 600,001 to 1,200,000.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Calcutta Electric Supply Corporation.—7,193 ordinary shares of £1 each, fully paid, Nos. 925,001 to 932,193.

Application has been made to the Committee to allow the following to be officially quoted:—

Shropshire, Worcestershire, and Staffordshire Electric Power Co.—150,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 450,001 to 600,000.

United River Plate Telephone Co.—112,000 ordinary shares of £5 each, fully paid, Nos. 648,001 to 760,000.

Kalgoorlie Electric Power & Lighting Corporation, Ltd.—The accounts for the past year show a profit of £18,504, as compared with £12,351 in 1923. After providing for depreciation there remains a balance, including the amount brought forward, of £7,359. This allows of the payment of 6 per cent., less tax, on the income debenture stock. The meeting was to be held yesterday (Thursday).

International Light and Power Co.—The following dividends are announced:—3 per cent. (less British tax) on $1,275,000 preference shares for the half-year ended June 30th; and at the rate of 6 per cent. (less tax) on $174,400 additional preference shares in respect of the period from the date of allotment (April 9th) to June 30th.

Eastern Telegraph Co., Ltd.—The directors announce a dividend at the rate of 3½ per cent. per annum less tax on the preference stock for the quarter ended June 30th, 1925, and a first quarterly interim dividend of 2½ per cent. on the ordinary stock, free of tax, in respect of the year ending December 31st next.

New General Traction Co., Ltd.—The accounts for the year ended at March last show a revenue of £12,700 and a net profit of £9,887—an increase of £1,087. The addition of £2,945 brought forward makes available £12,832, out of which the payment of a dividend of 4½ per cent. is recommended, leaving £3,695 to be carried forward.

Seaton and District Electric Light Co., Ltd.—It was stated at the annual meeting on June 20th that the present scale of charges, which worked out at 8¼d. per kWh, made it impossible for a dividend to be declared, and that new charges of 8d. and 10d. per kWh were to be imposed.

British Columbia Electric Railway Co., Ltd.—The dividend for the half-year ended June 30th has been declared on the 5 per cent. cumulative perpetual preference stock.

Midland Counties Electric Supply Co., Ltd.—The recent issue of 250,000 each of preference and ordinary shares has been fully subscribed by the shareholders.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The directors have declared an interim dividend for the three months ended March 31st last of 5s. per share, free of tax.

Aster Engineering Co. (1913), Ltd.—The directors report a further loss of £13,032 during the past year, making a total of £40,594.

Marconi's Wireless Telegraph Co., Ltd.—A dividend at the rate of 7 per cent. per annum has been declared in respect of the half-year ended June 30th.

Ferguson, Pailin, Ltd.—An interim dividend of 3½ per cent. actual has been declared on the ordinary shares.

St. James' & Pall Mall Electric Light Co., Ltd.—The following interim dividends are payable on August 1st:—At the rate of 3s. 6d. on the preference shares, and 5s. on the ordinary shares.

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange business comes by fits and starts. Some of the markets are tolerably active. In others, there is next to nothing doing. The monetary stringency should be eased by the turn of the half-year. The chance of a rise in the Bank Rate is held, once more, to be negligible for the time being,

but the apprehension is liable to revival at any moment, and in consequence, gilt-edged stocks go cautiously, having appreciably recovered, however, from their recent lowest prices. There has been too much outpouring of new issues for these stocks to have yet become properly assimilated by the investor. For some time to come, gilt-edged securities are liable to be affected by the financial indigestion caused by the number of new capital appeals that poured out during May and June.

The County of London Electric Supply Company is likely to experience no difficulty in securing subscription to the two million pounds 6 per cent. new preference shares which it is about to offer. The company held a meeting to-day, Monday, at which sanction was duly given to the raising of the capital from three million pounds to seven million pounds, half to be in preference, half in ordinary. Of the former the shares are to be issued immediately at 20s. 6d. No doubt the two million ordinary shares will be held in reserve until the County Company's Bill has been passed by Parliament, and the capital account can be re-arranged on the new basis rendered necessary by the extension of the company's lease of life under the Act lately passed. The advent of the new preference capital caused a slight dulness in the prices of the ordinary and preference shares, and the former have eased off to 53s. 9d., which is 2s. down on the week. The preference also are a trifle easier at 22s. 6d. These carry more dividend, of course, than the newcomers which are on the point of making their appearance.

City of Londons reacted to 47s., the preference being a shade lower at 23s. Notting Hill preference, quoted ex dividend last Thursday, recovered their 6s. deduction. Clyde Valleys are weaker at 31s. The list is steady as a whole, apart from these changes.

Eastern cable stocks continue dull, in spite of their recent declines. Prices do not seem to have reached those levels at which investment admits temptation. The Eastern company has declared its usual quarterly dividend of 2½ per cent. free of tax for the first part of 1925. Both the Globe shares are ex dividend. Westerns are 5s. down at 16⅛. Cuba Submarines fell back to 6¾. United River Plates have hardened to 7.

In the wireless group, Marconis have gone back 3/16 to 27s. 6d., there being no life in the market, and some of the recent applicants for the new shares being apparently desirous of selling them. The 7 p.c. participating preference at 27s. 6d. are ex 8½d. dividend. Canadian Marconis at 4s. 6d. show a trifling gain.

Railway stocks have been pursuing a very uneven track. From their recent despondency, they enjoyed a brisk recovery, prices rising several points for a few days. The improvement, however, has not been held, and public confidence is coy of buying stocks in companies that are so liable to disturbance both from financial causes and also from labour troubles. Underground Electric Railways £10 shares fell to 50s. and the shilling shares to 7s. 6d. Metropolitan Consolidated declined to 70½. Central London ordinary shed a point. London United Tramway debentures are 45½ ex dividend. British Electric Traction ordinary at 112 is down a nominal 7 points, but most of this is accounted for by deduction of the dividend. The 7 per cent. preference at 104 is also x.d.

Midland Counties Electric keep their price at 23s. 9d. It is announced that the company's recent issue of 250,000 preference and 250,000 ordinary shares, made to the shareholders of the company, has been fully subscribed. Dealings started a few days ago in the 6 per cent. preference shares of the Shropshire, Worcestershire and Staffordshire Electric Power Company. These can be bought at 22s. with dividends in March and September, the yield at the present price being nearly 5½ per cent. on the money. The amount required for the dividend service is £12,500 per annum, which was covered 7½ times over by the profits shown in last year's accounts. South Wales Power 6½ per cent. preference at a guinea yield £6 3s. 6d. ex the dividend payable on July 1st. Urban 6 per cent. preference can be bought at 19s. 3d., and there are a few thousand Westminster Electric 4½ per cent. preference obtainable at 18s. ex dividend, the return in this case being 5 per cent. on the money. These last-named can be regarded as a gilt-edged investment, so ample is the cover for the service of the dividend.

The manufacturing group is a little duller. A fall occurred in General Electrics to 25s., on scattered sales by a few of the people who bought the shares in advance of the dividend announcement, and who sold when the figures came out. Siemens went back to 25s. 9d., a fall of 6d. per share, the present yield on the money being small when matched against that offered by General Electrics and some of the others in this group. British Aluminium weakened to 30s. Callenders new shares are quoted at 6s. 6d. premium, and the senior issue remains at 58s. 9d. ex rights. Babcock & Wilcox at 2 7/16 display a loss of 2s. 6d., the market in iron and steel shares as a whole being what the Stock Exchange terms "tender," although there has been a little support from the North during the past few days.

Rubber shares keep up; the daily volume of trade transacted in this market is still considerable. The price of the produce has further advanced to 3s. 4½d. per lb. for cash. People are selling other Industrials in order to pay for rubber shares, and this explains part of the dulness that has crept into prices of shares in other companies whose prospects are held to lie more in the future than in the present.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price June 29, 1925.	Rise or fall.	Yield. p.c.
Bournemouth and Poole ...	1	13	14	2⅝	—	5 1 10
Brompton Ordinary	1	10	10	1⅜	—	*5 14 8
Charing Cross Ordinary	1	14½	15	46/9	—	6 8 2
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	1⅛	—	6 8
City of London	1	15	15	47/-	— 1/8	5 9 1
do. do. 6% Pref. ...	1	6	6	28/-	—6d.	5 4 4
Clyde Valley	1	8	8	31/-	—1/6	5 3 3
County of London	1	15	15	53/9	—2/-	5 11 6
do. do. 6% Pref. ...	1	6	6	22/6	—6d.	5 6 8
Edmundson's Ordinary	1	7	—	23/-	—	6 1 9
do. 7% Pref.	1	6	7	22/-	—	6 7 3
Elec. Supply Corporation ...	1	1	10	53/3	—	6 0 4
Kensington Ordinary	1	14	15	12⅜	—	5 16 6
Lancs. Light and Power ...	1	7½	⅞	26/6	—6d.	5 13 2
London Electric	1	10	10	35/-	—	5 14 1
do. do. 6% Pref. ...	5	6	6	5⅜	—	5 6 8
Metropolitan	1	10	11	38/3	—	5 15 6
do. 4½% Pref.	1	4½	4½	17/-xd	—	5 5 11
Midland Counties	1	5½	6	23/9	—6d.	5 1 1
Newcastle-on-Tyne Ordinary ...	1	6	7	22/-	—	6 7 3
do. 5% Pref. ...	1	5	5	18/3	—6d.	5 9 7
do. 7% Pref. ...	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10xd	+ ½	6 0 0
North Met. Elec. 6% Pref. ...	1	6	6	1⅛	—	5 6 8
St. James' and Pall Mall ...	5	17½	17½	1l 3/4	—	6 7 3
South London	1	15	15	2 7/16	—	6 3 1
South Metropolitan Pref. ...		7	7	1½	—	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref. ...	1	6	6	20/-	—	6 0 0
Westminster Ordinary	1	15	15	46/6	—	6 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	31/-	—	5 3 3

HOME RAILS.

Central London Ord. Assented Stock	4	4	68	—1	5 17 8
Metropolitan ... ... ,,	4	5	70½	— ½	7 1 10
do. District ... ... ,,	3½	3½	48⅜	—	7 4 4
Underground Electric Ordinary	10	Nil	Nil	2½	— ¼	Nil
do. do. "A" ...	1/-	Nil	Nil	7/6	—6d.	Nil
do. do. Income Bonds	6	6	98	—	*6 2 5

TELEGRAPHS AND TELEPHONES.

		Dividend. 1923.	Dividend. 1924.			
Anglo-Am. Tel. Pref.	Stock	6	6	105	—	5 14 3
do. Def.	,,	1½	1½	24½	—	6 3 9
Automatic Telephone	1	3	6	2⅜	—	2 18 1
Chili Telephone	5	6	5	5⅛	—	*5 10 4
Cuba Sub. Ord.	10	5	5	6¾	— ⅛	7 8 2
Eastern Extension	10	10	10	17⅜	—	*5 15 1
Eastern Tel. Ord.	Stock	10	10	175½	—	*5 14 0
Globe Tel. and T. Ord.	10	10	10	17½xd	—	*5 14 3
do. do. Pref.	10	6	6	16⅞xd	—	5 10 4
Great Northern Tel.	10	22	22	32	— ½	6 17 6
Indo-European	25	7	8½	41½	—	*4 4 4
Marconi	1	10	—	1⅜	— 3/16	7 5 6
Marconi Marine	1	10	—	1	—	10 0 0
Oriental Telephone Ord. ...	1	12	12	24xd	— 1/16	*5 2 11
United R. Plate Tel.	5	8	8	7xd	+ 1/16	*5 14 4
Western Telegraph	10	10	10	16½	— ¼	*6 8 10

HOME AND FOREIGN TRAMS, &C.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3¼xd	—	8 16 0
do. do. 2nd Pref. ...	5	6	6	2¾xd	—	10 8 8
do. do. 5% Deb. ...	Stock	5	7	74	—	6 15 2
British Electric Traction Ord. ...	,,	6	6	112xd	—2	5 7 2
do. do. 6% Pref. ...	,,	6	6	104xd	—3	5 15 5
Brazil Traction	100	4	4	57½	+ ½	6 19 2
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	91	+1½	5 9 11
do. do. Preferred	,,	96/-	96/-	84½	—	*5 10 10
do. do. Deferred	,,	1 9/5	12/6	106½	—	*6 1 6
do. do. Deb.	,,	4½	4½	75½	—2	5 19 7
Lond. & Sub. Trac. 5% Pref. ...	1	2⅜	—	6/-	—	Nil
London United Tram. Deb. ...	Stock	4	4	45½xd	—	8 15 10
Mexico Trams, 5% Bonds ...	—	5	5	62½	—	8 0 0
Mexican Light Common ...	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	61	—	Nil
do. 1st Bonds ...	—	5	5	65½	—1	7 12 8
Yorkshire (West Riding) ...	1	5	—	18/9	—	5 6 8

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	12	2 7/16	— ⅛	*4 8 6
British Aluminium Ord.	1	5	10	1⅜	— 1/16	5 0 0
British Elec. Transformer Pref.	1	Nil	7	17/6	—	... ...
British Insulated Ord.	1	15	15	8⅜	—	4 10 3
Brush Ord.	1	10	10	1	—	10 0 0
Callenders	1	15	15	2 15/16	—	5 2 0
do. 6½% Pref.	1	6½	6½	23/6xd	+6d.	5 9 5
Crompton Ord.	1	Nil	Nil	⅜	—	.. ..
Edison-Swan	4/-	10	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	80xd	—	6 4 3
Electric Construction	1	10	10	1⅜	—	6 5 1
Enfield Cable, Pref.	1	7½	7½	14xd	+6d.	5 0 0
English Electric	1	5	5	18/9	—	5 6 8
do. do. Pref.	1	6	6	21/-	—	5 14 3
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	5	7½	25/-	—6d.	6 0 0
Henley	1	15	16	3	—	5 0 0
do. 4½% Pref.	5	4½	4½	4½	—	5 8 0
India-Rubber	1	5	5	1	—	*5 0 0
Johnson & Phillips	1	10	10	2 1/16	—	4 17 0
Met-Vickers, Ord.	1	8	8	23/3	—	6 17 8
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	25/9	—6d.	*5 17 8
Telegraph Construction	12	19	19	27	—	4 9 0

* Dividends paid free of Income Tax.

The Incorporated Municipal Electrical Association.

Annual Convention at Brighton.

(*Continued from page* 1014, Vol. XCVI.)

Installation Policy: Its Importance to the Electricity Supply Industry.

By L. L. ROBINSON, M.Inst.C.E., M.I.E.E., M.I.Mech.E.

(*Abstract.*)

(*Concluded from page* 1014, Vol. XCVI.)

Referring to unemployment in a speech at Leeds, Mr. J. R. Clynes, M.P., said: "Under any conditions it was true to say that workmen who limited output were doing themselves the greatest harm. The author hesitates to say anything that might be construed as hostile to labour. Nevertheless, it is necessary to ask whether the workers in the electricity industry are doing their best towards popularising the use of electricity? Whether they are not on a mistaken hypothesis trying too much to advance themselves not with, but at the expense of the rest of the community? Labour costs in wiring and installation work are still abnormally high, higher than in proportion to the increase of wages since pre-war days. Cheap installations will, at the moment, increase the use of electricity more speedily than any other thing we can do for the public, because it is generally admitted that first cost of installation work is the great obstacle to greater progress. Therefore, by working more efficiently, the installation operatives will not keep other men unemployed but will actually increase employment throughout the country in factories making every type of current consuming device, cables, machinery, &c., right away to the feed pumps. At the present time no discussion upon wiring and installations could be complete without a reference to the 8th Edition of the I.E.E. Wiring Rules. Are regulations necessary? The author's opinion is that if only qualified people were allowed to carry out wiring and installation work, regulations would be unnecessary, and that all regulations are defeated unless steps are taken to ensure good workmanship.

It would be far cheaper to allow none other than properly qualified people to have anything to do with electrical installations The insurance interests are at the bottom of all the tightening up of installation and wiring rules; but do they ever refuse a risk because rules have not been complied with? And is it not a fact that even "curbstoners'" installations are so "safe" that it does not pay an insurance company to send an inspector to survey each risk? How much will an insurance company reduce a premium if a job is carried out under the 8th Edition Regulations instead of under the 7th Edition, or neither? The author is of opinion that it is unwise of the I.E.E. to call the present edition "regulations." They are not enforceable as such by any but one or two undertakings who have special powers to make regulations, and these may foolishly adopt the I.E.E. brand. At the most they are recommendations or draft regulations. As they are not enforceable they are little better than pious opinions and will become a dead letter like the ridiculous speed limits of automobile legislation. Commerce is seldom able to rely for trade upon selling only the absolute and ideally perfect.

It seems to the author quite superfluous to worry so much about Safety First. Even Mr. C. S. Russell, the well-known fire insurance expert, has only known of three cases where fires had an electrical origin in 30 years' experience. The author expects that he attributes the immunity to the power of the old Phœnix Rules, but as these are seldom observed it must really be due to the inherent safety of electricity. It is to be feared that the framers of electricity regulations always have in their mind great factories or public buildings where the responsibility of electricity is so much greater than in houses, small workshops and the usual run of business premises which do, and will increasingly, take the bulk of our output. The author has been asked to quote chapter and verse as to what particular items he objects to. He objects to nearly all of them. Each rule taken individually is almost perfect from the hyper-super-safety point of view, although absolute perfection can never be attained and fatalities may take place even if these costly rules are observed. One important objection is the unconscionable size of flexes imposed upon us, with all the resultant expense and clumsiness of bigger fittings. The new "medium insulation" may only be used for wiring pendants and fittings, and "high grade" must be used for all portable apparatus. This will mean altering the design of most portable fittings, particularly those with knuckle joints which as a rule will take none but the thinnest flex. Twin twisted flex is doomed—it may only be used for fixed wiring, fixed fittings and portable lamp standards. For all other purposes flex must be circular, braided or made up oval. Twin twisted flex is no longer permitted for electric fires or even for irons, toasters, curling tongs, shaving pots kettles, fans, &c. The most drastic and expensive change is the new current density ruling for flex, which is reduced to about half the old value. A six-pound 600-watt iron usually supplied with a light flex and adapter to fit any lampholder must, under the new rules, have a 23/36 or 40/36 flex at 200 volts and a 70/36 at 100 volts. For electric fires the increase in size is even more awful. A 2-kW fire at 100 volts will have to be fitted with a 296/.010-in. or 60/.018-in. flex and at 200 volts 110/.0076-in. As these flexes will have to be circular or oval braided, this increases the diameter still further as compared with present practice, which, in the author's experience, has not been unsatisfactory, and many manufacturers of fires will have to increase the diameters of the bushes through which the flex is led. The cost will vary from 3s. 6d. to 10s. per fire—the author has obtained samples which compare the flexes of present practice with the freaks "regulated" by the I.E.E. Look at the flexes for a 2-kW and 3-kW 100-volt fire! This *reductio ad absurdum* is not the author's—it is that of the Committee who framed the rules. And it is partly due to the earthing regulations which are, in the author's opinion, prohibitive. Is the electrical industry seriously going to advise the public that every coffee urn, every flat iron, and every toaster must be earthed? With regard to this requirement concerning earthing —earthing leads must be of high conductivity copper tinned or otherwise protected from corrosion, and while protected against mechanical injury must be easily accessible. One little undertaking the author knows of sends inspectors round to scrape earth wires to see if they are tinned, and if not is satisfied with daubing them over "where accessible" with a coat of paint.

Another very important clause provides that lamp adaptors shall not be used as plug connectors for appliances taking more than two amperes. Even if the flex rules and earthing rules do not kill the plug adaptor for irons, bowl fires, toasters, soldering irons, &c., this rule definitely settles the matter. Surely the convenience, an enormously important point in connection with two-part tariffs, is worth the small risk which is immeasurably less than that attached to similar gas-heated apparatus. This suppression of the handy little lamp adaptor is a most serious move against the popularising of domestic electrical appliances. These adaptors have been the secret of success on the Continent and in America. The author doubts whether table apparatus would ever have become so widespread in France, Belgium and Germany without them. And we are asked to abolish them. Why? The Electrical Development Association set up a small Committee to give consideration to the 8th Edition of the I.E.E. Wiring Rules, owing to the large number of complaints which had been received from its members, pressing for action in view of the great influence of any wiring regulations on electrical development. The Sub-Committee consisted of a few members of the E.D.A. Council, who could be regarded as generally representative of the four leading electrical supply interests, and in addition three members associated respectively with manufacturers, accessory manufacturers and electrical contractors. In making its specific observations this Committee prefaced its remarks by reminding the Institution that so far no powers existed to make enforceable regulations with the exception of a few supply undertakings which had acquired such powers through special Acts. The Sub-Committee suggested that after the recommendations had been altered or modified they might be submitted for re-drafting by an expert, not necessarily electrical, who would be able perhaps to simplify the wording and remove from the rules those objectionable characteristics which were leading to varied interpretation by different persons.

It was asked that the recommendations should be greatly reduced in bulk and that vague or "specification" matter should be excluded or dealt with separately; and that every attempt should be made to put in a minimum of definite rules, arranged in proper sequence and to be easily read and understood by anyone, down to the wireman's mate.

The Institution was reminded that the rules appeared to have been compiled under the influence of persons who had no interest in anything but complete safety and certainly did not appear to have regarded the value of the wider electrical development or the fact that every electrical appliance replaces some other method intrinsically more dangerous. The author doubts very much whether the most efficient way in which a supply undertaking should run its sales and service department or the best means the industry can find to ensure efficient installation work, have been discovered yet. This paper has not been written with the idea of laying down the law on the subject, but rather is intended to ventilate some of the difficulties in the hope that the discussion may lead to further progress.

Discussion.

Mr. F. W. PURSE (West Ham) said that the author had used the word "curb-stoner" with regard to certain contractors, but he could not help feeling that the paper itself was a "curb-stoner." It was one per cent. grain and 99 per cent. chaff. Whilst the author had said that he did not wish to be understood as condemning wiring contractors, yet he seemed to be doing so all through the paper for he repeatedly called them "curb-stoners" and little-minded men. Again, he said that municipal authorities must have full wiring powers and that wiring contractors had grown up as a separate part of the business. Surely all this indicated that the author was condemning wir-

ing contractors. Then it was stated that the primary object of the contractor was to make a profit. Did not Mr. Robinson wish to make a profit? Surely the answer to Mr. Robinson's own criticisms of the contractor was the I.E.E. Wiring Rules, and yet he condemned the wiring rules also. The object of the Institution wiring rules was to improve the standard of work of which Mr. Robinson complained. On the wiring rules he would have something to say later. He would remind Mr. Robinson also that contractors were represented on the Wiring-Rules Committee. The paper, too, contained many contradictions, such, for instance, as saying that the municipal electric supply authorities should work through contractors and then asking for full wiring powers for the municipalities. Then Mr. Robinson was quite wrong in saying that the average cost of wiring an installation was £25 per kW installed. It all depended upon the basis. If one took 40-W points, as Mr. Robinson did, it might be £25, but if one took 200-W points it would be £2. It was possible, of course, to work the figure up to £100, and it was a pity that in an engineering paper the figure of £25 should have been put forward. (Mr. Purse was proceeding to deal with the Institution wiring rules, but the President could not allow him any more time.)

Mr. S. E. FEDDEN (Sheffield) expressed regret that the opener of the discussion had not dealt with it in a broad way but had rather made it a personal attack on Mr. Robinson. After all, these meetings were held to endeavour to find the best way of securing the greatest good for the undertakings, consumers and ratepayers, and the really important point was whether full wiring powers should be granted to municipalities. He had full wiring powers in Sheffield, with a few restrictions, and his view was that if all municipal undertakings had full wiring powers, the supply industry could be developed in a manner not otherwise possible; moreover, the possession of such powers by the undertakings would benefit the contractors because the more energy that was sold the more wiring and installation work would have to be carried out. In Sheffield there were hundreds of contractors who were busy and doing an enormous amount of work and his own idea was that the Association should pass a resolution urging the Government to pass legislation which would give full wiring powers to the municipal electric supply authorities. Why should the gas and electric supply companies have these powers and the municipal electric supply authorities be placed at the disadvantage of not having them? Dealing with the paper, Mr. Fedden expressed the view that they must not expect to make the domestic development work pay at the very start, the profit would come all right later; that was where co-operation between the contractors and the supply authorities would come in. The supply authorities made a good profit on the sale of energy and therefore the installation work should be let out to the contractors on a schedule of prices, because the contractors could not become financially interested in hiring and similar schemes. It was one of the duties of the supply authorities to give service to the consumer and for that purpose he kept a business-getting staff which also dealt with maintenance and repairs, and an emergency staff which would carry out repairs at any time to either factory or domestic installations. During the war the turnover of the department was something like £90,000 per annum although it was not so large now, but a very large amount of business was done with satisfaction to the consumers. In order to introduce electricity into the smaller homes, a rental scheme of wiring was started last year but that did not prove a success. In February of this year he started a slot meter system under which the wiring and fittings were fixed free—the maximum number of lights for each house being fixed at five 40-W gas-filled lamps—and the meter set to give three hours' burning of one lamp for one penny. From February 1st to June 3rd, there had been 1,501 applications and, as the result of experiments, he was convinced that the cheapest and safest form of wiring was wood casing. In this way, the cost of the installation would be paid back in ten years. Applications were coming in at the rate of 100 per week under this scheme.

Miss PARTRIDGE (Exeter), speaking as a contractor, said that too much time was taken up by the contractor in teaching people what they ought to know as to the uses of electricity. If that education of the public was carried out by other means, there would be a more rapid development.

Mr. W. F. T. PINKNEY (Newcastle-on-Tyne Electric Supply Co.) regretted that Mr. Purse did not deal with the wiring rules first because he was looking for some convincing argument in their favour. Personally he did not see any reason for tightening up the 7th Edition and the only argument he had heard so far was that in Ontario the wiring regulations were very much more stringent. Whilst he agreed that the contractors were a weakness in the electric supply business he thought the fault and the remedy lay with the industry itself. The Electrical Contractors' Association was an excellent organisation, but it was weak in numbers and did not have within its membership anything like half the contractors in the country. It was up to the industry to help the contractors strengthen their Association. The "curb-stoners" had been brought into being not through any fault of the Contractors' Association, but because other sections of the industry would trade with anybody who called himself a contractor. Thus it was that we had men without capital and vision and everything should be done to eliminate this type from the industry; manufacturers should refuse to supply this class of man. He himself represented a company which, of course, had full trading powers and he had endeavoured not to start a wiring department of his own. Various methods had been tried of dealing through contractors, and as a result he was now working through a small section of selected contractors and the arrangement worked very smoothly. He was not interested in the question of municipal trading, but as there had been a good deal of opposition to it from contractors all he would say was that whoever supplied the electricity, the contractors should see to it that a vigorous policy was adopted by the supply authority because in that way, as Mr. Fedden had stated, there would be more and more work for the contractors. As an example of policy which might well be adopted in this country, he mentioned that in one large city in the United States the supply authority had put in over 80,000 trial installations in one year on the understanding that they would be taken out if they were not satisfactory, but none was ever taken out. In that city there were 2,300 contractors, all of whom were flourishing.

Mr. WALTER RIGGS (President, E.C.A.) said the general trend of the paper—not to put too fine a point on it—was that whilst contractors were thoroughly bad—with a few exceptions—supply undertakings were thoroughly good. During the past 25 years, tens of thousands of pounds and tens of thousands of man-hours of human effort had been wasted and actually thrown away as far as electrical progress was concerned, as a direct consequence of internal discord and strife within the industry itself. To-day this destructive effort had been almost entirely replaced by constructive work for the common good, and he deprecated any action which would throw us back into the confusion and bitterness of the past. The Electrical Contractors' Association claimed a great deal of credit for the very much improved position of things to-day, and its activities were meeting every day with increased encouragement and success; he gladly acknowledged the ever-growing good-will and support which was being received from manufacturers and others in the industry. A large number of central station engineers had recognised the folly of past discord and had settled down to a process of businesslike, co-operative development carried on in an atmosphere of local electrical peace and stability. To those who were making unsparing efforts on behalf of electrical unity and concord, such a paper as Mr. Robinson's came as a patience-trying ordeal of no small magnitude. Figures had been prepared which showed that those municipal electric supply undertakings which worked through contractors without any trading powers at all had made the greatest progress during the past 12 years, whilst those with full trading powers who were exercising them without contractors had made the least progress. He agreed that live contractors could not be found in districts which were subjected to rate-aided competition or to competition based on the bad business principle that what was lost on the swings of wiring could be made up on the roundabouts of supply. In an atmosphere of competition, opposition and discouragement, live contractors tended to move away to other and better fields, leaving the central station authority in full enjoyment of the remnant of "curbstoners" who were prepared to hang on and live from hand to mouth.

Mr. R. B. MITCHELL (Glasgow) said he would like to put in a plea for the contractor in a small way of business, who, he had found from experience, played a very useful function in the electric supply industry, and who would perform a still more useful function in the future, because there would be such a lot of small installation work to be done. Whilst agreeing that full powers were necessary for municipal undertakings he himself had not yet found it necessary to have an installation staff beyond such as would fulfil the internal requirements of a large Corporation. He had endeavoured to maintain friendly relations with the contractors, and in that he had been quite successful. All the work was done at schedule rates by the contractors, and just as cheaply as if it were done direct. All that was needed was supervision by the department to see that what was specified was actually provided. Having to deal with people with small incomes it was necessary to find a scheme which would come within those incomes, the people who did not own the houses they lived in. Consequently, in Glasgow, he had started, very successfully, a scheme of hire-purchase wiring, the installation work being carried out by contractors, and within a month 150 houses were dealt with; but there were something like 180,000 houses in Glasgow not supplied with electricity so that the field was very large.

Mr. H. MARRYAT (Messrs. Marryat & Place) also spoke in defence of the contractors and suggested that the gas industry would not be in the position it was as regarded getting new business, if it had not eliminated the contractor altogether in the manner it had. It was notable that Mr. Pinkney, representing the largest electric supply company in the country, and Mr. Mitchell, representing one of the largest municipalities, should have found it more satisfactory to work through contractors, and he was also pleased to hear Mr. Mitchell support the small contractor, because the fact that a man was in a small way of business did not mean that he did the work badly. At the same time, nobody had any sympathy with the "jerry" wireman. It must not be forgotten that the electric supply industry had been built up on the work of contractors and even Mr. Robinson did not always have selling powers, yet he had made progress. At the same time, it was necessary for the contractors to have the full support of the supply undertaking. After all, the undertaking reaped many times the revenue and profit from the consumer, brought by a contractor, than the contractor did. It was astounding to see the smallness of the turnover of those departments which did all their own installation work, and there were contractors who could put those figures in the shade. There were several firms in

London who were prepared to send men out at any time of the night and day to do repairs.

Alderman WALKER (Manchester) also supported the policy of working in friendly co-operation with the good contractor and so securing good work. The supply authorities should maintain a central showroom and maintain contact with potential consumers; that was a necessity and saved the contractor a lot of work, and also from having to keep money locked up in stock. At the same time he thought there should be some contribution in some form from the contractors towards the upkeep of these showrooms by way, perhaps, of a lower discount, than the full trade discount when sales of apparatus were effected. It did not seem to him fair that the supply authorities should maintain these showrooms altogether at their own expense and he was proposing to make some such suggestion to the contractors in Manchester with whom the department worked in perfect harmony. On the general question, he believed there was room for the contractor in the industry and that every endeavour should be made to eliminate bad work. As an instance of the enormous field for development, he stated that in Manchester, out of a sale of 240 million kWh, only 13.4 per cent. went for lighting and domestic power. The difficulty in Manchester was that up to two years ago the industrial power load came on at such a rate that it was impossible to do much with the domestic side but now that the new power station was at work that position was altered. In criticising the new wiring rules, the question to be answered was what was the extra cost of working under the 8th edition as compared with the 7th edition? It was very small indeed, and that was the test, and we ought to have the installation work done in a permanent and satisfactory way and not in a makeshift manner.

Mr. A. H. SHAW (Ilford) said that Ilford only had hiring powers but he had been working amicably with the contractors. Many hundreds of installations had been carried out in this way and he had never been called in for maintenance. At the same time, there was a very large amount of work to be done on hire-purchase which, however, he could not touch until he had the full powers. He also expressed the hope that it would not be thought that a small contractor was necessarily a bad one. As to the I.E.E. wiring rules, they contained the names of various Associations as having adopted them, including the I.M.E.A. He wished to know whether the names of those Associations were carried from one edition of the rules to another irrespective of whether alterations were made which were not approved by those bodies; in short, had the I.M.E.A. adopted the 8th edition of the rules? Personally, he agreed with Mr. Robinson that there was no reason to alter the old rules as to flexibles. The chief trouble had been with the connector to the piece of apparatus. He did not agree that adaptors should be cut out entirely as they were an extremely useful piece of apparatus in certain cases. The relative cost of working under the two editions of the Rules had nothing to do with the matter, in his opinion. It seemed rather that the "Safety First" microbe was at work and that the I.E.E. Wiring Rules Committee had put in every safety-first device imaginable regardless of expense.

Mr. J. W. BEAUCHAMP (Electrical Development Association) suggested that sufficient use was not being made at the present time of the existing contractors' organisations as centres of contact with the consumer. For instance, if a contractor showed in his shop window the hiring terms of the supply department, it helped to maintain contact with the public. It all helped to keep the main idea of the use of electricity in the mind of the public. Whilst there were many contractors who were fully alive to this aspect, there were a still larger number who were not and there were many matters in this connection which should be discussed between the departments and the contractors. Much more local work of this character was necessary. Another thing which might be done was on the lines of the "Red-Seal" plan in America, to indicate whether a house or premises were correctly lighted, &c. There might be some method of attaching a seal to the specification so that houses and premises would be wired according to specification "A" and so on, according to the completeness of the installation. Then the contractors might be given a bonus or some encouragement to get the houses wired on a higher grade of completeness. Perhaps there might be a Committee on the relations between contractors and undertakings, when full trading powers were secured.

Councillor HENNESSEY (Bristol) protested that at a meeting of municipal engineers and councillors, speaker after speaker should come on to the platform and support the contractor. He thought the time had come when it should be said that those who represented private firms should not be allowed to attend the Conferences. As a Socialist, he held the view that the undertakings should be run solely by the municipalities without the intervention of contractors. The sort of thing that had happened at the hands of contractors in Bristol was that rows of houses were wired and the occupants paid for the installation and then found they were a mile away from a supply cable.

Mr. A. H. DYKES (Beckenham) suggested that it should be appreciated that the paper had deliberately been written in a provocative form and that it would be well not to take seriously everything that was in it. The great point which Mr. Robinson was endeavouring to drive home was that mere reductions in price of electricity were not enough to bring about development of the use of electricity. Beckenham had full wiring powers and now worked through contractors, although a certain amount of work was done by the department. He agreed that every municipality should have full wiring powers, although it did not follow that the work would not be put through contractors. Full wiring powers were certainly necessary if small houses were to be dealt with. On this latter point two methods which had been successful, and he had introduced, were the current limiter and the fixed price light system. The latter was now being taken up by certain companies whom he advised in India, for bazaar lighting. Dealing with the wiring rules, as a one-time member of the Wiring Rules Committee he thought the Committee had fallen between two stools in bringing out the 8th Edition. It would have been better to have made the rules a code to which everyone should try to work rather than a sort of manual to which every wireman was expected to conform. They were too complicated for the ordinary wireman to understand. The difficult thing was to say that an installation which did not comply with the rules was wrong and that was why he thought it would have been better to have regarded the rules as a code for the best class of work. There could then have been a few shorter necessary rules which would have made it easier for the contractor. From his experience, the chairman of the Committee, in an endeavour to be very fair, allowed various fads of members of the Committee to be incorporated, and so it was that we had precautions against all sorts of contingencies which might or might not arise. An instance of the difficulties involved was that of a large house the wiring of which contravened practically every rule in the 8th Edition. The fire insurance company concerned was mentioned as one of those who had adopted the rules and yet when he inquired, he was told that the fire insurance company was going to pass the installation because if it did not some other company would.

Mr. J. R. DICK (W. Lucy & Co.) suggested that if the wiring rules were called "British standards for electrical installations," Mr. Robinson would fall in love with them. The difference in the cost of complying with the 8th Edition as compared with the 7th Edition of the wiring rules was not large enough to warrant the pessimistic attitude taken up by Mr. Robinson.

Mr. Robinson, who will give his full reply later, reiterated that his remarks with regard to contractors were not intended to be offensive, although they appeared to have been so taken in certain quarters. East London, however, suffered from a type of man whom, as a contractor, none of those present would care to associate with. The most important point was the question of municipal electric supply departments having full wiring powers, and no contractor need fear that these wiring powers would be put into operation by municipalities direct. They had heard of the municipalities who had found it advantageous to work through contractors, and they had also heard from Mr. Shaw, of Ilford, that he had not developed in the way he could—and he worked through contractors—because he had not full wiring powers; therefore, it would be to the advantage of the contractors if the municipalities had full wiring powers. He appealed to contractors to alter their policy of opposition and to assist the municipalities to obtain those powers in order that hire-purchase schemes could be put into operation. In Hackney at first they worked entirely through contractors; then they tried another method but had come back to working through contractors on the basis of a schedule of prices and specifications which had been drawn up in co-operation between the contractors and himself. He wished to put it perfectly plainly to contractors that municipal electric supply departments with full wiring powers would maintain small staffs for their own internal requirements and repair and emergency work, but the contractors would lose nothing by that. As to the wiring rules, he agreed that the difference in cost between the 7th and 8th editions was not much if only lighting were considered, but it would be considerable when radiators and other apparatus were fitted.

Annual General Meeting.

The Annual General Meeting was held on Friday, June 19th, in the Dome, the President in the chair.

It was announced that Mr. R. B. Mitchell (engineer, Glasgow), had been elected President for the coming year. Mr. MITCHELL expressed his thanks, as did Dr. DEWAR (Glasgow), who at the same time extended a cordial welcome to the Association to hold the 1926 Convention in Glasgow.

Mr. R. W. L. PHILLIPS (Bedford) was elected Vice-President.

The Annual Report of the Council was then presented, arising out of which a few matters were discussed.

The Report stated that the total membership stood at 217, representing 83 per cent. of the authorities eligible. The bulk of the Report related to the activities of numerous Committees of the Association, and of other bodies with which it was in collaboration. A statement had been sent to the Electricity Commissioners recommending, *inter alia*, that the coal consumption statistics which they published annually should be based upon the units delivered to the feeders and not upon units generated, and that the annual station load factor should be given. The possibility of using wireless communication between the power station and repair gangs, &c., was being investigated. The National Register of Electrical Installation contractors was commended to the members for their support. The Electric Vehicle Committee of Great Britain was about to be amalgamated with the Electrical Development Association. A report had been submitted to the Electricity Commissioners with regard to the development of electricity supply areas, containing a number of recommendations relating to generation,

transmission, and distribution, and to the extension of the scope of fringe orders. The Association had pressed upon the B.E.S.A. the desirability of adopting 250 V as the standard voltage of supply, but the decision was in favour of 230 V. Approval was expressed of the Illumination Design Courses organised by the E.L.M.A., as adding to the efficiency of salesmen, and the importance of contributing to the funds of the Electrical Research Association was emphasised, a scale of subscription based upon output being put forward for the guidance of electricity supply committees.

The accounts showed that the income for the year was £2,449, and the expenditure £2,280, leaving a surplus of £169. The balance sheet recorded a surplus of assets over liabilities of £2,518.

E.D.A. Subscriptions.—Councillor GOUGH (Cardiff), asked for expressions of opinions with regard to the new scale of subscriptions to the E.D.A., *viz.*, one-tenth of one per cent. of the revenue of the undertaking. Whilst he himself supported the new scale he was having difficulties with some of his committeemen. In the case of Cardiff it meant an increase in the subscription from £60 to £120.

The PRESIDENT said that strictly this was not a matter for the I.M.E.A. at all, but for the individual undertakings to make up their minds about. The I.M.E.A. Council merely recommended that the new scale should be adopted.

Councillor MCLEOD (Hull) expressed the view that if the money was for propaganda, not many councils would agree. If it were for research it was another matter. Councillor PEARLMAN (Hull) said that in the case of Hull the subscription would be increased from £60 to £300 and he thought the meeting should give a decision as to whether the new scale should be adopted. Mr. J. CHRISTIE (Brighton) said his subscription would be increased from £50 to £200, but every penny of the money would be well spent. Alderman WALKER (Manchester), said there would also be a considerable increase in the subscription from Manchester, but he supported the scheme fully.

Calorific Value of Coal.—On the motion of Alderman WALKER (Manchester), seconded by Councillor HAMMER (Hackney), a resolution was passed that an endeavour be made to secure direct representation for the I.M.E.A. on the Joint Committee formed by the Institutions of Civil, Mechanical, and Electrical Engineers, to deal with the question of moisture in coal and a test for calorific value. Certain work was done as the result of Mr. Miles's paper last year on "Power House Chemistry," but it had been abandoned in consequence of the appointment of the committee mentioned. It was felt by the meeting that the I.M.E.A. should have direct representation, although Mr. R. A. Chattock was on the committee representing the Institution of Electrical Engineers.

Standard Voltage.—The Council reported, in connection with the proposal of the B.E.S.A. that the standard voltage should be 230 volts, that it had passed a resolution that 250 volts was the more desirable figure. Mr. N. STANILAND (Hornsey) moved that the Council's resolution be confirmed, but the proposal was rejected by a large majority, the general opinion being that the standard voltage should be 230 volts. The hon. secretary intimated that the resolution in favour of 250 volts carried by the Council was not unanimous.

The Annual Report was then adopted.

Wiring Powers.—A long and lively discussion took place upon a resolution moved by Councillor THICKETT (Grimsby), instructing the Council to take steps to secure legislation which would give full wiring powers to all municipal electricity supply authorities. A long and detailed amendment to this was sent in by the representatives of Hackney, which Councillor Thickett said he was prepared to adopt. This amendment, in fact, set out the wiring clause in the Woolwich Act of some 20 years ago, and instructed the Council to take the necessary steps to make this general to all municipal authorities.

Strong objection was taken to the Hackney amendment by a large number of those present, on the ground that it would tie the hands of the various authorities to a particular form of wording which they had not had an opportunity of considering. Others preferred the original Grimsby resolution, which left the matter in the hands of the Council to a large extent. Various other amendments were proposed and objected to, including a proposition that the matter should simply be left in the hands of the Council to deal with.

Eventually, the Grimsby resolution, with certain modifications, was passed in the following form:—

> "That this Association consider the advisability of initiating legislation giving powers to municipal electricity undertakings to sell and install on the hire-purchase system or otherwise, electrical apparatus, such as cookers, stoves, &c., and also powers enabling such undertakings to finance and carry out through wiring contractors or otherwise, wiring installations, and to charge a rent in respect of such wiring installations, or recover the cost thereof on the hire-purchase system or otherwise."

Assessment of Electricity Undertakings.—A proposal was made on behalf of the Watford electricity undertaking that the matter of the increased assessments of electricity undertakings should be referred to a special committee, and this was agreed to.

Expenses of Members of Council.—On the motion of the delegates from Barrow-in-Furness, the desirability of making arrangements to pay the expenses of members of council was referred to the Council for consideration.

Bulk Supplies.—The Gillingham Corporation proposed that the matter of safeguarding the interests of those authorities taking bulk supplies be considered by the Council, and this was agreed to.

Joint Boards and Membership.—It was agreed to instruct the Council to take the necessary steps to alter the Articles of Association so as to admit to membership of the I.M.E.A. Joint Electricity Boards composed entirely of local authorities.

Chairmen's Meeting.—A resolution from the meeting of chairmen held on June 16th, recommending that the chairmen's meeting in future be a permanent part of the Convention proceedings and not an informal meeting was confirmed.

The usual votes of thanks to those who had assisted in the Convention arrangements closed the annual meeting.

(To be continued.)

The National Physical Laboratory.

Annual Inspection by the General Board.

THE annual inspection of the National Physical Laboratory by the General Board took place on June 23rd. On the arrival of Sir C. Sherrington, President of the Royal Society, with Lord Rayleigh and other guests at the new lodge, the director of the laboratory, Sir J. E. Petavel, invited the president to perform the ceremony of opening the Queen's Road entrance. The guests were addressed by the president and Lord Rayleigh, the former then receiving a special key from Sir L. Earle, secretary, H.M. Office of Works, with which he opened the gates; and he then declared the new roads open.

The new road scheme was undertaken as the first necessity in the development of additional land that was acquired in 1920 to meet the growth of the laboratory, which has been continuous since its foundation 25 years ago. The scheme offered an opportunity of improving the approaches to existing buildings and convenient access has been provided to the Admiralty Research Laboratory, to the new laboratory recently erected to meet the needs of the Chemistry Co-ordinating Research Board, and to other buildings on the new site.

Tea was provided during the afternoon, and in the course of their tour of the various departments numerous experiments were watched and apparatus examined by the visitors.

In the Aerodynamics Department the electrically-heated wire method of measuring rapidly fluctuating wind velocities is employed. The experimental difficulties are accentuated by the fact that anemometers of normal design are subject to a "lag" and cannot follow the variations of speed sufficiently faithfully, but with the finest platinum wires, one-thousandth of an inch in diameter, 2 or 3 fluctuations per second are faithfully recorded; even with instruments designed as carefully as this a pronounced lag is experienced for more rapid variations of speed. A full understanding of the laws which govern air flow claims first importance in aeronautical research. The investigation of those complicated problems is facilitated by a device known as the electrical tank. Its application is based upon the fact that air flow patterns in theory have features in common with an electrical field. The rectangular tank (5 ft. long and 2½ ft. wide) is filled with slightly acidulated water, and an alternating current of audio-frequency is passed between thin metal plates mounted on the two longer walls of the tank. The model to be studied (*e.g.*, an aeroplane wing), is fixed with its span vertical in the centre of the tank, and observations are made on the resultant electric field, for which purpose two exploring electrodes are used, connected to a 3-valve low-frequency amplifier. The observer is provided with headphones, and one electrode is moved until no sound can be heard. With the use of linkage attached to the moving electrode, the field is readily mapped on paper and the curves obtained are compared with the actual air pattern as determined in the wind-tunnel.

In the Metrology Department, amongst a variety of exhibits dealing with precision measurement, was an example of length measurement by means of the interferometer. A new form of cadmium lamp, recently invented by M. Hamy, was also shown; the waves of red light from the lamp are used as a fundamental unit by which all other light waves are measured and their extreme smallness may be realised from the fact that there are nearly 1½ million waves of red light in a yard. A method of depositing a film (from 1 to 2 millionths of an inch thick) of silver upon glass is to pass an electrical discharge through a vacuum chamber having a silver electrode, in the neighbourhood of which lies the glass to be silvered. The silvered-glass plates are used in interferometry methods of measurement.

In the Electrotechnics Department the new standard power-measuring apparatus includes a new precision electrostatic wattmeter. The standard type of instrument used for measuring the amount of power in an alternating circuit has been re-designed in detail, and a new one constructed to supplement that which has been in use for some years. The equipment includes very accurate voltmeters, all the instruments indicating the values of the quantities on a circular scale about 21 ft. long. These instruments are used for determining the corrections to be applied to instruments used for important measurements of power throughout the country, including instruments for adjusting ordinary domestic meters. It is important in many tests to maintain the frequency of the current, when testing instruments for use on alternating circuits, very accurately at the value at which they are to be used.

A special three-phase alternator has been attached directly to the shaft of the main machine; this alternator is connected directly to a special synchronous motor, which may be placed in the locality where it is desired that the speed should be indicated. It carries a ground glass disk on which a pattern is marked in black; the disk is illuminated from behind by flashes of light from a neon tube, which are of very short duration and produced by the motion of an accurately adjusted tuning fork, kept automatically vibrating on the electric bell principle. If a suitable repeating pattern depending on the speed is marked on the disk it can be made to appear to be at rest for certain particular frequencies, such as 50 cycles per second, when illuminated in the manner described. If the speed differs slightly from the proper value, the pattern appears to rotate slowly backwards or forwards. The whole arrangement requires no attention on starting up the main machine other than starting the tuning fork, the motor driving the rotating disk being self-synchronising.

The effect of an electric field on the operation of a thermionic valve was demonstrated with the aid of a metal plate, electrified by a battery and fixed on a pendulum which was made to swing past a fixed plate attached to the grid of a valve. Every time the pendulum approached the conductor connected with the grid it caused a variation in the current flowing in the anode circuit of the valve. The variation may be either an increase or decrease according to the polarity of the charge of the swinging plate, and the effect may be amplified by valves in cascade, so that either small movements of the plate or small voltages can be made to produce a measurable indication.

During an investigation to determine the most suitable methods of making electrical earth connections, interesting effects of the movement of moisture with the passage of a small current were obtained, and the special d.c. generator (giving 5,000 volts) has been used for testing specially impregnated timber used for protecting railway track workers from accidental contact with live rails.

The high value of land in congested areas often imposes upon architects restrictions of the severest nature as regards the provision of daylight in large block buildings. It has been estimated that the cost of daylight for such a building on a valuable site may be as much as £4 or £5 per annum for each room. Experimental work on the subject is being carried on in the Photometric Division of the laboratory.

In the Physics Department, in connection with sound-wave photography, a single spherical sound pulse is produced by the passage of an electric spark across a short gap and by means of a second illuminating spark gap activated after a suitable time interval the shadow of the pulse can be photographed. This method can be used for testing the acoustic properties of buildings by the use of sectional models.

Work has been done on determining the best manner in which to set diamonds which are used as pivots in various scientific instruments. The direction of the cleavage planes of the diamond with reference to the bearing surface has been found to be of great importance. In the Metallurgy Department there was seen what is perhaps the finest equipment for the experimental study of metals to be found anywhere in the world.

While the foregoing are but a few of the 180 items to which special attention was directed, they will serve to indicate the all-important role of the laboratory and its competent staff in the advancement of science and its application to national and industrial problems.

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

The Thermofan.

The accompanying illustration, fig. 1, shows one of the latest products of MESSRS. MATTHEWS & YATES, LTD., Swinton, Manchester, the cyclone patent thermofan. This device comprises a fan, intended to be coupled to a steam turbine, and an air heating element through which the exhausted steam from the turbine is passed, the heated air being circulated by the fan, thus providing an economical supply of heated air. This unique machine is claimed to be suitable for plenum heating, laundry work and drying by hot air, or for any other process where a large volume of warm air is required.

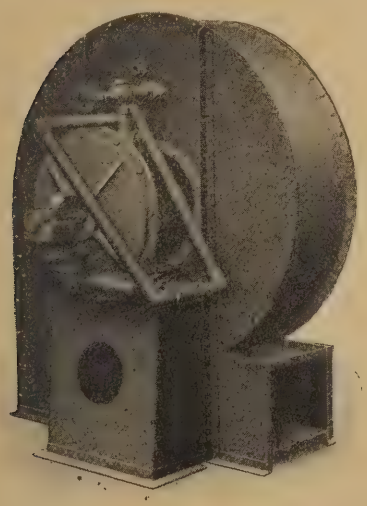


Fig. 1.—The Thermofan.

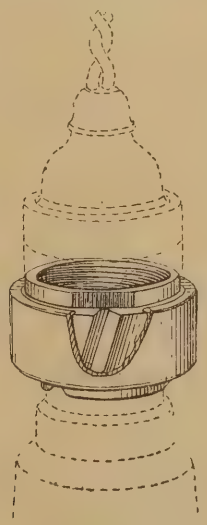


Fig. 2.—The "L.P." Electric Lamp Lock.

A New Electric Lamp Lock.

We illustrate herewith, in fig. 2, the "L.P." lamp lock, a device designed to prevent the removal of electric lamps by unauthorised persons, which is about to be marketed by MESSRS. G. P. PECKHAM & CO., 4-5, New Compton Street, Charing Cross Road, London, W.C.2. The device comprises two rings, inner and outer, with a one-way clutch between them, so that the inner ring may be turned by rotating the outer ring in one direction, due to the engagement of the clutch; but the free-wheel action of the clutch prevents this dual action in the opposite direction. The inner ring is threaded so as to engage with the lamp holder. The lock is first placed over the lamp cap, and the lamp fixed in the holder in the usual manner. The inner ring is then engaged with the lamp holder, an internal flange at the bottom locking the lamp by engaging with the lamp pins projecting from the slots in the holder. An additional lock is provided for the inner ring by means of the shade carrier ring of the holder. To release the lamp the inner ring is unscrewed by means of a special key which is fitted to the upper edge of the inner ring projecting above the outer ring, by means of two flattened milled sides.

Constant-Peripheral-Speed Electric Grinder.

The accompanying illustration, fig. 3, is of a double-end electric grinding machine, which, according to *American Machinist*, will maintain a constant peripheral grinding speed regardless of the wheel diameter. The machine is marketed by the UNITED STATES ELECTRICAL TOOL CO., 2,488, West Sixth Street, Cincinnati, Ohio. The wheel guards are mounted on gibs which are moved back as the wheel wears down. The gibs are attached to a speed controller so as to operate the controller, when displaced due to wear on the wheel, to such an extent that the motor speed is varied sufficiently only to

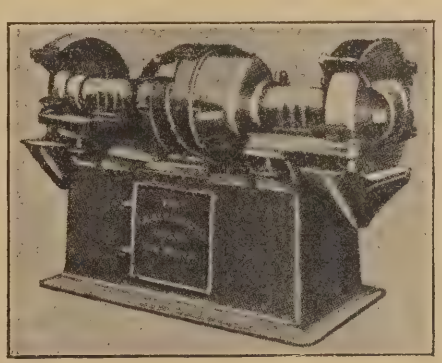


Fig. 3.—Constant-Peripheral-Speed Grinder.

maintain a constant peripheral speed on the grind wheel. The motor is totally enclosed and the bearings throughout are of the S.K.F. heavy-duty type.

Device for Testing Wire Wheels.

The diagram in fig. 4 illustrates the method employed for electrically testing wire wheels, to determine if the rims run true, by means of a device described in *Machinery*. The testing machine is built up on a frame A, from which an adjustable pin B projects to accommodate wheels of different diameters. The wheel C revolves on the pin so that the rim, if out of true, will make contact with one or both of the contact pins H during one revolution. These contact pins are held in and insulated from steel containers. The pins are connected in circuit

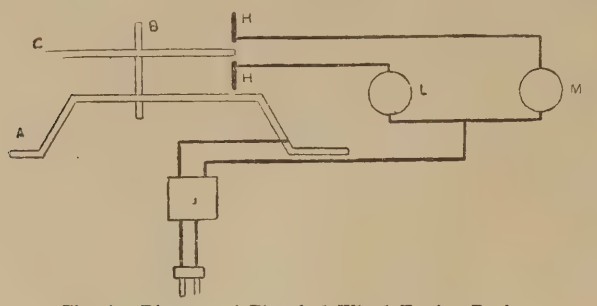


Fig. 4.—Diagram of Electrical Wheel Testing Device.

with two lamps L and M, a transformer J (decreasing supply pressure), and the framework of the device, to a source of supply in such a way that contact between the top or bottom of the rim and the top or bottom contact pin will light one of the lamps accordingly. One revolution of the wheel is sufficient to determine if it is accurate within the required limits. In the case of wheels that do not pass inspection, the single revolution on the testing machine serves to mark the rim in such a way that the workmen will know exactly where trueing up is required.

New Insulation for Leadless Cables.

We have received from HOMOGENEOUS CABLES, LTD., 43, Stadhoudersplein, The Hague, some particulars of two of their recent products, a new insulation "Karetnja," and leadless cables insulated with this product. "Karetnja" is a kind of bitumastic material, invented by Mr. Ali Cohen, the inventor of "Liconite." The makers claim that "Karetnja" is impermeable to water and possesses excellent electrical qualities, and that cables insulated with it can be used quite safely without lead sheathing.

The material is made in two forms, one for insulating the cores of cables, and one for use as outside sheathing. The inside insulation is somewhat softer than the outside sheathing, and it becomes slightly plastic at 100 deg. C., but still retains its elasticity and capacity for bending. It is also claimed that microscopic examination of the sheathing bent round a cylinder having a diameter of only three times the thickness of the material, fails to reveal any change in the state of the material. The use of this insulation renders cables extremely light; a 3 by 16 sq. mm. 10,000-V cable is said to have a weight of 1.7 kilo-gm. per metre.

Provision against mechanical damage is made by the use of a jute braiding applied over the sheathing. It is further claimed that the material is immune from the action of dilute acids, alkalis, oils, &c.

In order to avoid the possibility of the existence of electrostatic and electromagnetic fields on the "Karetnja" sheaths in the absence of metallic sheaths, the makers suggest a certain simple method of manufacture which does not appreciably alter the cost or weight of the cable.

Pressure tests on samples of the material 1.07 mm. thick, show a mean rupturing pressure of 38 kV, and on samples 10.0 mm. thick, 105 kV.

Tests on the cable after 24 hours' immersion in water show 0.72 per cent. dielectric loss on a 30 kV cable, insulation resistance per km. at 15 deg. C., 750 megohms, and the dielectric constant induce capacity in microfarads per km. at 15 deg. C., 0.394. The tests were repeated and the same results obtained 28 days after the immersion in water.

The New "Mazda House."

A FEW weeks ago we announced the opening of new showrooms at "Mazda House," Newman Street, W.1, by the British Thomson-Houston Co., Ltd. These are now in full working order and we recently had an opportunity of inspecting them. The new "Mazda House" is in an excellent position in one of the principal West End thoroughfares and is thus well served by omnibuses, &c.

The main showroom, part of which is shown in fig. 1, is a commodious one running the whole length of the building, and a very large selection of lighting fittings is displayed in a tasteful manner. Off the main body of the room are three small rooms arranged as a bedroom, dining room and study, each with appropriate lighting. In addition, there is a series of alcoves (fig. 2), in which the effects of any selected fitting can be demonstrated. By an ingenious bayonet type of ceiling fitting, combined with a pull switch, any lighting fitting can be readily taken down for separate demonstration or sale. On the ground floor other lighting fittings, more of the "utility" type, are shown. Here also is a collection of domestic heating, cooking, and labour-saving devices. Adjacent to this is a



Fig. 1.—A Part of the Main Showroom.

room set aside for the demonstration of "Tungar" rectifiers, a washing machine, a cooker, and exhaust fans. The lower ground floor is devoted principally to commercial and industrial lighting, one of the most attractive features being two shop windows which are placed at the disposal of firms who

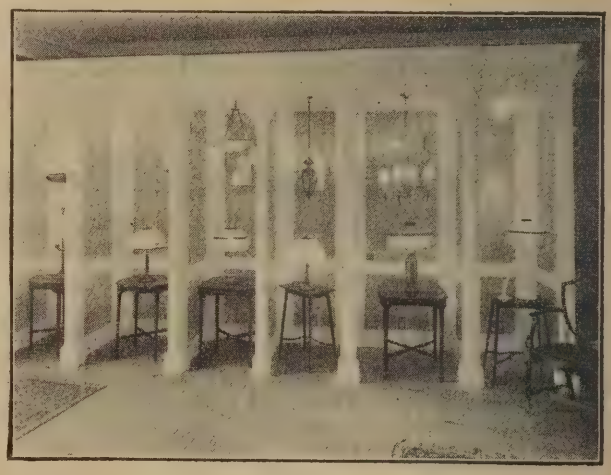


Fig. 2.—Alcoves for Demonstrating Individual Fittings.

require special arrangements for illuminating their goods with coloured light. There are also "Posterlite" fittings, projectors, and office and works lighting units. Radio apparatus of all kinds is also displayed on this floor. The two upper floors are devoted to offices, among which is the Lighting Ser-



Fig. 3.—Trade Counter.

vice Department, in which fittings are designed in accordance with customers' special requirements. The Newman Street entrance is flanked by well-arranged display windows which give the exterior an attractive appearance. A rear entrance leads to a trade counter (fig. 3) which is arranged for rapid and efficient service.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

The Marconi-Osram DE3B Valve.

The resistance-capacity method of inter-valve coupling possesses several important advantages, namely, distortion effects due to transformer losses are entirely eliminated, amplification is practically independent of the frequency over the entire range of speech frequencies, and the h.p. current consumption is low. The main disadvantage, however, is its low amplifying power, and, as the step-up must be performed by the valve, the latter should have a high amplification factor combined with low impedance. To meet these conditions, the Marconi-Osram DE5B valve has been designed with an amplification factor of 20 and an impedance of 30,000 ohms. Introduced several months ago, it has met with success not only as a resistance-coupled amplifier, but also when performing other functions, but although the current consumption is only 0.25 amp. the use of a number of these valves in multi-stage amplifiers, such as the supersonic heterodyne receiver, would result in a considerable demand on the accumulator. To overcome this disadvantage, the M.O. Valve Co., Ltd., has introduced a new valve, known as the DE3B 0.06-amp. type, operating at the same filament voltage (2.8), but having a much

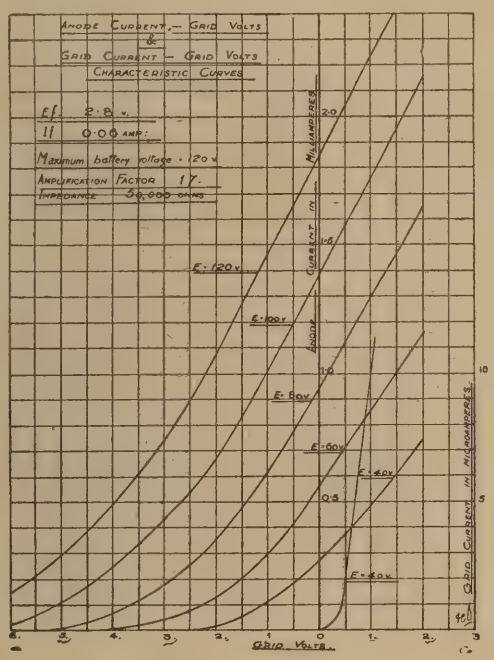


Fig. 1.—Characteristic Curves; Marconi-Osram DE3B Valve.

higher voltage amplification factor than the DE3 type; it has been found possible to design this valve with an amplification factor of 15, and still retain the comparatively low impedance of 50,000 ohms. It follows, therefore, that while the DE5B pattern remains the better valve from the point of view of characteristics, the economical operation of the DE3B type will commend its adoption in many cases. The characteristic curve, fig. 1, indicates that the DE3B valve can deal with a grid swing of about 2 volts at 120 h.p. volts, without working round the bottom bend, as the plate current characteristic is straight to a negative value of about 4 grid volts.

Thus, with the maximum h.p. voltage allowable (120), the DE3B type provides volume without distortion up to two stages of audio-frequency resistance coupling, using a negative grid bias of 1½ volts; for the last stage a DE3 valve may be used, but, if very strong signals are being received, type DE4 should be substituted. As a h.f. and detector valve, the DE3B will give better results than the DE3 type on weak signals, and it detects the short waves from KDKA (68 metres) well when followed by a DE3 as a l.f. amplifier. The DE3B is unsuitable for operating as a transformer coupled l.f. valve, as its impedance is too high for this purpose.

The "Acme" Filament Resistance.

The new filament rheostat illustrated in fig. 2, which is made by the Acme Production Co., Ltd., is of an original design. Its feature is the contact, which is of a roller type, secured to a phosphor bronze spring, thus avoiding the conventional method of rubbing contacts and giving a constant pressure on the inner surface of the resistance. By this design smooth control is combined with silent operation and the maximum gradation of the resistance without the use of any fine adjustment. These rheostats are made for one hole fixing and are stocked in 15- and 30-ohm sizes suitable for either bright or dull-emitter valves, and are complete with knob and pointer. There are no complicated parts to get out of order and the workmanship is good.

A New Porcelain Insulator.

In view of the fact that porcelain insulators have hitherto always been used in compression, the example illustrated in fig. 3 is of interest because it will actually withstand a direct pull of several hundred pounds quite safely. It is known as the "Climax low-loss" insulator, and its makers claim that it will stand four times the flash-over voltage of the ordinary shell, or egg, type, and has far less capacity to earth. It is made of the same vitreous porcelain as 100,000-V insulators for transmission lines, and is non-hygroscopic. It is a product of Climax Patents, Ltd.

The Mullard S.6 Valve.

The S.6 pattern is a dull-filament valve designed by the Mullard Radio Valve Co., Ltd., primarily for "anode bend" rectification. In this method advantage is taken of the curvature of the lower part of the anode current-grid voltage curve, whereby h.f. oscillation on the grid causes an increase

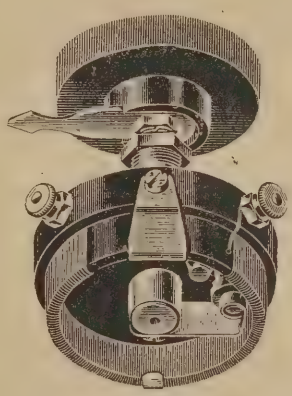


Fig. 2.—The New "Acme" Filament Rheostat.

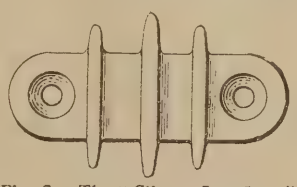


Fig. 3.—The "Climax Low-Loss" Insulator.



Fig. 4.—The Mullard "S.6" Valve.

in the mean anode current. It is important for this purpose that the characteristics of individual valves should not vary to any considerable extent from the accepted standard, and S.6 valves all meet this condition, it is claimed. Their amplification-factor (22) and impedance (100,000 ohms) are high, and they can be used with success as h.f. amplifiers and as resistance-capacity coupled amplifiers. In the latter case a h.p. voltage of from 150 to 200 volts is recommended with an anode resistance of from 100,000 to 200,000 ohms. A filament current of 0.2 amp. at 3 volts should not be exceeded, and an important feature of these valves, one of which is shown in fig. 4, is the helmet-shaped moulded cap which yields low inter-electrode capacity. The valve occupies small space and fits standard anti-capacity clips.

"Lilliput" Headphones.

Under the above name new headphones have been introduced by the Sterling Telephone and Electric Co., Ltd., to meet the demand for reliable instruments for general radio use. The magnets are made of tungsten steel, and the bobbins are carefully wound with best-quality wire and impregnated to prevent any possibility of corrosion. The gap between the Stalloy diaphragm and the pole-pieces is adjusted by grinding the pole-pieces. The headband is made of springy steel wire covered for its greater part with leather; adjustment to the head is easy. These 'phones, including the cords, which are totally enclosed, weigh 9½ oz., and the sample sent us gave good results and was found to be very comfortable in use.

New "Excel" Clips.

We have received from Messrs. S. H. Collett samples of some new saw-tooth jaw clips which are of general utility for making temporary connections. One of their points of advantage is the fact that the neck has been made of such a size as to accommodate any size of cable, or flexible, or a number of wires as may be required.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The Mersey Tunnel Bill.—On June 24th and succeeding days, having heard the case for the promoters of this Bill, the Select Committee of the House of Lords commenced to hear the evidence on behalf of the opposition.

Mr. MONCRIEFF, K.C., who represented the Mersey Railway Company, said that although there was at times great congestion at the riverside, there was no justification for such a costly scheme as was proposed, which would seriously interfere with the business of existing transport undertakings.

Mr. J. FALCONER, chairman of the Mersey Railway Company, said that his undertaking had had a great struggle in the past but was now proceeding towards prosperity. If the tunnel were sanctioned it would be very detrimental to the company.

Similar evidence was given by other witnesses. The proceedings concluded on June 30th, and the Committee signified its approval of the Bill.

Electric Lighting on Railways.—On June 22nd, Colonel DAY asked the Minister of Transport whether he was aware that many carriages on the Southern Railway, Brighton Railway section, were rendered objectionable by obnoxious gas fumes, due to leaking gas containers under the carriages; and would he make representations to the company suggesting that in the interests of public safety these carriages be electrically illuminated.

Col. ASHLEY said it was a recommendation of his Department that all new or reconstructed passenger stock should be electrically lighted, and the Southern Railway Company had adopted this practice. The company stated that any case of leakage which might be brought to its notice would receive immediate attention.

Wireless Aerials.—On June 22nd, Sir K. WOOD, Parliamentary Secretary to the Ministry of Health, informed Rear-Admiral Beamish that no objection had been raised by the Ministry to the erection of wireless aerials on State-aided housing schemes provided that the usual precautions were taken for the proper earthing of the installation.

Telephone Deposits.—On June 22nd, Sir W. MITCHELL-THOMSON, the Postmaster-General, informed Mr. W. Thorne that the minimum telephone deposit had been reduced to £1 and those subscribers who had deposited £1 10s. would be THOMSON, the Postmaster-General, informed Mr. W. Thorne credited with 10s. through the accounts to be rendered in July, except in cases where the charge for the quarter's calls appreciably exceeded £1 10s.

Wireless at Sea.—On June 25th, Sir P. CUNLIFFE-LISTER, President of the Board of Trade, informed Mr. B. Smith that representations were made some time ago to the Board of Trade and the General Post Office that, owing to the small field for training wireless operators at sea, great difficulty was being experienced in complying with the requirement that operators in charge of a ship must have had 12 months' sea service; and that unless some action were taken to amend the rules, there would soon be a serious shortage of experienced men available for the sea service. The matter was very fully discussed by the Board of Trade and the Post Office with representatives of the wireless telegraphy companies, the shipowners and the Association of Wireless and Cable Telegraphists. As a result of these discussions, the Board and the Post Office came to the conclusion that it was advisable to reduce the requirement to six months' service.

Gas Companies and Electricity.—On June 26th, in the House of Lords, LORD RAGLAN moved the second reading of the Statutory Gas Companies (Electricity Supply Powers) Bill, which enables statutory gas companies to apply for Special Orders under the Electricity (Supply) Acts to empower them to apply their funds or to borrow money for electricity purposes.

LORD BANBURY opposed the Bill, contending that it took from Parliament powers which it had exercised almost from time immemorial and bestowed them on the Electricity Commissioners, who were practically responsible to no one, and the future composition of whose body no one knew. The Commissioners would be able to grant concessions which had a pecuniary value and that power might lead to corruption. The Bill also enabled the Commissioners to grant powers to gas companies in areas in which electricity companies had already got powers and were subject to statutory obligations.

LORD DONOUGHMORE, Chairman of Committees, pointed out that these Special Orders remained subject to the control of Parliament in each individual case.

LORD PEEL, speaking for the Government, did not suppose the effect of the Bill would be very large, but its operation would probably be very useful in those areas which were not supplied with electricity, and were not of such a character as to encourage the ordinary electricity undertaking to enter for the purpose of giving a supply. He thought they might have full confidence in the Electricity Commissioners.

The Bill was read a second time.

The Government and Unemployment.—In the course of his reply to the vote of censure, in connection with the increase of unemployment, moved by Mr. Ramsay MacDonald, on June 29th, the PRIME MINISTER stated that the Government had a practical scheme of electrical development under examination. If the Committee which was considering it reported that the scheme was workable the Government would immediately take the necessary steps to enable it to be carried out. The Premier also mentioned the importance to industry of scientific research, which, he said, would always be aided by the Government. Referring to low-temperature carbonisation, he said that if the results of the East Greenwich experiment justified it, the Government would consider the erection of a plant on a commercial scale.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Installation Policy.

Mr. L. L. Robinson, at the I.M.E.A. Convention at Brighton, faced with characteristic courage the very real and vital problem of the extension of electricity supply into the homes and premises of the great mass of the people.

This important paper, not to speak of its subject matter, is not discussed in the present communication. A few points only are considered which call for immediate comment.

He remarks that the primary object of a wiring contractor is to make a profit. Had this been so, the financial strength of the contracting industry would not have left it so helpless in the face of piratical attack from municipalities or others who imagine that they could rule more to their advantage the provinces they covet.

Mr. Robinson says that "electrical contractors have come into existence through no fault of their own, but because in the early days suppliers of electricity entirely neglected 'the service to the consumer' end of the business." Before 1880-81, contractors were engaged upon arc lamp installations, A B C telegraph lines, electric bells and signals, and latterly telephone work. Then their early enterprise founded the electric light industry. They had to devise and make their own accessories and experiment with wiring methods, and I see very little in use to-day that was not tried in those early days. Where no existing mechanical power drive was available, they installed gas engines, steam sets, or water power to drive their dynamos. During the next ten years they dotted not only the towns but the whole country with private installations before ever there were any municipal engineers to speak of. The "Chiefs" of public supply stations may now be eternal with a hankering after omnipotence backed by taxation—but they had a beginning.

Nor did the earliest supply stations themselves come into being without the eager enterprise of contractors. In Scotland, probably also elsewhere, some of the pioneer stations were largely, if not entirely, conceived and founded by wiring contractors. These contractors had the ear of the public and gave at least enthusiastic and effective support to all good public schemes. They still do so in a measure. By far the greater part of the existing load was built up by the personal efforts of the wiring contracting trade. To-day every extension of area acquired by a supply authority delivers a harvest of independent plant installations sown by the contractors and reaped by the supply people without compunction or any compensation to those who have pioneered and prepared the field.

We do not hear of any movement in the Contractors' Associations to reduce the supply chief to the position which Mr. Robinson desires for the contractor, which is that of a compulsory servant of his destroyer, underpaid, overtaxed, robbed of all freedom, independence and initiative, forced to contribute to rival showrooms, but for his own, charged full rates for electricity used for advertising electricity supply.

Yet two problems remain—the "curbstoners" and the cheap wiring system. These demand further consideration.

Meanwhile each electrical contractor of vision will hasten to apply for formal registration. This subject also has its difficulties, but if all pull together, they can be solved.

Donald S. Munro, M.I.E.E.,
Registered Electrical Installation Contractor.

Edinburgh, *June 22nd*, 1925.

The Electrocution of Rats.

Forgive me for pulling your leg, but if any reader can advise us whether a scheme for the extermination of rates by electrocution has ever been devised, will he add if it can be applied to rate collectors?

Francis Thos. Fawcett.

Woodford Green, *June 22nd*, 1925.

[We fear the millennium is not yet due—only the rates.—EDS. ELEC. REV.]

A British Institute for Radio Engineers.

It would be of great interest to have more light on Mr. Nelson's proposal to form a new engineering society. In his letter he deals fairly fully with the constitution of the new society, but beyond stating that a really technical society for

wireless engineers is wanted in Britain, he does not put forward any real arguments in favour of such a step. Personally I can see several arguments *against* the proposal, and to put forward a materialistic point of view first I would mention that most engineers already pay quite enough annually in the form of subscriptions. From this point of view alone we want to limit the number of societies as far as possible. But the real point is: is there a real need for such a society as is proposed by Mr. Nelson, from the *technical* point of view? Apparently Mr. Nelson's objection to the Wireless Section of the I.E.E. is that one must be an electrical engineer before one can join the Wireless or any other section of the I.E.E. But surely this is as it should be, for a fully qualified wireless engineer must of necessity be an electrical engineer. I take it that the proposed new society is intended for those professionally engaged in the engineering aspect of wireless, and it therefore seems to me that the Wireless Section of the I.E.E. exactly covers all the ground and there is no sound argument for this ground being shared by a new society.

Incidentally, I notice that Mr. Nelson has discussed the matter with several "advanced *amateurs*." Why should amateurs, however far advanced, be interested in the formation of a *professional* society? There is already a technical society for amateurs, the Radio Society of Great Britain, and I think it is very desirable that the amateur and the professional interests of wireless engineers should be looked after by separate bodies. These two separate bodies already exist, so why worry?

J. F. Stanley, B.Sc., A.C.G.I.

London, *June 27th*, 1925.

[Mr. Nelson asks that all letters on this subject should be addressed to 66, Oxford Road, Manchester.—EDS., ELEC. REV.]

The Value of Super-Power Schemes.

The fourteenth annual report on the Toronto hydro-electric system, for the year ended December 31st, 1924, has just come to hand, and I quote the following figures therefrom:—

Kilowatt-hours sold: 485,708,476.

Net cost of energy purchased in bulk: 25 dollars per h.p.

The comparative figures for 1921 are as follows:—

Kilowatt-hours sold: 221,384,558.

Net cost of energy purchased in bulk: 18.54 dollars per h.p.

Despite an increase, therefore, of 120 per cent. in sales, there is an *increase* in the cost of bulk supply of 35 per cent. This, however, does not complete the story, and I quote the following paragraph in full from the report:—

"*Rates.*—At the date of issuing this report, it does not appear likely that the present rates will be entirely sufficient to meet operating and fixed charges and the cost of power during the year 1925, and it is possible your Commissioners will be under the necessity at the end of the year of making an appropriation from the system's reserve for the stabilisation of rates, which is fortunately ample. Your Commissioners believe it is better to meet the situation in this way, rather than to apply to the Hydro-Electric Power Commission of Ontario for authority to put into effect an increase in rates which would be severely felt by the customers of the system under existing industrial conditions. It is hoped that improvement in general business will before long enable your Commissioners to meet all charges with the existing scale of rates."

This demonstrates once again that there is an economical limit of expansion to any business or undertaking, and the following extract from the report of the Royal Commission on London Government further confirms this:—

"In 1911 a notable article in the *Journal* of the Royal Statistical Society on "Population and Costs in relation to City Management," was referred by the County Council to their comptroller and assistant statistical officer for their report. After some criticisms of the article, these officers reported as follows: 'The general conclusions of the writer of the article in question, however, appear to be borne out by the tables accompanying this return. It will be seen that the cost of administration per head of population shows an upward tendency as the size of the town increases, and dividing the towns given into two groups, it will be seen that the cost per head in towns of a population of 250,000, or over, considerably exceeds that in towns with a population under 250,000. . . ."

Will our super schemes prove an exception?

F. W. Purse,

Engineer and Manager, West Ham Electricity Dept.

Stratford, *June 24th*, 1925.

Technical Journals for Boys.

I have read with interest the letter on "Technical Journals for Boys," and the remarks by "Junior" on young engineers' clubs. I am teaching under the L.C.C., and am anxious to assist in developing young engineers or technical workers interested in anything connected with their work, apart from their daily "going to work," and to induce them to take advantage of the facilities for technical training offered in evening classes which a large number of day workers treat as a task instead of a valuable addition to their "daily grind."

I am willing to offer my services to "Junior" for one evening a week, either to assist in his scheme for a club or to lecture for one hour on an engineering subject without remuneration, and may perhaps induce some students to join. Or I would write a short practical article for the technical journal (free) for young engineers on engineering subjects periodically.

Arthur J. Rayner, A.M.I.Mech.E.,

Late Indian Educational Service, Bengal.

London, *June 19th*, 1925.

Charging for Light.

As so many lighting consumers do not understand the value of a "unit" or one kilowatt-hour, would it not do to say it is equal to two thousand candle-power-hours, and that is what they will obtain provided efficient "half-watt" lamps are used?

Gas is generally charged at so much per 1,000 cubic feet, but that conveys no idea to the ordinary consumer as to what lighting power it will give. It is the same with the electricity bill, so much per 1,000 watt-hours or per unit.

Make the unit equivalent to 2,000 candle-power-hours, and consumers will be more satisfied.

W. H. R.

June 25th, 1925.

[An objection to this system is that the candle-power-hours vary with the size of lamp. Only the largest gasfilled lamps approach the value stated; and over-statement is highly undesirable.—EDS., ELEC. REV.]

Lead-Covered Wiring and Visible Bonding.

As constant users of lead-covered cable we have watched, with some interest, the various shades of opinion expressed in your columns, on this form of wiring.

In reply to some of the critics who favour non-metal-covered systems, from experience we are for a metal-covered, properly bonded and earthed system every time. There is no doubt that metal is far superior to rubber, or similar material protective covering, if the bonding is done properly. The whole installation can be easily nullified by inefficient bonding, but with good-class fittings of reputable make, satisfactory bonding in the right hands becomes an easy and speedy matter.

Butler & Dickinson.

R. H. DICKINSON.

Birmingham, *June 24th*, 1925.

We have noticed in several recent issues that some of your readers seem to fight shy of this type of wiring on account of alleged troubles in bonding. We have used a well-known wiring system for many years in large quantities on the best class of work in Scotland, and could not wish for anything more simple, either in jointing or bonding.

W. C. Martin & Co.

Glasgow.

[This correspondence is now closed.—EDS. ELEC. REV.]

The Storage of Coal.

With a shadow of promised unrest either in the coal fields or the railways, engineers of power stations become wary these days and make provision by getting in ample stocks of coal.

This has to be stacked in varying heights from some 5 ft. high and where one has less room it has to be stacked perhaps 16 ft. high.

I wonder if any other engineer has discovered, as I did some years ago, that by taking a reading with a battery testing voltmeter across the vent pipes, which some engineers let down in the coal at intervals of about 12 ft., one can get a reading from 0.05 volt up to, say, 0.3 of a volt; and when its reading is high, it is time to look for combustion taking place in your coal heap.

H. W. Watts.

Cheltenham Electricity Works, *June 27th*, 1925.

Legal.

The N.S. Battery & Equipment Co., Ltd.

MR. JUSTICE RUSSELL, in the Chancery Court on June 26th, heard a motion, presented by Mr. Hecksher, for the appointment of a receiver of this company in a debenture holder's action on the ground of jeopardy.

Mr. HECKSHER said the ground of jeopardy was that the company had stopped business owing to entire lack of funds. The company was one that manufactured non-sulphating batteries. A number of ebonite containers was bought by the company at the end of last year which turned out to be faulty, and as it gave a guarantee with the battery the company was being pursued by customers to fulfil these guarantees. The water and electric light at the premises had been cut off, and the company had come to a stop. Summonses were pending and there were threats by creditors. The application was not for the appointment of a manager because there was apparently no business at the moment to manage.

Mr. MANSELL, for the company, consented to judgment.

His LORDSHIP made an order for a receiver of the company.

Comerton v. Multi-Way Earthing Clip Co., Ltd.

IN the Southwark County Court, on June 29th, Mr. E. Comerton, a commercial traveller and electrical engineer, sued the defendant company, of Old Kent Road, S.E., for the sum of £47, stated to be commission due on the sale of "Exide" batteries. Mr. WHITE, for the plaintiff, said that his client was engaged by the defendants to sell their earthing clips, on a salary of £3 per week and 5 per cent. commission on sales. In addition the plaintiff had sold a number of "Exide" batteries on which commission was also claimed. Subsequently his salary was increased to £4 per week, but the commission was stopped.

For the defence it was stated that the £1 increase was given as a temporary measure until the rate of commission on the sale of the batteries was fixed.

Judge Sir THOMAS GRAINGER held that there was an agreement for the plaintiff to receive commission. He would not, however, allow the cost of a season ticket to plaintiff. Judgment was given for plaintiff for £28 5s. and costs.

Electrical Trade of Kenya and Uganda.

THE following table, based on the recently-issued official trade returns, shows the value of the imports of electrical and allied material into Kenya and the Uganda Protectorate during the past year. The figures for 1923 have been given for purposes of comparison and notes of any increases or decreases added.

	1923. £	1924. £	Inc. or dec. £
Electric wire and cable, insulated.—			
Total	72,000	2,600	−69,400
From United Kingdom ...	71,500	2,500	−69,000
,, Germany	200	—	− 200
Electric wire and cable, not insulated.—			
From United Kingdom ...	400	6,000	+ 5,600
Electrical goods and apparatus not elsewhere specified.—			
Total	6,000	29,000	+23,000
From United Kingdom ...	4,000	28,000	+24,000
,, Germany	500	400	− 100
,, Sweden	700	—	− 700
,, United States	500	500	—
Telegraph and telephone instruments.—			
From United Kingdom ...	500	7,000	+ 6,500
Cranes, hoists, and lifting machinery.—			
Total (United Kingdom) ...	400	17,400	+17,000
Electrical machinery and parts.—			
Total	2,200	19,000	+16,800
From United Kingdom ...	1,900	17,500	+15,600
,, France	—	400	+ 400
,, United States	300	1,000	+ 700
Steam engines.—			
From United Kingdom ...	9,000	26,000	+17,000
,, United States	—	1,000	+ 1,000
Industrial machinery and parts.—			
Total	132,000	193,000	+61,000
From United Kingdom ...	125,000	175,000	+50,000
,, India	2,000	4,000	+ 2,000
,, Germany	2,500	6,000	+ 3,500
,, United States	1,700	4,000	+ 2,300
Pumps and pumping machinery.—			
Total	3,200	10,000	+ 6,800
From United Kingdom ...	2,800	9,000	+ 6,200
,, United States	400	700	+ 300
Machinery, not specified, other than agricultural.—			
Total	7,000	19,000	+12,000
From United Kingdom ...	6,000	17,000	+11,000
,, Germany	500	700	+ 200
,, United States	500	500	—

Reported New Elements.—An announcement made by Prof. Walter Nernst at the last meeting of the Prussian Academy of Science dealt with the reported discovery of two new elements by the physicist, Dr. Walter Nonnack, and Fräulein Eva Tacke, assisted by Dr. Otto Berg. The elements, which are said to have been detected by chemical analysis, and also by the Röntgen spectroscopic process, may be obtained from a number of mineral substances, of which the principal is platinum ore. Their atomic numbers are 43 and 75, and they have been named masurium and rhenium, after the East Prussian borderland and the Rhine.—*The Times.*

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

30,061. "Telegraphic apparatus for the automatic reception and retransmission of electric signals." Creed & Co., Ltd., and F. G. Creed. November 29th, 1923. (234,856.)

32,582. "Electric switches." Creed & Co., Ltd., E. A. Willson, R. D. Salmon, and S. E. Kirk. December 31st, 1923. (234,860.)

1924.

165. "Electric or other drives for lathes or other machines." V. A. Pinckney. January 3rd, 1924. (234,861.)

3,155. "Electric transmission for vehicles." Tilling-Stevens Motors, Ltd., H. K. Whitehorn, and N. E. Kearley. February 6th, 1924. (234,868.)

5,158. "Apparatus for television." G. J. Blake and H. J. Spooner. February 28th, 1924. (234,882.)

5,287. "Coil plugs and coil holders for use in radio instruments." G. F. Pickett and A. North. February 29th, 1924. (234,887.)

5,438. "Automatic electric direction-indicator for motor vehicles." T. W. Bennett. March 3rd, 1924. (234,892.)

5,460. "Electric telegraph retransmitter." F. E. Pernot. March 3rd, 1924. (234,894.)

5,474. "Microphones." H. J. Round. March 3rd, 1924. (234,895.)

5,542. "Device for enclosing a record of telephone addresses or other information and readily displaying said record when required." R. G. Thomas and B. Elliott. March 4th, 1924. (234,898).

5,820. "Method of constructing thermionic valves." P. V. Castell-Evans and J. M. Longe. March 6th, 1924. (234,906.)

6,109. "Thermionic valves." W. R. Bullimore. March 10th, 1924. (Cognate application, 21,263/24.) (234,916.)

6,332. "Storage batteries." F. J. Brown. March 12th, 1924. (234,921.)

6,355. "Control of the conditions of operation of electric motor-generator sets." English Electric Co., Ltd., and J. Birrer. March 12th, 1924. (234,924.)

6,459. "Electric junction boxes and the like." G. H. Scholes, F. J. Pearce, and G. H. Scholes & Co., Ltd. March 13th, 1924. (Cognate application, 14,796/24.) (234,925.)

6,720. "Electrical synchronising apparatus." A. B. Field, T. W. Ross, and Metropolitan-Vickers Electrical Co., Ltd. March 15th, 1924. (234,936.)

6,944. "Control of electric motors." E. A. Binney and Metropolitan-Vickers Electrical Co., Ltd. March 18th, 1924. (234,938.)

6,993. "Sound-reproducing apparatus." J. G. A. Kitchen. March 19th, 1924. (Patent of addition not granted.) (234,939.)

7,810. "Indicators for electric signalling systems and the like." R. Bullough. March 27th, 1924. (234,942.)

9,433. "Battery separator plate." W. B. Stone. April 14th, 1924. (234,954.)

10,662. "Apparatus for reception of wireless signals and the like." G. W. Hale and Radio Engineering Co., Ltd. April 30th, 1924. (234,965.)

10,667. "Anodes of vacuum electric-tube devices." E. Y. Robinson, E. J. E. Hubbard, and Metropolitan-Vickers Electrical Co., Ltd. April 30th, 1924. (234,966.)

11,727. "Electric lampholders and the like." J. Stone & Co., Ltd., and A. H. Midgley. May 12th, 1924. (234,974.)

11,772. "Electric wash boilers." B. Kay. May 13th, 1924. (234,975.)

11,802. "Electrical switches and switch fuses." Midland Electric Manufacturing Co., Ltd., and W. L. Barber. May 13th, 1924. (234,976.)

12,148. "Loud-speaking telephone receivers." J. W. Hobley. May 17th, 1924. (234,980.)

12,305. "Electric condensers." T. Hough. May 20th, 1924. (234,981.)

14,036. "Regulation of electric circuits." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). June 10th, 1924. (234,999.)

14,226. "Sparking plugs." L. S. Clarke. June 12th, 1924. (235,001.)

14,384. "Magneto-electric machines." M. L. Magneto Syndicate, Ltd., and E. A. Watson. June 13th, 1924. (235,004.)

16,949. "Telephone systems." Coventry Automatic Telephones, Ltd., and J. E. Collyer. July 15th, 1924. (235,027.)

19,380. "Rotor for electrical machines." W. Regelein, R. Sameith, and Thyssen & Co. Akt.-Ges. August 15th, 1924. (235,046.)

20,219. "Rheostats or variable resistances." Acme Production Co., Ltd., and W. D. Vick. August 27th, 1924. (235,051.)

20,265. "Inductance coils." Western Electric Co., Ltd. (Western Electric Co., Inc.). August 27th, 1924. (235,053.)

22,553. Telephone systems." Coventry Automatic Telephones, Ltd., and J. E. Collyer. September 24th, 1924. (235,064.)

23,751. "Device for measuring the apparent consumption in single and polyphase alternating-current circuits." Landis & Gyr Soc. Anon. November 9th, 1923. (224,512.)

24,255. "Incandescent cathode discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 17th, 1923. (223,564.)

24,279. "Electrical switch-boxes." H. E. Kammerer. October 13th, 1924. (235,070.)

24,357. "Flat electric cables for weak-current purposes and process of manufacture thereof." Siemens & Halske Akt.-Ges., K. Bohme, and H. Schmidt. October 14th, 1924. (235,072.)

24,800. "Switch arrangement for electric flat-irons." E. Berchtold. October 18th, 1924. (235,073.)

26,911. "Incandescent lamps and similar devices." British Thomson-Houston Co., Ltd. November 12th, 1923. (224,894.)

28,763. "Contact breakers for magnetos and like ignition apparatus." Fabrica Italiana Magneti Marelli. February 7th, 1924. (228,866.)

1925.

2,229. "Advertising and like signs." A. H. Brackensey and Franco-British Electrical Co., Ltd. January 24th, 1925. (235,105.)

5,556. "Wireless receiving apparatus." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 29th, 1924. (230,097.)

11,301. "Electro-deposition of metals." T. W. S. Hutchins. March 4th, 1924. (Addition to 197,066, divided application on 5,604/24.) (235,123.)

New Italian Magneto.—According to *Il Sole*, a meeting was held recently at the Royal Polytechnical Institute, Milan, at which the working of a new type of magneto invented by Signor Rinaldo Bassi was demonstrated. The magneto is said to be of simple and inexpensive construction and to work perfectly. A company is to be formed shortly to manufacture the new machine.—*Reuter's Trade Service* (Milan).

The

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Electrical Developments in Russia.

THOUGH the situation in Russia continues of such a character as to excite little practical interest on the part of British traders and manufacturers who desire to co-operate in the work of electrification, it is desirable that they should keep themselves informed regarding the course of events, through our periodical publication of Russian Notes.

It is reasonable to believe that a fair volume of work is in progress and that activity is not limited to the conferences, Commissions, and other official features of the Soviet organisation. From the reports that have reached us from time to time during the last few years there is plenty of evidence of the ambitions of certain minds for electrical developments to be proceeded with on a vast scale; great plans are mooted for electricity works, for production of machinery and equipment, for co-operation between electricity supply and industrial works; large sums are suggested for expenditure on new works during specified periods, and while one may find it difficult to arrive at any clear knowledge regarding the work that is actually being done and the prospect of its efficiency or success, there is no doubt that behind the screen, or the haze, electrical progress is being made.

One of the latest reports to reach us is to the effect that the Electrification Section of the State Planning Commission has arrived at decisions on a number of points affecting the further development of the production of electrical manufactures and the reduction of their cost. The difference between the prices of foreign manufactures and those of goods made in Russia is found to be largely due to the backwardness of Russia technically, and it is considered that the "rationalisation" of the native industry is necessary in order to reduce prime costs. Under the prevailing conditions of reconstruction and of extension of output, however, such a "rationalisation" scheme in complete form cannot be realised. Therefore, it is deemed essential in the first place to limit attention to the adoption of production in bulk of single types of manufactures. It is also considered necessary for the selling prices of foreign manufactures and those of the native works to be unified in order that those of Russian products should not exceed foreign prices by more than 10 to 15 per cent., including expenses, import duties, and freights, and the State Planning Commission has asked the Committee of Internal Trade, in conjunction with the Supreme Council of National Economy and the Foreign Trade Commissariat, to draw up a scheme to this end. It is thought that the amount of the import duties, with the addition of the 10 to 15 per cent. in question, should be allotted to a special fund for disposal on a

systematic basis. Thus, the fund would be devoted to covering the losses of the Soviet works owing to the reduction in prices, to the "rationalisation" of the production of manufactures the output of which in the first place must be improved, and to the granting of credit to the Russian works so as to permit them to deliver mass production for stock. Moreover, and in order to lower the costs of production, the Electrification Section considers it necessary for the industry to be exempted from the payment of import duties on raw and semi-finished materials required for manufacturing.

The upshot of the deliberations of the Section is the appointment of a committee consisting of representatives of the State Planning Commission, the General Electrical Commission, the two electrical machine trusts, and the Electrical Bank, to prepare concrete proposals along the foregoing lines.

The immediate necessities cannot wait, however, and while the Sectional Committee was settling down to its deliberations affecting the future, the Industrial Planning Committee was approving plans for the programme of production for the six months ending next September. This programme provides for the increase of the output of electrical manufactures to 35,775,000 pre-war roubles, as compared with 27,246,000 roubles in the first half of the current fiscal year. As to the financial position of the manufacturing industry, the Commission foresees a cash deficiency of about 20,000,000 roubles in the second half of the year, which deficit it is proposed to meet by obtaining credit from the bank, instalments on sales, and by the grant of a subsidy of 6,500,000 roubles by the State, for which application has been already made.

Further reports just to hand state that a conference to discuss matters concerning the electrification of Russia was held in Moscow in the third week in June under the presidency of L. D. Trotsky. Various reports were presented and considered. In the first place it was stated that a total of 126,000,000 roubles had already been expended on works in connection with the great scheme of electrification which was approved five years ago and was estimated to involve an outlay of 2,400,000,000 roubles. This work is being continued, and large sums must be provided in the Budget estimates for the next two years. During the discussion it was pointed out that the rate of general industrial regeneration last year had a great effect upon the matter of electrical construction. Last autumn a serious danger arose that the great regional stations would be unable to find consumers, but the situation had now radically changed. The existing stations were not only fully loaded, but those which were not yet completed were assured of a full utilisation, while the question of extending the Schatur station had been raised in connection with the development of the supply system in the region of Moscow. As to the question of where and how further stations should be built, Mr. A. Goreff suggested that it was necessary to proceed in the direction of establishing combinations of generating works with industrial works as had been effected in the case of the Nischni Novgorod generating station, which had been combined with nitrogen works and paper mills. Regarding the supply of the necessary materials for electrification, representatives of the manufacturing trusts raised objections to the placing of orders in other countries. While being an advocate of the protection of national industry, Mr. Trotsky stated that protectionism must not lead towards a self-blockade. The international distribution of work must be taken into consideration. Having regard to the fact that the Russian electrical industry was behind other industries in the republic, a portion of the orders must be given abroad. The question of the concentration of the import trade in the hands of the Electrical Bank or directly in those of the trusts, was also discussed. By means of such concentration it was reckoned that it would be possible to reduce the sale prices of manufactures for groups of customers as, for instance, for rural electrification works. In this connection representatives of large customers as, for example, the Moscow (Moges) supply combination, drew attention to the inefficient execution of orders by the electrical trusts and the difficult conditions of payment, expressing themselves in favour of an extended scope of imports, confining the trusts to the bulk production of manufactures in extensive demand. On their part the trusts urged the necessity for the installation of improved equipment and organisation at their works, which could be attained through the acquisition of technical assistance from foreign works.

From the foregoing it will be observed that while a large section is in favour of the production of equipment in Russia, it is realised that at present such an ideal is unattainable. Much of the material necessary to the execution of the vast schemes which are in contemplation must be obtained from external sources.

The Wireless Telegraphy Explanation Bill.

As we have already announced, the new Wireless Telegraphy Bill introduced in the House of Commons early in this session is not to be proceeded with in its present form. But a short Bill, somewhat quaintly entitled "The Wireless Telegraphy (Explanation) Bill, 1925," has been introduced instead. Its object is stated to be to remove doubts as to the meaning of the expressions "transmission" and "rent or royalty" contained in the Wireless Telegraphy Act, 1904. "Transmission," where used in Sub-section (7) of Section 1, and in Section 2 of the Act in relation to messages, is to include and is to be deemed always to have included the reception as well as the sending of messages. And the expression "rent or royalty," where used in Section 2 of the Act of 1904 in relation to licences, is not to include, and shall be deemed never to have included fees (whether periodical or of any other kind) charged in respect of the grant or renewal of licences.

As regards the first of these "explanations," it is to be regretted that the Bill has not extended it to "messages." Is an orchestral or other piece, for instance, a message within the meaning of the Wireless Telegraphy Act and the Telegraph Acts, as a part of the monopoly of the Postmaster-General? The proviso in the 1904 Act which has been relied on by possessors of unlicensed crystal receiving sets, excludes from the definition of wireless telegraphy contained in the Act of 1904 electrical apparatus made or used "for any purpose other than the transmission (and also, according to the Bill, 'reception') of messages." What is really meant by "messages"? Section 2 of the 1904 Act, in which "reception" is also to be read as included in "transmission," refers to telegrams, including wireless telegrams, "*as within the exclusive privilege of the Postmaster-General*," and therefore clearly means messages in the strict sense of the word, and not musical or dramatic performances. Thus this interpretative amendment serves to increase the doubt raised on the construction of Sub-section (7) of Section 1. It would seem, therefore, that even if the Bill, as introduced, is passed, unlicensed broadcast listeners may still be tempted to defy the Postmaster-General. Reliance by the latter on the fact that the items in the broadcast programmes are generally preceded by an announcement, which may be regarded as a "message" to the listeners, does not seem to be of sufficient substance to settle what, after all, is a doubt of tangible importance.

The agreement between the Postmaster-General and the British Broadcasting Co., Ltd., of January 18th, 1923, to which attention was drawn in these columns on May 18th, 1923, in a special article by Mr. W. H. Stoker, K.C., seeks partially to get over the difficulty by defining "telephone" and "broadcast matter"; but as pointed out in that article, this is merely part of the terms of a licence as between the Postmaster-General and the Broadcasting Co., and does not bind the public. Nor has it, of course, the same authority as a definition in an Act of Parliament. Altogether, it is very doubtful whether this new amending Bill will achieve what is no doubt intended by it, and get over the difficulty that the Postmaster-General's privilege or monopoly is concerned with "messages" and not with "concerts."

With regard to the "explanation" of the meaning of the expression "rent or royalty," as used in the Act of 1904, which it is now stated was never intended to have included fees in respect of the grant or renewal of experimenters' licences, it has been explained unofficially in the columns of *The Times* of June 30th, 1925, that the intention of the 1904 Act was to relieve experimenters from any payment in respect of the monopoly rights of the Postmaster-General, and that this was the meaning of the use of the words "rent or royalty," and that the fees charged for experimenters' licences were to cover charges attending administration and the investigation of applications for experimental licences. It is, to say the least, doubtful whether it was really contemplated or intended by Lord Stanley, when he stated in the House of Commons in 1904 that he desired to make it *as easy as possible* for people to conduct experiments, and therefore moved to add the words: "But shall not be subject to any rent or royalty," that the Postmaster-General's Department should introduce a tax on experimenters in the guise of fees, periodical or otherwise; and the public will look on the so-called "explanation" as amendment pure and simple, due to bureaucratic administration of what was intended as an encouragement of, and not a tax on, scientific investigation—an amendment, too, which leaves the Department free to charge exorbitant fees. Altogether this new "explanatory" Bill cuts rather a sorry figure.

The Railway Centenary Celebrations.

THE celebration at Darlington and Stockton last week of the centenary of railways was as full of historic significance as of personal sentiment, and the wonderful procession of rolling stock over that little stretch of line—only a dozen miles in length—which connects the two towns named was a singular display of the progress made in locomotive engineering in a hundred years.

The chief events were reserved for Thursday (July 2nd), when the historic procession was witnessed by a quarter of a million persons; for one hour there passed in quick succession a representative collection of engines, coaches, wagons, &c., such as had never been witnessed before. It was marvellously well staged, and a triumph of organisation.

In all the display there were few features that made special appeal to the electrical engineer. In the procession there was an electric locomotive built at the Darlington works of the North-Eastern Railway in 1914 to the design of Sir Vincent L. Raven for hauling freight trains over the Shildon-Newport electrified section; this engine is fitted with four motors transmitting power through spur-gearing to wheels which have a diameter of 4 ft. Later there came along an electric passenger engine, also designed by Sir Vincent Raven, and built at the same works; it was originally intended for use on the main line of the N.E.R. between Newcastle-on-Tyne and York, the electrification of which, however, has not yet been carried out. This engine is equipped with three motors with twin armatures transmitting power through spur-gearing and quill drive to wheels which have a diameter of 6 ft. 8 in. Mention may also be made of the electric cooking installation on the latest "Flying Scotsman." The suspended scheme for the electrification between Newcastle-on-Tyne and York was an ambitious one, which may develop sectionally. On the north side of the Tyne, between Newcastle and the coast, there is a very efficient electric service forming a circular route, which serves a large population, and this system, it is contended, might well be extended to the south side of the river. Apart from traction, however, immense use is made of electricity in lighting, signalling, &c., on railways.

The Johnson and Phillips Jubilee.

So few electrical firms that were in existence 50 years ago have survived the struggle for existence, which in the early years of this century became very strenuous, that such an occasion as the attainment by Messrs. Johnson & Phillips of their jubilee is indeed a notable event, with few precedents. We commented on its approach at some length in our issue of May 15th, and showed that the prosperity of the company was on a steep up-grade, whilst the chairman of directors (one of the original founders of the firm), Mr. W. Claude Johnson, looked forward to "still more astonishing progress in store for the electrical industry." We hope, and believe, that his confidence is well founded.

In the course of the luncheon, which is reported elsewhere in this issue, some stress was laid by the chairman, Mr. J. Macgregor, on the fact that the company, though older than most electrical firms, was young in spirit; he liked "old faces," but believed in affording young blood the opportunity to make good. Certainly in the shops there was plenty of evidence that the company's products were in every way up to date, and their popularity was demonstrated by the quantity of work that was passing through the various departments, as well as by the very satisfactory report that we recently recorded, which showed that a large and increasing proportion of the output was for export trade. Clearly, with the experience of mature age and the enthusiasm and enterprise of youth combined, "J. & P." is going to maintain its position in the front rank of electrical engineering in the future as in the past, and it has our heartiest congratulations and best wishes.

Electrical Accidents.

THE annual report of H.M. Senior Inspector of Factories and Workshops, an abstract of which is commenced elsewhere in this issue, is an instructive publication of considerable value. Considering the development of the electricity supply industry that took place during the period under review, it was to be expected that the number of accidents would increase, the figure being 20 per cent. The basis on which the accidents are reportable is not, however, quite the same as that of the previous year, for it is pointed out that there is now required a disablement of more than three days, as against more than one day only in 1923. This change tends to reduce the number of reportable accidents, but owing to the incidence of the Workmen's Compensation Act in 1924, the reporting of accidents is receiving more attention than in past years. No useful deduction can be drawn from the slightly greater proportion of fatal accidents, and the remarkable fact is that so many persons meet with severe accidents from shock every year at high and extra-high pressure and yet survive, although in some cases with permanent injuries.

Although most engineers regard the divisional inspectors' suggestions and recommendations seriously and co-operate heartily, instances are recorded of the management being unsympathetic, an attitude which is past understanding, for unsatisfactory plant and conditions not infrequently necessitate the enforcement of drastic alterations which are costly and occupy a considerable amount of valuable time. Too many engineers seem to install plant for the time being without giving thought to the future; as the system grows, they find themselves in difficulties through their failure to commence the sectionalisation of switchgear in the early stages, and expensive alterations become necessary which far exceed in cost the original saving. Another point that evidently needs emphasis is the number of public supply systems which are being changed from d.c. to a.c. When the consequent alterations are made to the consumers' installations, attention should not be confined to the power circuits; neglecting to overhaul the wiring and lighting fittings is a dangerous oversight, for after many years' use with d.c. in factory premises they may be quite unsuitable for conversion to alternating current.

It is gratifying to learn that the standard of industrial illumination is being raised, and that the quality of work in factory installations generally shows a distinct improvement. Nevertheless, contractors and works electricians come in for criticism, the northern area divisional inspector remarking that many firms would save considerably and secure more reliable work by employing a qualified consulting engineer.

D

Electricity in the Chilian Nitrate Works.

The Application of Modern Methods to a Highly Conservative Industry.

By "RETAC."

THE Chilian nitrate industry is one which is not very widely known amongst engineers, but the facts that it consumes annually very large quantities of engineering material, employs, indirectly or directly, somewhere about 200,000 people, and presents some very interesting problems indeed, should render a few notes as to the manufacture of Chilian nitrate of particular interest.

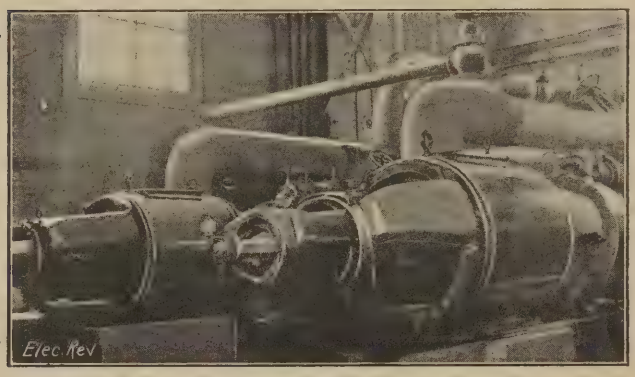


Fig. 1.—Two 300-kW Turbo-Alternators.

Chilian nitrate of soda is obtained from a crude saline material, called "Caliche," which is found in the northern deserts of Chile, between the 18 deg. S. and 26 deg. S. latitudes. The supplies of "caliche" in sight have been materially reduced by the methods of the early operators in the field, which have resulted in the "eyes" of the properties being literally picked out, numbers of them having to close down for lack of material of a sufficiently high percentage to justify their working. However, the advent of electricity has materially assisted in bringing about such large reductions in working costs that operations are being resumed, and material of a much lower percentage is now being treated at a profit. To-day, the power plant and electrical equipment of a modern nitrate oficina, *i.e.*, nitrate factory, are as up-to-date as those of any industrial concern in England, and the visitor to the Pampa may see any number of well-equipped central stations containing a.c. machinery and switchgear, and employing h.p. transmission to pumping stations, which may be anywhere up to 15 miles from the oficina.

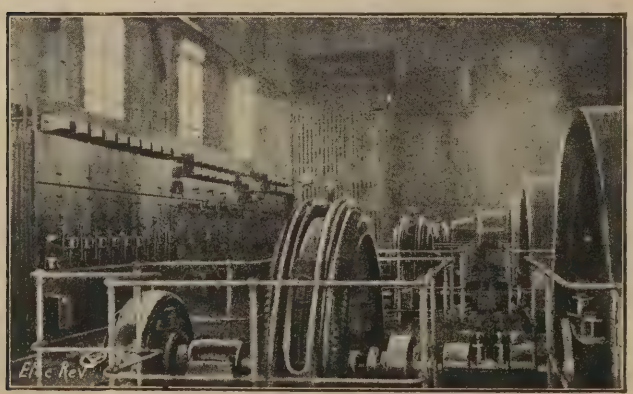


Fig. 2.—General View of Oficina Power House.

Briefly, the "Shanks" process for the extraction of nitrate of soda from "caliche," which is the system used in the majority of oficinas, consists in the deposition of nitrate crystals from a solution of the raw material. The "caliche" is placed in water in tanks and boiled up with the water to form a "caldo," or nitrate-bearing solution. This "caldo," on leaving the boiling tanks, goes, after clarifying, to open tanks or "bateas," where it is allowed to cool off, and in the process deposits nitrate crystals. The "caldo," or, as it is now called, "agua vieja," after cooling to the proper temperature, is run off from the "batea" to return *via* a settling tank to the boiling tanks to repeat the cycle, and the deposit of nitrate crystals left is dug out of the "batea" by hand, and later deposited on the drying floors to await sacking and dispatch to port. There are, of course, numerous elaborations of this treatment, and some special processes which need not be described here, as our purpose is merely to give an idea of the part played by electricity in the production of commercial nitrate of soda.

Electricity is in use right from the commencement of the operation of extracting the material from the ground to the disposal of the refuse or "ripio." Motor-driven air compressors furnish the air necessary for modern rock drilling equipment, the use of which is rapidly spreading, and is materially reducing the cost per ton of raw material extracted. We next find it in use for locomotives, which haul ore trains over considerable distances to the treatment plant, where electrically-driven crushers and conveying equipment place the material in distributing bins over or adjacent to the boiling tanks. A process such as the "Shanks" must necessarily employ a large number of pumps to deal with the liquids, and these, which may be of the centrifugal or ram type, are invariably driven by electric motor, more often than not direct coupled.

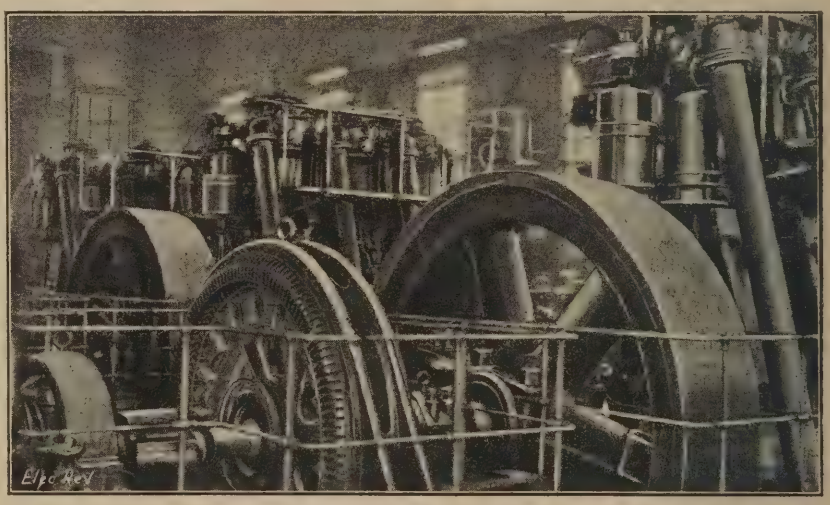


Fig. 3.—Three 180-kW Diesel Sets.

In some plants, special requirements may call for multi-speed equipments for various processes, and also the use of hydraulic power at pressures of up to 250 lb. per square inch. For the former condition a special 2-motor 3-speed push-button-controlled gear has been developed, having a small 1-speed motor for the lowest gear ratio, and a double-wound 2-speed motor for the higher speeds. The whole equipment is controlled from the operating platform by push buttons, and is so interlocked that the sequence of speeds must follow a predetermined order. This gear, however, is now being superseded by a variable speed device, giving, with a constant motor speed, any variation from zero to maximum; this enables the operator to work at the most efficient speed for the material being treated. Hydraulic

power is supplied, both by ordinary duplex pumps and by synchronous motor-driven, multi-stage turbine pumps, the motors being of the self-synchronising type. Electric winches are in use, both for the haulage of raw material to the boiling tanks, and for refuse disposal, and range from the converted steam winch to the modern specially designed gear now to be found in an up-to-date oficina. One of the chief necessities of the "Shanks" process is a supply of low-pressure steam for the boiling tank heating coils, and in bygone years this steam was generated by Lancashire boilers at from 30 to 40 lb. gauge pressure, according to requirements.

Modern practice, however, is to install water-tube boilers operating at 250 to 300 lb. pressure, and up to 250 deg. F. superheat, to supply steam to turbo-alternators, which exhaust into the boiling tank heater circuit at 30 to 40 lb. pressure. In order to obtain the best operating conditions for the turbo-alternators, it is necessary to run them as fully loaded as possible, but the condition may arise that the steam demand in the boiling tank heater circuit is lower than the full-load steam consumption of the turbine. To meet this condition, it is usual to install Diesel engine-driven alternators, which are run in parallel with the turbines, but so adjusted as to allow the turbines to take their most economical load. The heating circuit is a closed one, returning the condensed steam from the boiling tank coils to the boiler feed, but, as the natural well water is unsuitable, a large quantity of this water is withdrawn from the system daily for use in steam locomotives, boilers, and for animals and domestic purposes, and it is therefore necessary to evaporate an equivalent quantity of raw water to make up this loss. This may be done with evaporators, or, as is more usual, a battery of Lancashire boilers is used, which also serves to meet demands for steam above the capacity of the turbine plant which may be on load.

A plant, which is now in the design stage, will provide the necessary water for locomotives and domestic use by means of a condensing turbine of a suitable size drawing steam from the low-pressure steam main. A typical plant of this type consists of three 2,310 square feet heating surface oil-fired Babcock & Wilcox water-tube boilers operating at 210 lb. working pressure, and fitted with superheaters capable of heating to 100 deg. F., which supply steam to two 300-kW turbo-alternators, fig. 1, exhausting at 40 lb. gauge. The Diesel equipment consists of three 180-kW, 3-cylinder, direct-coupled sets, fig. 2. Both turbine and Diesel sets generate power at 460 volts, 60 cycles, 3-phase. Transmission of energy to the well, which is about 10 miles from the oficina, is effected at 6,600 V, the pressure being stepped up at the power house and down again at the well sub-station. In order to provide for emergencies, amongst which, of course, is fire, the well pumping station is equipped, in addition to regular 3-throw pumps, with two multi-stage, motor-driven turbine pumps which may be connected in series, and double the ordinary quantity of water may be pumped, if it is necessary. Low-pressure steam is supplied by a battery of Lancashire boilers, the low- and high-pressure steam mains being connected through a reducing valve to effect stabilisation under all conditions of load, both electrical and steam. The above plant is generating a little over 3,000,000 kWh per annum, at a cost of 0.65d. per kWh.

In some districts, advantage has been taken of water power, and small hydro-electric stations are in operation, transmitting at pressures up to 20,000 V several miles to the nitrate oficinas, and in some cases pumping tail water as well. Altogether, electricity has, without doubt, brought about a cheapening of working costs which has fairly established it as an efficient and economical means of power application, in one of the most conservative industries of the world.

A general view of a typical nitrate oficina power house is shown in fig. 3. The Diesel-driven machines are in the foreground, with the turbo-generators in the rear, and the switchboard is shown on the left.

Electro-Magnetic Sound Recording Machines.

A Wire Recorder Applicable to Radio Broadcasting.

By H. BISHOP, B.Sc., A.C.G.I.

CONSIDERABLE public interest has been created recently in the subject of electro-magnetic recording machines, which may enable a broadcasting company to give programmes of speech or music previously recorded—a development which, when it is perfected, will increase the already great interest in broadcasting.

The Telegraphone Company, of the U.S.A., and the Vox Company, of Berlin, have recently produced electro-magnetic recording machines, and their success has already indicated many uses to which they could be put.

In this article it is proposed to consider, first, the application of the Vox machine for ordinary office dictating purposes, indicating in detail the general and technical conditions involved These being understood, the wider application of the machine to broadcasting problems will follow.

The ideal dictating machine should make the dictator independent of the presence of a stenographer. It should be possible to dictate at any time, and for the work to be copied at any subsequent moment; ideally, it should be no more inconvenient or difficult to dictate to a machine than to a stenographer direct. For this reason it must be possible at any time to interrupt the dictation and to obtain the repetition of any desired part; finally (and this is important) it must be possible for any desired words or sentences to be erased, and corrections made in the appropriate places.

The invention of the phonograph offered a means whereby the spoken word could be recorded and transcribed at a later date, and, in fact, the first dictating machine placed on the market worked on the well-known Edison principle, whereby the sound vibrations of the voice are mechanically recorded on a revolving cylinder or disk of wax, the finished cylinder or disk being re-run to reproduce the speech.

It will be readily appreciated that considerable, nay, almost insuperable, difficulties lie in the way of making such a machine fulfil all the conditions set out above for an ideal machine; the last consideration especially calls for a different type of machine. The Vox Company, of Berlin, has evolved a machine which does fulfil all the conditions, but it works on an electro-magnetic principle, and it can be used equally well for dictating or for recording matter to be subsequently broadcast.

At the beginning of this century the Danish physicist, Valdemar Poulsen, conducted a series of experiments whereby he was able successfully to record speech or musical sounds on a steel wire by causing it to move past the poles of an electro-magnet, the latter being energised by a battery current, the fluctuations of which were controlled by a carbon microphone in the circuit. The fluctuations of the current, and hence the magnetism of the moving steel wire, were, of course, an electrical reproduction of the mechanical vibrations of the voice.

To reproduce the voice or music the microphone and battery in the circuit were replaced by a telephone receiver and the wire was made to move past the magnet poles a second time. The varying magnetisation of the wire passing the pole piece induced across the magnet winding varying e.m.f.'s, which (assuming the linear speed of the wire to be the same as before) produced in the telephone receiver notes of the same pitch as were previously recorded. Poulsen also found that by making the wire sufficiently hard the magnetisation given to it was retained, and therefore that reproduction could be obtained after a considerable period of time had elapsed.* The "quality" or "trueness" of the reproduction will depend chiefly on three things: (1) The uniform hardness or permeability of the steel wire throughout its length; (2) the uniformity of its cross-section; and (3) the constancy of the speed at which it is moved past the magnet, both in recording and reproduction. A variation of any one of the above factors will produce distortion, while serious variations in all three simultaneously may well cause the reproduction to be unrecognisable. Especial importance must attach to these considerations in broadcast reproduction, where a very much higher standard of "quality" is necessary than for ordinary dictating work. Poulsen's invention was put to no practical use at the time, and it can only be surmised that the practical difficulties in the way of satisfying the three conditions given above were

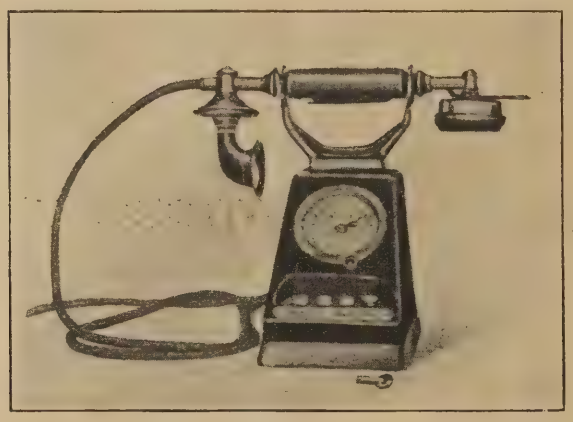


Fig. 1.—The "Speech Unit."

too great. These difficulties have now been overcome, and a machine embodying Poulsen's principle has been perfected by Dr. Stille, of the Vox Company.

As mentioned above, in an ideal dictating machine it must be possible to erase any portion of the recorded matter and substitute a correction. How can this be accomplished? If the wire on which the speech has been recorded is run past the poles of an electro-magnet, energised by d.c., before it passes the poles of that to which the telephone receiver is connected, then nothing will be heard, as the original magnetisation given to the wire will have been wiped out, and a fresh "impression" can be made by speaking into the microphone again. It will also follow that the wire can be used an infinite number of times, for, as soon as any dictation has been copied and is no longer required, the original magnetism can be wiped out by running the whole wire past the d.c. magnet. We need no new records!

The dictating machine itself is in two separate parts, which may be called the "speech unit" and the "copying unit." The first will generally be situated in the dictator's room, while the second will be in that of the typist; the two must be connected by the necessary length of multi-cored cable, which can be quite small, as no large currents are to be carried by it. The "speech unit" is essentially a remote control device for the "copying unit," containing the moving wire, the motor to drive it, and the magnet systems, &c. It consists of an ordinary desk telephone set, fig. 1, with a handset comprising a microphone and telephone earpiece mounted on the top. In front is an indicator with two pointers which revolve like the hands of a clock, showing whether the steel recording wire is moving, and its exact position. At the base there are four buttons: The first three, controlling the motor, are labelled "Forward," "Stop," and "Backward"; while the fourth, labelled "Call," is an alarm to draw the attention of the typist who may actually be copying at the moment when it is desired to give further dictation. There is, further, a "Press to speak" switch on the handset which connects the microphone in series with a battery to the recording magnet, and at the same time switches a battery on to the erasing magnet which the moving wire passes before it reaches the former. Thus, previously recorded dictation is automatically erased before a further record is made. The releasing of this switch also connects

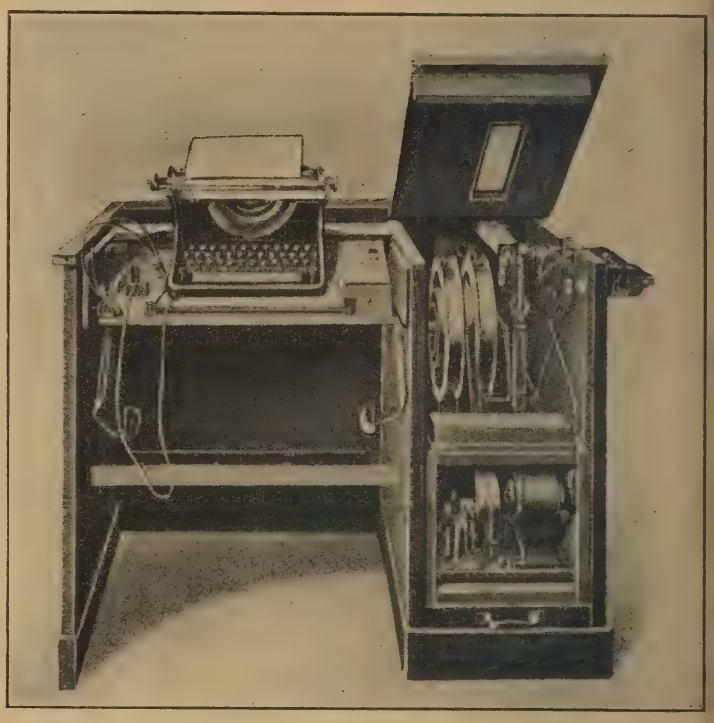


Fig. 2.—The "Vox" Dictating Machine, or "Copying Unit."

directly to the recording magnet winding the telephone earpiece of the handset, instead of the microphone and battery. It follows, therefore, that the "Press to speak" switch must not be closed if the moving wire is being run through with the object of listening to a previously dictated letter.

The "copying unit," the construction of which can be seen from fig. 2, consists of a desk with room for a typewriter and position for the stenographer on the left, the "recorder" itself being built in on the right. This is composed of two large pulleys which, together, hold the moving wire—some six miles of hard steel wire 0.25 mm. in diameter—and are driven by an electric motor. The wire runs from one pulley between the poles of the erasing and recording magnets round a small pulley at the back and then on to the second large pulley. As the wire has to be run back before it is possible to listen to a dictation, switching is incorporated for cutting in and out a resistance so that the wire runs backwards much faster than forwards, and thus time is saved.

In addition, the desk contains various relays for remotely controlling the motor, the drive to the pulleys with its gearing, and also small dry batteries and accumulators for the microphone, alarm bell, and relays. There is, further, an indicator which shows the position of the wire and runs synchronously with that on the "speech unit." To the immediate right of the typewriter is a small switch box, which provides for the local control of the machine, and is similar to that provided on the "speech unit." When the machine is in use, and the dictator presses the "Call" button, a signal will be heard by the typist, who can stop and.

* Full descriptions of the Poulsen "Telegraphone" were published in the ELECTRICAL REVIEW of April 27th and October 12th 1900, and May 10th, 1901.—EDS.

by operating a switch, bring the remote control into action for fresh dictation. There is one extra button on this control unit, labelled "Repeat," which is used as follows: Foot controls for "Stop" and "Start" are provided in parallel with the respective push buttons so that the typist's hands are free, and, when copying, a few words would be listened to, the machine stopped and those words typed; the machine would then be started again and more listened to, and so on. Moreover, if the "Repeat" button is pressed, each time the machine is started the last word of the previous group will be repeated, thus rendering it impossible to miss a word. The telephone receivers provided are worn on a headband as are ordinary headphones for "wireless" reception.

Briefly, the method of using this machine for dictation is as follows: The dictator takes up his hand-set and presses the "Call" button. If the stenographer is copying at the time, the call will be heard in the headphones, copying will be suspended, and the wire run through to a position where it can be used, the signal to start being given with the "Call" button. The dictator then presses his "Forward" button, and will see by the small hand of his indicator that the machine is running, and by the large one (which runs more slowly) where his dictation will start on the wire; later, of course, it will indicate the finish. The stenographer can also note the start and finish by the indicator on the "copying unit," and thus will know where the wire must be started to copy each piece of dictation.

The dictator next presses the "Press to speak" switch on his hand-set and speaks his dictation into the microphone. If he wishes to pause it is only necessary to press the "Stop" button, when the motor will stop; to start again the "Forward" button is pressed, and the dictator can proceed. If a repeat is desired, the "Press to speak" switch must be released and the "Backward" button pressed, when the wire will run back quickly until it is stopped by pressing the "Forward" button at the desired point, shown by the indicator pointers, when the wire will move forward again and repeat the already dictated portion. If a mistake is discovered, it is only necessary to run the wire back past the point and set it going forward again; then, at the appropriate moment, to press the "Press to speak" switch and speak the correction into the microphone. At this instant the errors will be erased and the correction recorded on the wire.

Here it may be mentioned that the six miles of wire provided takes about an hour to run through, so that dictation of considerable length can be undertaken. The dictation is concluded by pressing the "Stop" button, and placing the hand-set on the rest.

At the "copying unit" end the indicator will show how dictation is proceeding. The stenographer, wearing the head telephones, operates the machine for copying as follows: The switch is put over to "copying unit" and the wire run back (by pressing the "Backward" button) until the desired place is reached, further control of the machine being by the two foot pedals—that on the right starting the wire and that on the left stopping it. When the copying is completed the stenographer has only to run the wire back to prepare the machine for further use.

There are no "records" to change, the same steel wire being always available. Power for the motor is obtainable from the mains, while the dry batteries, &c., will last several months. The upkeep costs are therefore negligible, and it will be apparent that by a simple exchange system one copying unit could be installed in the stenographer's office, while a "speech unit" might be provided in each of several offices, thus permitting the use of the machine by several members of the staff—in each case from their own offices. Such facilities are not provided by the standard model.

Having dealt in detail with the dictating machine *per se*, we may now turn to its application to the purposes of broadcasting. It will be realised that its uses are manifold: First, an actual broadcast programme can be recorded and reproduced at a later date. This may be either a concert or some event of national importance, such as the opening ceremony at Wembley. This could be done either by the broadcasting authority, in which case the performance could be broadcast again, or by the listener, in which case he only could repeat it through his own loud speaker or headphones.

Secondly, it will enable a programme given in one place to be recorded and re-transmitted from another place, the wire containing the record being dispatched like a kinematograph film. In this way programmes could be exchanged internationally, and British listeners could be given an American programme without the almost invariable accompaniment of fading and atmospherics to which "wireless" relaying is subject! Thirdly, the recording machine provides a simple method of confidential transmission, which may be accomplished by recording the message on the steel wire. Transmission is then effected by reversing the travel of the wire, the message thus being rendered wholly unintelligible, until, at the receiving end, the message is recorded on a similar machine and the necessary reversal carried out.

The recorder already described requires several modifications to adapt it to broadcasting purposes. The remote control unit can be dispensed with and the so-called "copying unit" installed in the control room of the broadcasting station. The ordinary carbon microphone would be replaced by the studio microphone equipment for recording local programmes, or by a "wireless" receiver, or telephone line for recording those of a distant station. The steel wire must be capable of removal from the machine, and as it has to be carefully handled if it is to preserve the record, it should be removable without detachment from its spools. For re-broadcasting a previously recorded programme the recording magnet winding would be connected through amplifiers to the "wireless" transmitter, which would replace the headphones.

The Vox Company has also produced a smaller machine, which, while it can be used as a dictating machine, has provision for application to broadcasting purposes as outlined above. A smaller amount of wire is provided, and the two spools are mounted so that they can be removed instantly with their bearings, &c.—in fact, the operation of changing wires is as simple as that of changing a gramophone record. Further, as soon as the spools are removed from the machine with their carrier they are automatically locked, so that it is impossible for the wire to unwind and get kinked.

The writer recently had the experience of hearing a demonstration of these machines for purposes of both dictating and broadcasting. The reproduction of speech was excellent, but that of music left something to be desired. The latter, of course, requires a much higher standard of perfection, but further experimental work, which is still in progress, will doubtless result in this standard being attained. It is hoped that the time is not far distant when British listeners may have the opportunity of testing the success of reproduction by these electro-magnetic machines.

The author desires to express his thanks to the Vox Company, of Berlin, for its courtesy in allowing the publication of the accompanying illustrations and for supplying information regarding the machines.

City of Winnipeg's New Steam-driven Plant.—Tests on the plant of the new steam-driven electricity generating station at Winnipeg, which serves as a stand-by to the city of Winnipeg hydro-electric system, were recently carried out under the supervision of Professor N. M. Hall, of the Manitoba University. This new up-to-date station has three boilers fired with pulverised coal installed by Combustion Engineering, Limited, and two electrically-heated boilers installed by the Canadian General Electric Co., Ltd. The engine-room contains two 5,000-kW turbines, and one of 1,000 kW, all running at a speed of 3,600 r.p.m., manufactured by James Howden & Co., Glasgow. These turbines are coupled to Parsons alternators, and are supplied with steam at 220 lb. and 150 deg. F. superheat. The larger turbines exhaust into Hick, Hargreaves condensers, and the 1,000-kW set is a back pressure unit and exhausts into the hotwell. Each day all three turbines are run up to speed to ensure that everything is in order, and once each week they are put on the line. The boilers supply the central steam heating system of the city, and sufficient steam is always available to meet a sudden call for the stand-by plant.

The International E.H.P. Conference.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

(*Concluded from p. 7.*)

In the second part of Group (I) of the papers read at this Conference the following were the more interesting features:—

Insulating Oils.—An excellent review of the research work carried out in Great Britain was given by Mr. A. R. Everest. Incidentally he mentioned that rheostat oil required a very high flash point, and further that oil for electrolytic arresters must be free from any tendency to emulsify with the electrolyte. The discussions on the subject generally were rather disappointing, as they tended to hark back to old ground rather than to venture into new pastures. However, it is work that the I.E.C. has well in hand.

Outdoor Sub-stations.—France has now no fewer than 89 open-air equipments on a fairly large scale. Mr. Planteau gave an excellent *résumé* of progress made during the last two years, illustrated with the ingenious coloured stereoscopic views to which reference has already been made. Some very interesting modern bus-bar arrangements were described.

Test Pressures.—This is again a somewhat hackneyed subject, which nevertheless always arouses considerable discussion. Still no progress was made. It was decided to transmit a report of the discussion to the I.E.C.

Ironclad Switchgear.—Two most interesting papers were read by Messrs. R. W. Gregory and H. W. Clothier (the latter illustrated with a kinematograph film). Both contained matter that was novel to most Continental engineers, and were admirable expositions of modern practice. Further, both papers were well illustrated.

Group (II) of the papers presented dealt with the following matters, under the general heading of the construction and insulation of transmission lines: line construction generally; posts; insulators; cables and conductors; and the prevention of damage to electrical installations by earthquake. This last item was of a most novel and interesting nature, for detailed particulars were given in a paper of 118 pages of the damage caused to Japanese installations by the recent terrible convulsions. Though one and a half million electric lamps were destroyed, 900 electric tramcars burned by fire, and several tens of thousands of kilowatts of plant put out of commission, in five months the demand for electricity had recovered to that of pre-earthquake days. As the result of a careful analysis of the damage done, new rules have been drawn up, which it is hoped will greatly mitigate any adverse results of future earthquakes to electrical installations.

In this particular group it was disappointing that Great Britain did not present any papers that supported an industry in which she is far ahead of other nations, *viz.*, cable manufacture. The stock arguments that there is nothing very new in cable design, and that everyone knows that England makes the best cables, are not good enough. Foreign engineers are becoming very interested in the subject, but fear to use cables as much as they might, owing to lack of experience in laying and maintaining them, &c. Their views on the earthing of the neutral, protective apparatus, and the like, as disclosed by the discussions, are much behind British practice. It is to be hoped that this important section of British industry will be well represented on another occasion.

Overhead Lines.—Very often approximate data are required for a preliminary idea as to the type of overhead line that should be employed. Some very useful notes in this connection were given in a paper by Mr. E. V. Pannell. The Italian delegation, through Mr. L. Maggi, presented a very useful report upon the practice of that country in overhead e.h.p. line construction, including wide river crossings. Though there is insufficient space to deal here with the general subject as discussed at the Conference, it may be well to draw attention to the very great progress that is being made. It is far greater than many British engineers—unaccustomed to this class of work—are apt to think.

Poles.—Of particular interest were the papers on concrete pole construction. According to Mr. P. Ferrier, concrete poles are economical for lengths less than 60 feet or over 80 feet (steel towers being cheaper for lengths of from 60 to 80 ft.). The centrifugal process of constructing ferro-concrete poles was described by Mr. C. Montagni. This process is carried out in revolving moulds, which cause a previously prepared conical reinforcement to be covered with a homogeneous layer of concrete, both externally and internally. In this way the reinforcement is properly centred.

Insulators.—Mr. A. O. Austin drew attention to the fact that there are now two main schools of thought as regards dealing with electrical flashes-over on overhead lines. The one believes that it is impossible to prevent them, and therefore that attention should be concentrated on controlling the path of the power arc to the ground. The other school considers that electrical flashes-over can be prevented by raising the flash-over voltage of the system. This seems reasonable, as losses increase very rapidly with voltage, so that a slight rise in the flash-over voltage of the system may cause surges to be dissipated without reaching a voltage sufficient to strike an arc to ground. For some years past the insulator has been considered to be the chief source of trouble on a transmission line. To-day it appears as if the conductor is likely to cause more trouble than the insulators. The method of employing insulated controls at the conductor end of link suspensions was described in this paper. These controls merely consist of a bowed arm, the external ends of which embrace, but do not touch, the last insulator of the suspended chain. This method has given excellent results on the lines of the Consumers' Power Co., Jackson, Michigan; the Illinois Power Co.; and the Penn Public Service Corporation.

Cables.—Mr. L. Emanueli described the 130,000-volt three-phase cable recently laid in Italy. It is laid as three single cables, each 600 metres long (with two joints in each length). The cables are hollow, and insulating oil is placed in the interior, expansion chambers being provided at the ends. This development is looked upon as of importance, as it will enable e.h.p. lines to be carried by cable through congested areas.

Group (III) of the papers—the development of the transmission system—covered the effect of earthing the neutral of transmission systems on telephone and telegraph lines; telephonic communication between power stations; surcharges, surges, atmospheric and other transitory phenomena in connection with high-pressure lines; measurement of energy and losses; power factor; standardisation of pressures; regulations for high-pressure lines; accidents and breakdowns; rural distribution and electro-farming.

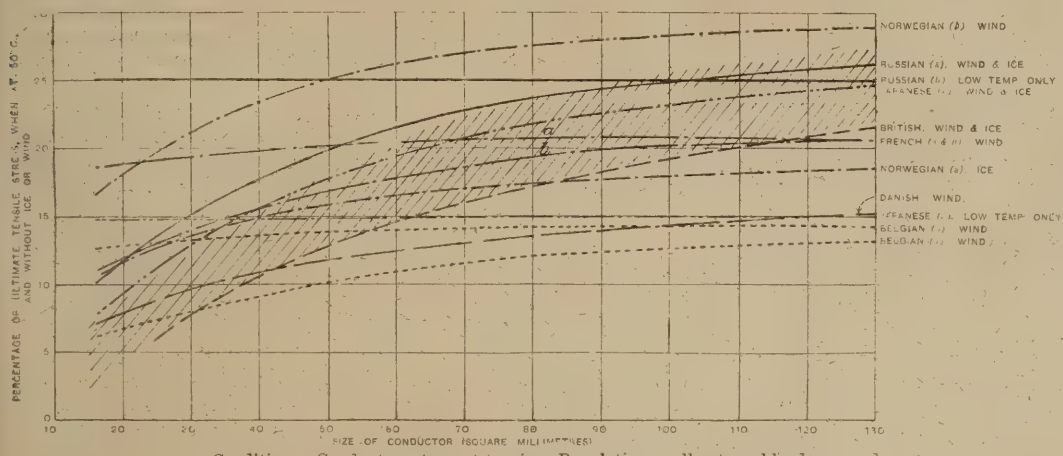
Télécommunication is the joint French word that refers to both telephony and telegraphy. It is a word that is missing, though needed, in the English language. The general tenor of the discussion was that all difficulties that had arisen so far could be overcome. The chief difficulty was the cost. It appeared that the Governments of most countries were co-operating with, rather than laying down regulations for, the providers of electricity to ascertain the most economical solutions.

The klydonograph was the name of a newly developed instrument, described by Mr. Peters, and employed for measuring abnormal voltages of a transitory nature on transmission systems. It consists of a clockwork-operated photographic film (so as to obtain records over a week) in contact with which are discharge points.

On development of the film, figures appear that give pertinent information concerning the nature of the voltage impressed. This device has already proved its merits in operation.*

Statistics on Accidents.—A very detailed report was presented by the I.M.E.A., in reply to a request circulated by the Council of the Conference, asking for information on this point. Apparently the majority of short-circuits are due to vermin and workmen's picks. Similar reports were also presented by the Dutch and the Swiss. While these escape the troubles due to workmen's picks, in their stead they have to contend with the troubles of thunderstorms.

Regulations for Overhead Lines.—Five countries reported upon this subject. A most interesting summary of the practice in many countries was given by Mr. G. V. Twiss. This paper was accompanied by a diagram, which is reproduced herewith. A similar paper was presented to the I.E.C. conference at The Hague (see ELECTRICAL REVIEW, p. 727, May, 1925).



Conditions: Conductors strung to various Regulations; all external load removed, and temperature raised to 50° C; span, 150 metres.

Curves showing Stress remaining in Stranded Copper Conductors.

From this chart it will be observed that the graphs tend to fall into two groups, (*a*) rectilinear, and (*b*) hyperbolic. Of these the British I.E.C. Committee appears to consider that the hyperbolic curve is the one that most closely represents the conditions required to meet practical working needs. The reason for this is that this curve takes into account the observed tendency of smaller lines to fail when erected to the equivalent loadings of the larger ones, whilst at the same time it also eliminates excessive precaution in the case of the larger sizes of conductors. A shaded band or zone is indicated on the figure. The idea of this is to represent arbitrarily by the lower boundary of the zone the loadings sufficient to safeguard lines under severe climatic conditions; on the other hand, the loadings indicated by the upper boundary correspond to the conditions occurring in countries with equable climates. The formula calculated for these loadings is:—

$$A = M\,(2.25 \times .052\,D^{1.35})$$

where A = added load in kg./m length,
D = overall diameter of conductor in mm.,
and M = a constant dependent upon the climatic conditions.

Electro-Farming.—Two papers were presented on this subject, one, by M. Fukuda, describing the progress that was being made in Japan in this direction. Some very interesting comparative figures were given as to the relative costs of the use of electricity, steam, and oil engines on the farm. Considerable attention is given to irrigation in Japan. Novel uses of irrigation water are for destroying (*a*) obnoxious insects, (*b*) destructive worms, and (*c*) weeds. The other paper, by the present writer, dealt with the lay-out problem for rural e.h.p. lines. Attention was particularly drawn to the fact that rural line calculations should always be based upon miles or kilometres of route, instead of upon the area of supply—as is usually done by those antagonistic to the idea. It was pointed out that there was now ample evidence that when rural areas, with at least one-third of the land under the plough, were handled properly they were remunerative. This paper was illustrated with a kinematograph film to demonstrate the possibilities of using electricity on the farm. To illustrate one method of educating farmers, a propaganda magazine, now issued in England, was distributed.

In Conclusion.—The next Conference is to be held in 1927, at Paris. A full report of the proceedings will be published in French in the autumn. It will be published in English if only 1,000 copies are ordered.

A resolution was passed at the final proceedings asking each country to form a special committee—as was done in Great Britain last year—to make the necessary preparations for representing each nation's work in an adequate manner.

Dr. C. O. Mailloux (U.S.A.) was charged with the preparation of a report upon the economy of the use of various fuels by various nations, ready for the next Conference. Mr. Norberg Schulz (Norway) is to form a committee for establishing in every country a uniform basis for statistics concerning the production, transmission, and distribution of electrical energy and the economics thereof. Questions relating to insulating oils and test pressures were referred to the I.E.C. Insulators are also to receive special attention at the next Conference.

The proceedings terminated with a special vote of thanks to the President of France (M. Doumergue) for the very kind way in which he had shown his interest in the distribution of electricity.

*For a description of the instrument see ELECTRICAL REVIEW, May 9th, 1924, p. 770.

The First International Congress of Radiology.

AN International Congress of Radiology was held at the Central Hall, Westminster, from June 30th to July 4th. It was organised by the three radiological societies of Great Britain, namely, the Roentgen Society, the Electro-Therapeutic Section of the Royal Society of Medicine, and the British Institute of Radiology. The President of the Congress was Mr. C. Thurstan Holland, and it was decided to constitute it the first of a series of triennial Congresses.

The official opening by the Duke of Connaught took place in the afternoon of Wednesday, July 1st, but actually the various sections of the Congress had started work in the morning. There were some 500 delegates from all over the world, and in connection with the Congress, an exhibition of radiological apparatus was held.

The DUKE OF CONNAUGHT, before declaring the Congress open, recalled that it was just over 30 years since Roentgen discovered X-rays, and said it was an eloquent tribute to his discovery that in the year 1925 such a large body of scientists and medical men should meet to discuss the many directions in which the science of radiology had developed. In addition to the value of X-rays in fighting disease, their use for the detection of faults in steel was an established procedure, whilst X-rays were also used for the detection of faults in wood used for the construction of aeroplanes, for determining the structure of coal, &c. One of the most recent developments was the step taken by the British Red Cross Society in the use of mobile X-ray units which could be taken to villages and out-of-the-way places for the treatment of persons who would otherwise not be able to obtain it, and such was the perfection which had been reached, that these portable X-ray units were as good as many of the permanent ones in the large hospitals. After a reference to the objects and aims of the recently formed British Institute of Radiology, His Royal Highness spoke of the use of radium in conjunction with X-rays in the treatment of malignant disease, and with reference to the Ministry of Health's inquiry into the treatment of cancer by this means, expressed the hope that the outcome would be sufficiently encouraging to warrant further large supplies of radium being placed at the disposal of the medical profession.

Mr. NEVILLE CHAMBERLAIN, Minister of Health, who welcomed the delegates on behalf of the Government, also referred to the inquiry into the treatment of cancer, and spoke of the scarcity and high cost of radium, sufficient quantities of which under present circumstances were hard to find.

The Congress was divided into several sections, and we commence below a short account of the items of special interest to our readers.

International Units and Standards.

The whole of Wednesday, July 1st, was devoted by Section I (Physics), and Section III (Radiology), to a discussion upon international units and standards for X-ray work.

SIR WILLIAM BRAGG, F.R.S., who opened this discussion, said the problem of arriving at international units and standards for X-ray work was beset with more difficulties perhaps than was the choice of any other unit which science had ever had to devise. There were the difference between quantity and quality, the difference between the amount of energy and the wave-length which carried it, and the continual difficulty of the scattering of the X-rays and the formation of other beams which had to be taken into account. In Germany a Congress had been held at which definite resolutions had been passed as to the best means to be adopted. In England also there was a Standing Committee formed by the Physical Society and the Roentgen Society which had been considering the question, but the work done only served to emphasise how complex a question this was. The whole thing was a matter of compromise, and looking at it broadly there were three things to be considered. First of all, there was the determination of the scientific unit; secondly, there was the determination of a standard piece of apparatus which could be used for comparison, and, thirdly, there was the comparison of the results obtained under treatment with the standard. The first two were largely matters for physicists, whilst the third was entirely a hospital matter. It was no use, however, carrying any one of these three questions to completion and leaving the others in a state of incompleteness or indefiniteness. All three must be attacked together.

Mr. A. BECLERE (France) expressed the hope that an endeavour would be made to find a physical unit for dosage which would be recognised and adopted by all radiologists in all countries rather than a biological unit. Perhaps the best course to adopt would be for the Congress to constitute an International Committee for the study of this very important question.

Dr. I. SOLOMON (France) suggested that the ionometric method constituted the best for the measurement of Roentgen rays and expressed the view that the Behnken unit adopted in Germany, although satisfactory in many respects, had certain difficulties of technique which were likely to prevent its general adoption. He preferred the notation in R units which he had devised and which had been used in France for four years.

Prof. H. MARTIUS and Prof. L. GREBE (Bonn, Germany) spoke of the difficulties introduced by secondary radiations in endeavouring to arrive at standards for international units, and referred to experiments which showed that the scattered radiation might be many hundreds per cent. in excess of the primary radiation.

Dr. W. ALTSCHUL (Prague) urged the necessity for standards which would enable a dosimeter to indicate at any moment of the radiation, the actual dose which was being given.

Dr. J. H. SHAXBY (Cardiff), speaking on behalf of Dr. A. Dauvillier, of France, described apparatus for standardising dosimeters, and urged the adoption of physical units in arriving at standards rather than biological units.

Dr. N. S. FINZI (London) seconded the proposal of Dr. Béclère for the appointment of an International Committee to determine the unit of X-ray dosage. One of the first things which it would have to determine was whether a physical or a biological unit should be adopted. The best method in the general interests should be adopted and no questions of priority of work on the problem in any particular country should hamper a decision.

The proposal was carried unanimously, and the Chairman promised to bring the matter before the general meeting of the delegates later.

Dr. H. MOORE (London) said that it would be an important step towards a solution of the problem of measuring X-rays if radiologists were provided with generating apparatus with which they could, at any time they chose, obtain an X-ray beam of definite quality. Suppose, for example, they could have a battery of cells giving 200,000 volts and could connect that across an X-ray tube and could pass through that tube 10 milliamperes, they would be fairly certain of getting the same type of X-rays from that tube one day after another. The important thing was to get a constant voltage. Therefore, he suggested what was perhaps rather revolutionary, namely, that radiologists should scrap their present apparatus and install as rapidly as possible constant-voltage apparatus. The only thing required was the money, because such sets were on the market. A voltmeter which could be depended upon should be used. With such apparatus as he had suggested in common use throughout the world, a mass of information could be accumulated which would be of enormous use for comparative purposes and would assist the adoption of international standards.

(To be continued.)

A Visit to Messrs. Johnson and Phillips's Works.

A Jubilee Celebration.

ON Friday last, to mark the completion of half a century's continuous activity in connection with electrical engineering, the firm of Johnson & Phillips, Ltd., entertained a large party of journalists to luncheon at its works at Carlton, and afterwards conducted the guests through the various departments of the factory, which has grown up round the original workshop that was built in 1875 to manufacture telegraph cable and accessories. The products of the company now include cable-handling machinery for cable steamships; cables for electric lighting and power and for telephony, of numerous varieties; cable-making machinery, transformers, switchgear, instruments, and overhead line equipment, and from the appearance of the workshops it was evident that an abundance of work was passing through them.

At the luncheon Mr. J. Macgregor, managing director, occupied the chair, supported by Sir Philip Dawson, K.B.E., M.P., Mr. H. J. Sheppard, Mr. C. Stewart, and other members of the directorate and staff.

After the toast of "The King" had been honoured, SIR PHILIP DAWSON proposed "The Press," to which he admitted he had himself been a contributor on many occasions. From his experience in various countries, he declared that there was no fairer or more honest Press than that of this country, and his political career had taught him that it exercised the greatest possible influence. Coupling the toast with the name of Mr. E. A. Gatehouse, Sir Philip said that his father, the late Mr. Tom E. Gatehouse, was one of his dearest friends, and introduced him to journalism many years ago.

Responding, Mr. GATEHOUSE recalled the good advice Sir Philip gave him when he left college and was about to start practical work—to enter an engineering workshop. The firm of Johnson & Phillips had been associated with the ELECTRICAL REVIEW for nearly the whole of its 50 years' existence; it was a privilege which the Press appreciated to take part in the celebration of such a jubilee, which was especially noteworthy at a time when industrial difficulties were rife. The prosperity of the firm bore witness to the foresight and determination of the men in charge of its destinies. On behalf of the Press he cordially congratulated the directors and staff, and wished them the greatest possible success in the future.

Mr. J. W. BEAUCHAMP, director of E.D.A., proposing the health of "The Firm," remarked that few electrical concerns had yet celebrated their jubilee. Thirty years ago the company was producing everything required by an electricity supply undertaking; he had had experience of the quality of its products at Tunbridge Wells, and found them all very good. Now the company had concentrated upon the production of everything essential to transmission and distribution. It was not yet fully realised that the distribution problem was every year increasing in importance; the cost of distribution must be reduced, and they must get more units through every thousand pounds' worth of plant. Immense quantities of copper were being put underground: they must get a higher duty out of that copper. Upon success in that direction the cheapness and abundance of electricity supply depended even more than on economies effected in the power station. A tour of such a factory as that of Messrs. Johnson and Phillips was of great educational value.

Mr. MACGREGOR, responding to the toast, said that 50 years ago they could not have looked forward to such a gathering; it had been a hard struggle for all electrical firms. He believed in old faces—but they must have young blood, and the success of the firm was largely due to its having always been ready to give young men a chance to make good. The firm was founded by Mr. W. Claude Johnson and Mr. S. Phillips, and was made a limited company in 1905. The period from 1904 to 1908 was a very bad time, but they weathered the storm, and to-day they were fairly satisfied with the success they had attained. He knew it paid to advertise; in the early days the Press was rather dependent on the manufacturers for support, but now they could rely on the support of the Press—it was sometimes critical, but always with goodwill. He could tell them a good deal about their first Gramme dynamo, their first arc lamp, their first cable, for they were pioneers. Fortunately the keen competition formerly met with in this country had been broken down, allowing them to make a little profit which could be devoted to research and enabled them to keep up to date, as would be seen in the shops.

A lengthy tour of inspection of the shops then took place, ending with a visit to the test room, where tests were carried out on cables at pressures up to 190,000 volts, without breakdown. The test-room equipment for the accurate measurement of dielectric losses in high-pressure cables, and for the determination of cross-talk and capacity in telephone cables, was especially interesting.

Electricity in Factories and Workshops.

H.M. Electrical Inspector's Annual Report.

THE annual report of the (Home Office) Chief Inspector of Factories and Workshops for the year 1924 has just been issued.* Chapter IV, which is devoted to the report of the senior electrical inspector, Mr. G. Scott Ram, M.I.E.E., is abstracted below: It is pointed out that at no time since electrical stations first became "factories" in 1902 has the development of the electricity supply industry been so active. The number of transforming and distributing sub-stations is greatly increasing, and they are generally satisfactory; cases have, however, been found where the work has been entrusted to contractors new to this class of work, who have obtained it by quoting very low prices, and serious mistakes have been made involving grave risks to the persons who subsequently have to operate and maintain the plant.

The divisional electrical inspectors have been very active during the year, and their reports are of much interest and value, but it is impossible to quote more than a few very brief extracts. Mr. Swann (southern area), in dealing with various supply undertakings, refers to some which, being originally of small importance, have relied on being able to shut down for cleaning or other work on the switchboards, but now find themselves in difficulties through failure to commence sectionalisation of switchgear in the early stages, it being now a difficult and expensive matter to deal with. He refers also to the varying attitudes adopted by engineers of different undertakings; some co-operated heartily, and considerable improvement has been effected, but in other cases the management is not sympathetic.

In two large works being erected for a new industry by Continental firms, the open type switchgear was hopelessly mixed up with the factory process plant and otherwise contrary to the regulations, necessitating very considerable alterations. Special attention has been paid to various brickyards recently electrified, and Mr. Swann has been able to secure that the lighting pressure shall not exceed 110 volts alternating for the numerous portable lamps used at the kilns under very trying conditions of rough usage, exposure to weather and heat.

In electric lamp and radio valve works, where very high pressures are used, he has been able to obtain extensive and far-reaching precautions to suit the particular processes without interfering with output. At the request of the directorate of the British Empire Exhibition, a good deal of inspection work was carried out at Wembley in connection with the electrical exhibits.

Mr. McColgan, after describing large extensions of public supply in the northern area, refers to the excessively rough usage to which electrical plant is put in such places as steel works by reason of the unskilled labour employed. Master controllers and contactors could with advantage be utilised for controlling other than large mill motors, thereby taking out of the hands of the unskilled operator the sequence and speed of operation. In some of the steel works engineering and shipyards, the system of maintenance is very good, but in others the tendency appears to be to wait until apparatus actually breaks down. False economy in electrical staffs whereby the staff cannot possibly carry out all the work expected from it, is responsible for some of these deficiencies. Fuses which do not comply with the regulations are still very numerous and responsible for accidents. There is undoubtedly an extensive field for a small type of circuit-breaker at a competitive price, as a substitute for the larger fuses.

It frequently occurs in factory installations that the occupier leaves his electrical arrangements to a contractor, and is surprised to learn after inspection that he has a very third-rate job that is not in order. In certain cases Mr. McColgan interviewed the contractors, whom he found to be entirely ignorant of the regulations. Similar observations apply sometimes to works' electricians who are responsible for much bad and dangerous work. An installation to comply fully with the regulations, if properly thought out, should cost little if anything more than one in which there may be many irregularities. Much apparatus, not in compliance, is installed through ignorance and many firms would save considerably by employing an experienced consulting engineer.

Mr. Brown (North of England area) reports that electric driving is making rapid progress in the woollen and worsted industry, more so than in the cotton industry, and great improvements are taking place in the standard of industrial lighting. In some installations the illumination has been increased several-fold with very little increase in the energy consumption, and unexpected results are sometimes found, showing that efficient lighting of the work is not the only aspect to be considered.

Whilst a distinct improvement is noticeable in the quality of work in factory installations generally, some recent installations demonstrate a deplorable lack of engineering knowledge and of the requirements of the regulations. There is still a tendency for small contractors to use light gauge close-joint conduit and grip fittings for large power installations, for which they are quite unfitted; cleat wiring well installed, with the conductors protected where liable to damage, is far preferable to a cheap conduit system. Faulty designs of apparatus are still turned out by some manufacturers, *e.g.*, star-delta starters with fuses so placed that the whole of the live parts have to be exposed in order to get at the fuses, and switch lampholders having live switch spindles. Many contractors do not realise the necessity for placing single-pole switches in the live wire on systems where one pole is earthed, and some supply authorities are also very lax on this point.

The accidents reported during the year numbered 433, including 27 fatal cases, compared with 361 and 21 fatal cases in 1923. The proportion of fatal accidents is slightly greater. Of 37 accidents on high-pressure or extra-high-pressure systems only six were fatal. (Twenty-three of them, three fatal, occurred on public supply systems to employés of the supply undertakings.)

One of the most fruitful sources of serious accidents (96 cases, 21 on h.p.), is that of persons working on live switchboards or other apparatus, thinking that the conductors were dead; some cases are quite inexcusable. Many accidents on h.p. apparatus are due to mistakes which could be avoided by the rigid observance of a rule to test all conductors, even if "known" to be dead, and then earthing them.

The next largest class of accidents concerns the use of portable apparatus in which there were 72 accidents, all at low pressure. In 48, or two-thirds of them, the injuries were burns from short circuits, and in the other 24, including 5 fatal cases, the injuries were from shock. Half of this class was due to the use of poor quality or worn-out flexible; a dozen occurred at electric irons, due to short circuit at the point where the wires leave the iron close to the operator's hand.

Thirty-six accidents, including one fatal, occurred in the testing departments of electrical manufacturing works; twenty (three fatal) occurred in connection with electric cranes, and inadequate protection of cables and wires in factories accounted for four fatalities. The greater number of fatalities, including all those in the ordinary use of electricity as distinguished from generation and distribution and in electrical manufacturing processes, occurred as usual on a.c. circuits where the pressure to earth or pressure of shock did not exceed low pressure; there were 17 such fatalities at low pressure.

During the year a number of further changes in public supply systems from direct to alternating have been put in hand. In the case of a supply to factory premises, such a change necessitates compliance with a number of the regulations from which the factory had previously been exempt, and rightly so on account of the increased dangers. There are many d.c. installations which may have been in use from twenty to thirty years which are quite unfit for use with alternating current.

Prosecutions, mostly following on serious or fatal accidents due to breaches of the regulations, were taken against 12 occupiers in respect of 26 offences; penalties varying from 20s. to £95 were imposed on 21 summonses. Three were withdrawn, and two dismissed on payment of costs. In one case the occupier took out a cross summons against a foreman under Section 141; the foreman admitted his neglect in not completing the earthing of certain apparatus, in consequence of which a fatal accident occurred. In view of his own distress over the matter he was merely admonished.

* H.M. Stationery Office; price 2s. 6d. net. Cmd. 2437.

Condenser Water from Lower Lake Levels.—How large power plants could save thousands of dollars in summer coal bills by tapping lower levels of lake water, was the subject of a paper read before the American Society of Mechanical Engineers recently by Professor A. G. Christie, of which *Science-Supplement* gives some interesting details. By placing intakes for cooling water for use in condensing steam so that they would reach the cold bottom layers of the northern lakes, Professor Christie showed that water from 10 to 20 deg. colder could be obtained. With this colder cooling water additional vacuum could be created in the condenser, with a resulting decrease in steam consumption, which he estimated would be equivalent to a saving of $36,956 in about 4½ months' operation of a 100,000-kW plant.

Manchester Association of Engineers.—On July 1st, some 150 members of the Manchester Association of Engineers visited Lincoln to view the various engineering works of Messrs. Ruston & Hornsby, Ltd. The visitors were received by Col. Ruston and his co-directors, who, with the staff, conducted them through the various departments. The works are principally employed in the manufacture of oil, gas, and steam engines, traction engines, boilers, and all classes of agricultural machinery. During luncheon the chairman gave a hearty welcome to the visitors, and a hearty vote of thanks was accorded to the company for courtesies extended and hospitality shown to the party. After tea the visitors proceeded to Lincoln Cathedral, where the principal architect explained the work now being done to prevent the building from falling into decay.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The Balfour Committee.—On June 29th, in reply to Mr. H. WILLIAMS, who asked when he anticipated receiving the first interim report of the Balfour Committee on Trade and Industry, Mr. A. M. Samuel, Secretary to the Department of Overseas Trade, said he was informed that a first volume entitled "Surveys of Overseas Markets," was about to be published. The volume was based on material furnished to the Committee from official sources, with an introduction by the Committee. It would not contain the Committee's recommendations, as they could not be formulated until it was able to consider the effect of the evidence as a whole. The Committee had received by now most of the evidence which it proposed to take but the representatives of certain important organisations remained to be heard.

Railway Electrification. — On June 30th, Mr. R. SMITH asked the Minister of Transport if the Government intended to take any steps with regard to the electrification of the main railways.

Col. ASHLEY said that the Government was considering the whole question of electricity. It might be assumed that any improvement in the supply and distribution of electricity would facilitate its use as a motive power on railways, as well as in other directions.

P.O. Electrical Apparatus. — On July 2nd, Sir WILFRED SUGDEN asked the Postmaster-General if he would call for details of all electrical and telephonic apparatus and supplies, including cables, needed by his department; and would he institute inquiries in the electrical industries of this country to ensure that the major supplies of this nature were manufactured in Great Britain instead of, as now, being mainly of foreign origin.

LORD WOLMER, Assistant Postmaster-General, said the hon. member was misinformed; more than 99½ per cent. of the electrical apparatus, including cables, purchased by the Post Office last year was manufactured in this country.

London and Home Counties Electricity Supply Scheme.—A Select Committee appointed by the House of Lords to consider the London and Home Counties Electricity District Order, met under the chairmanship of Lord Donoughmore on July 2nd. The Electricity Commissioners were represented by Sir John Snell and Sir Harry Haward, whilst there were also present representatives of the London County Council, the 10 London companies and the four London companies which have promoted the London Electricity Supply Bills Nos. 1 and 2 respectively, the Conference of Local Authorities owning Electricity Supply Undertakings, and the National Association of Local Government Officers. The terms of reference to the Committee were to consider whether the scheme had been sufficiently dealt with by departmental inquiry, whether an opportunity should be afforded for petitions against the Order, and what alterations or modifications were recommended.

Mr. SEAGER BERRY, representing the 10 London companies, put forward certain objections to the scheme of the Electricity Commissioners in its present form. In the first place, however, he informed the Committee that the 10 companies for whom he appeared, considered that the whole matter had been sufficiently dealt with by the various departmental inquiries, as well as in the discussions that had taken place on the Nos. 1 and 2 Bills. He said that his main point of objection was with regard to the clause in the Draft Order made by the Commissioners, which stated that all authorised undertakers in the district should contribute towards the administrative expenses of the Joint Electricity Authority when formed. Under the Electricity Supply Act of 1922, however, it stated specifically that the expenses of the Joint Electricity Authority were to be contributed by those authorised undertakers represented on the Joint Electricity Authority and therefore he contended that the provision in the Draft Order was *ultra vires*. At the present moment none of the companies in London was represented on the Joint Electricity Authority; he asked that the wording in the Draft Order should be the same as in the Act of 1922. According to the Statute an authorised distributor which was not represented on the Joint Electricity Authority could not be made to contribute towards the expenses of that authority, whereas by the terms of the Order all authorised distributors, whether represented or not, could be compelled to contribute. The position under the scheme would be that the Joint Electricity Authority, when formed, would generate electricity and supply to the local authorities; then the 10 companies which he represented would generate and supply to themselves, and finally there would be the other group of four companies generating and supplying to themselves. Although there was no competition between the three bodies generally, the Joint Electricity Authority could compete in the areas of the companies for large power loads such as docks, railways, &c., and to that extent the contribution of the companies towards the expenses of the Joint Authority would subsidise competition against them. However, the companies did not wish to hamper the Joint Electricity Authority in its inception, and he would make the offer that the companies should make this contribution towards the administrative expenses of the Joint Electricity Authority for the first five years. At the end of that time the Authority would be able to pay its way and as its expenses then should be on account of generation only, there should be no call upon the companies.

Mr. SYDNEY MORSE, for the Group of four companies, supported the amendment asked for by Mr. Berry.

On behalf of the London County Council the amendment was objected to. At the same time the Committee was asked to amend Paragraph 31 of the Order so that all authorised undertakers, whether local authorities or companies, should furnish statistics, &c., to the Joint Electricity Authority. At present under the Order only the local authorities were compelled to furnish those statistics which, it was stated, created the position that whereas the companies would be able to ascertain the position of the local authorities, the local authorities would not have similar information with regard to the companies.

Mr. MORSE said that this question had been before the Commissioners at all their inquiries and it had been agreed that the companies should have financial and administrative independence.

On behalf of the London County Council it was next asked that the date of election of members of the Joint Electricity Authority should be December instead of April, in view of the fact that the borough councils' elections were in November and that new members should come on to the Joint Authority immediately.

The National Association of Local Government Officers raised a point with regard to the compensation of officers and servants for loss of employment under the scheme. It was pointed out that under the Order no officer or servant could claim compensation if he had not been in the employ of the particular authorised undertaker before May 8th, 1919. This it was pointed out applied only to the local authority employés because in the two Bills relating to the companies no such limitation of date was imposed. It was understood that the Commissioners were not averse to making the scheme uniform for both companies and local authorities, but they feared that it would be *ultra vires* for them to do so having regard to a Section of the Act of 1919.

On behalf of the Conference of Local Authorities it was stated that if the Committee made the alteration asked for by Mr. Berry they must ask for permission to be heard against it.

Sir HARRY HAWARD, one of the Electricity Commissioners, said the Commissioners challenged Mr. Berry's interpretation of Section 5 of the Act of 1922 with regard to the contribution to the expenses of the Joint Electricity Authority by authorised undertakers. The intention all through had been that all authorised undertakers should contribute and nobody had contemplated the position that an authorised distributor would refuse to contribute towards the expenses of that Authority. There was no question of the Authority's paying its way, because there must always be administrative expenses so that no limit of time could be set during which authorised distributors could be asked to contribute towards administrative expenses. The Authority had not only to generate but it had to act in an advisory capacity, so that there would always be expenses which could not be put on to the charge for electricity supplied by the Authority to the local authorities. The fact that the Commissioners had to approve the estimates of expenditure each year by the Joint Authority was sufficient check upon extravagance which was suggested by Mr. Berry.

The CHAIRMAN said that the very important question raised by Mr. Berry would have to be carefully considered and a decision would be given later. With regard to the alteration concerning statistics suggested by the London County Council, the Committee did not think that that alteration should be made, neither did the Committee think that the date of election should be altered from April to December.

Sir HARRY HAWARD, dealing with the question of compensation, said the Commissioners were fully in sympathy with the suggestion of the N.A.L.G.O., but the only question was whether it would be *ultra vires*.

The Committee then adjourned; its decisions will be announced later.

Transfer of the U.S.A. Bureau of Mines to the Department of Commerce.—President Coolidge on June 4th by executive order transferred the Bureau of Mines from the Department of the Interior to the Department of Commerce. In furtherance of the same purpose the President some months ago transferred the Patent Office, and other bureaux will be similarly treated when the required legislation is obtained under the reorganisation Act. In many respects the two Departments were engaged on work of the same character, and the purpose of the transfer is to avoid duplication and to facilitate relations with the public.—*Science*.

Educational. — ROYAL TECHNICAL COLLEGE, Glasgow.—Department of Engineering. The Session 1925-26 commences on Tuesday, September 22nd. The Calendar, 3s. post free, and prospectus, gratis, can be obtained on application to the Director at the College.

MANCHESTER MUNICIPAL COLLEGE OF TECHNOLOGY.—The prospectus giving particulars of the courses in electrical, mechanical, and sanitary engineering, and in chemical, textile, and photographic technology, can be obtained free on application to the Registrar, College of Technology, Manchester. The new session commences on Thursday, October 8th. (See our advertisement pages to-day.)

Legal.

Theft of Wire.

THE Bristol *Evening Times and Echo* reports that Frederick Farren pleaded guilty at the Bristol Police Court on June 29th to the theft of 750 ft. of electric wire, valued at £2 12s. 6d. Mr. Reed, the owner of the wire, stated that he found the defendant putting the wire in the United Methodist Chapel and discovered that he had contracted with the chapel authorities to do the work for nothing if they would pay £35 for the materials.

The defendant was sentenced to a month's imprisonment with hard labour.

Manager's Claim for Wrongful Dismissal Settled.

IT was announced at the Derby Assizes last week that terms of settlement had been arrived at in the action brought by Mr. Daniel Wise, of Long Eaton, against the Concordia Electric Wire Co. for wrongful dismissal from the post of manager of the company's Sawley works.

Mr. CRAIG HENDERSON, K.C., for the plaintiff, said that the terms included the payment of compensation to his client.

Tucker v. Wandsworth Electric Mfg. Co., Ltd.

MR. JUSTICE TOMLIN, in the Chancery Division on July 3rd, had before him an action by Mr. J. B. Tucker, of Solihull, Birmingham, against the Wandsworth Electric Manufacturing Co., Ltd., of Birmingham for an injunction restraining an alleged infringement of his letters patent for electric switches.

Mr. WHITEHEAD, K.C., for the plaintiff, said the defence was that the patent was invalid and for this purpose the defendants relied on a number of prior specifications and alleged prior users, and they also said that they were not guilty of infringement. Explaining the nature of the action, Counsel said there was a general type of switch known as a "quick make-and-break" switch. Where one was dealing with fairly high voltages it was necessary that on the break there should be an adequate separation between the two parts of the contact, because, if it was not adequate, arcing might result. The plaintiff's specification described the invention in relation to a particular switch of the tumbler type. Reading the claims contained in the specification of the plaintiff's invention, Mr. Whitehead said the first claim was for a switch with quick make-and-break action by virtue of a compression spring pivotally operating on the one hand with a contact arm and on the other with an operating member which was utilised for positively displacing the contact arm in the operations both of making and breaking in the event of the spring failing to act or to act effectively. That claim, he said, had been infringed.

SIR ARTHUR COLEFAX, K.C. (for defendants) said the issue would turn on the words "pivotally co-operating . . . . with an operating member." The question was: Did this exclude the case of an intermediate member or did it include such a member?

The second claim, said Mr. WHITEHEAD, could be infringed by a device which differed only colourably from the device illustrated in the specification. What he said was that the defendants' apparatus, in so far as it differed from plaintiff's by having a slot cut in the contact arm instead of two lugs on it, and by the arrangement of an open compression spring as against one in a closed box, was only colourably different from the plaintiff's switch. It was not necessary for him to go so far as to say that a claim of this sort could be infringed by mechanical equivalents.

Expert evidence was given by Mr. G. E. Folkes as to the plaintiff's patent.

The hearing was adjourned.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The "Electrical Review" Index.—The Index for the last half-yearly volume of the ELECTRICAL REVIEW (January to June, 1925), will shortly be published. Copies will be forwarded post free to those requiring them for binding or for reference purposes, if they will make application to the Publisher, ELECTRICAL REVIEW, 4, Ludgate Hill, E.C.4.

The E.D.A. Appeal.—Attention was called at a meeting of the Blackburn Town Council on July 2nd to the decision of the Electricity Committee to increase its annual subscription to the British Electrical Development Association to £156. Alderman Higham (chairman of the Electricity Committee) said the Association acted on similar lines to the British Commercial Gas Association. The only difference in Blackburn was that the Electricity Committee paid its Association £100 less than was the case with the Gas Department.

A Manchester Dispute.—A correspondent states that members of the Manchester City Council have been circularised by the local electrical factors concerning certain friction with the Corporation Central Purchase Committee. The complaint is made that all city factors have been omitted from the list of firms whose tenders for electric lamps have been accepted. It is contended that the Committee does not save any intermediate profits, as the local tenders were the same as, or lower in price and discount than, those of the favoured firms. The point of the grievance is that the Corporation should, quality and price being equal, give its own ratepayers an opportunity of making a living.

Radio Corporation Restrained from "Spying."—The *Electrical World* states that the application of the De Forest Radio Company for an injunction restraining the Radio Corporation from using spies in the De Forest plant and soliciting information from the De Forest employés has been sustained by Vice-Chancellor Backes in Newark, N.J. The vice-chancellor modified the existing injunction to the extent of permitting the Radio Corporation to make use of information already obtained as evidence in a pending litigation, but denied the Corporation the right to maintain an organisation of spies in the De Forest plant.

Trade Announcements.—MESSRS. C. HARRISS & Co., electrical power engineers, of Strover Street, Gillingham, Kent, have changed the name of the firm to The Electrical Power Repair Co. The same partners (Messrs. C. Harriss and W. Orrick) continue; the object of the change is to indicate the special nature of the business, which is the repair of armatures, stators, rotors, &c.

The offices of *Combustion* have been removed to Hampden House, 84, Kingsway London, W.C.2.

Mr. R. FERGUSON BROWN, late of Glasgow, who has resumed business as an electrical engineer and contractor at 3, Ewenfield Road, Ayr, desires to receive catalogues, &c.

Mr. R. H. TURNER, of St. John's Road, Eastwood, has taken over the wireless business of Mr. H. Handley, of 193-195, Infirmary Road, Sheffield.

MR. S. E. HUNT, electrical engineer and contractor, has opened new premises at 8a, Torwood Street, Torquay.

MR. E. MERCER, electrical and radio engineer, has opened new showroom premises at 37, Bridge Street, Castleford, Yorks.

MESSRS. E. HODGKINS & Co., have removed to 64, Stafford Street, Birmingham. Telephone No. "Central 65."

MESSRS. WOOD & CARLING have removed to 161, Wardour Street, London, W.1. New telephone No.: "Regent 4796."

Bankruptcy Proceedings.—F. A. FRASER, 33, Tothill Street, Westminster, S.W.1, electrical engineer.—The first meeting of creditors herein was held on June 26th at the London Bankruptcy Court, and in the absence of any resolution the administration in bankruptcy was left in the hands of the Official Receiver. According to the debtor's statements it appeared that some 30 years ago he obtained employment with a telephone company, eventually becoming engineer. Some 16 years ago a company was formed and he became a director and engineer, and he continued with it until it went into liquidation last year. On January 1st a new company was formed, and the assets, goodwill, lease, &c., of the old undertaking were bought from the Official Receiver. The new company was now carrying on business at the same address. The debtor estimated his liabilities at £3,000, of which the greater portion was due in respect of guarantees. He attributed his present position to the loss of his investments in the old company in which he held two-thirds of the shares, and he possessed no assets whatever.

J. E. LOCKING, 14, Fish Street, Kingston-upon-Hull, dealer in cycles and wireless goods.—The public examination of this debtor was held on June 29th at the Guildhall, Hull. The statement of affairs showed liabilities of £291, against assets of £46. Debtor was formerly a dock labourer, and commenced business as a cycle dealer in 1922. Later he opened a workshop and stocked radio apparatus, purchasing stock to the value of £250. When he gave up the business his stock only realised £18, although the debtor considered it was worth £150. The examination was closed.

J. R. PATTISON, 15, Goldsmith Street, Nottingham, electrical supplies factor.—The public examination of this debtor was held on July 2nd at the County Court House, Nottingham. The statement of affairs showed liabilities of £2,266, against assets of £280, or a deficiency of £1,986. Debtor stated that he commenced business as an electrician in July, 1920, with £500 lent by his father-in-law. He was in financial difficulties by the end of 1923, and his father-in-law advanced him further sums from time to time. The examination was closed.

G. HILL, G. NOBLE and E. COWLEY (G. Hill & Co.), electrical engineers, 29, Chantry Lane, Gt. Grimsby.—Supplemental dividend of 2 13/16d. in the £, payable at the Official Receiver's office St. Mary's Chambers, Great Grimsby.

H. A. Birleson (Birleson & Co.), electrical engineer, Clarence Buildings, Back Fazackerley Street, Chorley.—First and final dividend of 2s. 7½d. in the £, payable at the Official Receiver's office, 11, Winckley Square, Preston.

F. J. North, electrical engineer, 13a, Midland Road Wellingborough.—Receiving order made June 25th, on debtor's own petition. First meeting, July 8th, at the Official Receiver's office, The Parade, Northampton; public examination, July 10th, at the County Hall, Northampton.

S. O. Cowper-Coles, galvanising plant manufacturer, Rossall House, Thames Street, Sunbury-on-Thames.—Application for discharge to be heard on July 31st, at the Court House, Kingston, Surrey.

H. Fildes, electrical engineers' superintendent, 108, Monton Road, Eccles.—Receiving order made June 25th, on creditors' petition.

W. R. Grigsby (Wenham Lighting Corporation), electrical factor, 184, Gray's Inn Road, W.C.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., appointed June 25th.

B. N. Halson, electrician, 29, Mayfield Road, Northfleet, Kent.—Trustee, Mr. A. H. Ward, Official Receiver, 280a, High Street, Rochester, released May 20th.

F. W. Caseley (The Radiograph Co.), wireless engineer, 5, Hepworth Arcade Kingston-upon-Hull.—Receiving order made June 30th on debtor's own petition.

D. Bould, motor and electrical engineer, Burn Croft, Birchencliffe, Huddersfield.—Trustee, Mr. W. Durrance, 12, Duke Street, Bradford, released June 19th.

Private Arrangements. — W. R. Thornton & Son, Ltd., electricians, Barrow-in-Furness.—The creditors interested herein were called together on June 29th, when Mr. Houston, representing several trade creditors, was elected to the chair. A statement of affairs as at May 30th last showed liabilities of £9,652, of which £7,214 was due to unsecured creditors, £2,000 was in respect of debentures, £75 secretary's remuneration, £62 Inland Revenue, and £300 contingent liabilities. The assets were valued at £2,667, from which preferential claims of £400 had to be deducted, leaving net assets of £2,267, or a deficiency of £7,385. Mr. W. H. Vale, who had been appointed receiver and manager of the company by the debenture holders, stated that although the ledger showed book debts of £2,550, these had been set down at £1,121. During the last two years, the company had lost £6,000. The chairman said that after the debentures had been deducted there would be nothing available for the unsecured creditors.

The contingent liabilities were stated to be in respect of a claim which had been received for £298 for commission on sales. It was not known whether the claim was good or not.

The company was formed on September 29th, 1916, with a nominal capital of £5,000, of which £4,301 was issued and paid up. The consideration for the purchase of the assets was fixed at £4,300. The company originally carried out contracting work but during the war discontinued contracting, and became a wholesale house. Branches were opened in Reading and Bradford, but these had not paid, and the Reading branch had been closed. Since January 1st, 1925, four bad debts at the Bradford branch had involved a loss of £1,000, and it was consequently decided to close that branch. The business was founded over 64 years ago.

Mr. Thornton, one of the debenture holders, said that rather than see the business go out of existence, he would take it over, continue it himself, and pay the creditors 2s. 6d. in the £.

The meeting was of opinion that some further investigation should be made regarding the valuation of the assets, and eventually it was decided to appoint a committee consisting of Messrs. W. B. Campbell (W. T. Henley's Telegraph Works Co., Ltd.), G. T. Etches (Edison Swan Electric Co., Ltd.), and Arthur T. Eaves, C.A., representing the General Electric Co., Ltd. The committee, it was intimated, would issue a report to all the creditors after the investigations had been completed, advising whether the offer of 2s. 6d. in the £ should be accepted or not.

H. & T. Edwards, electricians, trading as George Miles, 12, Waterloo Road, Smethwick.—A meeting of the creditors of the above was held recently, when a statement of affairs was presented, which had been prepared by Messrs. Poppleton and Appleby, Birmingham. The liabilities were set down at £427, of which £414 was due to unsecured creditors and £13 to the bank. The assets were estimated to realise £197, less £22 for preferential claims, leaving net assets of £175, or a deficiency of £253. It was reported that the debtors took over the business from their mother in April, 1922 and latterly the turnover had declined. A writ was recently issued against them and they consulted their solicitors, who advised the calling together of the creditors. The creditors decided to accept a composition of 5s. in the £, payable in cash within ten days.

Company Liquidations.—Henry R. Leveson & Co., Ltd., electrical engineers and contractors, 55, Park Lane, Leeds.—A meeting of creditors of the above was held on July 3rd at Leeds. Mr. J. P. Wardale, the liquidator in the voluntary liquidation of the company, submitted a statement of affairs which showed ranking liabilities of £1,788. The assets were estimated to realise £641, from which had to be deducted £28 for preferential claims, leaving net assets of £613 12s. 11d., or a deficiency of £1,175, so far as the unsecured creditors were concerned. The company was registered on March 19th, 1924, with a nominal capital of £2,500 of which £1,500 had been issued. It took over an existing business, and the vendors were allotted £1,000 in fully-paid shares. There were only three shareholders, two being the vendors to the company. The third shareholder introduced £400 in cash and stock to the value of £100 in payment for the 500 shares transferred to him. During the 13 months to April of the present year the sales totalled £5,012, with a loss of £736. The deficiency was accounted for by the loss on trading and depreciation of stock. A resolution was passed in favour of an application being made to the Court for the appointment of Mr. C. H. Baker, Leeds, as the liquidator of the company, whilst a committee was also appointed, consisting of Mr. F. Crosland and the representatives of the Metropolitan-Vickers Electrical Co., Ltd., and Messrs. Dawson & Co., Ltd.

Liverpool Electrical Engineering (1923), Ltd.—Winding up voluntarily. Liquidator, Mr. C. Hodgson, 70, Central Buildings, 41, North John Street, Liverpool. Meeting of creditors, July 13th, at 70, Central Buildings. Particulars of claims to the liquidator by August 31st.

Weaverham Electricity Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. L. Dale, 4, Darwin Street, Northwich. Meeting of creditors at 20, Winnington Street, Northwich, on July 16th. Particulars of claims to the liquidator by August 4th.

F. S. Petrol Electric Omnibus Co., Ltd.—A meeting of members is called for August 5th at 119, Moorgate, E.C., to hear an account of the winding up from the liquidator, Mr. S. H. Clench.

Electrolite, Ltd.—First meeting of creditors and contributories, July 15th, at 29, Russell Square, W.C.

Tele-Dis Services (Founders' Company), Ltd.—First meetings of creditors and contributories were called for July 9th at Carey Street, W.C.

Electric Distributing Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. S. Jones, 3, York Street, Manchester.—A meeting of creditors was called for July 3rd.

Airco Aerials, Ltd.—A meeting of members is called for August 5th at the offices of Messrs. A. J. Hill, Vellacourt & Co., 2, Broad Street Place, E.C., to hear an account of the winding up from the liquidator, Mr. C. W. Weston.

Dissolutions of Partnership.—Hutton & Quirk, electrical engineers, 120, Brook Street, Dundee.—Messrs. M. Hutton and T. Quirk have dissolved partnership. Mr. Hutton will attend to debts and continue the business on his own behalf at the same address.

Parker & Frizzell, motor and electrical engineers, The Garage, Grosvenor Road, Richmond, Surrey.—Mr. C. Parker and Mr. L. T. Frizzell have dissolved partnership. Mr. Frizzell will continue the business.

Meeting of Creditors.—Astro Electric, Ltd.—A meeting of creditors is to be held at the offices, Carlton House, Lower Regent Street, London, S.W., on July 14th, when Mr. R. Rook Jones, the receiver and manager, will submit his report on the present position of the company.

Catalogues and Lists.—The Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—A blotter bearing a calendar for July and an illustration of an electric iron.

Also three priced and illustrated pamphlets dealing respectively with the "Jackson" electric wash boiler; electric hot cupboards and carving tables; and laundry, &c., irons.

Siemens & English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, E.C.4.—July price sheet of electrical materials, appliances and accessories.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—July stock list of motors and dynamos.

The Magna Wire & Cable Co., Ltd., 137, Victoria Street, S.W.1.—List C151, a net trade price list of v.i.r. and lead-covered cables; also an advertising blotter.

Messrs. Herbert Morris, Ltd., Loughborough.—A price list of electric hoist-blocks. Illustrated.

Tok Switches, Ltd., Granville House, Arundel Street, W.C.2.—A calendar-blotter advertising the "Aristocrat" interlocking switch plug.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Publication F3707, containing an illustrated description of the "Wembley" street-lighting lantern with views of installations.

Sulzer Bros., 31, Bedford Square, W.C.1.—A pamphlet illustrating an installation of the firm's Diesel-engine generating plant.

Messrs. Ferranti, Ltd., Hollinwood, Lancs.—A leaflet illustrating a 30,000-kVA bank of Ferranti 11 000/120,000-V transformers.

Messrs. L. McMichael, Ltd., Hastings House, Norfolk Street, Strand, W.C.2.—An illustrated folder describing the company's plug-in transformers, condensers, &c., for h.f. amplification.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., U.S.A.—Four illustrated pamphlets dealing respectively with motors for mine locomotives, oil circuit-breakers, anti-vibration lampholders, and baking ovens.

The Regent Trading Co., 2, Woodlands Road, Harrow.—A priced and illustrated pamphlet advertising the "Regent" mica undercutter and glass brush.

Cryselco, Ltd., Kempston Works, Bedford.—A price list of valves of various British makes.

Higgs Motors, Witton, Birmingham.—July stock list of a.c. and d.c. motors.

The Norwest Electrical Manufacturing Co., Ltd., Motherwell, N.B.—A card bearing illustrations of "Norite" products.

NOBEL INDUSTRIES, LTD., Nobel House, S.W.1.—An illustrated brochure describing the company's exhibit at the British Empire Exhibition.

MESSRS. MAY & PADMORE, Tyseley, Birmingham.—A priced and illustrated folder advertising "Maymore" electric soldering irons, including one for radio work.

THE BRITISH THOMSON-HOUSTON CO., LTD., Mazda House, Newman Street, Oxford Street, W.1.—A brochure describing the company's new showrooms &c., at the above address.

MESSRS. J. STONE & CO., LTD., Deptford, S.E.14.—An illustrated catalogue of "H-R" gears for various applications. Also a folder dealing with the same subject.

MESSRS. CROSSLEY BROS., LTD., Openshaw, Manchester.—Publication No. 2,435, containing a report of a test carried out on "Crossley" heavy-oil engines at a pumping station. Also Publication No. 2,436, illustrating and describing the "Crossley-Premier" multi-cylinder heavy-oil engines.

Book Notices.—"History of the Telephone and Telegraph in Uruguay, 1886-1925," is the title of a brochure by Mr. Victor M. Berthold, of the American Telephone and Telegraph Company. This little Republic had a telegraph service for 21 years before the Government started a national system, in 1887; but in 1892 the Government took over nearly all the telegraph systems then in operation, and in 1894 decided to inaugurate a telephone service. The author minutely chronicles the rather stormy course of events leading up to these results, after which he devotes some 50 pages to the history of the various telephone concessions, of which the chief holder is the Montevideo Telephone Company. The conditions under which the service was carried on were extraordinary, an excessive demand for increased wages on the part of the employés in 1922 being supported by the Administrative Council of Montevideo and the Government, although the latter was then negotiating for the purchase of the undertaking. At the beginning of this year the question of nationalising the service was still unsettled.

"Commercial Credit Risks—Export Credits and Credit Insurance," by A. H. Swain. Pp. 143. London: Sir Isaac Pitman & Sons. Price 5s. net.

The author of this treatise, upon a subject which is of the first importance in the light of the present unsettled condition of the world, is the chairman of the Leicester Electricity Committee and a member of the East Midlands Electricity Advisory Board. The opening chapter of the work deals with the present position of credit insurance in the United Kingdom, and extended consideration is given to the Export Credits scheme of the Department of Overseas Trade. This is followed by a brief study of conditions in the United States in this respect. In the next two chapters the attitudes of the insurance companies and the banks are examined. The other chapters deal with the Government and the "catastrophe" risk; status information; a historical note on the Fuggers of Augsburg and their financial problems (similar to present-day matters in many respects); financial facilities; and a suggested commercial clearing house on a mutual basis in which the conclusions drawn from the preceding chapters are "crystallised" in a definite way. There are two appendixes, one reproducing a *questionnaire*, circulated by the D.O.T., relating to insurance against bad debts in export trade; the other a statement by Mr. Arthur Kitson on the American financial crisis of 1893.

"Mechanical Appliances, Mechanical Movements, and Novelties of Construction," By Gardner D. Hiscox, M.E. Pp. 412; fully illustrated. London: Constable & Co., Ltd. Price 21s. net.—This volume contains short illustrated descriptions of 998 engineering devices chiefly mechanical, which have either been put on the market or are merely suggestive ideas.

The issue of the *Mechanical World* for July 3rd is the first of a new series of that journal enlarged by 25 per cent. and containing a number of new features, without sacrificing existing ones, and without any increase in subscription rates. The journal is an old friend, and we are glad to see it progressing and extending its usefulness to the engineering industry.

"The *Journal* and Record of Transactions of the Junior Institution of Engineers." Vol. XXXV. Part X. July, 1925. London: Percival Marshall & Co.

"The *Journal* of the South African Institution of Engineers." Vol. XXIII, No. 11. June, 1925. Price 2s. net.

Sofia to Compensate Belgian Company.—The International Tribunal has just given its award in the action brought by the Société d'Electricité de Sofia, a Belgian undertaking, against the municipal authorities of Sofia in respect of the seizing of its central station and distribution system in 1914. The award is in favour of the company, which is not only to have its plant handed over immediately, but the concession is to be extended for 20 years without further payment. In addition, the Municipality is ordered to pay the company an indemnity of 9 million Belgian francs.

Social Events.—The sixth annual sports of the General Electric Co., Ltd., were held on Saturday, June 13th, on the main playing field at Witton, which, together with the Magnet Club building, has been provided by the company for the benefit of its employés. The "Harold Hirst" Cup for the 100 yards flat race was again won by A. Bird, of the Witton Works.

G.E.C. GALA AND ANNUAL SPORTS.—In celebration of the official opening of its new sports ground at Wembley, the General Electric Co., Ltd., held a successful gala day at the ground on Saturday last. Many sports events took place, the most outstanding being probably a cricket match between teams representing the head office and other London establishments of the company, the result being a draw. During the afternoon the chairman, Sir Hugo Hirst, Bart., declared the ground open. In his address he referred to the recent honour which had been conferred on him, and said that it was not due to his work alone, but also to that of the G.E.C. staff which had supported him. He was a sportsman, and wished to see sports fame attained in the company; he would be willing to defray the expenses of any member of the firm who could get into the Olympian games. Lady Hirst subsequently presented the prizes to the winners of the events of the day. The new ground comprises about 17 acres, including five football and four cricket pitches, 12 tennis courts, and a pavilion.

The Hackbridge Transformer Sports Club recently held its annual sports meeting at the new sports field adjoining the company's works at Hersham. About 2,000 employés and friends attended. The prizes were distributed by Mrs. J. F. Cleeves (wife of a director) at the close of the meeting, after which the large assembly participated in dancing on the lawn and in the amusements of a first-class fair.

The annual "outing" of the employés of the Merthyr Electric Traction & Lighting Co., Ltd., took place on June 25th, the party proceeding to Weston and Cheddar by charabanc and boat. Mr. F. J. Cursons (secretary) presided at dinner at Weston, and tea was taken at Cheddar. The arrangements were very successfully carried out by Mr. E. J. Rowlands.

On June 27th the employés of Messrs. Gent & Co., Ltd., held their annual "outing." The party travelled from Leicester to Matlock Baths and from the latter centre explored the Peak District in groups. The co-operation of the directors added to the day's enjoyment.

"Amplion" Loud-speakers Abroad.—At a time when complaints of German penetration into the British radio market are heard on all sides, it is of interest and satisfaction to see the process reversed. The accompanying picture is a view of a stand at a recent Frankfort fair, on which



"Amplion" Loud-Speakers at Frankfort, Germany.

"Amplion" loud-speakers (Messrs. Alfred Graham & Co.) were prominently displayed by the Cie. Continentale Amplion. Messrs. Graham have also sent us two other photographs, one showing an exhibit of "Amplions" at Copenhagen and the other a similar display at Toronto.

Annual Holidays.—The works of the Metropolitan-Vickers Electrical Co., Ltd., will be closed for the annual holidays from the evening of Friday, July 24th, until the morning of Tuesday, August 4th.

Lead.—Reporting on July 4th, Messrs. James Forster and Co. stated:—"Buying by cable makers on a moderate scale was chiefly responsible for yesterday's advance, accentuated by some 'bear' covering of July lead. This small amount of buying was sufficient in the present firm state of the market to send the price up 10s. a ton. . . . A steady consumption is going on in this country of from 18-20,000 tons a month, and whereas a month or two ago there was plenty of lead to meet it, there are signs now, owing to short arrivals in June, of lead for prompt delivery becoming more difficult to obtain."

British Trade-mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 1st:—

Exaphone. No. 458,424. Class 8. Instruments and apparatus used in telephony.—The International Exaphone Co., Ltd., Derby.

Spartanite. No. 458,714. All goods in class 8.—Fuller's United Electrical Works, Ltd.

Meron. No. 457,981; Neron. No. 457,991; and Maron. No. 457,994. Class 8. Instruments and apparatus, and parts thereof, for use in radio-telephony and telegraphy. No. 457,982. Class 13. Electric lamps (ordinary), lamp-holders, electrodes, &c.—Osram Gesellschaft, 11-14, Ehrenbergerstrasse, Berlin, O.17, Germany. (British representatives: Cruikshank & Fairweather, 65-66, Chancery Lane, W.C.2.)

Matched Tone Trade Mark (lettering and design). No. 455,643. Class 8. Headphones and parts thereof for use in radio-telephony.—Brandes, Ltd., 296, Regent Street, W.1.

Receptite. No. 456,917. Class 8. Detector crystals for use in radio-telephony.—W. T. Cocking and D. E. Salari, trading in co-partnership, 78 Estcourt Road, South Norwood, S.E.25.

The Condition of French Industry.—The Paris correspondent of the *Daily Mail* recently said:—"In nearly every industry French factories are working overtime and are yet unable to meet all their contracts, not only for the home markets but also for abroad. Big metallurgical and electrical firms have large orders for foreign markets, notably for China and other parts of the Far East."

Japanese Electrical Imports.—The destruction of the Government archives in Tokio by the earthquake of September, 1923, involved the loss of a mass of statistics, including those relating to foreign trade. This accounts for the non-appearance of any detailed figures since the publication of those for 1921. The total figures of two important items in the import list for the years 1922 and 1923 are as follows:—Electrical machinery and apparatus, 12,824,555 yen and 11,359,210 yen, respectively; and insulated electric wire, 485,107 yen and 1,885,053 yen, respectively.

Registration of Trade Marks in China.—The British Chamber of Commerce announces that the period for registering marks under Clause 4 of the Trade Mark Law has been extended to December 31st, 1925.—*Reuter* (Shanghai).

"Relay" Exchanges for Switzerland.—Last year the Director-General of Telephones, Berne, Switzerland, installed as an experiment a small "Relay" automatic telephone exchange in one of the rural areas of Switzerland. The Swiss telephone authorities have now ordered a further twenty "Relay" exchanges for installation in various places in Switzerland.

New Zealand's Electrical Imports.—The *Board of Trade Journal*, in a review of New Zealand's external trade during the first quarter of the current year, states that Great Britain increased her share of the trade in electrical machinery and appliances, having supplied 70 per cent. of the total imports, which were valued at £632,000.

Australian Tariff Applications.—In May last Amalgamated Wireless (Australasia), Ltd., applied to the Australian Tariff Board for the imposition of an increased scale of duty upon imported radio apparatus and for the free admission of the raw materials of the industry. Considerable opposition was encountered by these proposals, a representative of the British General Electric Co. stating that the admission free of duty of headphones (which it was suggested should be classed as "raw material") would result in a heavy loss to those firms who held large stocks of the appliances, as they would be drastically undersold by cheap imported apparatus which had not paid duty.

Scanlon's Electric Co., a firm of switchgear manufacturers, asked for increased duties on knife switches, low- and medium-pressure fuses, and motor-starting equipment. It was stated that a number of English concerns were landing this gear at prices which gave local manufacturers "considerable trouble."

Another firm, making telephone apparatus, asked for increased protection in respect of this class of goods. A representative of the Ericsson Telephone Co., in opposing the application, said that Australian manufacturers could not produce one-tenth of the Commonwealth's telephone requirements.

The Tariff Board's decisions in these cases are not yet to hand.

Alleged "Price Ring" in Australia.—At a meeting of the Sydney City Council in May, the question of concerted tendering was again raised. It was stated that tenders were invited for the supply of rubber-insulated cables; nine offers were received and they all bore the same price. The Council decided to eliminate two companies from the list as it was alleged that they were concerned in the recent "scandal" of adding an extra amount to a tender for distribution to the unsuccessful tenderers. It was left to the general manager (Mr. Forbes Mackay) to decide which firm should receive the contract.

Unemployment.—An increase of 19,330 occurred in the number of unemployed persons during the week ended June 22nd, the total at that date being 1,299,700. This represents an increase of 285,918 in the past twelve months.

For Sale.—Woolwich Corporation Electricity Department has for disposal one 1,500-kW Willans-Siemens turbo-alternator plant. (See our advertisement pages to-day.)

The Chinese Disorders.—The Shanghai correspondent of the *Daily Telegraph* reported on July 5th that the Municipal Electricity Department had decided to cut off the bulk of the power supplies at noon on July 6th, while maintaining lighting. "This action will affect chiefly the Chinese mills, most foreign concerns being idle. Essential undertakings will be excepted, but the action will not only affect the settlement mills, but mills outside, as settlement power plant at the riverside, recently completed at a cost of 30,000,000 taels, and selling over 300,000,000 kWh annually, supplies many Chinese outside the settlement through a native electricity company. The decision will mean total industrial cessation inside the settlement and restriction of production outside, but the department announces that this is inevitable owing to inability to maintain output since the strike of Chinese. The general opinion is that this step will shorten the duration of the strike."

Street Lighting in Tottenham Court Road.—The old series arc-lighting system in Tottenham Court Road, London, has been replaced by 1,000-watt Siemens gasfilled lamps arranged in series between the outers of a three-wire d.c. distribution system, the change-over involving very little expense. As a result, the whole of the thoroughfare is brilliantly illuminated, and the buildings stand out in bold relief.

The New Chester Showrooms.—The new showrooms acquired by the Chester Electricity Department at a cost of £10 000 were recently inaugurated by the Mayor. The premises are in one of the busiest shopping thoroughfares and have an imposing appearance, the entrance being flanked by two attractive show windows in which washing machines and other domestic appliances have been arranged. In the main shop is a series of recessed tiled hearths in which electric fires of various patterns are fitted. Another notable feature is a varied array of lighting fittings. A commodious oak counter provides space for the display of numerous small appliances, and full use is made of showcases in all odd corners and niches. On the same floor a suite of rooms has been arranged with the appropriate electrical equipment; this comprises a dining-room, a bedroom, and a bathroom. On the top floor are the Department's offices. Every appliance is to be provided with a card showing its consumption, initial cost and running cost. Particular attention is given to electric cooking, the Corporation having instituted very favourable rental and hire-purchase systems for cookers. Prior to the opening ceremony the efficacy of electric cooking was practically demonstrated by the provision of an electrically-cooked dinner in which members of the Electricity Committee participated at the invitation of their chairman. The reconstruction of the premises and their layout were carried out under the supervision of Mr. W. A. Gillott, A.M.I.E.E.

New "Exide" Depôt.—On July 1st, the Chloride Electrical Storage Co., Ltd., opened a new depôt at Tureen Street, Gallowgate, Glasgow, where every facility for the sale, charging and repair of accumulator batteries is available. The new premises will be under the control of Mr. McDonald Sinclair, A.M.I.E.E., the company's general representative for Scotland.

The Reduction of Railway Expenses.—The railway companies of Great Britain have made proposals to the trade unions in which their employés are organised which, it is estimated, will result in a reduction of £6,000 000 in their annual expenditure. Briefly, it is suggested that the whole of the officials, staff and employés, shall consent to a "cut" of 5 per cent. in their fees, salaries or wages, for a period of a year, at the end of which the position would be reviewed. The trade unions have raised the question of the application of the scheme to stockholders, but the companies have so far not replied to this. The companies promise that if the unions agree to the "cut" they will restore the railway workshops, which are at present on short time, to the full working week.

Rumanian Export Taxes.—According to *La Dépêche Commerciale*, the Rumanian Government is imposing an export tax on a number of classes of goods. These include electric motors, which are subject to a levy of 5 lei per kg., and "electric burners" ("*becs électriques*"), 5 lei per 100 kg.

An American View of European Electrical Conditions.—The *Electrical World* quotes the views of Mr. H. E. Irish, purchase engineer of the Western Electric Co., who recently returned from a six months' business trip abroad. Mr. Irish says that European business conditions seem to be generally better. "Credit and money are to some extent more stable; unemployment, although serious in England, has been greatly reduced in Germany, and is not an important factor in France. Political conditions, upon which almost everything depends, seem gradually to be becoming somewhat more settled." The development of power and lighting companies is going ahead rapidly in many countries, but the lack of standardisation is a serious bar to manufacturers seeking to enter this field. There is always a certain demand for American electrical equipment, but in the main Mr. Irish believes that the American contribution will be along the line of leadership in new technical developments rather than the export of any great quantity of supplies.

"This is in part because electrical development is influenced to so large an extent by political conditions," said Mr. Irish. "The telephone, radio, and, in some instances, power, are in general controlled by the governments. The use of electricity was stimulated by the war, and is probably growing faster than it otherwise would have grown, but most of the manufacturing will probably continue to be done in local national factories. The employment situation has added force to this policy, which is a deliberate one. Home industry is generally supported even when better supplies could be obtained from another country at lower prices. This preference for home products will probably continue. National feeling at the present time is particularly high, and the opportunities for exporting electrical supplies to Europe may be less now than at some periods in the future."

Radio is reported as being apparently popular, and Mr. Irish received the impression that a much wider popularity is at hand. This, however, is thought to be limited by inherent characteristics of European nations, which will probably prevent a sweep of radio enthusiasm comparable to that in the United States.

New Netherlands Tariff.—The *Board of Trade Journal* of July 2nd contained a translation of Groups V and IX of the schedule of goods which will be dutiable under the Netherlands Tariff Law of 1924. The first group comprises electro-technical articles, including all kinds of switch- and fuse-gear, measuring instruments, rectifiers (except rotary and mercury-vapour types), static transformers, &c. Group IX includes telegraph, mining, and signalling apparatus, &c. All goods in these classes are subject to a duty of 5 per cent. *ad valorem*.

The Persian Electrical Market.—According to the *British Export Gazette,* importers into Persia are experiencing a growing demand for electric fans, irons, and vacuum cleaners, and other electrical appliances. This applies mainly to the cities where current is available, but, in addition, the more prosperous among the landowners are beginning to install self-contained lighting and power outfits for their homes, gardens, and estates, and the sale of motors, both for alternating and direct current, is likely to increase steadily. The vogue was introduced during the war by the British military forces stationed along the Persian Gulf, and by inference the bulk of the supplies should be drawn from the United Kingdom.

The F.B.I. and the Pensions Bill. — The Federation of British Industries has addressed a protest to the Government against the extension of the Insurance Acts to provide for widows', orphans', and old age pensions. The Federation states that the burden of social services already bears hardly on industry and the additions now proposed will be highly detrimental; indeed, in the cases of trades which are exposed to the full force of foreign competition they may well involve actual disaster.

The State of German Industry.—Activity on the German metal market, says the *Deutsche Bergwerks Zeitung,* has again dwindled after a short period of liveliness. The improvement in the orders received in the machine building industry is worthy of mention. The cable works and the electrotechnical industry are still well employed; the Post Office in particular seems to have been giving larger orders of late. The brass works have also plenty of work in hand, but considerable quantities of semi-finished goods are being offered in the trade at low prices. The situation in the labour market has hardly changed.—*Reuter's Trade Service* (Essen).

New French Company.—A new company has recently been formed with the title La Société Hydro-Electrique de l'Afrique du Nord, to establish an electric power station to utilise the water power of the River Ould-el-Berd in Algeria.

New Swiss Company.—Under the auspices of the Bernischen Kraftwerke Gesellschaft, a new company has been formed in Berne under the title of the Oberhasli Kraftwerke Gesellschaft, to establish and work the large new hydro-electric station at Oberhasli.

Irish Free State Electrical Imports.—As a measure of economy, the Irish Free State Government, at the commencement of the present year, ceased to issue its usual monthly detailed import and export returns, only monthly summaries being now issued. The latest of these available is for the three months ended with March last, during which period the imports of electrical goods—a term which apparently does not include generators, motors, and other electrical machinery—attained a value of only £73,568, as compared with £100,893 in the corresponding quarter of 1924.

Lighting and Power Notes.

Australia. — TASMANIA.—*Launceston.*—We have received from Mr. R. J. Strike, city electrical engineer, a copy of his report, together with the statement of accounts of the electricity undertaking for the year ended June 30th, 1924. The total revenue was £59,517, and the working expenses were £44,426, leaving a gross profit of £15,091. The figures for the previous year were: Income, £56,125; working expenses, £32,753; gross profit £23,373. After meeting capital charges there was a deficit of £557, as compared with a surplus of £8,061 in the preceding year. The electrical energy sold amounted to 4,836,076 kWh, an increase of 629,055 kWh. The Council decided to change over the voltage of supply to consumers from 110/190 to 240/415 V, and a portion of the South Launceston area was completed during the year.

Birmingham.—YEAR'S WORKING.—The statement of accounts of the Corporation electricity undertaking (engineer, Mr. R. A. Chattock) for the year ended March 31st last, records a total revenue of £1,182,622, as compared with £1,110,028 in 1923-24. Working expenses totalled £736,855, as against £668,197, leaving a gross profit of £445,767 (£441,831), to which was added bank interest of £2,884, and the sum of £31,000 brought from the reserve fund, making a total of £479,651. This was distributed as follows:—Interest, £180,465; redemption of debt, £176,621; payment to the Tramways Department in respect of feeders, cables, &c., £1,368; payment to the Tame and Rea District Drainage Board in respect of railway siding, £449; borough rate, £31,000; surplus carried to renewals and special expenditure account, £89,370. The surplus on the previous year's working was £102 224. The amount spent on capital account during the year was £841,567, and was made up as follows:—Land, £1,028; buildings, £105,312; machinery and plant, £446,186; mains, £289,042. The sales of electrical energy amounted to 193,370,748 kWh, an increase of 22,218,158 kWh, and the average price per kWh obtained fell from 1.556d. to 1.468d. The motor connections increased from 186 927 to 206,160 h.p., and the lamp connections in 60-watt lamps from 556,068 to 659,666.

Chester.—LOAN SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £10,000 for mains for supplying electricity to the parishes of Tarvin, Barrow and Aldford.

Continental.—BELGIUM.—A new 4,800-6,000-kW turbo-alternator set is being installed at the power station connected with the collieries of the Société des Charbonnages Winterslag. An electric winding engine is also in course of erection.

GREECE.—Owing to the increasing demand for electricity in the town of Salonica, the Société des Tramways et Eclairage Electrique de Salonique is now establishing a new central power station.

Crediton.—ELECTRICITY SUPPLY.—The question of an electricity supply for the district was considered by the Urban District Council at a recent meeting, when it was stated that the Electricity Commissioners had refused to sanction the erection of a generating station at Crediton. The clerk stated that the commissioners had communicated with the Exeter City Council to the effect that the terms offered for supplying Crediton with electricity in bulk were excessive and that in consequence Exeter had submitted revised terms as follows:—£250 for the first year's supply, £300 for the second year, £350 for the third year, £400 for the fourth year, and £500 for each succeeding year. The Council decided to consider the matter further in committee.

Croydon.—YEAR'S WORKING.—The report of the borough electrical engineer (Mr. A. C. Cramb) on the working of the electricity undertaking for the year ended March 31st last, shows a total revenue of £204,757, as compared with £173,150 in the preceding year. Working expenses, including special expenditure charged to revenue account, amounted to £138,898 as against £124,841, leaving a gross surplus of £65,859 (£48,309). After providing for capital and other charges there was a net surplus of £9,194, as compared with £2,446 in 1923-24; this was transferred to reserve. The capital expenditure during the year amounted to £152,074, the main items being £67,035 for machinery and plant, and £42,538 for mains. The sales of electrical energy increased from 14,947,610 to 18,724,318 kWh and the average price per kWh obtained fell from 2.728d. to 2.498d. The maximum supply demanded rose from 8,600 to 9,200 kW. The extensions to the works which it was hoped to have completed last autumn were held up by a delay in the completion of the reconstruction of the buildings, but it is anticipated that the work will be completed and the new 10,000-kW turbo-alternator installed in time for next winter's load.

Dalkeith.—ELECTRICITY SCHEME.—It is proposed that the existing main of the Lothians Power Company should be extended to the Dalkeith generating station, where a metering and control panel, a transformer, and converting plant should be installed. Mr. Dixon, Dumbarton, for the Electric Supply Corporation, is to furnish the Town Council's engineer with the details and probable cost of the proposed scheme.

Ilford.—LOANS.—The Urban District Council has applied for sanction to loans of £20,000 for mains and services, and £2,000 for apparatus to be let out on hire.

Kingston-on-Thames.—ELECTRICITY SUPPLY.—Application has been made by the Town Council for sanction to a loan of £4,000 for extending the mains in the Cambridge Road area. The Council has sealed an agreement with the Twickenham and Teddington Electricity Supply Co., Ltd., for a supply of electricity in bulk to the company for distribution to consumers at Ham.

Keighley.—NEW FEEDER CABLES.—The Electricity Committee has recommended to the Town Council that the existing feeder cables in connection with the railless-car system be replaced by new and larger cables and that new control gear be provided at the generating station at a total estimated cost of £4,000.

Liskeard.—ELECTRICITY SUPPLY.—The proprietors of the Liskeard (Cornwall) Gas Co. have confirmed a resolution to convert the old private company into a limited liability company, with a view to developing the supply of electricity. It was stated that it was hoped the installation of plant would be sufficiently advanced to enable current to be supplied during the coming autumn.

Liverpool.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer Mr. H. Dickinson) for the year ended March 31st last, show a total revenue of £1,037,673, as compared with £966,338 in 1923-24. Working expenses amounted to £591,269, as against £528,937, leaving a gross profit of £446,404 (£437,401), which was distributed as follows: Interest, £153,524; repayment of loans, £597; contribution to Bootle Corporation stock redemption fund, £1,277; sinking fund contributions, £130,579 (£2,851 contributed by the Housing Committee); renewal fund, £43,278; city rate, £120,000. During the year £535,909 was spent on capital account, the chief items being £184,107 for mains, £154,308 for machinery, £113,148 for buildings, and £84,245 for accumulators.

London.—ST. MARYLEBONE.—The report on the working of the Borough Council's electricity undertaking (engineer, Mr. C. H. Smyth) for the year ended March 31st last, records a total income of £435,628, as compared with £406,226 in 1923-24. Working expenses totalled £220,999, as against £220,548, leaving a gross surplus of £214,630 (£185,678), to which was added interest on bank balances, &c., making a total of £215,850. After deducting capital charges there was a net surplus of

£49,614, as compared with £32,654 in the preceding year. The capital expenditure during the year amounted to £159,632, the chief items being £123,560 for extensions of plant and £18,915 for mains and services. The sales of electrical energy increased from 43,770,345 to 50,667,433 kWh, and the maximum supply demanded rose from 25,506 to 28,003 kW. The average price per kWh obtained fell from 2.11d. to 1.94d.

Hampstead.—The accounts of the Borough Council's electricity undertaking (engineer, Mr. J. Leadbeater) for the year ended March 31st last, show a total revenue of £142,009, and working expenditure of £105,422, leaving a gross profit of £36,588. After deducting capital charges there was a net profit of £10,732. The previous year's working resulted in a net profit of £21,717. The capital expenditure during the year amounted to £31,093 the chief item being £12,700 for mains. The sales of electrical energy increased from 10,110,363 to 11,818,702 kWh, and the average price per kWh obtained fell from 3.35d. to 2.80d. The maximum supply demanded rose from 5,675 to 6,100 kW.

Manchester.—Loans.—The Electricity Committee has recommended to the City Council that application be made for sanction to loans of £420,000 for mains, transformer stations, &c., and £25,000 for street lighting.

Progress During Past Year.—The sales manager's annual report for the year ended March 31st last shows that the total connections during the year amounted to 25,369 kW, and that 9,277 applications were received. The number of consumers increased by 3,526, and the number of hired electrical cookers connected by 401 to 678.

Morecambe.—Electricity Extensions.—The Electricity Committee has recommended the installation of another e.h.p. feeder from the Lancaster generating station, at a cost of £12,500, to supply electricity in the Heysham area.

Peterborough.—Loan.—The Electricity Committee is applying for sanction to borrow £5,000 for the provision of services.

Electricity Extensions.—The electrical engineer and the city surveyor have been instructed to prepare plans for extensions at the generating station.

Electricity in Bulk.—The Electricity Committee is in communication with the Electricity Commissioners and Sir Charles Bright & Partners, Ltd., with regard to the proposal to give a bulk supply of electricity to the Spalding Urban District Council.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Shipley.—Lighting: 6½d. per kWh. Domestic power: 2¼d. per kWh. Charges subject to a discount of 2½ per cent. for prompt payment of accounts.

Sutton Coldfield.—Lighting: A reduction of ½d. per kWh. Charges for heating, cooking, and power have also been reduced.

Salford.—Lighting: From 4¾d. to 4½d. per kWh. Alternative annual charge rate for lighting: The kilowatt charge reduced by 10s. Heating: From 1¾d. to 1½d. Power: Varying from 2½d. to .9d, according to quantity consumed. Alternative annual charge for power: From £7 10s. per kW and .40d. per kWh (under 25 kW), to £7 per kWh and .375d. per kWh. Special reductions have also been made in contract rates for power. The charges have also been reduced in Prestwich urban district.

Swansea.—Lighting: From 6d. to 5½d. per kWh. Maximum demand rate: Percentage increase from 40 to 20. Power: From 25 per cent. to 12½ per cent. above the pre-war rate. Heating and cooking: From 2d. to 1½d. per kWh for the winter quarters.

Pwllheli.—Electricity Agreement.—The Town Council has decided to sign an agreement with the Gwynedd Trust, Ltd., to supply the town with electricity at 6d. per kWh for public lighting and 9d. per kWh for domestic use. The company is prepared to proceed with the scheme at once, and the Council has agreed to withdraw all objections to an Order.

Southend-on-Sea.—Inquiry.—An inquiry is to be held by the Electricity Commissioners on July 14th, to ascertain the manner in which the electricity supply has been administered.

Loans.—The Town Council has applied for sanction to the following loans in connection with the electricity undertaking:—New plant and works £40,000; excess expenditure, £7,100 and £2,980; a.c. mains, converting plant, switchgear, and transformers, £25,000.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the following authorities:—Wrexham Corporation, for the supply of electricity in parts of the rural district; the Derbyshire and Nottinghamshire Electric Power Co. in certain parishes in the rural district of Shardlow.

The Commissioners have submitted to the Minister of Transport for confirmation an Order made by them, for the supply of electricity by the Stanley Urban District Council in its area.

St. Austell (Cornwall).—Electricity Scheme.—A scheme of electrical development is proposed by the St. Austell Electric Light & Power Co., Ltd. The object is the supply of electricity in the entire area in which the company has powers, embracing the towns of St. Austell and Fowey, St. Blazey, Par, part of St. Mewan, and in all 15 parishes, but as a first instalment it is intended to cater for half this area. On a site outside St. Blazey and close to the Par-Newquay railway line, a power station is to be erected with a capacity of 1,250 h.p. Work will be commenced upon it in a few weeks' time, the scheme having been sanctioned by the Electricity Commissioners. The rates to be charged in the new area will be 10d. per kWh for lighting and 6d. per kWh for power.

Stoke.—Extension of Supply.—At a recent meeting of the Electricity Committtee the engineer reported that he had, with the borough electrical engineer of Newcastle-under-Lyme, interviewed the Electricity Commissioners regarding a supply being given in the western portion of the North-West Midlands electricity district and that the Commissioners would favourably regard any applications for the necessary powers to give supply to large and long-hour consumers therein. He further reported that the development of supply in the North-West Midlands district would probably involve extensions of the central power house.

Plant Extensions.—The Electricity Committee has instructed the engineer to prepare a preliminary report upon extensions to the central power station to meet prospective demands which will have to be met in about three years.

Electricity Agreement.—A communication has been received from the borough electrical engineer of Newcastle-under-Lyme with regard to the Madeley and Parkhouse collieries, and the engineer reported upon the terms which had been discussed by the Newcastle Electricity Committee, and these were approved. It was agreed that subject to an agreement being entered into for a supply of not less than an average of 2,000,000 kWh per annum for a period of seven years or more, with a maximum demand of not less than 100 kVA or more than 750 kVA, such a supply should be given and that the engineer should report as to the necessary mains.

Swansea.—Loan.—The Town Council is applying for sanction to a loan of £33,137 for mains.

Walton-on-the-Naze.—Electricity Supply.—There are now 463 houses and shops taking a supply of electricity, the total number of meters in use being 524. Street lighting extensions are being carried out by the Urban District Council.

West Ham.—Year's Working.—The accounts of the Borough Council's electricity undertaking (engineer, Mr. F. W. Purse) for the year ended March 31st last, record a total revenue of £367,874, and working expenditure of £236,550, leaving a gross profit of £131,324, to which was added interest and other sundry items, making a total of £133,208. The previous year's figures were: Income, £335,885; working expenses, £229,172; gross profit, £106,713. Capital charges absorbed £94,356 and there was a net profit of £38,852 as compared with £21,577 in 1923-24. Of the profit, £15,940 was contributed to the borough fund, and the remainder transferred to reserve. The capital expenditure during the year, which included £16,462 for mains and £11,196 for transformers, &c., amounted to £31,996. The electrical energy sold increased from 50,612,888 kWh to 58,307,188 kWh, and the average price per kWh obtained fell from 1.58d. to 1.50d. The maximum supply demanded rose from 19,040 to 21,900 kW. The engineer's report states that during the year a contract was placed for a third 10,000-kW set, three water-tube boilers, and additions to the coal-handling plant, and it is anticipated that the new plant will be in commission before the coming winter. The interconnecting link between East Ham and Ilford was laid during the year, and a bulk supply to Ilford was commenced in December last.

Tramway and Railway Notes.

Australia.—Tasmania.—*Launceston.*—The accounts of the City Council's tramway undertaking (superintendent, Mr. R. J. Strike) for the year ended June 30th, 1924, record a total income of £54,886, as compared with £53,097 in the preceding year. Working expenses totalled £37,181, as against £35,468, leaving a gross profit of £17,705 (£17,628). Interest absorbed £8,471, and £1,503 was contributed to sinking fund, leaving a net surplus of £7,731 (£7,553), which was transferred to reserve. The car-mileage increased from 466,361 to 472,701, and the number of passengers carried from 4,403,454 to 4,540,999.

Continental.—Rumania.—At the recent annual meeting of the Société des Tramways et Eclairage Electriques de Braila, in Brussels, it was stated that negotiations were in progress with the municipal authorities of Braila regarding an extension of the concession. The existing power station having become unequal to the demands, a scheme for increasing the capacity of the plant is being considered, to finance which it is possible the concern will be converted from a Belgian to a Rumanian undertaking.

Bulgaria.—The first electric railway line to be built in Bulgaria was opened on June 28th. It links Sofia with its chief suburb, Kniajevo.

Belgium.—La Société Nationale des Chemins de Fer Vicinaux is about to commence work on the electrification of the local railways between Antwerp and Wyneghem and between Antwerp and Wommelghem.

Germany.—At a recent meeting of the Baden Architects' and Engineers' Association, Herr Meyer stated that water power to the extent of 4,500 million kWh was available in Baden. The cost of electrifying the Mannheim-Basle section of the railway was estimated at £4,000,000, and £2,300,000 for the Mannheim-Heidelburg and Carlsruhe-Heidelberg sections. No date can be fixed for the commencement of the electrification work, as the matter of finance has yet to be settled.

(Continued on page 63.)

The Rugby Radio-Telegraph Station.

Some Notes on the Plant and Constructional Work.

THE accompanying illustrations of some of the plant that is being installed at the radio-telegraph and telephone station which the Government is building at Hillmorton, near Rugby, for communication with India, Australia, and South Africa, convey some idea of the magnitude of the constructional work involved. It is hoped to complete the station, which is being constructed by the Post Office Engineering Department, by the end of this year, and it has already been announced that the Western Electric Co., Ltd., is manufacturing the telephonic apparatus that is being installed, which will make transatlantic radio-telephony possible. Distant control from the Central Telegraph Office in London will be provided by direct land lines.

A general view of the exterior of the power house is shown in fig. 3. Three 500-kW motor-generator sets have been installed for furnishing the h.p. supply to the valves at from 12,000 to 18,000 V; the sets consist of 6,000-V d.c. generators connected in series and driven by synchronous motors. The machine illustrated in fig. 1 is of the British Thomson-Houston Co.'s manufacture, and it will be noticed that its bedplate stands on insulators. Fig. 2 is a view of the main power switchboard, while fig. 4 shows one of three 640-kVA, 12,000/2,200-V, 3-phase, 50-cycle Johnson & Phillips transformers. The station will use 54 metal-glass Western Electric valves, which will be connected in parallel and excited by an auxiliary oscillator. The filament supply will be provided by a 200-kVA, 416-V, 100-cycle synchronous motor alternator, and 700 tons of concrete have been used to build a ferro-concrete reservoir, which will contain the 500,000 gallons of water needed in connection with the cooling system of the transmitting valves.



Fig. 3.—General View of the Power House.

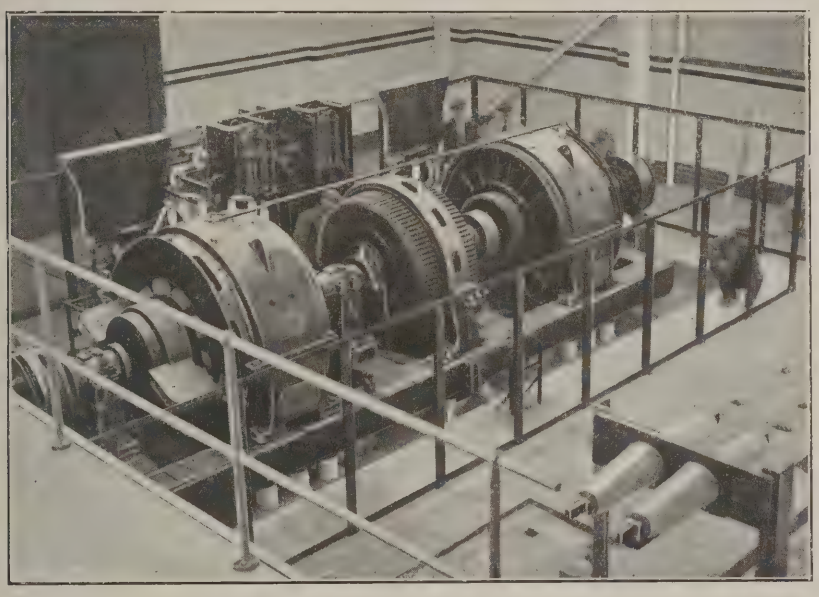


Fig. 1.—One of the 500-kW Motor Generators.

What is claimed to be the world's largest bank of mica condensers is being supplied by the Dubilier Condenser Co. for installation at Rugby. They are constructed in such a manner that should a plate fail, it can be detected and replaced in a short time. Some of the contactor switchgear to be used in the station is being made by the General Electric Co., Ltd. Some 8,000 tons of concrete have been utilised for constructing the mast foundations and the anchor blocks to which the stay ropes are attached. For making stays alone, 3,000 miles of wire have been used; the stay ropes were all made on site, for which purpose

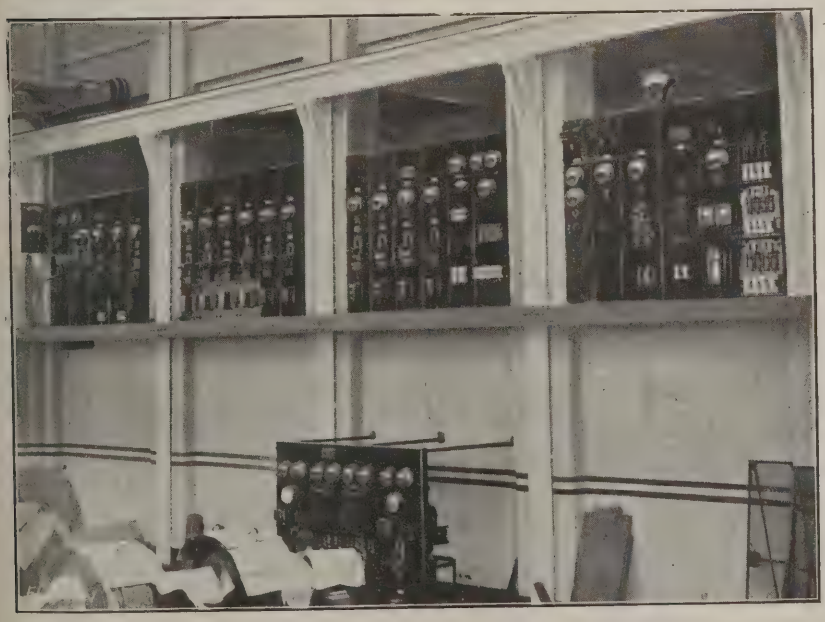


Fig. 2.—Main Power Switchboard.

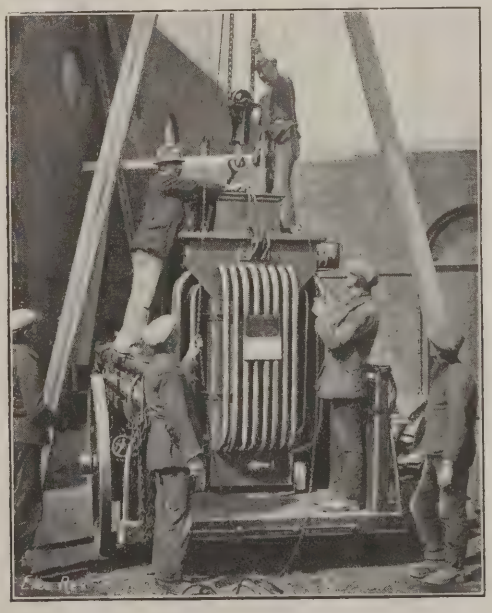


Fig. 4.—Unloading a Power Transformer.

special machinery was provided. The 150 wires, composing each of the largest stays, were drawn out, two by two, and then clamped together mechanically before being bound together with steel wire, the ends of the stays being bent over and fitted into tapered sockets, into which low-temperature melting metal was run so as to bind the ends of the wires.



Fig. 5.—Laying Earth Wires.

The 12 main lattice-steel masts have been nearly completed; they are 820 ft. high, and are supported on porcelain insulators and granite blocks as indicated in fig. 6, the maximum downward thrust of each mast being 400 tons. The aerial will take the form of wire "sausages," which will be supported by means of 12-ft. diameter steel spreaders, the whole being clamped to steel cables that pass down the centres of the masts. The aerial will be $2\frac{3}{4}$ miles in length. Each of the cables will have to withstand a tension strain of 6 tons on a calm day, the masts themselves being designed for a top horizontal pull of 10 tons, but during strong winds these figures will be considerably exceeded, and as a precautionary measure slipping devices have been fitted to the drums of the cable winches, one of which can be seen at the base of the mast in fig. 7. It is of interest to note that the top of a mast has been seen through a telescope to oscillate 3 ft. beyond a central position about its pivotal base. When designing them, however, allowance was made for a deflection of 8 ft., with a safety factor of from 3 to 6.



Fig. 6.—Pivoted Base of Mast.

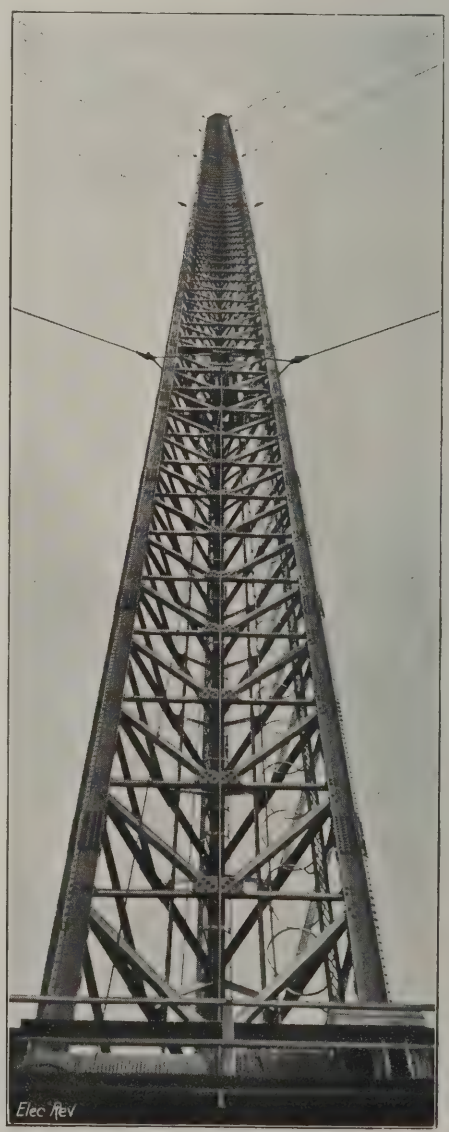


Fig. 7.—An 820-ft. Mast.

The "earth" system consists of about 80 miles of wire laid in the ground with the aid of a plough which was designed and built, with much of the other special plant

in use at Rugby, by the P.O. engineering staff. The plough, fig. 5, in a single operation, cuts a trench less than 1 in. in width, lays the wire, and partly fills in the trench again.

As no plant existed with which the porcelain mast insulators could be adequately tested electrically, a 100-kW steam-electric set was erected at Rugby for the purpose, the 500-volt d.c. being converted into high-frequency current by means of an electric arc and oscillating circuit. Up to April last 2,000 insulators had been tested at a pressure of 15,000 volts and a frequency of 50,000 cycles per second, no insulator being passed if an appreciable rise of temperature was recorded after a period of one hour.

It is noteworthy that the application of this voltage and frequency to defective insulators has occasioned, in some cases, a sufficient rise in temperature to melt the porcelain. It was the failure in this way of some of the Leafield insulators that caused the P.O. Engineering Department to inquire into the behaviour of various insulating materials.



Fig. 10.—Switchboard and some Condensers.

being teak, yellow deal, and satin walnut, all of which are superior to two well-known proprietary synthetic resin and cellulose materials which are generally regarded as suitable for high-frequency work.



Fig. 8.—Testing Aerial Insulators at Rugby.



Fig. 11.—Some of the Valve Panels.

In connection with the manufacture of large inductance coils, investigation has revealed American white-wood (Canary) to be the most suitable material (being quite cool at the end of the test), the next best in order



Fig. 9.—Aerial "Lead-in."

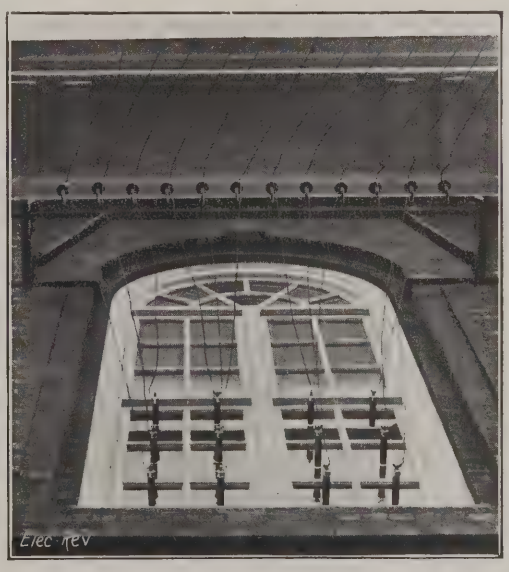


Fig. 12.—Earth "Lead-in."

In conclusion, we have to express our indebtedness to the *Post Office Electrical Engineers' Journal* for permission to reproduce figs. 5 and 6, and for some of the details set out above.

Electricity on a 100-ton Motor Yacht.

The Electrically-Equipped Yacht "Mahceeb."

Successful trials have recently been completed of the 100-ton yacht *Mahceeb*, constructed at Hampton-on-Thames by Messrs. Thornycroft for Mr. Henry Beecham, under the supervision of Messrs. Wells & Kemp, naval architects. The vessel is of the schooner type, having fore and aft rig. It carries two pole masts fitted with foresail, fore staysail and main sails; it is 92 ft. long, the beam being 16 ft. 6 in., and the draught 6 ft. The hull has been constructed to Lloyd's special survey, class



Fig. 1.—The Motor Yacht "Mahceeb.

16, A1, and is built of double skin teak on English oak frames, the decks and covering boards being also of teak.

Equipped with two Thornycroft engines, fitted with reducing and reversing gears, and having a total output of 15 b.h.p., the yacht will attain a speed of nearly 11 knots when running on both engines, and about $8\frac{3}{4}$ knots on one engine. These speeds are said to be remarkably good for a vessel of the given dimensions.

In addition to the main propelling machinery, the engine room is equipped with a Thornycroft M/2 type, 15-b.h.p. generating set, arranged at the forward end. This supplies electrical energy to the capstan, and also for cooking, heating, and lighting purposes throughout the boat. Fuel and oil tanks are arranged at the after end of this compartment, while on the port side are to be found the tool rack and work bench, and space has been provided for water pumps.

The accommodation has been laid out to embody the fullest degree of comfort possible on the dimensions. The headroom throughout is ample; that in the guests' quarters is 7 ft., and in the deckhouse over 6 ft. The owner's cabin, situated just aft of midship, extends the breadth of the yacht. The decoration of this compartment is very attractive, and consists of Indian grey wood framing and panelling, all French polished, the roof being in flatted white. All the furniture is of grey wood, and includes a large double bed, full-height wardrobes on each side, dressing table, settee, and writing desk. A bathroom of good size is arranged on the port side adjoining the owner's cabin, and is reached from the passage running aft. Separate taps provide for hot and cold water and also salt water to both bath and wash basin, a No. 4 Bastian storage electric geyser, ship's pattern, providing the hot water for the bath and the cabins. The guests' staterooms are arranged aft, two being on the port side and one on the starboard. The decoration and furnishing of these rooms are similar to those in the owner's cabin, but in mahogany; a wardrobe is provided in each, and lockers are also arranged underneath the berths. A wash basin with hot and cold water taps is also fitted in each room.

A servants' cabin is situated in proximity to these state rooms, and is fitted up with two berths, the top one being made to hinge up. As in the other compartments, a wardrobe and wash basin are provided. Access to the baggage room and linen cupboard aft is arranged from the servants' cabin. The crew space forward is of good size and fitted with four folding cots, also the usual furniture and fittings. The captain's and engineers' quarters adjoin, and in these are provided two sofa berths and one folding berth with drawers underneath, a hinged table, cupboards and cushioned seat. A large and well-equipped galley and pantry occupy the space between these quarters and the engine room, and is fitted with every electrical convenience. One sectional hob and two ovens are installed for cooking. The hob is fitted with Bastian "Quartzalite" heating elements, which, it is claimed, are immune from damage if milk, &c., is spilt over them, an important consideration aboard ship. The elements are easily removable for cleaning, &c. The ovens are of the light sheet-iron type, and the doors are arranged with glass panels to enable the chef to see the progress inside without opening the doors. The two ovens are built on the multiple unit system, so that additions can be easily arranged. A No. 3 size storage geyser is also fitted in the pantry for general use. As it is intended that meals should be taken in the deck saloon, a lift is provided between this and the pantry directly underneath; a staircase gives direct access to the pantry from the deck. A view of the interior of the pantry, showing the cooking apparatus, &c., is shown in fig. 2.



Fig. 2.—A Corner of the Electrically-equipped Pantry.

Electric fires, fitted with "Quartzalite" elements, are provided in the various compartments. These are of the Adam 1,000- and 500-W patterns, finished to match the decorative schemes.

A view of the *Mahceeb* afloat is shown in fig. 1.

Tramway and Railway Notes.

(*Continued from page 58.*)

Chesterfield.—RAILLESS CARS.—An exhaustive report on the tramway system has been prepared by Mr. G. H. Margrave, the former manager, in which he estimates that the natural life of the present tramway will be reached about two years hence, and recommends the adoption of a railless-car system. He states that the new capital needed for railless traction would be £39,954, with £10,269 additional for interest and sinking fund. To modernise the present system would cost £64,308 capital and £11,423 interest, &c., while petrol 'bus capital would total £35,400, with £12,132 interest. Mr. Margrave estimates a profit of £2,100 on railless cars, a loss of £4,691 on tramways, and a loss of £3,720 on petrol 'buses.

Croydon.—YEAR'S WORKING.—The report on the Corporation tramway undertaking (manager, Mr. T. B. Goodyer) for the year ended March 31st last shows a total revenue of £112,685, as compared with £112,021 in the preceding year. Working expenses amounted to £141,537, and recoverable expenditure charged to revenue £3,796, making a total of £145,333, as against £121,734, leaving a gross deficit of £32,649 (£9,713). Capital charges absorbed £26,188, and there was a net loss of £58,837, as compared with a deficit of £25,543 in 1923-24. The number of car miles run increased from 2,240,584 to 2,570,542, but the number of passengers carried fell from 19,946,512 to 19,552,621.

Ipswich.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (manager, Mr. A. S. Black) for the year ended March 31st last record a total revenue of £41,776 (railless-cars, £4,084), as compared with £42,348 in 1923-24. Working expenses amounted to £35,328 (railless-cars, £3,245), as against £35,254, leaving a gross profit of £6,447 (£7,094). After deducting capital charges, there was a net surplus of £2,937. The number of car-miles run increased from 587,348 to 582,729 (railless cars, 38,565 and 61,698 respectively), and the number of passengers carried from 5,719,168 to 5,922,474.

Kirkcaldy.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking for the year ended May 15th last shows a total revenue of £35,167, and working expenditure of £24,595, leaving a gross profit of £10,572. The figures for the previous year were—revenue, £35,372; working expenses, £24,757; gross profit, £10,615. Capital charges absorbed £6,456, and there was a net profit of £4,116, as compared with £3,838 in 1923-24. The number of car-miles run fell from 429,425 to 426,790, but the number of passengers carried increased from 5,205,865 to 5,543,456.

London.—REOPENING OF KENNINGTON STATION.—The Tube station at Kennington was re-opened for traffic on Monday, July 6th. This station was closed in November, 1923, and has since acted as a base for the engineering operations in connection with the enlarging of the City & South London Railway tunnels and latterly with the new Underground extension from Kennington to Charing Cross. Considerable progress has been made with the elaborate junctions and tunnel work at Kennington, and when this work is completed, trains from the Hampstead or City lines will be able to continue southwards to Clapham and Morden. At the present rate of progress the "Kennington Loop" will be opened for traffic early in 1926, as also will the new extension from Clapham to Morden.

Middlesbrough.—INQUIRY.—A Ministry of Transport inquiry was held on June 25th relative to the Corporation's proposal to widen Newport Road. The estimated cost was stated to be £17,231, of which £15,000 would be expended on a new tramway track.

Sheffield-Rotherham.—RAILWAY ELECTRIFICATION.—In an exhaustive report on road and rail communications to the Rotherham Regional Planning Committee, Mr. W. R. Davidge, a member of the Town Planning Institute has recommended a regular 10-minute railway service between Sheffield and Rotherham, and the electrification of the line.

Telegraph and Telephone Notes.

Azores.—GERMAN CABLE STATION.—An agreement has been concluded between the German and Portuguese Governments whereby the buildings in Horta, Fayal, which belonged to the German Atlantic submarine telegraph cable station, and were taken from it at the outbreak of war, are now to be given back to the company. The German Government, in return, has renounced all right to the German Church in Lisbon, and the German Government and Cable Company also undertake to forgo all claims in the matter against the Portuguese State. The agreement in no way affects the reparations owed by Germany to Portugal.—*Reuter* (Lisbon).

Belgian Congo.—NEW TELEPHONE LINE.—The Compagnie des Chemins de Fer du Congo Superieur au Grands Lacs Africains is erecting a new 430-mile telephone line along its railway system.

Canada.—NEW RADIO STATIONS.—Arrangements are being made by the north-west territories branch of the Department of the Interior to erect three radio stations in the far north. They, it is thought, will help materially the work of the police, navigators, and traders who are cut off from civilisation for so many months in the year. Edmonton, Alberta, will be the southern terminus of the system.—*Reuter* (Ottawa).

Electrophone Service.—As already announced, the electrophone service, which commenced 35 years ago, is being discontinued on account of insufficient use having been made of it since the establishment of radio broadcasting. There were 644 subscribers to the service on June 1st, and it is understood that Lord Wolmer, Assistant Postmaster-General, is willing to discuss the possibilities of granting a licence to a company wishful to provide such a service.

Persia.—THE TELEPHONE SYSTEM.—In 1903 a concession was granted to a group of Persians for 60 years, its terms exempting telephone buildings from all Government taxes, and all equipment consigned to the company from customs duties. The Societe Generale des Telephones de Perse, with headquarters at Teheran, is the present holder of the concession; the owners of two-thirds of the shares of stock must be Persian subjects. The 24 telephone magneto exchanges serve a total of 2,639 subscribers; the subscribers must furnish their own instruments, which are mostly of Swedish manufacture, but there are also Russian and German makes in service. A few American and English instruments are on sale, but are not in general demand. Besides the exchanges belonging to or licensed by the telephone monopoly, there are exchanges in Gilan Province, Resht, Isfahan, and a number of private exchanges bordering the Persian Gulf. The latter are, as a rule, operated by the British military authorities. The central office equipment in Teheran is of Russian manufacture and has been in service about 20 years. There are five branch exchanges and at present 1,350 subscribers, the average number of calls being 414 per day. General reconstruction of the plant is now under way, says *Commerce Reports*, and all of the equipment has been purchased in Germany. Bare iron wire on poles is being replaced in part by underground cables, and hereafter subscribers will not be required to furnish their own instruments. Eleven other exchanges average 66 subscribers each.

Spain.—TELEGRAPH IMPROVEMENTS.—A Government appropriation is announced for the improvement of Spanish telegraph lines and for relaying the cable between Spain and the Canary Islands.

Sweden.—NEW RADIO STATION.—Sweden's largest telegraph establishment, the Trans-Atlantic radio station at Grimeton, near Varber, was opened by the King on July 2nd. After the inauguration, the King addressed a long telegram to President Coolidge, who answered in cordial terms.—*Reuter* (Stockholm).

Radio Notes.

East Africa.—PROPOSED STATION.—Colonel Norman Harrison a director of the Western Electric Co., who has just concluded an investigation into the possibilities of wireless in Kenya and Uganda, advocates the erection of a broadcasting station at Nairobi, with a daylight range of 400 miles, serving the whole of East Africa, says *The Times* Nairobi correspondent. He considers that such a station, coupled with a public address system, would prove invaluable to the Education, Medical, and other Departments. The cost of the proposed station would be at least £10,000.

European Broadcasting Conference.—GENEVA MEETING.—At the invitation of the International Broadcasting Office, representatives of some seventy European broadcasting stations agreed to take part in the technical conference which met at Geneva on July 6th. It is hoped that this conference may discover a solution of the difficult problem of wave lengths. By courtesy of the Secretary-General of the League of Nations, the conference was held in the Palais des Nations.—*Reuter* (Geneva).

Radio on Aircraft.—DELIBERATE INTERFERENCE.—One of the most interesting features of the recent Royal Air Force Display at Hendon was the demonstration of radio-telephone equipment for formation control. This is the first time that such an exhibition has been given to the public. Compactness of apparatus is of vital importance; the Marconi A.D.5 set requires no trailing aerial, the whole of the aerial system being permanently attached to, and insulated from, the wings and fuselage of the aeroplane. The latter's power of manœuvring is thus in no way impaired and a high degree of radiation is maintained by the use of short wavelengths, which have the advantage of freedom of interference from, and with other aircraft and ground sets. The transmitter and receiver are mounted as separate units and remote control enables the apparatus to be mounted in any odd corner of the machine without interfering with the ability of the pilot to operate and adjust it when flying. The disappointing results, both to the spectators on the ground and to listeners generally, of the recent squadron drill at Hendon have been investigated by a joint conference of technical experts of the Royal Air Force and the B.B.C. It has been established that the organisation was complete and that no breakdown of apparatus occurred. There is no doubt that the trouble was due to an extremely powerful heterodyne, and the evidence suggests that this interference was deliberate, although it cannot at present be traced. The incident is the more regrettable as the Royal Air Force had announced the wave-length beforehand, and made a special appeal to the public to refrain from interfering on it.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—SYDNEY.—July 27th. Municipal Council. One 5,000-kVA, 5,000/33,000-V step-up transformer; supply of gas-filled lamps. Specifications from the office of the Construction Engineer, Electricity Department, Town Hall, Sydney.

Postmaster-General's Department.—Automatic c.b. telephone exchange equipment, Canberra exchange.

New South Wales Public Works Department. September 14th. Electrical equipment, machinery, &c., for bascule bridge over Cooks River at General Holmes' Drive.

September 21st. Material and apparatus for complete communication system, Barrenjack hydro-electric scheme.—*Tenders.*

MELBOURNE.—August 3rd. Electricity Commission of Victoria. Switchgear and accessories.

September 14th. 3,000-kVA transformers and spares. Particulars from the Purchasing Section of the Commission, William Street, Melbourne.

Postmaster-General's Department. August 11th. (Sched. C. 26), plugs and sleeves (switchboard). (Sched. C. 25), switchboard cords.

September 15th. Lamps lamp caps, and lamp sockets. Tender forms from High Commissioner, London.

Barking.—July 28th. Electricity and Tramways Department. One 1,000-kW and one 500-kW rotary converters, with oil-cooled transformers and synchronising panels or, alternatively, one 1,000-kW and one 500-kW motor-converters (La Cour type), with starting and synchronising panels, e.h.p. switchboard, 3-wire d.c. switchboard and traction board. (See this issue.)

Belgium.—July 22nd. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Supply and laying at Liége of a quantity of telephone cable, with accessories. Particulars (Cahier des Charges Special No. 3-124) for 5 fr. 30 c.

Bridgend.—July 31st. Penybont Rural District Council. Kenfig Hill electricity scheme. L.p. underground and overhead mains, transformers, switchgear, meters, and house wiring. (June 26th.)

Cardiff.—Education Committee. Electrical wiring and fittings for Council schools at Ely and Mynachdy. Specifications from the City Electrical Engineer, The Hayes, Cardiff.

Dundee.—July 17th. Electricity Department. Steam and exhaust pipes. (June 26th.)

Eccles.—July 15th. Electricity Department. 2,200-V switchboard, consisting of five feeder panels. Specification and form of tender from Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft.

Edinburgh.—July 13th. Electricity Department. Installation of electric lighting at the public wash-house, Abbeymount, Edinburgh. Specifications from Engineer, Dewar Place.

Egypt.—CAIRO.—Inspecting Engineer in London. 3,000 metres submarine cable, underground cables, 10 tons line wire, bolts and nuts, &c.

Grimsby.—August 1st. Electricity Department. Storage battery, booster, and switchgear. (See this issue.)

Hanwell.—July 18th. Central London School District. Extension of the electric lighting installation. Specification from Mr. G. F. Morrell, clerk to the Managers, Greenford Avenue, Hanwell, W.7.

India.—SIMLA.—July 20th. Indian Stores Department. Diesel-engine alternator sets, water-cooling units, oil fuel storage tank, oil-purifier equipment, 10-ton overhead crane, switchboard, cables, transformers, e.h.p. feeder cables, &c.*

July 17th. India Store Department. Porcelain insulators. (See this issue.)

Leeds.—July 15th. Corporation. Electric lighting installation at 40, Park Lane. Particulars from Mr. W. T. Lancashire city engineer, Municipal Buildings.

July 14th. Board of Guardians. Supply of "Osram" electric lamps. Specifications from Mr. J. H. Ford, clerk to Board of Guardians, Poor Law Offices, 11, South Parade.

London.—ST. PANCRAS.—September 3rd. Electricity Department. One 10,000-kW steam turbine, alternator, condensing plant, pipes, &c. (See this issue.)

BETHNAL GREEN.—July 20th. Electricity Department. L.p. cables and switchgear. (See this issue.)

Lymm.—July 13th. Urban District Council. Electrically-driven centrifugal pump. Particulars from Mr. N. Holt, clerk to the Council, Council Offices.

Manchester.—July 16th. Board of Guardians. Electrically-driven booster pumping plant at Booth Hall Infirmary. Particulars from Mr. E. Hargreaves, Union Offices.

July 20th. Electricity Department. Electric cooking ranges, and switches and cut-outs for 12 months. (July 3rd.)

July 14th. Tramways Committee. Span wire brackets for tramway poles; copper trolley wire; copper bonds. Specifications from Mr. H. Mattinson, general manager and chief engineer, Corporation Tramways, 55, Piccadilly, Manchester.

New Zealand.—WELLINGTON.—August 18th. Posts and Telegraph Department. Switchboard plugs.*

INVERCARGILL.—Electricity Department. 2 200 ft. .1 sq. in. 11,000-V cable; 80 ft. .3 sq. in. 3,300-V cable and spares.*

August 17th. Four 667-kVA single-phase transformers.*

MARLBOROUGH.—September 22nd Electric Power Board. Turbines, generators, and switchgear. (B.X. 1,904.)*

South Africa.—JOHANNESBURG.—August 1st. Municipal Council. Twelve a.c. power relays.*

West Ham.—July 20th. Education Committee. Wiring of eight schools. (June 26th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—SYDNEY.—City Council. Accepted:—

Double-braided weatherproof cable (£4,554).—Enfield Cable Works (Aust.), Ltd.
Service boards (£999).—G. Hudson & Sons, Ltd.
10,000-V feeder protective apparatus (£587 and £113).—Australian General Electric Co., Ltd.
5,000-V potential transformers.—Australian General Electric Co., Ltd.
A.c. consumers' meters (£15,287).—Electricity Meter Mfg. Co.

MELBOURNE.—Department of Works and Railways.

7 motors at City South Telephone Exchange, Sydney (£728).—Siemens Bros. & Co., Ltd. —*TENDERS.*

Belgium.—Belgian, Swiss, and British (Metropolitan-Vickers, Ltd.) firms submitted tenders last week to the municipal authorities of Schaerbeek, Brussels, for the supply of 112 h.p. and l.p. electricity meters. The lowest offer was that of the New Antwerp Telephone and Electrical Works Co.

Birkenhead.—Tramways Committee. Accepted:—

Electrical equipment at tramways depôt (£2,961).—British Thomson-Houston Co., Ltd.

Birmingham.—Education Committee. Accepted:—

Electric lighting installation at Billesley elementary school (£435).—R. H. Newton.

Corporation. Accepted:—

Three double-deck railless cars.—Railless, Ltd.

Burton-on-Trent.—Electricity Committee. Accepted:—

Mains (£2,885).—Johnson & Phillips, Ltd.
Switchgear (£481); switchgear and transformers (£1,605).—Ferguson, Pailin, Ltd.

Canterbury.—Town Council. Accepted—

2,300 yd. of cable (£1,897).—Western Electric Co., Ltd.

Dundee.—Corporation. Accepted:—

Electric lighting installation at 216 houses at Dudhope (£1,696).—R. Kilpatrick & Co.

Hawarden.—Rural Council. Accepted:—

Five sub-station transformers (£499).—General Electric Co., Ltd.
Switchgear (£972).—Powell Lighting Supplies Co., Ltd.

Hull.—Electricity Committee. Accepted:—

Two 7,000-kW turbo-alternators:—

	Steam Consumption. (lb. per kW hr.).	Price.
Oerlikon, Ltd.	11.20	£43,042
Escher Wyss & Co.	10.72	53,176
English Electric Co., Ltd.	11.06	56,812
James Howden & Co., Ltd.	11.00	57,640
Ditto	11.00	57,681
C. A. Parsons & Co., Ltd.	11.00	57,720*
Brush Electrical Engineering Co., Ltd. (Accepted.)	10.67	**57,823**
British Thomson-Houston Co., Ltd.	11.10	57,988
Ditto	11.10	58,319
Ditto	11.10	58,834
Fraser & Chalmers	10.80	59,251
British Thomson-Houston Co., Ltd.	11.10	59,304
Metropolitan-Vickers Electrical Co., Ltd. ...	10.66	61,430
C. A. Parsons & Co., Ltd.	10.42	62,280*
Richardsons, Westgarth & Co., Ltd.	11.27	76,036

*7,500 kW.

Telephones Committee. Switchboards:—

British L. M. Ericsson Manufacturing Co., Ltd.	(Accepted.)	**£298**
Western Electric Co., Ltd.		325
Peel-Conner Telephone Works, Ltd.		299

Lamp Contracts.—The Royal Mail Steam Packet Co. has placed a contract for a 12 months' supply of gasfilled lamps and an order for a large number of metal-filament and carbon-filament lamps with the Siemens & English Electric Lamp Co., Ltd.

The Edison Swan Electric Co., Ltd., has received an order from the Great Southern Railway of Ireland for six months' supply of electric lamps.

Leeds.—Tramways Committee. Accepted:—

50 gear wheels (£444).—National Steel Foundry (1914), Ltd.
150 pinions (£139).—W. Muir & Co., Ltd.

Electricity Committee. Accepted:—

Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£7,485); Enfield Cable Works, Ltd. (£3,499); Macintosh Cable Co., Ltd. (£2,664).
Meters (£3,900).—Measurement, Ltd.

Libraries Committee. Accepted:—

Electric lighting installation, Alexander Street premises (£184).—Cloke's Extension, Ltd.

London.—ST. PANCRAS.—Electricity Committee. Recommended :—

Coal for the electricity station for eight months from August 1st :—

15,400 tons Bentinck Derby main slack, ¾ to 1 in. (22s. 5d. per ton); 7,200 tons Stanton Deep nutty slack (21s. 11d. per ton).—J. H. Beattie and Co., Ltd.

GREAT WESTERN RAILWAY CO.

Six petrol-electric mobile cranes.—Ransomes & Rapier, Ltd.

Manchester.—The City Council at its meeting last week, by 77 votes to 17, rejected the recommendation of the Tramways Committee to place a £5,000 contract for tramway track work with the United States Steel Products Co. The *Manchester Guardian* states that at one time during the discussion there seemed to be a possibility of the old fiscal controversy being reintroduced but eventually the Council took the view that the tender should not be accepted, mainly because of the unemployment in this country, and because evidence was produced to the effect that the conditions of employment in the American firm did not conform with the provisions of the Fair Contracts Clause of the Standing Orders of the Manchester Corporation. By an overwhelming majority the Tramways Committee was instructed to accept the lowest English tender for this particular work.

Oldham.—Electricity Committee. Accepted:—

Transformers.—Ferranti, Ltd.

Rotherham.—Electricity Committee. Accepted:—

250-kW transformer (£217).—General Electric Co., Ltd.

Sheffield.—Tramways Committee. Accepted:—

750 tons of tramway rails (£8,250).—Steel, Peech & Tozer, Ltd.
Copper bonds (£92).—British Insulated & Helsby Cables, Ltd.
Three 500-kVA transformers (£1,233).—British Electric Transformer Co., Ltd.
Ropeway extension at Neepsend power station (£2,145).—R. White & Sons, Ltd.

Sleaford.—Urban Council. Accepted:—

Additions to station (£849).—Banks & Son.
Switchboard (£107).—Edison Swan Electric Co., Ltd.
Oil engine (£4,960).—Premier Gas Engine Co., Ltd.
Generator (£1,450).—General Electric Co., Ltd.

South Africa.—JOHANNESBURG.—Department of Posts and Telegraphs. Accepted :—

Apparatus for automatic telephone exchange, Kloof, Natal (£1,532).—Siemens Bros & Co., Ltd.

DURBAN.—Municipal Council.

5 miles .25 sq. in., 6,600-V cable (£7,539); 1½ miles .1-in. ditto (£1,065); 1 ton bare copper wire (£90).—T. Barlow & Sons, Ltd.
10 "Falco" electric stoves and 1 bath heater, for the fire station (married quarters) (£204).—J. F. Chapman.
One 250-kVA, 3-phase transformer (£185).—Ferranti, Ltd.
1½ miles .06 sq. in. 6,600-V cable (£1,000).—R. D. Lavery & Co., Ltd.
Watt-hour meters.—Metropolitan-Vickers Electrical Co., Ltd. (£611); Vincent & Pullar, Ltd. (£392).
Two 250-kVA single-phase transformers (£414).—Vincent & Pullar, Ltd.
One telpher hoist for ash removal at power station (£785).—R. Dempster and Son, Ltd.—*South African Power Engineer.*

Notes.

Traffic Control Device.—Experiments are being made in Berlin at night with electrically-lighted street "islands," which will afford policemen on point duty a safe stand. The light is thrown upwards from the ground on to the traffic controllers so that their signals can be seen clearly from a distance, says the *Daily Mail*. In winter the "islands" will be heated.

Electrical Exhibits at the Royal Agricultural Show.—About 50 of the stands at the Royal Agricultural Show of England, which is being held at Chester this week (July 7th to 11th), are electrically equipped, energy being supplied free of charge by the Chester Corporation, to which must be given credit for having persuaded the R.A.S.E. to agree to the wiring of stands. One and a half miles of overhead transmission is employed. The Electricity Department of the Corporation has a stand where demonstrations are being given, showing the utility of electricity in the homestead and on the farm, in numerous directions. Mr. S. E. Britton, M.I.E.E., M.I.Mech.E., city electrical engineer, informed our representative that his department was "all out" to dissipate some of the prejudiced and ill-informed ideas concerning the use of electricity in agriculture. The purposes for which electric power is used on various stands at the Royal Show are :—Refrigerating, milking and milk cooling, corn grinding and milling, conveyors, ploughing, mole draining, cultivators, winnowing, barley dressing, seed cleaning, churning and separators, thrashing machinery, water pumping, pasteurising, barn machinery, bottle washing, bacon slicing, oil refining, heating and driving linotype machinery, crop drying, lighting, heating, fans, and for general purposes. On Wednesday morning (July 8th) there was to be an Electro-Farming Conference, at which Lord Bledisloe, K.B.E., was to preside, and Sir E. John Russell, D.Sc., F.R.S., was to deliver a speech from the point of view of the agriculturist. Mr. S. E. Britton and Mr. R. Borlase Matthews were also down to speak on the practical applications of electricity to agriculture.

Fire.—On July 6th, the premises of the Brighton Supply Stores, Gloucester Road, Brighton, were badly damaged by fire and water. The shop was stocked with electrical and radio accessories.

Appointments Vacant.—Fitter-Driver (67s. 3d.), for Severalls Mental Hospital, Colchester. Lady Demonstrator (£182) for the Borough of Cheltenham electricity department. Charge Engineer for the St. Helens Corporation electricity department. Charge Engineer for the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board. Meter Tester and Repairer for the Eastbourne Corporation Electricity Department. Junior Draughtsman for the Cardiff Corporation Electricity Department. Junior Electrical Testing Assistant for Salford Borough Council Electricity Department.

Transformer Oil Problems.—The American National Electric Light Association's 1925 Electrical Apparatus Committee has reported that some difficulties have been experienced through the congealing of oil in transformers that have been subjected to extremely low temperatures, and a few examples are cited in *Power*. Freezing in the pipe connection between the transformer and the conservator tank has occurred in several cases, and a remedy has been found in covering the pipes with a heavy lagging of heat insulating material which in some cases has been supplemented with a small electric heater. In one case the temperature of the transformer was noticed to rise, due apparently to the oil congealing and impeding the circulation through the radiators; after applying external heat for a short time to the lower end of the radiators, free circulation was established and the transformer temperature reduced. A case of the sludging of transformer oil is also reported; investigations indicated that the deterioration of oil varied considerably with transformers of different make, but the possible causes have not yet been determined. The causes of the deterioration of oil for use in transformers and oil circuit breakers are engaging the serious attention of several manufacturers of equipment for filtering and cleaning oil. In addition to the well-known methods, using blotter filters and centrifugal separators, other methods, involving supplementary treatment, are being tried in which certain reagents are introduced into the oil to absorb impurities, and separated out again, leaving a clean oil.

Coosa River Hydro Project. — According to *Power*, the Alabama Power Co. has filed an application with the Federal Power Commission for licence to build a hydro-electric power dam on the Coosa River 15 miles above Montgomery, Ala. It proposes to complete the scheme within three years, commencing in December next. The dam is to be 90 ft. high with an initial installation of 72,000 h.p., estimated to cost $13,500,000. It will complete about 65 miles of navigation pool created by the power dams of this company on the 116-mile non-navigable stretch of the Coosa River between Gadsden and Montgomery. The pools submerge several small low locks and dams built by the Government more than a third of a century ago to improve navigation, but which have long since been abandoned.

A Substitute for the Liquid-air Trap for Mercury Vapour.—In an interesting letter published in *Nature* of June 27th, Messrs. A. Ll. Hughes and F. E. Poindexter, of Washington University, U.S.A., refer to the disadvantages of the liquid-air trap for mercury vapour in the mercury vapour condensation pump, and state that in the course of a search for an alternative method of trapping mercury vapour, they have found that the alkali metals have an extraordinary power of absorbing mercury vapour. Their practice is to put a small piece of sodium or potassium into a trap between the diffusion pump and the apparatus to be exhausted, and to distil it, after the vacuum has been obtained, on to the sides of the trap, thus lining it with the metal for a few centimetres. Using an ionisation gauge for the vessel to be exhausted, they have found that the pressure of mercury vapour in it with a potassium-lined trap between it and the pump is certainly less than 5×10^{-9} mm. By making direct comparisons between the trapping power of a potassium-lined tube and that of the usual liquid-air trap, the same ionisation gauge measuring the pressure reduction, they have found that the potassium-lined trap is quite as satisfactory as liquid air. The residual pressures obtained in various tests seemed to depend entirely upon the vigour with which the ionisation gauge and connecting tubes were outgassed by heat treatment before the measurements were made, and not at all upon whether liquid air or metallic potassium was used to trap the mercury. In one test, in which sodium was the active metal, the pressure in the ionisation gauge beyond the trap after 25 days was within 50 per cent. of its initial value (2×10^{-7} mm.).

In a second test, they used the first appearance of mercury lines in the spectrum of helium, at less than 0.01 mm. pressure, as a criterion of the diminution of the trapping power of a potassium-lined trap for mercury vapour. The mercury lines did not appear until the eleventh week, in which time the potassium had absorbed a little more than 150 per cent. of its own weight of mercury.

Report on a Nottingham Breakdown.—A recent dislocation of the Nottingham electricity supply, involving an entire stoppage throughout one day of the tramways and the partial holding up of the supply for illuminating and general motive purposes, formed the subject of reference at a meeting of the City Council on July 6th, when Alderman E. Huntsman, chairman of the Electricity Committee, explained that investigations as to the firing of the cables at the St. Ann's Well Road generating station, which was the cause of the mischief, showed that the outbreak did not originate through electrical

defects. It had been mistakenly conjectured that it was due to the overloading of some of the cables from the station into the general system. That erroneous idea was, however, discounted by the fact that a minute examination of the copper conductor disclosed no traces of fusion or melting. The fire happened early in the morning, when the load was well below the normal. An official sent down by the Board of Trade and a representative of Messrs. Callender's Cable and Construction Co., Ltd., who were doing work for the Corporation in connection with the extension of the present system, had participated in making independent investigations, with the result that they coincided in the view that the cause of the fire was not electrical. The cables were in a subway, and at this time of the year, and with a certain temperature in the cables themselves, everything was abnormally dry. The only possible explanation of the affair was that possibly a match or a cigarette end thrown through a ventilating aperture in the subway fell on one of the cables. There was a tendency to draught in the subway, and when one cable burnt, the others were soon alight. That, Alderman Huntsman concluded, was the only possible explanation of the whole trouble.

Cheap Electricity Promised. — Speaking at Bradford recently, Lieutenant-Colonel Moore-Brabazon, Parliamentary Secretary to the Ministry of Transport, said he hoped that if a Bill to be introduced in the autumn was passed this country would have electricity cheaper than anywhere else. With its coal-reserve England was one of the best countries in the world for the cheap generation of electricity, which meant so much to an industrial nation.—*The Times.*

A Tasmanian Appointment.—A newspaper report just to hand, and dated May 16th, states that 12 applications were received for the position of general manager and chief engineer of the Tasmanian Hydro-Electric Department. Eleven came from within Tasmania and the mainland, and one from South Africa. The position carries a salary of £1,250 a year, with an annual increase of £50, to a maximum of £1,500. The Cabinet was to consider the applications.

Transport of a Large Stator.—A new M.V. stator for the 25,000-kW generator at Lister Drive power station, Liverpool, has recently been delivered. Weighing 91 tons, this was sent by road from Manchester, being hauled on a specially built bogie weighing 16 tons, by three large road tractors. Thus the total load was 107 tons. The journey of 40 miles occupied fifteen hours' travelling time.

The Contractor and Electric Farming.—In his speech at this year's annual dinner of the Electrical Contractors' Association, Mr. W. Riggs, the president, made reference to the opportunities which would be presented to contractors when rural electrification was seriously undertaken in this country.

In preparing for this the contractor must bear in mind that the class of work which he will have to undertake has many aspects which are absent from other installation work, but should be given the fullest consideration to ensure complete satisfaction with electrical methods. Some of these points are dealt with in an article which recently appeared in *The Electragist* (the United States contractor-dealers' organ) and they seem to be worthy of reproduction. The general remoteness of farms from any contractor's premises and from a fire station makes it imperative that installations shall be as free as it is humanly possible to make them from interruptions and fire risks. This should always be the aim, of course, but it may be necessary in the case of rural installations to take extraordinary precautions. In barns there is always a danger of wires being gnawed by rats and our American contemporary suggests the use of an all-metal system of the flexible or conduit types. Much of the outside work on the farm will be done by a single portable motor which will have a wide range to cover. Efforts should therefore be made to provide a large number of plug-in points to obviate the use of great lengths of cable. The rearrangement of farm machinery may be suggested, as the bringing of as much of it as possible into a small area will save a great deal of wiring.

It is worth the while of any contractor to obtain diagrams of several typical farm buildings in his area and if he is not already thoroughly acquainted with working conditions on farms, to learn what they are. So seemingly unimportant a matter as the position of a switch with reference to a stable door, the stalls and the runway, may be a matter of considerable importance to the farmer. Farm wiring systems should be planned with the thought in mind that, eventually, power will be obtained from a rural distribution line even where the establishment has its own small power plant. It should also be remembered that the use of electricity for some farm processes will almost inevitably lead to its use for other purposes and preparation should be made for such extensions to facilitate them when they are called for. It is also fair to assume that many of the heavier electrically-driven machines, such as thrashers, hay balers, &c., will be taken from farm to farm. Provision should be made for attaching them most conveniently and efficiently.

After pointing out the benefits which will accrue from the electrification of farms, the writer says that the contractor will play an important part in furthering the business. "More than this, he will do much to promote or retard it by the kind of work he does, which will involve careful planning the best of workmanship, and the use of quality materials."

Staveley Coal Co.'s New Plant.—The Staveley Coal and Iron Company has installed what is said to be the largest gas engine in the country for the purpose of increasing its output of electricity, and this was recently set in motion. The new engine is operated by waste gas from the blast furnaces, and generates sufficient energy to supply the district within a 30-mile radius. The company owns about 10,000 houses, most of which are supplied with electricity on the weekly payment system.

H.p. Pirelli Cable for New York.—We learn from *Power* that a new underground 132,000-V cable of the Pirelli type, the patent rights on which were recently secured by the American G.E.C. from the Italian electrical firm, is about to be installed in the Bronx for the New York Edison Co. This new line, costing about $2,500,000, will be used to link up the generating stations of the New York Edison Co. and its allied companies, which is calculated to render available 120,000 h.p. additional for this section. The new cable, which will be only 3 in. in diameter, will be placed in concrete ducts four or five feet deep. It is said that it will be the highest-pressure cable ever installed in America and probably in the world.

Institution Notes.

Institution of Electrical Engineers.—CONVERSAZIONE.—On Thursday last week the annual conversazione of the Institution was held at the Natural History Museum, South Kensington, London, the guests being received by the President, Mr. W. B. Woodhouse, and Mrs. Woodhouse, with members of the Council. Music was provided by the string band of the Royal Engineers under Lieut. Neville Flux, F.R.A.M., and a concert was given by the Gresham Singers and other artistes. There was a large attendance, though not quite so many were present as there were last year, fewer members from provincial Centres being met with on this occasion. The arrangements were as usual admirably organised, and the function was very enjoyable. The central hall was lighted with powerful gasfilled lamps, and although these were at a considerable height the fact that they were wholly unscreened was unpleasantly noticeable; doubtless the Institution was in no way responsible for this lapse from good practice, but the lamps must have been fixed by someone professing to be an electrician, and the attention of the Trustees might well be drawn to the crudity of the method adopted. In the West Wing very appropriate fittings have been installed.

Association of Mining Electrical Engineers.—It is necessary to correct some of the statements contained in the report which appeared under the above heading in our issue of June 26th. The meeting referred to as the summer meeting was the annual general meeting of the Association, held in Cardiff at the invitation of the South Wales branch. It should also be noted that Mr. Theodore Stretton is the new president of the Association, who with the vice-presidents, Messrs. D. Martin, O.B.E., and G. M. Harvey, and the hon. treasurer, Mr. Alex. Anderson, was elected at the meeting. The meeting at which Major David's paper was discussed was a joint meeting of the Association of Mining Electrical Engineers, the Western Centre of the I.E.E., and the South Wales Institute of Engineers. This meeting was presided over by Mr. Spence Thomas, president of the South Wales Institute of Engineers, who was supported by Mr. Theodore Stretton and by Mr. A. C. MacWhirter, past chairman of the Western Centre of the I.E.E. The dinner held at the Park Hotel was the Association's annual dinner.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

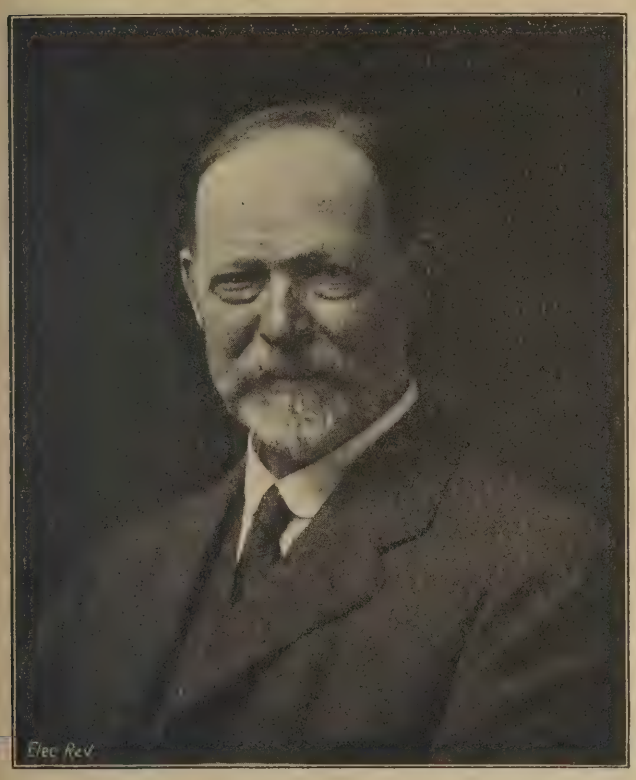
On the motion of Alderman Aspinall, a resolution of Bolton Tramways Committee raising the salaries of the tramway manager and two of his staff by two years' increments instead of one, was defeated at a recent Town Council meeting.

Mr. HUGH CASEY, on his retirement on pension from the chief collectorship of the Londonderry Corporation Electricity Department, has been presented with a wallet of Treasury notes.

The honorary degree of Doctor of Laws has been conferred upon Mr. SAMUEL INSULL, president of the Commonwealth Edison Co., of Chicago, by the North-West University. The *Electrical World* records the following tribute paid to him by the Dean:—"Pioneer in public utility development, president and moving spirit of the Chicago Civic Opera Company, trustee of St. Luke's Hospital and active worker in its behalf, chairman of the Illinois State Council of Defence, patron of music, humanitarian and public-spirited citizen, a leader in civic and industrial progress."

Messrs. Vickers, Ltd., Naval Construction Works, Barrow, announce that Mr. G. W. JACKSON, Mr. W. E. PRICHARD, and Mr. J. CALLANDER, have been appointed special directors of the company. Mr. Jackson and Mr. Pritchard are at the head of the commercial department of the Barrow establishment, and Mr. Callander was recently appointed general manager of the engineering departments.

The president of the International Congress of Radiology which was held in London last week is Mr. CHARLES THURSTON HOLLAND, C.L., Ch.M. Mr. Holland, whose portrait accompanies this note, is one of the leading British radiologists, and



Mr. C. Thurston Holland, D.L., Ch.M.
President of the International Congress of Radiology.

he was one of the pioneers of X-ray work, having commenced the study and practice of the subject in 1896. He was an original member of the Röntgen Society, of which he has twice been president.

Among the distinguished foreign delegates to the Congress was M. LE DUC DE BROGLIE, who has for a number of years taken a leading part in physical research in France. He is well known in this country having been connected, as French representative, with the Admiralty Inventions Board during the war. He has read papers before the British Association and other British scientific bodies, is an honorary member of the Royal Institution of Great Britain, and a doctor, *honoris causâ*, of the Oxford and Leeds Universities. The Duc de Broglie delivered the eighth Silvanus Thompson Memorial Lecture on July 1st.

At the Helsby offices of the British Insulated & Helsby Cables, Ltd., last week, Mr. H. HARDING, a member of the technical staff was presented with a leather suit-case, subscribed for by his colleagues on the technical staff. He is taking up a position on the Prescot works contract staff. The presentation was made by Mr. W. J. Britland.

The daily Press is informed that the head of the Wireless Research Laboratories of the Royal Air Force, Dr. JAMES ROBINSON, has tendered his resignation to the Air Ministry, in order to take up the post of Director of Research to the group of periodicals produced by the Radio Press, Ltd. Dr. Robinson received a large sum for his war inventions from the Royal Commission on Awards to Inventors, his radio navigating apparatus for aeroplanes being used in the Royal Air Force.

Mr. Z. H. KINGDON, who has been superintending electrical engineer at Devonport since 1908, and was recently awarded the O.B.E., is about to retire. He will be succeeded by Mr. H. F. HUNT, superintending electrical engineer at Rosyth Dockyard. Since Mr. Kingdon took up his post at Devonport Dockyard the electrical staff has increased from 450 to 1,300.

At a gathering of all grades of the electrical department at Devonport Dockyard on Friday last, a presentation was made to Mr. KINGDON, in the form of a grandfather clock. Mr. E. E. Benham, senior electrical engineer, expressed the regret of all at parting with Mr. Kingdon, who was appointed 17 years ago and had set before them a very high standard of personal duty. Mr. H. Simpson, representing the skilled labourers, spoke of Mr. Kingdon's ready sympathy with them at all times. Tributes to the retiring chief were also paid by Messrs. W. J. Wooton, who presided; W. McClelland, Director of Electrical Engineering, on behalf of the Admiralty staffs, and several other colleagues and Mr. Kingdon, in reply, said that their aim as fellow workers was to keep the Navy efficient, and the position the department now held was due more to those who helped him than to himself. He then introduced to the gathering his successor, Mr. Hunt. A gold anchor brooch and a bouquet were presented to Miss Kingdon.

With reference to the appointments of Messrs. H. C. LAMB and H. A. RATCLIFFE as chief engineer and manager, and deputy chief engineer at Manchester, the Council, in confirming the recommendations of the Establishment Committee, which were given on p. 27 of our last issue, altered the salaries to £2,000 and £1,150 respectively. The Electricity Committee has placed on record its high appreciation of the services of Mr. S. L. PEARCE, extended over a period of 24 years, and while regretting its loss "is not unmindful of the high honour conferred upon the Manchester Corporation" by the Government in asking Mr. Pearce to become an Electricity Commissioner. An Australian newspaper recently to hand quotes from a letter written by Mr. Pearce expressing regret that the Sydney City Council has decided to disregard his recommendation in respect of the agreement with the Railway Commissioners and the new power house and hoping that some means may be found of averting what he would regard "as a disaster both for the City and the State."

Mr. JOHN RICHARDSON has been appointed working electrical engineer under the electricity scheme of the Hawarden Rural District Council. There were 290 applicants from whom a short list of three was selected to appear before the Council.

Mr. E. C. WANSBROUGH having relinquished the secretaryship of the Electrical Accessories Manufacturers' Association, all correspondence should for the present be addressed to Mr. J. N. Stephens, the chairman of the Association, at 39, St. James's Street, S.W.1.

Mr. R. S. HERBERT, assistant mains engineer, Oldham Corporation electricity department, has resigned to accept an appointment in Singapore.

When the Birmingham Tramways Department's Social Athletic and Thrift Society celebrated its coming-of-age at the Town Hall on July 1st, Mr. ALFRED BAKER, the manager of the department, who has been president of the Society since its formation 21 years ago, was presented with a model omnibus, oxidised finish and having silver panels for windows. The upper half of the model takes the form of a cigarette box.

The Oldham Town Council has been recommended by the Tramways Committee to grant the following increases of salary:—Mr. J. F. RICHARDS, works superintendent, from £300 per annum, plus £85 7s. 4d. bonus, to £350, plus the same bonus; Mr. J. S. SMITH chief cashier, from £221 per annum, plus £71 18s. 8d. bonus, to £271, with the same bonus; Mr. M. MULLIN, traffic superintendent, from £276 per annum, plus £38 bonus, to £326 per annum, plus the same bonus.

The Staffing Sub-Committee of the Crewe Town Council recommended that the salary of Mr. DENTON, electrical engineer, be in accordance with the scale fixed by the Association, less 5 per cent. reduction. This would advance him from £660 per annum, less 5 per cent., to £725 per annum, less 5 per cent. The General Purposes Committee has, however, by the chairman's casting vote, referred the matter back for further consideration.

Worcester Corporation Electricity Committee recommends that the salary of Mr. SHAW, the chief electrical engineer, be increased to £1,000.

Dr. T. F. WALL has been appointed head of the electrical engineering department in the University of Sheffield.

On Tuesday afternoon, in the Lord Mayor's Parlour, at the Town Hall, Manchester, a public presentation was made to Mr. S. L. PEARCE, on the occasion of his vacating the various offices which he has held apart from his Manchester position.

Mr. W. CHAMBERLAIN, late tramway manager and engineer at Oldham, who has left for Leeds, has been presented by the chief officials of the Oldham Corporation with a piece of silver plate.

We are asked to state that Mr. A. G. M. MICHELL, of Michell Bearings, Ltd., Crankless Engines, Ltd., and Crankless (European Patents) Proprietary, Ltd., has recently arrived from Australia, and has opened an office at 20, Grosvenor Gardens, London, S.W.1.

In our "Lighting and Power" Note under Dover last week we inadvertently gave the name of the engineer as Mr. H. D. Munro. We regret the error. Mr. R. C. HARPUR, A.M.I.E.E., is borough electrical engineer at Dover.

Obituary.—MR. E. W. ROBINSON.—We regret to record the death which occurred in hospital of enteric fever, on June 24th, of Mr. Erik Watney Robinson, of Kingston-on-Thames. Mr. Robinson, who was the youngest son of the late Mr. Mark Robinson (Willans & Robinson, Ltd.), was 37 years of age. He was an electrical engineer with a London firm. At the outbreak of war he enlisted in the Grenadier Guards and later he was given a commission in the Royal Worcester Regiment.

MR. W. FINNERTY.—*The Times* records the death, which occurred on July 3rd, at Cherbourg, France, of Mr. William Finnerty, of Bedford Park, "for many years with the International General Electric Co. of New York."

Wills.—The late MR. ARTHUR JACOB left £2,201 net and £4,465 gross personalty.

Mr. W. SEYMOUR, electrical engineer (W. Seymour & Co. London, S.W.), left £2,299 net and £5,620 gross personalty.

New Companies Registered.

New Wilson Electrical Manufacturing Co., Ltd. (206,993).—Private company. Registered July 1st. Capital, £500 in 400 12½ per cent. cumulative preference shares of £1 each and 2,000 ordinary shares of 1s. each. Objects: To acquire from C. F. Adolph and Winifred Bryce-Wilson letters patent and provisional protections Nos. 8,574/25 and 13,516/25 for valveless amplifiers for crystal wireless sets and any secret or other information, process or formula of the said C. F. Adolph, &c. The directors are:—Brig.-General O. K. Chance (permanent director and chairman), Rothmans, Great Baddow, Essex (sales manager to British Cyanides Co., Ltd.); Mrs. Winifred Bryce-Wilson, 41, Denbigh Street, Victoria, S.W.; M. Stephany, 68, Melrose Avenue, Cricklewood, N.W.2. Qualification, £1. Solicitors: Peacock & Goddard, 3, South Square, Gray's Inn, W.C.1. Registered office: 65/6, Basinghall Street, E.C.2.

Lincoln Wireless Co., Ltd. (207,015).—Private company. Registered July 2nd. Capital, £1,200 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless telegraphic and telephonic apparatus, valves, instruments, equipment, accessories, electrical, X-ray, magnetic and radioactive instruments and apparatus, &c. The directors are:—R. H. Harrison, 79, Newland Street West, Lincoln, wireless engineer; O. H. Waterton, 19, Tennyson Street, Lincoln, wireless engineer; H. Waterton, 19, Tennyson Street, Lincoln, tailor. Qualification, 25 shares. Remuneration as fixed by the company. Secretary: R. H. Harrison. Solicitors: Langley, Stevens & Phillips, 34, Silver Street, Lincoln. Registered office: 30, Newland Street West, Lincoln.

O. S. Choppin & Co., Ltd. (207,018).—Private company. Registered July 2nd. Capital, £1,000 in £1 shares. Objects: To acquire the business of electrical engineers carried on by O. S. Choppin & Co., at 41, Lower Belgrave Street, S.W.1. The first directors are: O. S. Choppin, Oakwood, Herne Bay Road, Whitstable, electrical engineer; M. C. Creswell, 45, Hillcourt Road, East Dulwich, S.E.22, electrical engineer. O. S. Choppin is permanent governing director subject to holding 500 shares. Solicitors: Doyle, Devonshire & Co., 14, Bedford Row, W.C. Registered office: 41, Lower Belgrave Street, S.W.1.

Official Returns of Electrical Companies.

Henry Joseph & Co., Ltd.—R. G. Sidford, of 36, Southampton Street, Strand, W.C., was appointed receiver on June 18th, 1925, under powers contained in debentures dated May 16th, 1924.

Electrical Insulating Composition Co., Ltd.—J. Lucas, of 26, Lirley Street, Blackpool, incorporated accountant, was appointed receiver on June 19th, 1925, under powers contained in debenture dated September 10th, 1924.

E. S. Company, Ltd.—B. A. Smith, F.C.A., of 11, Queen Victoria Street, was appointed receiver and manager on June 26th, 1925, under powers contained in first mortgage debenture dated November 17th, 1920.

Dawlish Electric Light and Power Co., Ltd.—Satisfaction to the further extent of £500 (balance) on May 25th, 1925, of mortgage debenture dated September 24th, 1920, securing £2,000.

Néon Lights (1923), Ltd.—Satisfaction in full on June 3rd, 1925, of debenture dated October 30th, 1924, securing £1,500.

Debenture dated June 17th, 1925, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Major T. G. Pollock, 2, South Parade, Southsea.

Sudan Light and Power Co., Ltd.—A trust deed dated June 20th, 1925, to secure £400,000 debenture stock and all sums paid by the guarantors thereof, charged on the benefit of two agreements dated January 10th, 1925, with Lt.-Col. Schuster, C.B.E., M.C., and moneys payable thereunder and the company's undertaking and property, present and future, including uncalled capital, has been registered. The trustees are: Debenture Corporation, 4, Walbrook, E.C. The guarantors are: Commissioners of H.M. Treasury.

Orling's Telegraph Instruments Syndicate, Ltd.—Issue on June 17th, 1925, of £25 debentures, part of a series already registered.

W. R. Harding & Co., Ltd.—Debenture dated June 12th, 1925, to secure £325, charged on the company's property, present and future, including uncalled capital. Holder: Business Investments, Ltd., 172, Bishopsgate, E.C.2.

Rushden and District Electric Supply Co., Ltd.—Satisfaction in full on June 15th, 1925, of two charges, dated March 28th, 1914, and January 10th, 1921, securing all moneys due or to become due from the company to the Northamptonshire Union Bank, Ltd. (now the National Provincial Bank, Ltd.).

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Kalgoorlie Electric Power and Lighting Corporation, Ltd.

The annual meeting of this company was held on July 2nd. Mr. G. C. Howard who presided, in moving the adoption of the report and accounts (*vide* our last issue, p. 29), said that the balance was much greater than that of the preceding year. The item "Properties, buildings and plant," had been increased by £16,200, representing the cost of a 1,000-kW Belliss & Morcom turbo-generator. This new set was put into operation in February last and was running well and justifying its cost. The plant would probably be fully loaded by the end of the current year and the installation of a further set was under consideration. Their manager, Mr. Marmion, had given evidence before a Commission which the Government had appointed to investigate mining conditions in Kalgoorlie with a view to possible improvements. He had promised that the company would extend its plant to enable the mines to draw their whole power requirements from it at an economical cost. The Commission had recommended the amalgamation of the seven existing mines and the scrapping of obsolete plant. The use of central power and treatment plants was advocated. It was stated that if those recommendations were carried into effect the field might be worked profitably for another 25 years. While the last estimate might be optimistic, the chairman said that it would be the company's future policy to bring down costs to the utmost.

Ward and Goldstone, Ltd.

The report for the year ended March 31st, 1925, shows a net profit of £21,939, of which, it is estimated, income tax and Corporation profits tax will absorb £4,964, leaving £16,975, plus £12,587, the balance brought forward, making £29,562. Interim dividends already paid are:—Preference, at 7 per cent. per annum, £4,340; ordinary, at 7 per cent. per annum, £2,985. It is now proposed to pay a final dividend of 4 per cent. on the ordinary shares, making 11 per cent. for the year (£1,760); and a participating dividend of 1 per cent. on the cumulative preference shares, making 8 per cent. for the year (£640), leaving £19,837 to be carried forward.

The directors have disposed of such of the industrial investments as were negotiable at a profit, and the proceeds have been reinvested in Government securities. £7,500 which stood in the books as a reserve for depreciation on shares has now been allocated to extinguishing the book value of all the remaining industrial shares to a nominal sum, although the directors consider that there is still some value attaching to them. The volume of turnover during the year under review exceeded that of the previous year. Owing, however, to keen competition the margin of profit was reduced. The applications of electricity continue to expand, necessiting additions to plant, and building extensions are in progress. It is anticipated that the extensions will be in operation by the end of the year.

"Underground" Railway Dividends.

The members of the London "Underground" group have declared the following dividends in respect of the six months ended June 30th:—

Underground Electric Railways Co. of London.—3 per cent. on the 6 per cent. first cumulative income debenture stock and 3 per cent. (free of tax) on the income bonds, as in 1924.

Metropolitan District Railway.—2 per cent. on the 4 per cent. guaranteed stock; 2¼ per cent. on the 4½ per cent. first preference stock; 2½ per cent. on the 5 per cent. second preference stock; and 1½ per cent. on the ordinary stock, as in 1924.

London Electric Railway.—2 per cent. on the 4 per cent. preference stock; and 1¾ per cent. on the consolidated ordinary stock (as compared with 2 per cent. last year).

City and South London Railway.—2½ per cent. on the 5 per cent. preference stocks; and 1½ per cent. on the consolidated ordinary stock (as against 2 per cent. in 1924).

Central London Railway.—2 per cent. on the undivided ordinary stock; and 2 per cent. on the preferred ordinary stock (both unchanged).

No interim dividend is being paid by the *Associated Equipment Co.*

Chili Telephone Co., Ltd.

The directors' report for the year ended March 31st last states that the gross revenue was £185,222, and the profit £42,599. With the addition of £3,816 brought forward, the amount available was £46,415. It was proposed to place £10,500 to the reserve for the renewal of plant; to pay a final dividend of 2s. per share free of tax (making 5 per cent., free of tax, for the year); and to carry forward a balance of £3,095. The provision for plant renewal is necessitated by the heavy expenditure on new plant entailed by the company's concession. Negotiations with the Chilian Government are in progress for an increase in the company's tariffs in order to produce the minimum return on the capital specified in the new concession. In January last the capital of the company was increased to £750,000 by the issue of 31,200 shares of £5 each. None of these shares was taken up by the Chilian public. The exchange value of the peso showed a further decline during the year. The meeting was to be held yesterday (Thursday).

Edmundsons' Electricity Corporation, Ltd.—The directors' report for the year ended March 31st, 1925, states that after providing for income tax, debenture stock charges, and expenses of the ordinary share issue, the net profit amounts to £74,784, as compared with £58,360 for the previous year. With the balance of £16,375 brought forward, the total profit becomes £91,160. Deducting therefrom the interim dividends of 3½ per cent. paid upon the cumulative preference shares and 3 per cent. upon the ordinary shares, there remains a balance of £65,160. It is proposed to carry £20,000 to reserve; a final dividend of 3½ per cent. upon the cumulative preference shares, making 7 per cent. for the year, requires £14,000; a final dividend of 4 per cent. upon the ordinary shares, making 7 per cent. for the year, requires £16,000, leaving £15,160 to be carried forward. Meeting: July 14th.

Prospectus.—*The County of London Electric Supply Co., Ltd.*—The subscription list opened on July 2nd and closed on the same day in the issue of 2,000,000 six per cent. cumulative preference shares of £1 each at £1 0s. 6d. per share. The purpose of the issue was to provide funds for the repayment of the £1,500,000 five and a half per cent. one year bearer notes and for the general business of the company. Applications by debenture stockholders and preference and ordinary shareholders were to receive special consideration. The prospectus stated that the net profits for 1924, after providing for all fixed charges, were sufficient to cover the dividend on the preference shares then issued and on the present issue of 2,000,000 shares more than 3¼ times over.

Crompton & Co., Ltd.—The report for the year ended March 31st last, which was to be presented at yesterday's meeting, recorded a net profit of £20,317 and the addition of £1 458 brought forward made available £21,775. After the payment of the preference dividend a balance of £11,927 is carried forward. The last distribution upon the ordinary shares was 5 per cent. in respect of the year 1921-22.

W. & T. Avery, Ltd.—The balance at the credit of the revenue account for the past year is £121,502, and the disposable surplus £94,096. It is proposed to pay a final dividend of 10 per cent. on the ordinary shares (making 15 per cent. for the year), to transfer £10,000 to reserve, and to carry forward £43,572.

Stock Exchange Notices.—The undermentioned have been ordered to be officially quoted :—

Newcastle-upon-Tyne Electric Supply Co.—465,000 ordinary shares of £1 each, fully paid, Nos. 1,297,682 to 1,762,681.

Shropshire, Worcestershire and Staffordshire Electric Power Co.—150,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 450,001 to 600,000.

United River Plate Telephone Co.—112,000 ordinary shares of £5 each, fully paid, Nos. 648,001 to 760,000.

Victoria Falls and Transvaal Power Co., Ltd.—A final dividend of 1 per cent., making 10 per cent. for 1924, has been declared on the preference shares, and one of 3 per cent. for the first half of 1925 is also to be paid. The final dividend on the ordinary shares for 1924 is 9½ per cent., making 12½ per cent. for the year.

Companies Struck Off the Register.—The names of the undermentioned companies have been struck off the Register, and they are thereby dissolved :—

Central Electrical Engineering Co., Ltd.
Northern Electrical Manufacturing Co., Ltd.

New Indian Company.—A new company has lately been formed at Barsi Bombay, with a capital of 1,500,000 rupees and the title the Shri Bhawami Marathal Mills and Electricity Supply Co. to carry on a cotton mill and to also act as suppliers of electricity.

Tilling-Stevens Motors, Ltd.—On June 30th, Mr. Justice Eve confirmed the reduction of the company's capital by £204,000 by the writing down of the value of the £1 ordinary shares to 8s. The preference shares are not to be reduced in value, but certain arrears of dividend are to be given up.

Notting Hill Electric Lighting Co., Ltd.—An interim dividend of 4s. per share, free of tax, has been declared on the deferred shares.

Traction and Power Securities Co., Ltd.—Interim dividends of 2½ per cent. on the preference stock and 4 per cent., less tax, on the ordinary stock have been declared

Telegraph Construction and Maintenance Co., Ltd.—An interim dividend of 6s. per share, free of tax, is announced.

Stocks and Shares.

MONDAY EVENING.

FEW of the markets in the Stock Exchange can claim anything approaching activity. It would almost appear as though the advent of summer weather had already made its seasonal effect felt upon business enterprise. In addition, however, there are various elements at home and abroad that arouse caution in the minds not only of the speculator but of the investor. Industrial conditions certainly do not make for hopefulness as regards the immediate future. As is generally the case when home business is quiet and foreign politics are disturbed, money turns to gilt-edged securities in order to seek, at least, temporary employment. Latterly the outpouring of new stocks has been so fast as to bring about a state of financial indigestion that requires time for its tranquilising, and prices therefore are inclined to hug the dull side. Good stock, nevertheless, is being steadily absorbed.

The only market in which real animation prevails is that for rubber shares, where the strength of the price of the raw material continues to act as a magnet for the attraction of money in large as well as in small amounts. The first batch of Home Railway dividends in respect of the half-year just ended is that of the Underground group, and it must be confessed that the results are not up to expectations. Home Railways as a whole are flat. Material falls occurred to-day, Monday, upon a comparatively slight pressure to sell.

The London Electric and City & South London are both paying reduced dividends as compared with a year ago, the ordinary stock of the former receiving 1¾ per cent. and of the latter 1½ per cent., against 2 per cent. in both cases in July, 1924. No changes are recorded in the cases of the District's 1½ per cent., the Central London 2 per cent., London General Omnibus 3 per cent., and Underground Electric Railways 3 per cent. on the income bonds, the last two being free of tax. The announcements had no particular effect upon the market, though Districts gave way 1 to 47¼. At the present rate, it will be noticed that Districts pay seven guineas per cent., and Metropolitan a little over 7 per cent. on the money. Underground Electric income bonds yield 6¼ per cent. free of tax, which is equivalent to 7½ per cent. taking tax at 4s. in the £. The electrification of the Southern Railway proceeds apace; this week, Guildford is celebrating the advent of an augmented service of trains now that the electrified portion has extended to its town.

The home electricity market received a good advertisement from the success achieved by the County of London company's offer of two million 6 per new preference shares at 20s. 6d. The subscription lists were open for only a few hours. This is a somewhat remarkable achievement, in that gilt-edged stocks are as a rule heavy and there has been a good deal of under-subscription during the past few weeks in the cases of the best-class securities. The County Company is fortunate in having won the confidence of investors to such an extent that, had the directors wished it, they could have secured, several times over, subscription to the new shares. The allotment letters will be out this week, and it is probable that the price will start at a small premium. Meanwhile, the existing preference remain at 22s. 6d., and the ordinary suffered another small loss at 2⅝, on sales by a few people who have been able to take substantial profits and have converted these into cash with the idea of taking up the new preferences. The St. James's & Pall Mall Electric has declared an interim dividend of 5s. per share on the ordinary, payable on the 1st of next month. This is the same rate as that distributed a year ago. Midland Counties eased off to 23s. 3d. North Metropolitan shed sixpence.

Whitehall Electric pref. drooped to 19s. 6d. on the slight contraction of profits shown by the last report. The debentures, however, are well maintained at 97½, at which price they would appear to be a sound investment with an element of speculation attached. The yield is £6 3s. per cent. on the money, and interest is payable in April and October.

There is a moderate amount of Tokyo Electric 6 per cent. on offer at 86, giving a return of practically 7 per cent. on the money; or, allowing for redemption by 1948, 7¼ per cent. The price is ex the June interest, and according to the last available figures, the interest on this issue was covered ten times over. It is scarcely necessary to refer to the factor of speculation which attaches to anything Japanese by reason of the natural convulsions to which Japan is subject. Barcelona Traction 6½ per cent. prior-lien bonds can be bought at 88, paying 7⅜ per cent., and amongst other foreign speculative investments it may be mentioned that Anglo-Argentine Tramways 5 per cent. debenture stock is obtainable at 74, offering 6¾ per cent. on the money at that price. A small amount of Metropolitan-Vickers Electric 4 per cent. mortgage debenture stock can be bought at 74½ ex the interest due this month, the yield being £5 7s. 6d. per cent. The interest service is amply covered, and the stock, although redeemable at any time, cannot be paid off under 110.

La Plata Tramways 5 per cent. debenture stock is 6 points up at 67½; otherwise, this section is disposed to dulness. Brazilian Tractions have fallen back to 56½. London United Tramways debenture at 42½ is 3 down. Calcutta Electric Supply debentures have declined to 104½.

Cromptons did better in the year which the new report covers, the net profit of £20,000 being £18,600 up. The ordinary are not to have a dividend yet: the last paid on these shares was in July, 1922. Shareholders can reasonably hope for something next year. Edmundson's profits show a substantial increase over those of the previous year, and the repetition of 7 per cent. dividend on the ordinary is upon the increased capital of the company.

No recovery has occurred in cable stocks and shares. Western Telegraphs are again lower, at 16; Eastern Extensions at 17¼ are ⅛ easier. Marconis, on their fall, attracted a little buying, and the price rallied to 28s. 9d. Radios are 11⅝ for the common and 10¼ for the preferred. Automatic Telephones reacted to 2 1/16. Chili Telephones are unchanged at 5 7/16. The company's report refers to the offer in Chile of £62,000 of the new capital created last January, but no applications were received. It is rather surprising that the natives of Chile should have failed to take advantage of a new issue of shares that was eagerly taken up in this country. At the Kalgoorlie Electric Power & Lighting meeting last week, the chairman referred to the progress which the company is making, but the price of the 10s. ordinary shares remains at 3s. 6d., while the 6 per cent. income debenture stock is quoted at 50 middle. It is probable that no large amount of either class could be secured in the market at these prices.

British Aluminium have lost 1s. 9d. at 28s. 3d. and Metropolitan-Vickers ordinary shed a florin, going back to 21s. 3d. General Electrics are maintained at 25s., and Johnson & Phillips keep their price at 41s. 3d. India-Rubber shares are scarcely so firm as the nominal quotation of £1 might indicate, there being shares obtainable at about 19s. 6d. The engineering group is quiet: coal mining and railway troubles do not make for public support to this section.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price July 6, 1925.	Rise or fall.	Yield. p.c
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole ...	1	13	14	2⅝	—	5 1 10
Brompton Ordinary	1	10	10	1⅞	—	*5 14 8
Charing Cross Ordinary	1	14½	15	46/9	—	6 8 2
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	1⅞	—	6 8 0
City of London	1	15	15	47/-	—	5 9 1
do. do. 6% Pref. ...	1	6	6	28/	—	5 4
Clyde Valley	1	8	8	31/-	—	5 3
County of London	1	15	15	2⅝	—1/16	5 14 1
do. do. 6% Pref. ...	1	6	6	22 6	—	5 6 8
Edmundson's Ordinary	1	7	7	23/-	—	6 1 9
do. 7% Pref.	1	6	7	22/-	—	6 7 3
Elec. Supply Corporation ...	1	10	10	33/3	—	6 0 4
Kensington Ordinary	5	14	15	12⅜	—	5 16 8
Lancs. Light and Power ...	1	7½	7½	26/6	—	5 13 2
London Electric	1	10	10	35/-	—	5 14 1
do. do. 6% Pref. ...	5	6	6	5⅜	—	5 6 8
Metropolitan	1	10	11	38/3	—	5 15 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5⅞	6	23/3	—6d.	5 4 4
Newcastle-on-Tyne Ordinary ...	1	6	7	32/-	—	6 7 8
do. 5% Pref. ...	1	5	5	18/3	—	6 9 7
do. 7% Pref. ...	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10	—	6 0 "
North Met. Elec. 6% Pref. ...	1	6	6	22/-	—6d.	5 9 1
St. James' and Pall Mall ...	5	17½	17½	13⅜	—	6 7 3
South London	1	15	15	2 7/16	—	6 3 1
South Metropolitan Pref. ...		7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref. ...	1	6	6	20/-	—	6 0 0
Westminster Ordinary	1	15	15	46/6	—	6 0
Whitehall Elec. Invst. 7½% Pref.	1/	7½	7½	19/6	—6d.	7 13 10
Yorkshire Elec.	1	8	8	31/-	—	5 8 3
HOME RAILS.						
Central London Ord. Assented Stock		4	4	68	—	5 17 8
Metropolitan	"	4	5	70	— ½	7 2 10
do. District	"	3½	3½	47⅜	—1	7 7 4
Underground Electric Ordinary	10	Nil	Nil	2½	—	Nil
do. do. "A" ...	1/-	Nil	Nil	7/6	—	Nil
do. do. Income	Bonds	6	6	93	—	*6 2 5
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	105	—	5 14 3
do. Def.	"	1½	1½	24½	—	6 3 9
Automatic Telephone	1	3	6	2 1/16	— 1/16	2 18 2
Chili Telephone	5	6	5	5⅞	—	*5 10 4
Cuba Sub. Ord.	10	5	5	6⅜	—	7 8 2
Eastern Extension	10	10	10	17½	— ⅛	*5 15 11
Eastern Tel. Ord.	Stock	10	10	175½	—	*5 14 0
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 14 3
do. do. Pref.	10	6	6	1 1/8	—	5 10 4
Great Northern Tel.	10	22	22	31⅜xd	—	6 18 6
Indo-European	25	7	8½	41⅜	—	*4 4 4
Marconi	1	10	—	1 7/16	+ 1/16	6 19 2
Marconi Marine	1	10	—	1	—	10 0 0
Oriental Telephone Ord. ...	1	12	12	2⅜	—	*5 2 11
United R. Plate Tel.	5	8	8	7⅜	+ ⅛	*5 12 3
Western Telegraph	10	10	10	16	— ⅛	6 5 0
HOME AND FOREIGN TRAMS, &C.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	3½	—	8 16 0
do. do. 2nd Pref. ...	5	6	6	2⅝	—	10 8 8
do. do. 5% Deb. ...	Stock	5	7	74	—	6 15 2
British Electric Traction Ord. ...	"	6	6	113	—	5 7 2
do. do. 6% Pref. ...	"	6	6	104	—	5 15 5
Brazil Traction	100	4	4	56½	—1	7 1 7
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	91	+1½	5 9 11
do. do. Preferred	"	96/-	96/-	86⅜	—	*5 10 10
do. do. Deferred	"	129/5	129/5	106½	—	*6 1 6
do. do. Deb.	"	4½	4½	75⅜	—	5 19 7
Lond. & Sub. Trac. 5% Pref. ...	1	2½	—	6/-	—	Nil
London United Tram. Deb. ...	Stock	4	4	42⅜	—3	9 8 4
Mexico Trams, 5% Bonds ...	—	5	5	62½	—	8 0 0
Mexican Light Common ...	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	61	—	Nil
do. 1st Bonds ...	—	5	5	65⅜	—	7 12 8
Yorkshire (West Riding) ...	1	5	—	18/9	—	5 6 8
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	12	2 7/16	—	* 4 8 6
British Aluminium Ord.	1	5	10	2s/3	— 1/9	7 1 7
British Elec. Transformer Pref.	1	Nil	7	17/6	—	... ...
British Insulated Ord.	1	15	15	3⅜	—	4 10 8
Brush Ord.	1	10	10	1	—	10 0 0
Callenders	1	15	15	2 1/16	—	5 2 0
do. 6⅔% Pref.	1	6⅔	6⅔	23/9	—	5 9 6
Crompton Ord.	1	Nil	Nil	⅜	—	... ...
Edison-Swan	4/-	10	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	1⅜	—	6 8 1
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	18/9	—	5 6 8
do. do. Pref.	1	6	6	21/-	—	5 14 3
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	5	7½	25/-	—	6 0 0
Henley	1	15	16	3	—	5 0 0
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	1	—	*5 0 0
Johnson & Phillips	1	10	10	2 1/16	—	4 17 0
Met-Vickers, Ord.	1	8	8	21/3	—2/-	7 10 7
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	25/9	—	*3 17 8
Telegraph Construction	12	19	19	27	—	4 9 0

* Dividends paid free of Income Tax

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c		Price July 7.	Fortnight's Inc. or dec.
a Acid, Oxalic	per lb.	5½d.	...
a Ammoniac, Sal	per ton	£60	...
a Ammonia, Muriate (large crystal)	"	£52	...
a Bisulphide of Carbon	"	...	...
a Borax	"	£25	...
a Copper Sulphate	"	£25 10s.	...
a Potash, Chlorate	per lb.	4d. to 4½d.	...
a " Perchlorate	"	5½d.	...
a Shellac	per cwt.	£15 15s.	...
a Sulphur, Commercial	"	£7 15s.	...
a " Roll	"	£7 15s	...
a Soda, Chlorate	per lb.	3½d. to 3¾d.	...
a " Crystals	per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ...	per lb.	4d.	...
METALS, &c.			
b Aluminium, Ingots	per ton	£120 to £125	...
b " Wire	per lb.	1/9 to 2/6*	...
b " Sheet	"	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			...
Grade I	per ton net	£231	£2 inc.
Grade II	" "	£165	£1 inc.
Grade III	" "	£91	£1 inc.
c Brass (rolled metal 2" to 12" basis)	per lb.	9⅜d.	...
c " Tubes (solid drawn) ...	"	1 1/32d. to 1/-	...
c " Wire, basis	"	9⅜d.	...
c Copper Tubes (solid drawn) ...	"	1/1	...
c " Bars (best selected) ...	per ton	£90	...
c " Sheet	"	£90	...
c " Rod	"	£90	...
d " (Electrolytic) Bars ...	"	£65	22s. 6d. inc.
d " " Sheets ...	"	£145 10s.	...
d " " Wire Rods	"	£75	22s. 6d. inc.
d " " H.C. Wire	per lb.	9 3/16d.	...
f Ebonite Rod	"	2/- to 3/6	...
f Sheet	"	2/- to 3/6	...
n German Silver Wire	"	2/8	...
h Gutta-percha, fine	"	8/3	...
h India-rubber, Para fine	"	3/1	6d. inc.
l Iron Pig (Cleveland Warrants) ...	per ton.	nom.	...
l " Wire, galv. No. 8, P.O. qual.	"	£28	...
g Lead, English Pig	"	£15 5s.	10s. inc.
g Mercury	per bot.	£14 to £14 5s.	5s. inc.
e Mica (in original cases) small ...	per lb.	3d. to 3/-	...
e " " medium	"	4/- to 8/-	...
e " " large ...	"	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	"	1/3½	...
p " " drawn bars & rods	"	1/3	...
p " " rolled strip & sheet	"	1/2¾	...
p " " wire	"	1/3½	½d. inc.
o Platinum	per oz.	£26	...
d Silicium Bronze Wire	per lb.	1/0½	...
r Steel, Magnet, in bars	"	7½d.	...
n Tin, Block (English)	per ton.	£255 to £255 10s.	45s. inc.
n " Wire, Nos. 1 to 16	per lb.	3/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnston & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Mathey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W F Dennis & Co

The Shannon Power Scheme.—The Shannon Electricity Bill has now finally passed the Irish Free State Senate, and will receive the Governor-General's assent forthwith. In the closing stage a final protest against the measure was made by Sir John Keane, who argued that the scheme was not economically sound. He was alone in his opposition.

An Electricity Supply (Special Powers) Bill has been introduced in the Free State Parliament to confer special powers for a limited period on certain supply undertakings and owners of generating stations with a view to the more economical supply of electricity pending the availability of electricity supplied by the State under the Shannon scheme.

The Irish Free State Parliamentary Committee on the River Liffey Electricity Bills rejected the East Leinster Syndicate's Bill in favour of the Dublin Electricity Bill promoted by Sir John P. Griffith and others, and the examination of the clauses of the latter Bill will proceed without further questions. The Dublin Corporation's Special Bill was withdrawn, at the request of the Government, after the preamble had been proved.

A Name for 2π-times-the-frequency.—In *Science* of June 5th a letter is published in which Mr. A. T. Jones, of South College, U.S.A., refers to the need for a name for the quantity p which represents 2π times the frequency of a simple harmonic motion, and which appears in the equation $v = V \sin(pt - a)$. Various terms have been suggested by famous physicists, but none of them has been generally adopted. The writer now proposes to call this quantity the "π-frequency." This expression is easily spoken and printed, and suggests a close relationship with frequency.

The International Railway Congress.

A Review of some of the Electrical Features.

(*Continued from page* 11.)

High-speed Electric Locomotives.

The whole of June 26th and the morning of June 29th were occupied by Section II by a discussion of high-speed electric locomotives; two reports were submitted, dealing with the practice and tendencies in America and other countries. Mr. J. T. Wallis (Chief of Motive Power, Pennsylvania Railroad System), reported on American practice, and Mons. M. Weiss (Engineer-in-chief, Swiss Federal Railways and President of Section II) reported upon the practice in other countries. The two reports were analysed in a special report submitted by Mons. Weiss, who put forward the following findings:—

There were relatively few electric high-speed locomotives (running at speeds above 75 km. (46.4 miles) per hour) in service, or at present being constructed; such locomotives ran on, or were intended for, the following railway systems:—

America: Chicago, Milwaukee and St. Paul; New York, New Haven and Hartford; New York Central; Chilean; Paulista; and Pennsylvania Railroads.
Germany: German State Railways.
Austria: Austrian Federal Railways.
England: Metropolitan Railway.
France: French Midi Railway; Paris, Lyons and Mediterranean Railway; and Paris-Orleans Railway (the two last named were in process of electrification).
Italy: Italian State Railways.
Sweden: Swedish State Railways.
Switzerland: Swiss Federal Railways.

Information had only been obtained of high-speed locomotives without carrying axles operating on the Metropolitan Railway, the Paris Orleans, and the New York Central; the two latter administrations had also locomotives with carrying axles and bogies. The transmission of the tractive effort from the motors to the driving wheels was effected by very varying methods—by the direct drive, by connecting-rods, and by driving through gearing and coupling rods. The locomotives with connecting-rod drives had the advantage, possessed also by steam locomotives, of having a higher centre of gravity than the other types of locomotives, which was of importance for securing good running. This arrangement, if well made and well maintained, provided that it was also fitted with spring driving gear, appeared to give good results. The rotating masses on electric locomotives could be accurately balanced, so that there was no production, as in steam locomotives, of additional load due to hammer blow; hence, it was possible to increase the axle load, which, in the case of a locomotive on the Pennsylvania Railroad was 35 tons, and on the Swiss Federal Railways 20 tons.

With the Westinghouse drive (with hollow shafts and driving through springs), spring breakages frequently occurred when the axle load was high, and when concentricity of the driving axle and of the hollow axle could not be accurately maintained in service, a fact that was particularly to be feared on locomotives having more than three driving axles on one frame.

In locomotives with a relatively low centre of gravity, with consequently greater stresses on the superstructure (due to lateral shock), it was advisable to reduce the axle load as much as possible. On locomotives on the Paris Orleans Railway the load was 12.4 tons, and on the New York Central from 15 to 17 tons. In order to obtain good stability in running for high-speed locomotives, a long wheel-base should be provided. The leading wheels with lateral play (radial axle boxes) and leading bogies were generally fitted with restoring gear (springs or inclined surfaces). The restoring force varied greatly from 0 to 14,800 lb., according to the various types of locomotive.

The methods adopted for collecting current were generally of the two following types:—(*a*) Overhead collectors of the pantograph or bow forms, which were in general use on lines using single-phase current, and also often used on d.c. lines. In all cases the collector was raised by compressed air, with the exception of the Midi Railway, on which it was lowered by this means. The contact pressure of the collectors on the wire varied from 22 to 33 lb. for d.c. and from 6.6 to 11 lb. for alternating and three-phase current. (*b*) Collector shoes, only used on d.c. lines.

The main switch was either constructed with a magnetic blow-out, with or without high-speed break (the latter method was coming more and more into use) for d.c., or with a multiple-break oil-break for a.c. The main switch was controlled differently on different administrations, either by hand, by compressed air, or electro-pneumatic, electro-magnetic, or electric control. The control gear appeared to be settling down into the two following main forms:—(*a*) For d.c. and to some extent for single-phase current, a controller with contactors; (*b*) for a.c., either controllers with contactors, or in the form of cylindrical contacts or appliances consisting of contacts arranged near together with special contacts for breaking the spark. It would appear that the electro-pneumatic control was in most general use up to the present.

The transformers required on single-phase locomotives, and to some extent also on three-phase locomotives, were of the oil-immersed, or air-cooled types; it might be said that the oil-immersed type appeared to be more favoured than the other. The cooling of the transformer was generally effected by means of fans.

The external form and dimensions of traction motors varied with each type of locomotive; between the lowest-powered locomotives (of from 185 to 275 h.p.), of the Metropolitan Railway and the Midi Railway, and the highest powers (3,000 h.p.) of the German State Railways, all intermediate powers might be found. The mean value was from 550 to 600 h.p. The cooling of the motors was, with few exceptions, effected by special fans. Where d.c. was used, insulation generally presented some difficulty; with a.c., on the other hand, the weak point was the commutator; experience showed, however, that the cost of maintenance under some conditions could be considerably reduced, and the mileage run after turning up until this was again required might be high (94,000 miles on the Swedish State Railways).

The auxiliary electrical equipment of the locomotives did not vary appreciably for different types of locomotive. The question of train heating had not yet been definitely settled, but it appeared likely to be generally effected, in Europe at any rate, by means of resistances on the trains.

Direct comparison of the power of these locomotives was rather difficult, owing to the fact that at present there were no existing international standards that defined the maximum permissible heating of the motors and the methods by which the tests should be carried out.

It was pointed out by Mr. Weiss that present experience was not sufficient to enable them to judge which types of locomotive were best suited to through-train service. Further experience was necessary before it would be possible to make certain which type, using a particular type of current, and under actual conditions of working, would be the most suitable for this purpose. In particular, it would only be after further experience that they would be able to ascertain which method of driving was best suited to these locomotives—through connecting rods and coupling rods, or the direct drive.

Mr. WALLIS, in his analysis of American practice, said that there was a tendency towards greater application of the principles followed in steam locomotive design, and towards greater co-operation between electrical and mechanical engineers, a very hopeful indication.

Discussion.

Mr. BACHELLERY (of the Midi Railway, France) referred to the working on that railway of electric locomotives of the two-truck type with ordinary tram-geared motors. They behaved quite well on the track at a speed of 55 miles an hour, which they normally attained. There had been a little trouble with the collector brushes, which had had to be modified. With regard to the mechanical side, he said that, in order to attain high speeds, it was necessary to couple the trucks together as tightly as possible. He had found it necessary to supplement the drawbars between the trucks with lateral buffers, which did not allow lateral movement, and that gave good results.

Mr. LEBOUCHER (Midi Railway) said he had had considerable trouble with brushes, owing to inertia effect, but by dividing the brushes, and thereby reducing the inertia, the locomotives could be run at speeds of 100 kilometres (about 62 miles) an hour without flashing or other difficulties.

Mons. G. BIANCHI (Italian State Railways) said that in Italy they used double-bogie locomotives with a spherical coupling, and had no difficulty with them when running up to 110 km. (70 miles) per hour. He considered that the difficulties with brushes were due to high-voltage, and that possibly the higher "tension" in France as compared with Italy would lead to more trouble in the former country. In reply to a question, Mons. Bianchi said that the motor was spring-borne on the locomotive he had referred to.

Mr. WEISS, discussing connections between bogies, said that on the Swiss railways they had suffered from excessive tire wear on express passenger engines. This led to the introduction of a special coupling, by means of which the leading bogie guided the trailing bogie and prevented the leading wheel of the trailing bogie pressing too heavily on the rail. By this means tire wear had been reduced.

Mr. BIANCHI said that in Italy they had 535 electric locomotives with the rigid rod drive, and there were no means of adjusting the centres of the rods. The maximum play allowed was 0.2 mm.

Mr. WALLIS said that in the United States it was the general feeling that all engines should have springs between the rods and motor shafts. Some locomotives were running without them, and there was a tendency to do away with them in the lower-speed locomotives. Most people who were

considering high-speed locomotives in America, however, wanted to use springs to take care of the shaft between the motor and the rods. There was very little difficulty with regard to the maintenance of the rods of high-speed locomotives so far. There were about 33 rod-driven locomotives on the Pennsylvania railroad with no spring arrangement, but there was a slip arrangement by which the crank slipped on the motor shaft, and pressure was exerted on a disk that was supposed to take care of the inertia of the motor, but experience showed that it was very rarely necessary for this arrangement to come into action.

Mr. WEISS, dealing with gearing and lubrication, said that on the Swiss railways different types of gear were used, none of which had given any difficulty, although it was rather early yet to make any definite statement. It was essential that the gears should be very carefully made. Oil was used entirely for lubrication and, although there had been trouble at first through leakage of oil through the boxes, that had been overcome.

Mr. BACHELLERY discussed some of the peculiarities of the gears used on the Midi Railway. There had been a lot of trouble with a gear which was fixed on the axle, because the axle was liable to break between the gear and the wheel. To do away with that difficulty a new type of gear was designed, with simply a gear rim fixed to part of the wheel centre, so that the effort was transmitted, not to the axle, but to the wheel itself. Very good results had been obtained with that. Moreover, on the locomotives developing high tractive effort there was generally a double gear, one at each end of the axle, so that the effort was perfectly balanced. Grease only was used for lubrication; that gave very good results, and the gears wore very well.

Mr. WALLIS said that on the latest locomotives on the Pennsylvania railroad that method of attaching the gear to the shaft had been utilised. The bearing was on the hub of the wheel, and the shaft went through that, so that in America they accepted the same practice as had been described by Mons. Bachellery with regard to the connection of the gear on heavy locomotives.

Mr. LEBOUCHER said that on the Midi Railway they used a pump for the continuous lubrication of high-speed locomotives with vertical motors, and transmission of the power by right-angled pinions. The result had been satisfactory.

Mr. WALLIS referred to a locomotive used in America of which all the bearings in the motor assembly were oiled by means of a circulating pump. The gears were lubricated with grease. The circulating pump was mounted on the shaft of the gear.

The question then arose as to the use of directing axles on electric locomotives, and the weight on axles.

Mr. BIANCHI said that the Italian railways had locomotives with a speed up to 100 kilometres (62 miles) per hour, with no directing axle at all.

Mr. BACHELLERY said that on the Midi Railway there was no difference in axle weight as between steam and electric locomotives, and it was considered that, for a particular axle weight, the electric locomotive was safer than the steam locomotive, because with the former there was no alternating effort on the track. Thus, in electric locomotives they had a weight up to 18 tons for the driving axle, and on the two-truck electric locomotive, which attained a speed of 55 miles per hour, there was an 18-ton axle without any directing truck. For locomotives attaining a speed of 65 miles per hour, it was considered advisable to use directing trucks.

Mr. H. PARODI (Paris-Orleans Railway) raised the question of the disposition of axles as between electric and steam locomotives, pointing out that a steam locomotive was usually turned round at the end of its journey and, therefore, always pulled in one direction, but that an electric locomotive was not usually reversed, and it was necessary, therefore, to design it so that it would pull at high speed in both directions.

Mr. WALLIS said that on the Pennsylvania railroad an electric locomotive had been built having a single truck at each end. When tested and compared with a steam locomotive, there was no difference between the two from the point of view of pressure on the track. The two ends of the electric locomotive were alike, except that the truck at one end was connected to one pair of drivers, and that at the other end to three pairs of drivers.

Mr. BACHELLERY said that the high-speed electric locomotives of the Midi Railway, attaining a speed of 130 kilometres (80 miles) per hour, had a symmetrical disposition of axles, and had not given any trouble from the point of view of stability on the road. He was glad to hear Mr. Wallis say that the same conclusion had been reached on the Pennsylvania railroad, because about 20 years ago they had concluded that the symmetrical arrangement was a source of trouble at high speed.

Mr. WALLIS said that the original conclusion was based on an improper arrangement of the springs, and that, had the springs been modified, the subsequent conclusion would have been reached in the first place.

Mr. BIANCHI, comparing steam and electric locomotives from the point of view of mileage covered without repair, said that in Italy electric locomotives had covered a mileage of 75,000, as against about half that amount by steam locomotives. The mileage of the electric locomotives had since been reduced, for service reasons.

Mr. PARODI considered that the mileage of electric locomotives was about twice that of steam, under the same operating conditions.

Mr. WEISS said that the difference between the two in Switzerland was not so great. His figures were 50,000 miles for steam, and 60,000 for electric engines.

Mr. LACOIN (Paris-Orleans Railway) pointed out the difference between the distances run in Switzerland and Italy, and said that this question was one which had to be considered, not only from the electrical and mechanical points of view, but also in relation to service and the general organisation of trains.

Sir HENRY FOWLER (L.M. & S. Railway) said that the figures given by Mr. Bianchi were low as compared with the English standard, and needed to be multiplied by three or four.

Mr. WALLIS said that the first three electric locomotives built by the Pennsylvania railroad, in 1910, compared favourably, from the point of view of repairs, with steam locomotives. There was regular repair of the running gear, boxes, wheels, tires, &c., in both types. The electrical repairs amounted to practically nothing, and, since 1910, only in the case of four or five of the electric locomotives had re-winding been necessary. He had not the exact figures of mileage, but it was at least 100,000 miles between repairs of wheels and tires; between repairs of motors it was much greater.

The next question discussed was whether it had been found that the presence of the oil necessary for the circuit breakers used with alternating current or with the transformers gave rise to any danger in working.

Mr. BIANCHI said that in Italy they had had experience of interruptors working in oil, but they had given trouble owing to the breaking of the containers. This only applied to locomotives working on the industrial frequency.

Mr. F. STEINER (Swiss Federal Railways) said that undoubtedly there was danger if oil were used in transformers, both as regarded explosion and fire. The danger could be reduced by paying particular attention to weak points of construction of the apparatus. The remedy was also to be looked for in the direction of the use of air insulation rather than the use of oil.

Mr. WALLIS did not think the subject was nearer settlement in America than in Switzerland. They had not enough engines running to produce sufficient experience to enable a final design to be arrived at. Nobody had objected so far to the oil transformer.

On the question of what type of remote control had given the best results, Mr. BIANCHI said that in Italy electro-pneumatic control had given the best results.

Mr. WALLIS said that both electric and electro-pneumatic control were used in America, and he believed experience there was the same as in Italy.

Mr. LEBOUCHER said that on the Midi Railway cam control had been adopted. It appeared attractive at first sight, but had certain disadvantages, particularly when it was desired to cut off the current, the principal trouble being with the pneumatic blowers, which were of different patterns. In the end they were obliged to cut the current off by the main switch, which caused a rise in voltage on the locomotive and an unfortunate effect on the line. Consequently they were adopting electro-pneumatic control for the latest machines.

Mr. PARODI said that the Paris-Orleans Railway made tests 20 years ago with the purely electric and electro-pneumatic systems, and had chosen the latter.

(To be concluded.)

The 27th Anti-Aircraft Battalion, R.E., T.A.—All suitable candidates for enlistment in the 27th Anti-aircraft Battalion R.E. (London Electrical Engineers), of the Territorial Army, are cordially invited to call at the battalion headquarters, 46, Regency Street, to receive any information desired concerning the unit's activities. This unit was founded originally by the late Dr. John Hopkinson in 1898, and served during the South African War, and it still carries on the old traditions of good work and fellowship. Technical knowledge is not an essential qualification for recruits, and any who show keenness and intelligence will be welcomed and helped to become efficient members of this progressive and well equipped force. The primary rôle of this unit lies in the defence of London against enemy aircraft, and it has an up-to-date plant, including searchlights, stationary 40-h.p. generating sets, lorries, sound locators, and all the minor accessories. The terms of enlistment are, initially, four years' service, with an optional minimum of one year, and the age limits are 17 to 50. Each member is required to attend 40 drills of one hour each, a one-day's musketry course and a summer camp of 15 days, usually at a seaside place, during the first year; and 20 drills, and the other obligations of the first year, during the subsequent years. The camp pay for N.C.O.'s and men ranges from 2s. 9d. to 14s. 0d. per day, according to qualifications and rank; and everything is found, uniform, kit and equipment being provided. Marriage allowance is paid to married men over 26 years of age. The training is of a most interesting character and affords the opportunity to learn the groundwork at least of certain branches of electrical and mechanical engineering. Displays, such as those at tattoos, and the Royal Tournament at Olympia, which are frequently operated by the unit, add to the interest of the duties. A billiard table, canteen and miniature rifle range are among the provisions made at the headquarters for the social entertainment of members.

The Incorporated Municipal Electrical Association.

Annual Convention at Brighton.

(*Continued from page* 34.)

ıre Supply Authorities doing their utmost to develop the Demand for Electricity?

By W. H. THICKETT (Chairman, Grimsby Corporation Electricity Committee). (*Abstract.*)

The annual output of electricity by statutory undertakings as increased during the last 20 years from about 500 million Wh to some 5,000 million kWh. In 1918 the municipal out-ut was 2,367 million and in 1924 3,821 million. This output, may point out, is nearly double the corresponding output by ompanies. Yet in spite of this progress the output of elec-ricity per head of the population in Great Britain remains ar below that of many other countries.

The number of "authorised undertakings" in Great Britain n March 31st, 1924, amounted to no fewer than 560. An nalysis of the total number of generating stations shows that, f 541 stations submitting returns 224, or 41 per cent., gene-ated less than one million units each, while 398, or 73 per cent. f the stations, generated less than ten million units each. It s apparent that there is great scope for re-organisation on lines vhich will lead to the more economical production of elec-ricity, by concentrating the generation in fewer well-placed nter-connected stations and thus leading to the supersession f many of the small and uneconomical stations, both public nd private, as cheaper and reliable supplies become available rom such centralised systems. Since the establishment of the ommissioners, local generation at 37 small stations has been ntirely superseded by bulk supplies, and in upwards of ten urther cases similar stations have been relegated to the posi-ion of stand-by sources of supply only. This desirable pro-ess needs to be accelerated.

The present consumption of electricity in Great Britain is bout 130 units a year per head of the population. Yet the verage consumer in the best organised, lowest priced dis-ricts, has been proved capable of using some 2,000 to 3,000 nits a year instead of the 200 to 300 required for lighting lone. Recent experience in those districts has shown that the verage consumption throughout the country might easily be rought up from 130 units per head to somewhere between 00 and 750 units.

How are we to effect this? We must first realise the ob-tacles; these—excluding, of course, obstacles at present in-erent in the national organisation of the industry—may per-aps be classed in the following order:—Cost of appliances, nstallation, &c.; lack of knowledge by the people; and cost of lectricity in certain districts.

It is a well-known fact that a large number of the most ractically useful and far-reaching scientific discoveries have een made by men whose aim was simply the discovery of ruth. This always must be the governing aim of the true earchers after knowledge, and I will suggest to you very trongly that research can only be conducted and encouraged n these broad lines. We must do all we can, working both hrough such an organised body as the British Electrical and llied Industries Research Association, and through every pri-ate channel we can devise, to see that a constant all-round ffort of research into every kind of electrical problem is kept p and generously provided for. If we do this, we shall not ind the practical and profitable results wanting; but if we efuse to take this broad view, and refuse to encourage any esearch of which we cannot at once foresee the practical and rofitable issue, we shall be wasting the money that we do pend.

Closely related to research, and of extreme importance in lealing with the problem of domestic supply, is the question f standardisation. The term "Standardisation," is no doubt nappropriate. It seems at once to convey the idea of crystal-isation and the setting up of an unalterable standard. Too nuch stress cannot be laid on the fact that industrial stan-lardisation need involve no such dangers. Specifications pre-ared by the B.E.S.A. are rather in the nature of handy tools o be used in contracts for the purchase of materials and ap-aratus on the most economical lines.

The British Standard Specifications are arrived at by unify-ng the needs of industry and recommending what is best n present practice and what can be adopted by industry with he least possible disturbance. In its broadest sense this olicy means national simplification, the reduction of the num-er of types and patterns used for one and the same article. Proper safeguards are needed, of course, principally a thorough eriodical review and revision of the specifications.

I suggested to you that the first obstacle to the growth of he electric home might be regarded as the cost of the appli-nces and installation; and it is to research and standardisation hat we must look to remove this basic disadvantage. One ears eminent and able men in charge both of municipal and f company undertakings who say that the great domestic levelopment must pay its way from the first, and can only e carried out where there are profits to be obtained from such speculative enterprise, and so on. Why? These same men n the past progressed by steady steps, with courage rather han with caution, and the reward and stability of the domestic business is apparently likely to be higher than anything we have enjoyed in the past.

We have in this country been making electric cookers which would cook, for possibly 30 years. During the past ten a really practical appliance has begun to emerge, and in the last four or five years we have had put at our disposal some very sound stuff, any minor defects in which are disappearing rapidly. Yet the full electric cooking range for domestic use is apparently now being turned out by no more than a bare dozen manufacturers. They are producing something like 15,000 or 20,000 ranges a year, and the curve of output is rising rapidly. There are probably not less than 50 undertakings offering electricity at rates which make it easily competitive with gas and coal for cooking. If we assume, on a normal basis of calculation, that such areas include a quarter of a million houses, or about one-fifth of the total number of houses connected with electricity supply, to provide those people with cookery appliances on our present production basis looks like a ten-year job. These facts suggest a further question. How far can we expect at present to compete with coal and gas purely in the matter of price, and how far should pure consideration of price affect our attitude towards efforts at domestic development?

Equally essential, I believe, is uniformity of price. Not only do the present wide discrepancies between different areas render impossible any uniform national policy of publicity and development, but they undoubtedly convey to the consumer an impression of uncertainty and unstability which disinclines him to "go all out" on electricity even if he lives in one of the best and cheapest areas. He feels that he may, if he moves, find himself in an area where he will not be able to afford to use electricity for any but a few purposes. Hence he hesitates to equip his house with a full range of electrical devices, and accustom his family to use them. He is inevitably led to look on electricity rather as an occasional luxury than as a universal necessity.

There is ample scope for greater foresight and enterprise in paving the way for domestic electrification by the extension of wiring facilities rather in anticipation of, than in response to, specific demands. The extension of mains and cable networks is a perfectly sound investment which should be carried out progressively on generous, far-seeing lines. Ample cable work is relatively much cheaper than restricted cable work. Some undertakings are already laying down from 100 to 400 miles of cable a year.

There are at least 100,000 houses in Glasgow suitable for electrification. Most of these are occupied by tenants on a yearly rental basis. Hence the difficulties of arranging for electrification must obviously be greater than if the houses were occupied by their owners, who would stand to gain directly through the increased value of their properties once electricity had been introduced. After various ineffectual efforts to deal with the problem Mr. R. B. Mitchell, engineer and manager of the electricity department, devised a plan for wiring houses on the easy payment system, with a view to making a studied inroad on the large number of unwired houses in the Glasgow area. In September, 1924, the Glasgow Corporation approved the scheme and it was put into operation. The cost worked out at £4 10s. for a five-roomed house, to include eight lighting points and three plugs, and in spite of various obstacles 640 houses were wired in the first six months and no bad debts were incurred.

In one of the residential districts of Brighton Mr. Charles Blaker and his architect, Mr. E. Weir, have been building labour-saving houses comprising two floors, four bedrooms, two reception rooms, with bathroom and usual offices, which they are able to offer to the public at a price of £1,000 or a little over. Each house has one coal fireplace in the dining room and one central water-heating stove of the "Glow-worm" type in the kitchen. Only two flues are necessary, but in construction a six-flue chimney has been employed, the spare ducts being used to ventilate the rooms, which they do very effectively. Other artificial heating for the different rooms including the dining room in all but the coldest weather, is provided by electric fires. The omission of the usual complement of fireplaces, chimney breasts and flues is of great importance. The saving effected by this radical change in design is far more than sufficient to cover the whole cost of a full range of electrical equipment.

It is impossible to speak of the problem without a word on tariffs, but I do not wish to enter into the technical details of the various possible tariff systems. My own views are in agreement with those expressed at the Institution meeting by my friend and colleague, Lieut.-Col. W. A. Vignoles, D.S.O. I take this summary of part of his remarks from the ELECTRICAL REVIEW:—

"They must have a one-meter tariff. The only practical tariff was the plain two-part one, with a fixed charge per year, plus 1d. per kWh. That had proved to be successful, and he was certain that they would all adopt it sooner or later. It was difficult for a Government department to make anything compulsory, but the Commissioners' Committee which proposed to fix the first charge would, if it tackled the matter

properly, solve their difficulty. He maintained that the tariff problem was settled, and that now they must get down to the business of selling electricity by the same means as were used for selling other commodities."

To selling electricity—yes, that is our business too often neglected in the past. But I should like to emphasise to you that it is useless to sell electricity by itself as an impersonal commodity. Every sale of electricity must be accompanied by a generous giving of service. Our aim must be to sell to the consumer not lamps, stoves, and motors, but light, heat and help.

Let me draw your attention to one field in which Great Britain is at present most certainly not "making the most of electricity." I refer to agriculture. In this connection I would commend to your notice the pamphlet entitled "Electricity on the Farm," written by Mr. R. Borlase Matthews. There is plenty of work for electricity on the farm, and the need for it there should, I suggest, be earnestly and increasingly considered by all undertakings whose power lines are within convenient reach of agricultural areas.

Electricity and publicity—our business as electrical suppliers requires the closest, the most constant union between the two. I think it may safely be said that in the past our publicity work has been far and away the weakest point in the whole organisation of the electrical industry, and that this weakness has been more fully responsible than any other single cause for the inadequate use made of electricity throughout the country. We must realise that the electrical industry, on account of its high overhead charges, is very particularly dependent on a larger and constantly increasing demand for its product. The only way of creating this demand is through educational publicity. There are two broad kinds of publicity—the one personal and local, the other co-operative and national.

The E.D.A. is just now asking for modestly adequate funds to continue the work which it has been doing for the past five years. Its present demand is for really less than sixpence per year per consumer, and the contributions from each undertaking are very small indeed compared with the total volume of its business and its expenses. When this small contribution is sent forward into the central exchange, the whole value of the work which it makes possible comes back to the contributor. The E.D.A. classes its publicity work under three broad heads :—

Educating the consumer in the various uses and applications of electricity supply.

Assisting him to obtain appliances and material.

Securing the sympathetic interest of all in the electrical industry, and enthusiasm for the electric method in home, business and industrial life.

Just as publicity must be of two kinds, national and local, so its appeal must, broadly speaking, be of two corresponding kinds—general and personal. We have first to create a general atmosphere favourable to electrical development. We need for this a wide diffusion of knowledge as to the advantages and capabilities of electricity. We must see that every man and woman in the country, whether a user of electricity or not, has a firmly impressed notion of what electricity can do for social progress and domestic efficiency. We must cultivate the idea of an "Electrical Age" as, from the point of view of social organisation, a golden age, a noiseless soot-less age, swift and clean, ever-ready and trouble-free. We can do this both by making clear what electricity has already achieved in those countries and districts where it is most used, and by explaining in detail what more it might do if the public would only give free scope to its services by asking for them. A general broadcasting of electrical propaganda is necessary and valuable, but it is not enough. From the central power house of our publicity we must carry our lines of propaganda into every individual household and there light the lamps of electrical knowledge.

Discussion.

The PRESIDENT said that although the paper was addressed principally to Committee members, it also provided a stimulus for engineers and managers to impress upon their Committees and Councils the importance of supporting the three Associations relating to research, standardisation and publicity referred to in the paper.

Mr. LL. B. ATKINSON said that his main object was to bring the importance of research and the need for supporting it financially, to the notice of members of Electricity Committees. The whole electrical industry was founded upon research, and its continued prosperity depended upon research being continued on a very large scale. There were two classes of research; *viz.*, that carried out by individual firms for their own special benefit—a very legitimate class of research—and that carried out for no one's special benefit, dealing with the fundamentals of the industry and therefore only to be carried out effectively co-operatively. As far as the first type of research was concerned, it was estimated that a sum of £250,000 per annum was being spent in that manner. As to co-operative research, with which he was more particularly concerned and which dealt with materials and substances and methods, and promised no particular benefit to anyone and yet was of primary importance to the proper development of the industry as a whole, the sum of only £20,000 a year was being spent on this, partly provided by the State and partly by a group of manufacturers, and this in an industry which must be reckoned not in thousands but in millions of pounds sterling. Dealing specifically with the electricity supply industry, he said that the placing of this largely in the hands of municipalities was a great social experiment. Public control of great industries involved very considerable responsibilities and, so far as research was concerned, he could not but say that they had failed lamentably in taking their share of those responsibilities. That was due to the fact that they had not understood what research could do. The engineers had understood it, but the Committees and Councils had not, and therefore he wished this paper to be a starting point for Chairmen and members of Committees. He believed that when they fully understood the importance of the point he was stressing they would come forward and assist in the work of the Electrical Research Association to a much greater extent than in the past.

The HON. SECRETARY then read a letter from the Electricity Commissioners in which attention was called to the position of the Electrical Research Association. It was pointed out that at present the Association was mainly financed by the B.E.A.M.A., and an equal contribution from the Department of Scientific and Industrial Research. The Commissioners had been informed that there was a possibility that the financial grant from the Department might cease after this year or might be given on a descending scale for a limited period. In these circumstances it was evident that unless some additional source of revenue could be secured, the work of the Association, which had already proved of considerable value to the electricity supply industry might have to be curtailed or discontinued altogether, and the Commissioners were confident that on the position being made known, the necessary support for the continuance of the work would be forthcoming from authorised undertakers and others directly and indirectly concerned in the activities of the Association. The Commissioners expressed their sympathy with the endeavour of the I.M.E.A. to secure support from its members, and stated that they were prepared to sanction the payment of reasonable subscriptions in this connection under Section 30 of the Act of 1919.

Mr. C. LE MAISTRE (Secretary of the British Engineering Standards Association), in asking for additional support for that body, spoke of the manner in which the work was restricted through lack of funds. At present something like 300 standard specifications were in hand, but it had been possible to issue only 45 of them for this reason, and the work of the Association was being starved through inadequacy of office accommodation and staff. The endeavour was being made to secure that its work should be effective throughout the world, and he impressed upon the meeting the great saving and convenience which would result all round if British standard specifications, with the imprimatur of a body like the B.E.S.A., were generally adopted and were translated into foreign languages. The general aims of the Association were being copied by the Americans, who had put a large scheme in hand in an endeavour to secure as much as possible of the trade in South America, and they were spending money very freely on standardisation in America. Last year the subscriptions to the B.E.S.A. from private sources amounted to £12,000 and the sum received from the Government was only 10 guineas. He hoped that that would be remedied and in order to increase the private subscriptions, a scheme had been put into operation whereby professional business and other men connected with the industry, including firms and municipalities, could become members on a two-guinea subscription which would carry with it certain privileges. He expressed the hope that municipal electricity supply authorities would support this work both in the interests of the development of the industry here and also in assisting us more effectively to meet foreign competition.

Mr. J. W. BEAUCHAMP (Director of the Electrical Development Association) spoke of the work of that body and the new scheme of subscriptions sanctioned at the annual meeting a short time ago on the basis of the payment of a subscription amounting to one-tenth of one per cent. of the revenue of supply undertakings, the manufacturers having promised to contribute to an increased extent. The details of that, he said, and arguments in favour of the scheme, had been set out in a booklet which was being distributed to all municipal and other supply authorities. Hitherto the Association had been working on a subscription of about £5,000 a year, but the amount of money required to carry out a more intensive propaganda was four times that amount. Since the booklet to which he had referred had been distributed three weeks ago he thought he could see half the extra sum in sight and his visit to the Convention had been extraordinarily successful in obtaining promises of support. He concluded by saying that he had got to have this money and that whatever might be the result of the appeals on behalf of research and standardisation, he knew the industry would provide him with what he wanted.

Ald. JAMIESON (Glasgow) said he would recommend his Council to support the Associations mentioned in the paper. The Belfast Gas Department contributed £900 a year to the various Associations.

Councillor W. HAMMER (Hackney) said that what was wanted was to take every possible step to secure full wiring powers for the municipal electric supply authorities, because 90 per cent. of the people of this country lived in small houses and had very small incomes, so that unless some system could be adopted for wiring these places through municipalities, these people would never get the advantages of electricity.

Councillor HIGGINS (Glasgow) said that the average man or woman did not need to be convinced of the benefits and advantages of electricity supply; what they wanted was to be able to secure it at a price within their means, and he wondered how

many municipal electric supply authorities were endeavouring to find a solution of that problem. In Glasgow an endeavour was being made to deal with it by means of an assisted wiring scheme, and further efforts in that direction were necessary.

Councillor CONOLLY (Salford) alleged that councillors and would-be councillors had more to do with retarding the growth of electricity than anybody else. There was no doubt that more research work was necessary if electricity was to be developed on the right lines and yet as soon as funds for this purpose were suggested, there was opposition in councils and committees. The development in Salford had been very much held back because of this class of opposition.

Councillor TUMMON (Sheffield) said that although many interesting things had been said with regard to the importance of research, standardisation and publicity, he would like to get down to something of practical interest at the moment, viz., what was actually being done to bring electricity within the reach of the people. The Sheffield Electricity Committee had supported the E.D.A. to the tune of £500 to start with, and he would have great pleasure in bringing the appeals that had been made to the notice of his Committee.

Alderman SENNINGTON (Bristol) said that the important thing to concentrate upon was the cheapness of electricity supply, because there had been cases in Bristol where people had gone back to gas on this account. In looking at figures of cost throughout the country, it was impossible not to be struck by the extraordinary variation both of costs and charges, and attention should be given to this.

Alderman (Mrs.) HAMMER (Hackney) asked the members to give all the support they could to the newly-formed Women's Electrical Association, because it was only by educating the women that the greatest development in the use of electricity could be looked for in the home. What was required was a central place where women could go for information and the Women's Electrical Association hoped to provide these facilities with the support of the industry.

Councillor THICKETT, in the course of a short reply, said he had not written the paper from any pessimistic point of view. The question was whether they had done all that could be done. Nobody could be satisfied with the position of the supply industry as it was to-day, because things could be very much better than they were, and the object of the paper was to stir up interest from that point of view.

(To be continued.)

Finnish Trade and Conditions.

The Development of Natural Resources.

ALTHOUGH Finland, on account of its small population, cannot be looked upon as a potential large consumer of British electrical goods, it possesses a certain significance from its proximity to Russia. It is probably in the light of this that a recent report by Mr. C. H. Mackie, the British Consul at Helsingfors,* should be read. This report reviews the economic, financial and industrial conditions of Finland. In some prefatory notes the population of the country is given as 3,400,000, of which 65 per cent. is engaged in agriculture, and only 15 per cent. in industry and manual labour.

Foreign Trade.

Great Britain is by far Finland's most important customer having taken 40.3 per cent. of her exports in 1924, Germany being second with 9.1 per cent. The positions are reversed in the case of imports; in 1924 Germany supplied 29.9 per cent., and Great Britain 18.8 per cent. The imports and exports for 1924 are fully analysed in an appendix to the report, and it is seen that electrical machinery weighing 1,141,936 kg. was imported during the year, the value being given as 21,729,650 Finnish marks (about £114,370). Insulated wires and cables are shown at 972 987 kg., valued at M 11,074,881 (£58,300); incandescent lamps at 82,455 kg., valued at M 13,583,442 (£71,500); steam machinery and turbines at 98,848 kg., valued at M 2,473,281 (£13,000); and water turbines at 364 kg., valued at M 6,800 (£36).

Copper Production.

A number of the older copper deposits in Finland are said to be extinct, but in 1909 a new important deposit of ore was discovered at Outokumpu, in East Finland, within easy reach of the sea. This deposit has a width of from 7 to 28 ft., and a length of about a mile, and it has been penetrated to a depth of 600 ft. It is estimated that about eight millions tons of ore (containing from 4 to 5 per cent. copper and 1.5 per cent. zinc) is available, but there is reason to believe that the deposit extends much deeper in which case the quantity may be much greater. The actual production of copper is at present estimated at 300,000 tons, worth about £20 millions at present prices, but double or treble that quantity may possibly be obtained. The State has acquired the Outokumpu Copper Works and provided working capital of M 3,458,000 for 1925. In the appendix referred to above, the exports of "Copper, unworked and scrap," are given as 195,611 kg., valued at M 1,637,985 (£8,620).

* Stationery Office. 2s. net.

Lead and zinc ores exist along the coast of the Arctic Ocean and in the southern part of Finland, but their economic value appears at present to be uncertain.

Hydro-Electric Development.

A scheme of reclamation of flooded land involving the regulation of the Vuoksi River, has been put in hand, and in this connection an important hydro-electric scheme is being carried out. This is the Imatra Rapids scheme, to which we have made reference from time to time. This scheme comprises a water area of about 60,500 sq. km., and embraces the large number of rivers and lakes that, pouring their waters into the great Saima Lake, issue forth as the Vuoksi River. The rapids on the first 27 km. of its course have a total fall of 64.24 metres, making the river very suitable for hydro-electric power production. A dam is in course of construction above the rapids in order to raise the water level there and attain a net head of 23 metres in the power plant, ultimately to be raised to 24 metres. The work of excavating the canal 500 metres long which will lead the water from above the dam to the power house, and the tail race of similar length linking up with the lower river is nearing completion. The site for the power house has been cleared and the building is in course of erection. It will accommodate three turbo-generators with an aggregate capacity of 80,000 h.p. A Swedish firm has secured the contract for the generators, while the turbines will be installed by a Finnish company. Tenders have been invited for sluice machinery and sub-station equipment. It is hoped to complete the first stage of the scheme by 1928.

General.

Finnish industry, in common with that of most other European countries, met many difficulties during 1924, the chief being stringent credit conditions and money shortage. The metallurgical industry appears to have suffered from the depressed state of the market, and electrical engineering works complained of keen foreign competition which compelled them to confine their attentions to the smaller classes of goods.

Mr. Mackie says that a ready sale can generally be found for all classes of British goods provided their prices are on a level with those of other countries' products. The British manufacturer is now more or less inclined to give as favourable payment terms as his competitors, but there is a general complaint that his prices are too high. The quality of British goods is never disputed, but their cost often appears to be beyond the means of the Finnish buyer. It is also stated that foreign suppliers have much better representation in the market than the British manufacturer.

Electrical Trade in Brazil.

The Scope for Domestic Appliances.

MR. P. W. COOK, Trade Commissioner of the Canadian Government at Rio de Janeiro, has recently reported on the Brazilian market for domestic electrical appliances. He considers that the country's position with regard to actual and potential hydro-electric development is most satisfactory, the comparatively small seasonal climatic change being favourable to steady output. Mr. Cook apparently regards the recent difficulties due to water shortage in Sao Paulo as exceptional and unlikely to recur.

There is no doubt that hydro-electric development has been undertaken on a large scale and at a cost comparing favourably with all other South American countries. Yet owing to lack of social development the use of electrical domestic appliances is comparatively small at present. At the same time the national manufacture of electrical appliances has not as yet progressed far and consequently the market remains largely supplied by importation which in Mr. Cook's opinion, represents but a fraction of the potential market.

For the guidance of exporters the Trade Commissioner gives the voltages, &c., in the various cities. In Rio de Janeiro, Pernambuco, and Sao Paulo, a.c. at 50, 50, and 60 cycles respectively, at voltages of 120 and 220, is employed. Porto Alegre and Ceará have a 220/230 V, d.c. supply; while at Bello Horizonte and Juiz de Fora, 60-cycle a.c. at 220 V is in use.

The Trade Commissioner proceeds to describe the selling possibilities of a variety of electrical appliances. He says that electric irons have a steady market in all the larger cities. A 3-lb. iron sold c.i.f. at 8s. or 9s. would stand a fair chance. Toasters are used to an increasing extent, not only for domestic purposes but also by a number of the more important hotels.

There is a fairly good demand for grills, and it is apparently increasing. The price to the trade of a grill weighing 3 lb. is about 8s. or 9s. There is practically no market for electric stoves, nor are cooking ranges used to any appreciable extent.

For curling tongs there is a fairly steady demand, undoubtedly growing from year to year. The prospects for washing machines are poor, but cheap and efficient electric refrigerators would sell well.

As regards electric lighting sets, there is some demand in South and Central Brazil, *i.e.*, the States of Rio Grande do Sul, Santa Catharina, Parana, and in the interior of Sao Paulo and Minas Geraes.

The Electrical Imports of Australia.

(Britain's Preponderating Share).

THE following figures showing the values of the imports of electrical goods into Australia in the fiscal year 1923-24 have been taken from the recently-issued official trade returns. The corresponding figures for the previous twelve months have been added for purposes of comparison and notes of increases or decreases given. We refer briefly to the electrical exports at the end of this article.

	1922-23. £	1923-24. £	Inc. or dec. £
Cable and wire, covered with cotton—			
Total	16,000	15,000	– 1,000
From United Kingdom	15,000	14,500	– 500
Telegraph and telephone cable, paper-insulated, lead-covered—			
Total, all from United Kingdom	15,000	14,500	– 500
Other telegraph and telephone cable—			
Total	953,000	996,000	+ 43,000
From United Kingdom	934,000	962,000	+ 28,000
,, Netherlands	4,000	9,000	+ 5,000
,, United States	13,000	22,000	+ 9,000
Carbon manufactures—			
Total	18,000	24,000	+ 6,000
From United Kingdom	11,000	12,000	+ 1,000
,, United States	4,000	9,000	+ 5,000
Dynamo-electric machines—			
Total	949,000	990,000	+ 41,000
From United Kingdom	645,000	613,000	– 32,000
,, Canada	6,000	7,000	+ 1,000
,, Germany	7,000	31,000	+ 24,000
,, Holland	2,000	7,000	+ 5,000
,, Sweden	35,000	31,000	– 4,000
,, United States	241,000	271,000	+ 30,000
Fans, electric—			
Total	41,000	41,000	—
From United Kingdom	16,000	15,000	– 1,000
,, Italy	7,000	8,500	+ 1,500
,, United States	17,000	15,000	– 2,000
Switches, fuses and lightning arresters—			
Total	216,000	253,000	+ 37,000
From United Kingdom	121,000	114,000	– 7,000
,, Japan	4,000	3,000	– 1,000
,, United States	87,000	132,000	+ 45,000
Heating and cooking appliances—			
Total	21,000	42,000	+ 21,000
From United Kingdom	9,000	11,000	+ 2,000
,, Canada	1,000	5,000	+ 4,000
Lamps, filament—			
Total	338,000	348,000	+ 10,000
From United Kingdom	173,000	165,000	– 8,000
,, Hungary	1,000	2,000	+ 1,000
,, Holland	123,000	128,000	+ 5,000
,, United States	36,000	44,000	+ 8,000
Measuring and recording instruments—			
Total	176,000	230,000	+ 54,000
From United Kingdom	119,000	146,000	+ 27,000
,, Switzerland	29,000	46,000	+ 17,000
,, United States	23,000	30,000	+ 7,000
Regulating and controlling apparatus—			
Total	528,000	219,000	–309,000
From United Kingdom	243,000	81,000	–162,000
,, United States	281,000	128,000	–153,000
Static transformers and induction coils—			
Total	146,000	124,000	– 22,000
From United Kingdom	64,000	83,000	+ 19,000
,, Sweden	1,000	5,000	+ 4,000
,, United States	80,000	32,000	– 48,000
Telegraph instruments and appliances—			
Total	51,000	28,000	+ 23,000
From United Kingdom	3,000	19,000	+ 16,000
,, United States	1,000	6,000	+ 5,000
Telephones—			
Total	196,000	237,000	+ 41,000
From United Kingdom	114,000	107,000	– 7,000
,, Canada	19,000	4,000	– 15,000
,, Sweden	2,000	6,000	+ 4,000
,, United States	59,000	115,000	+ 56,000
Telephone switchboards and appliances—			
Total	262,000	325,000	+ 63,000
From United Kingdom	97,000	170,000	+ 73,000
,, Belgium	5,500	7,700	+ 2,200
,, Sweden	3,000	12,000	+ 9,000
,, United States	155,000	134,000	– 21,000
Vacuum tubes—			
Total	7,700	33,000	+ 25,300
From United Kingdom	5,000	15,000	+ 10,000
,, Holland	—	3,000	+ 3,000
,, United States	2,000	12,000	+ 10,000
Electrical appliances, n.e.i.—			
Total	478,000	695,000	+217,000
From United Kingdom	255,000	333,000	+ 78,000
,, Canada	13,000	9,000	– 4,000
,, Denmark	8,000	6,000	– 2,000
,, Germany	3,000	6,500	+ 3,500
,, Japan	13,000	16,000	+ 3,000
,, United States	179,000	312,000	+133,000

Exports.

Australia carries on a small export trade in electrical goods of her own manufacture, but that in machinery is not expanding. Below are given the comparative values in 1923-24 and 1922-23.

	1922-23. £	1923-24. £	Inc. or dec. £
Electrical materials, other than machinery and appliances—			
Total	44,000	22,000	– 22,000
To New Zealand	42,500	20,000	– 22,500
Electrical machinery and appliances—			
Total	7,800	15,500	+ 7,700
To New Zealand	5,400	11,000	+ 5,600
,, Fiji	250	1,000	+ 750
,, New Guinea	360	800	+ 440

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

Extra-High-Pressure Potential Transformer.

In the accompanying illustration, fig. 1, is seen an e.h.p. potential transformer on test recently at the Rugby works of the BRITISH THOMSON-HOUSTON CO., LTD. It is designed for use on a 110,000-volt circuit, and occupies a floor area of 5 ft. 6 in. by 4 ft. 3 in. It measures 7 ft. 2 in. from the floor to the top of the tank, the overall height to the top of

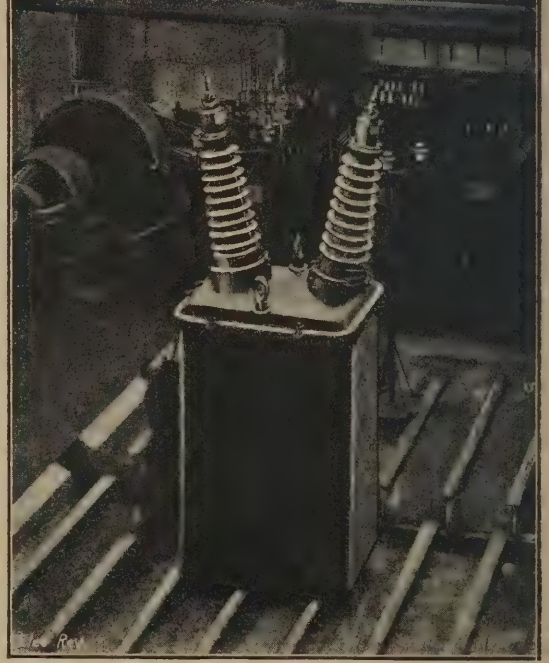


Fig. 1.—A 110,000-V Potential Transformer.

the bushings being 11 ft. 8 in. The transformer holds 600 gallons of oil, and when empty weighs 4,200 lb. It is interesting to note that four transformers, similar in design but for use on a 25-cycle, 74,000-volt circuit, are now in course of manufacture at the Rugby works, and will shortly be put on test. These transformers, as well as the 110,000-V unit illustrated, it is claimed, meet the requirements of B.S.S.81.

A Quick-acting Circuit Breaker.

According to *Electric Traction*, a new G.E. MR circuit breaker for railway service has been developed, having better circuit rupturing characteristics than previous designs, due to a powerful magnetic blow-out and the use of arc suppressor plates as used in drum controllers. The rupture is complete in a case of short circuit in approximately .03 second, about half the time required by the previous breakers.

The breakers are used for both protection against overloads and short circuits, and as hand-operated main switches. They

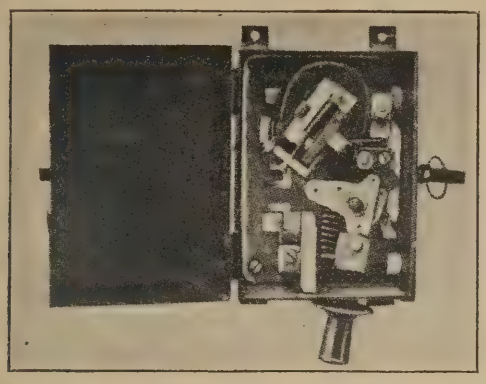


Fig. 2.—Quick-acting Circuit Breaker.

are light in weight and are enclosed in asbestos-lined sheet steel boxes.

A heavy compound base, held in the box by three cap screws, supports all the operating mechanism. Examination of the contact tips may be easily made by the removal of the arc chute, which is held in place by a single latch attached to the box in such a way that it can be moved only when the cover is open. All parts of the breaker are readily accessible for repairs or inspection. A view of the breaker is shown in fig. 2.

A New Tinning and Soldering Compound.

A patent compound called "Soldo," which automatically cleans as well as tins any metal except aluminium, has been brought to our notice by the SOLDO CO., of Sicilian House, Southampton Row, London, W.C.1. It is a greyish-white powder consisting of particles of pure tin mingled with a crystallised salt, slightly hygroscopic and is put up in moisture-proof tin boxes. We have tried this compound on a rusty iron wire and a No. 24 s.w.g. galvanised iron wire, without cleaning them in any way; heated in a gas flame, dipped in the compound (of which a small quantity adhered to them) and again heated and placed in contact, they were soldered together so effectively that when stretched the wire broke outside the joint. The makers claim that the compound is free from acid, and the tinning is permanent; moreover, interpenetration of the metals occurs to a greater extent than in the case of ordinary solder. In support of these claims they



Fig. 3.—Rusty Steel and Manganese Bronze Sections.

have had tests made at the National Physical Laboratory, whose report states that phosphor-bronze, "Ohmal" strip, manganese-bronze, steel, and cast-iron were all tinned with one application of "Soldo." Rusty steel and rusty cast-iron were also tinned with two or three applications of the compound, assisted by rubbing with a soldering iron. Comparative tests with workshop methods of tinning were made by microscopic examination of sections to ascertain the degree of interpenetration, which was found to be, in the case of phosphor-bronze, about twice as great with "Soldo" as with the ordinary method. "Ohmal" is usually hard-soldered on account of the difficulty of tinning it with soft solder, but was successfully tinned with the compound. In the case of manganese bronze the interpenetration was four or five times as great, and the sections of very rusty steel and cast-iron showed that the rust had been effectively removed wherever "Soldo" was applied, and interpenetration had been obtained, "illustrating in a marked manner the cleansing properties of the compound." Fig. 3 shows a section of rusty steel (×200) tinned with "Soldo" at *a*, rusty and untinned at *b*; and sections of manganese bronze (×350) at *c* and *e*, tinned in the ordinary way at *d*, and with "Soldo" at *f*, the greater depth of the copper-tin alloy being apparent in the latter case. For tinning the soldering bit we have found "Soldo" most effective, and with the bit so tinned a small joint can be soldered without further application of soldering flux.

An Electric Melting Pot.

Some particulars are given in *The Electrical News, Toronto*, of an electric melting pot which has recently been developed by HAROLD E. TRENT. The heating element is of nickel-chromium wire embedded in heat conducting electrically insulating refractory which, it is stated, is assembled under hydraulic pressure and secured to the bottom of the retort. It is claimed that this construction permits a temperature of 1,200 deg. F. to be reached. The heat insulation is a special cement for which high efficiency is claimed. A three-heat switch at the end of four feet of flat armoured cable protects the leads and facilitates installation.

The capacity of the pot is 30 to 35 lb. It is 10 in. in diameter and 8 in. high, and it weighs 36 lb. It is stated that 1,000 deg. F. may be obtained in 65 min., and 500 deg. F. in 35 min. The current rating is 1,200 W normal. It is especially adapted for melting tin, lead, zinc, babbit, solder, and type and needle metal.



Fig. 4.—The "Touchtone" Horn.

A New Electric Horn.

Fig. 4 illustrates the Tangent "Touchtone" electric horn, an industrial hooter which is being marketed by MESSRS. GENT AND CO., LTD., Faraday Works, Leicester. The horn can be supplied to operate on either a.c. or d.c. systems at any pressure up to 250 V, or on 6 V or 12 V batteries. The mechanism is encased in a hermetically sealed cast-metal case and is claimed to be flameproof, fireproof and water-tight. The electrical parts are well insulated and leading-in glands are provided for sealing the cable openings after insertion of the cables. No delicate or micrometer adjustments are necessary and it is claimed that permanent adjustment can be effected with an ordinary screwdriver.

An Electric-Light Bath.

THE HIGHBURY ELECTRICAL APPLIANCE CO., 57, Compton Road, Highbury, N.1, is about to put the portable radiant apparatus which we illustrate herewith, on the market. When open the appliance takes the form of a three-sided appliance which is intended to be inverted over the limb or part of the body requiring treatment. It is claimed to be perfectly rigid when

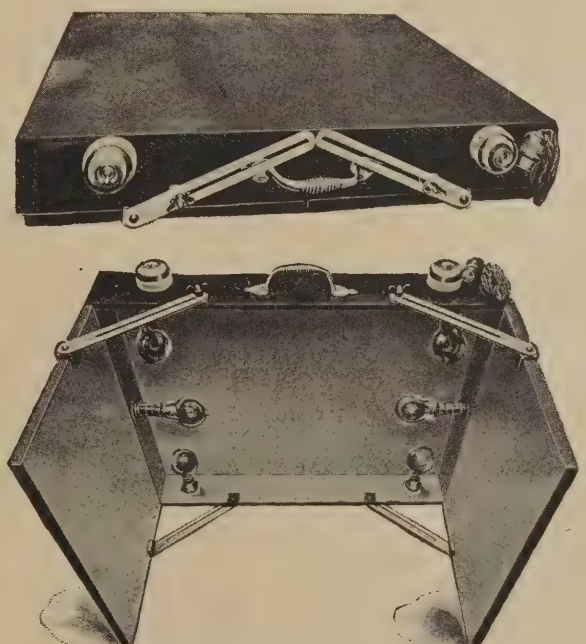


Fig. 5.—Electric-Light Bath, Folded, and Ready for Use.

in use, but is rendered portable when folded in a small compass similar in form to an ordinary suit-case. The apparatus is lined with sheet tin and is wired for six lamps with a consumption of about 800 W. The device is made in two styles, one with a mahogany case and the other of a lighter make in plywood for the use of the visiting practitioner.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Power Factor.

As a reader of some years' standing of your paper, I think the article by "Stan Dard" in your issue of June 19th on "This Puzzling Power Factor" does not make for electrical progress. Why did "Stan Dard," if he desired his article to be a progressive one, not finish his subject with some of the simpler methods of ascertaining the power factor in electrical circuits? As one of your non-technical readers I should have enjoyed "Stan Dard's" article much better if it had been finished in that manner.

James L. Shiels.

Lenzie, *June 29th*, 1925.

[The article referred to dealt with the lighter aspect of the subject, and did not profess to discuss it from the technical point of view, for which we may refer our correspondent to the little book on "Power Factor Correction," by Mr. A. E. Clayton (Pitman's, price 2s. 6d. net).—Eds. Elec. Rev.]

Artificial Crop Drying.

In your issue of the 26th ultimo Mr. Borlase Matthews offers some remarks on an article published by you on the 12th ultimo on "Electricity in Agriculture." Referring to the hot-air process for drying crops, he observes that this has not proved itself in practice for ricks of over 25 tons. It may not yet have done so, but the maximum dried has been eighteen tons of finished material. But the implication that all practical farmers incline to stacks of this size is scarcely justifiable. Stacks vary in size in different parts of the country. Stacks of 10 to 14 tons (finished material) are quite as common in some parts as the larger stacks in others. It is also suggested that the hot-air process bases all its claims on one of two 8-ton stacks dried last year. Those two were experimental stacks—they were not demonstrations. Much was learnt from them and put into practice last year with the greatest success—some 250 tons of wet corn being dried in an average time of under an hour per ton. The method is being proved in a practical way by numerous demonstrations conducted by the Ministry of Agriculture, and practical farmers express no doubt as to the excellent quality of the hay produced. It is certainly better than that produced in the experiments conducted with cold air in 1923 by the Ministry of Agriculture, and it is more than doubtful whether the hot-air process is dearer, as Mr. Matthews seems to assume. It is certainly not so tedious, nor does it require the same care and attention as the cold-air method. It is quite true, as Mr. Matthews states, that no comparative feeding trials of the two artificial systems—hot air and cold air—have been made. Nor are they likely to be. Nor have there yet been any conclusive detailed feeding trials of either in comparison with ordinary hay. So far, however, as tests have gone, there is no doubt that in palatability the hot-air hay surpasses the best natural hay, and trials on milk yield show that milk production is considerably increased by replacing ordinary with hot-air hay, weight for weight. Chemical analysis has shown that fermented hay produced by the cold-air process is inferior in every respect to ordinarily weathered hay.

B. J. Owen, M.A., D.Sc.,
Director of the Institute of Agricultural Eng.
Consulting Engineer of the Ministry of Agriculture and Fisheries.

Oxford, *June 29th*, 1925.

Is there an Age Limit?

I have been engaged in electrical engineering for thirty-three years, for twenty-five of which I have acted as assistant and chief engineer of contracting and maintenance departments for municipal and engineering firms. Owing to the closing of a similar department with my last employers, I have been out of a definite berth for eighteen months, during six of which I have advertised, and made persistent applications with negative results.

I should be glad to learn if there is an age limit in this era for obtaining employment; perhaps some readers of a pioneering journal such as yours can give their experience or opinions on the matter.

L. P. Ives (Non-Union).

London, *June 30th*, 1925.

Cooking by Electricity the Ideal Method.

Herewith is an extract from a letter received from a prospective consumer:—

"Your surveyor can confirm that there is absolutely no provision in this house for cooking except with a gas cooker . . . the lack of cooking facilities is simply intolerable."

This seems to be a great tribute to electric cooking, that gas is simply intolerable.

K. A. T.

July 4th, 1925.

Installation Practice.

Your correspondent "Essex" is up against the old trouble of "Mr. Plumber" carrying out electrical installations, and while I am in full sympathy with your correspondent, I am afraid there is no redress. Some time ago the Electrical Review published a report from the *Melbourne Age*, wherein a plumber was fined for interfering with matters electrical. This, of course, happened in Australia, but in Britain it seems that anybody can do an electrician's work with impunity.

"Essex" states that a decorator and plumber (a strange combination) is carrying out electrical work and is being assisted in it by the burgh electrical engineer. If that is the case, the engineer must be a strange sort of individual, or perhaps the plumber-decorator is a relation of the former. I would suggest to "Essex," first, to ascertain definitely if the engineer in question is aware that the work is being carried out by someone other than a *bona-fide* electrical contractor. On making sure of his ground "Essex" could then report the electrical engineer to the proper quarters. If "Essex's" statement is correct it will be the first time I have heard of a burgh electrical engineer giving technical advice to a plumber. Most of the gentlemen that I have met are above that sort of thing.

A word of consolation to "Essex": the client who has employed the plumber to carry out his work will probably have to pay "through the nose," and also he will be obliged to call in a *bona-fide* contractor at the finish to do the work over again.

Contractor No. 2.

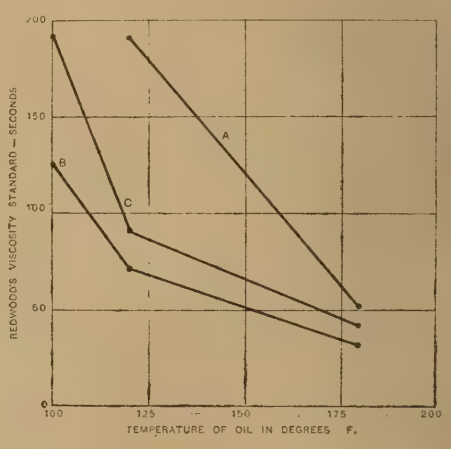
June 27th, 1925.

Lubricating Oil for Turbines.

The question of the best class of lubricating oil for steam turbines is most often left to the decision of the turbine makers; this is the wisdom of safety, at the same time acknowledging the lack of sufficient knowledge to specify what oil is suitable, and the physical conditions of the tests that should be conformed to.

Most turbines are provided with rotary displacement oil pumps; therefore, each revolution implies the same cubic capacity of oil being circulated; an ideal pump would be one that increased the amount of oil per revolution, depending upon its temperature. But as this is not at present attainable it behoves the operating engineers to obtain an oil having as flat a viscosity grade to temperature rise as possible.

Usually makers specify the viscosity in seconds at one temperature, generally 100 deg. F. This tells the operating engineer nothing. At least three readings should be required, corresponding to different temperatures; the flattest curves will usually indicate the best class of oil for the purpose.



I enclose the readings recently taken by myself for three oils, all guaranteed to be high-class turbine oils. I am not drawing the connecting lines as curves, which, of course, should be done but the straight lines show up the incongruity of the makers' statements.

The matter is of such importance to power station staffs that you will no doubt publish this letter, and it will, I hope, be the means of helping all round.

J. E. Stewart.

Swansea, *July 2nd*, 1925.

A British Institute of Radio Engineers.

I was very pleased to see Mr. Stanley's letter on this subject in your "Correspondence" columns of this week's issue.

In the first place, I would like to make quite clear the sense in which I have used the term "advanced *amateurs*." An "*amateur*" is one who does not engage in a pastime for personal gain, whereas a "professional" is one who relies upon his work wholly or partly as a means of livelihood. It will be seen that an amateur may be more skilled and even better trained technically than his professional brother. I cannot agree with Mr. Stanley's statement that the Wireless Section of the I.E.E. covers all the ground necessary; I only wish it were so.

If one will peruse a summary of all the papers read and discussed at the I.E.E. headquarters *and* local centres it will be seen that wireless forms a very small proportion of the subject matter.

My whole contention is that for the radio man this position should be exactly reversed, *i.e.*, he requires, say, 90 per cent. of the papers, &c., to be on radio matters and the balance on kindred electrical subjects. I think Mr. Stanley will appreciate this point if he will realise that radio matters are quickly becoming so important that they cannot simply be attached as a side line to general electrical engineering. These are not only my views, but are amply borne out in the correspondence Mr. Evans and myself are receiving daily.

If I may, I would like to amplify one statement in my original letter. I have actually discussed the matter with advanced amateurs *and professionals*.

If any further argument is necessary as to the usefulness of the above Society, I would ask why so many British radio engineers have joined the American Institute of Radio Engineers; surely if all these members had felt that the I.E.E. covered the ground they wanted, they would not have joined a society which, although it publishes excellent proceedings, does not hold any meetings or discussions in this country.

I am afraid also that the amateur societies in this country do not fill the bill; a technical society must not in any way be political or be concerned with such matters as broadcast programmes, &c. Please do not let there be any misunderstanding—the amateur societies have done and will do in the future good work, and it is not intended that this new society should encroach on their province. Also it would be an ideal condition if it were possible for the I.E.E. to take into its Wireless Section a number of workers at present barred. It would be well to bear in mind that a number of eminent scientists have, during their career, passed through what I have already called the advanced amateur stage. Please do let us avoid any "dog in the manger" policy; surely if the Americans can run a successful Institue of Radio Engineers as well as the American Institute of Electrical Engineers, we Britishers can do the same. It is a great pity that we were not the pioneers in the matter.

In conclusion, I would say that I have been in correspondence with a prominent member of the I.E.E. in London on this subject, and have also called at headquarters, it being our wish to act with the approval of the Council of this body. However, at the moment the matter in this direction must be considered *sub rosâ*.

J. Nelson.

Prescot, *July 4th*, 1925.

A Neglected Instrument of Precision.

I read with much interest the article entitled as above, which you published in your last issue. It is somewhat out of the usual run, and so, being different, attracts attention. The subject is one to which I have often given consideration and frequently tried to put into practice. It is, however, difficult amidst the pressure of ordinary work to find time to make some record of that work in writing—though I agree that it should be done, even if it means the burning of midnight oil. I have found that the very fact that records are put in writing facilitates one's work, for friends read it and discuss it, with the result that ideas are developed that facilitate further work and progress. Again, writing about a subject compels one to make sure that all the salient points are noted. To inspect a new machine and then to go away is one thing, but it is a very different thing if a description has to be prepared, for in the latter case the observation necessarily has to be more careful—thus one learns more as the result of writing. I have done a fair amount of writing, but still find it a difficult task to express matters clearly and logically in an interesting manner, though I feel that I am gradually improving. I always endeavour to get others to record their experiences for their own benefit and that of others.

As your contributor, Mr. Monaghan, says: "An engineering problem is not completely solved until the solution is available for the world at large." To-day that must be largely done through the written word.

R. Borlase Matthews.

East Grinstead, *July 4th*, 1925.

The Training of Power Supply Engineers.

I was very interested in the article of Mr. Bromley which appeared in your issue of June 12th but holidays have prevented me from commenting upon it earlier.

With some of the things he has said I am quite in agreement, but he has not succeeded in convincing me, nor do I think he will have succeeded with other engineers, that a two years' course in a manufacturing workshop is unnecessary. If there was one feature more than another in the E.P.E.A. Report on the Training of Engineers, which met with the most general approval amongst engineers throughout the country, it was the proposal that the trainee should spend at least two years in a manufacturing works before entering an electricity undertaking, as the latter was not the best place in which to acquire a good mechanical training.

Everyone will agree, of course, that a power-station engineer need not be an expert fitter, but he ought to know the best way in which to go about a job. Mr. Bromley admits this, but he is mistaken if he supposes that an engineer will possess this ability after having had only about twelve months on repair and construction work in a power station.

In the first place, the experience gained during this short period will be much too limited, and may even be confined to the carrying-out of minor repairs, whereas a longer period in a manufacturing works will enable the trainee to know something of the actual construction of an engine, turbine, or other piece of machinery, from start to finish. Also his attitude towards the carrying-out of an engineering job is likely to be much better if he acquires his mechanical experience in a works rather than in a station. In the latter a repair job must necessarily, in nine cases out of ten, be carried out as speedily as possible and those circumstances are not such as are calculated to develop thoroughness and accuracy.

Furthermore, if my own experience is anything to go by, I should say that many power stations are not equipped with the most up-to-date workshop machinery as are manufacturing works, so the trainee cannot hope to get the same acquaintance with modern methods in the former as he can in the latter. Expert mechanics are not always available in power stations, and even if they are, every experienced engineer knows that occasions frequently arise when he himself has to decide on the best way of carrying out a difficult repair job, and it is then that a good mechanical experience stands him in good stead.

With regard to his criticism that the training outlined by the E.P.E.A. is too protracted, I am unable to see that there is much in it. Under the scheme which he has outlined it is expected that the student shall have had a technical college training and preferably shall have taken a degree. This will mean a period of three years, and together with the time spent in an electricity undertaking will amount to a total of six years. Under the draft scheme of the National Joint Board the total may be six or seven years, according to circumstances.

With his remarks relative to the pecuniary disadvantages under which the engineering student labours as compared with the young medical or dental student, I am in entire agreement. The only remedy for this, however, is for electricity undertakings to shoulder some of the responsibility and thus provide sufficient inducement to youths entering upon the course marked out.

J. W. Thomas.

Manchester, *June 29th*, 1925.

Celluloid in Accumulators.

May I, through you, ask your anonymous correspondent whether he has made a great discovery, or whether he has only just heard of the material, commonly called "non-inflammable celluloid" which, as is very well known, has been on the market for many years?

If the latter is the case, your correspondent may like to know that as soon as this material was available, attempts were naturally made to use it for manufacturing cell cases.

It was, however, very quickly discovered that the material simply shrivelled up under the action of sulphuric acid, and was, therefore, quite useless for cell cases. It so happens that some years ago I demonstrated this fact to the Mines Department, and I still have the cell case—or rather the remains of it—with which I demonstrated.

I am more particularly interested in the cells of miners' lamps, and for some years I have developed and used ebonite cell cases as an alternative to celluloid—the choice being entirely with the purchaser.

It must be admitted, and has been admitted, that whilst the ebonite case has the advantage of being non-inflammable and easily handled it will not stand the same amount of ill-usage as celluloid, and is opaque.

I am sure that a number of your readers, including myself, will be most anxious to know whether your correspondent has now discovered a "non-inflammable celluloid," which will withstand the action of sulphuric acid.

Theodore Stretton.

Cardiff, *June 30th*, 1925.

The Electrocution of Rats.

As you have not published any reply to the letter on the above subject in your issue of June 19th, perhaps what I have attempted in this connection may be of interest.

I constructed a trap consisting of a baseboard of wood carrying on its face an annular metal ring 3 in. in width and about 9 in. in diameter on the centre line, with a concentric hole in the centre cut through the base board about 3 in. in diameter. Below this was fixed a metal dish containing the bait, consisting of pieces of cheese, apple rind, and drops of oil all floating in water. The leads from a 220-V single-phase alternating circuit were soldered to the ring and the dish. I calculated that the hind legs of the rat would be on the ring and his front paws, holding to the edge of the hole in the wood, insulated, so that he would get a current through the mouth right through the brain and body to the hind legs.

From the subsequent appearance of the straw I put down to camouflage the trap, I fancy the rat got the surprise of his life, but that was all, and I stopped up his hole whilst I proceeded to investigate the more remunerative business of the extermination of "rates" suggested by your printers' "devil" in the letter referred to.

R. K. Hearn.

June 29th, 1925.

Street Lighting in Bradford.

I desire to correct a misstatement in the report of my remarks in the discussion on street lighting at the Brighton I.M.E.A. Convention.

I am reported as saying that in Bradford we had appointed a lighting expert to advise a new Committee selected from the Watch and Finance Committees. What I said was :—

"The Chairman of the Electricity Committee and myself had suggested a scheme for complete lighting, and as it was too large an undertaking to do at once, it was suggested to take part in hand, taking the most important part one year, and afterwards to work from a centre until all was completed."

The misquotation I desire mainly to draw attention to is that the Committee is being advised by an independent expert.

As the matter at present stands, we in Bradford are awaiting reports from both the Gas and the Electricity Departments before the scheme is considered, so that it will be quite clear that I could not make the statement attributed to me, but what I did say was :—

"In my opinion the proper Committee to deal with street lighting was a Committee selected from the Watch and Finance Committees, so that the cost would be watched and also the Watch Committee as controlling the Police Force would be in the position through having their men in all streets of being at all times able to report as to the efficiency of the street lighting."

I was also very careful to state at the conclusion of my remarks my own personal opinion :—

"I feel very strongly that the time has come when there should be appointed in all towns of any reasonable size and which will warrant it a lighting superintendent, who shall be responsible and shall be in a neutral position between gas and electricity and who shall advise the Committee responsible for lighting as to the methods to be adopted. I am quite satisfied that not only would this make for better results from the lighting side, but also for economy, and it would remove any feeling between the two departments."

I must apologise for the length of this letter, but feel that under the conditions at present obtaining in Bradford as to the lighting of streets the correction should be made.

J. W. Longley.

Bradford, *June 30th*, 1925.

The London County Council Tramways.

Report for 1924-25.

At the meeting of the London County Council on July 7th, the Highways Committee presented its report on the working of the tramways for the year ended March 31st last.

This shows that the total income for the year was £4,229,837, as compared with £4,374,057 in 1923-24, while the working expenses rose from £3,518,362 to £3,754,140. There was accordingly a surplus of £475,697 (£855,695), but against this the cost of renewals amounting to £282,382 (£310,241) was charged, reducing it to £193,315, as compared with £545,454 in the preceding year. Owing to the temporary suspension of certain sinking fund payments the capital charges were considerably reduced, the amount charged against the surplus being £471,756, as against £705,676. In spite of this, however, the net deficit for the year was £278,441, as compared with £160,220 in 1923-24. This deficiency has been met to the extent of £40,604 out of the balance of the reserve fund formed from the surplus of £200,827 which accrued in 1922-23; the remainder has to be met by a special county rate.

The total net capital expenditure upon the undertaking amounted at March 31st last to £16,692,535, of which £436,721 represented expenditure during the past year. The amount of debt incurred up to March 31st was £17,025,583; the net debt outstanding, after allowing for repayments, sinking fund balances, &c., was £9,099,538. It is worthy of note that the amount of capital expenditure which had become obsolete owing to the electrification of horse tramways was £2,024,688, but this had been reduced to £751,215 by March 31st last.

The sum paid to metropolitan borough councils and the City Corporation for rates on the permanent way amounted last year to £59,933, in addition to £77,609 paid in respect of offices, car sheds, sub-stations, &c. The saving to the road authorities in consequence of the obligation of the Council to maintain the paving along the tramway routes was estimated at the end of the year under review to be about £240,000 a year on the present mileage. Debt charges in respect of street widenings amounted to £30,906. These three items, *i.e.*, rates on track, road maintenance, and street improvement charges, together amounted to £330,839, and various local rates were therefore relieved to this extent.

The traffic figures show that the inclusive length of track was 164.14 miles; the car-miles run during the past year totalled 68,068,216, as against 64,118,565; the number of passengers carried fell from 689,015,086 to 682,595,733; the average receipts per car-mile declined from 16.04d. to 14.63d.; and the average working expenses per car-mile rose from 13.17d. to 13.24d.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

3,374. "Receiving and transmitting aerials for wireless telegraphy and telephony." J. Plebanski. February 8th, 1923. (211,151.)

3,472. "Cathode-ray oscillographs." E. V. Appleton, J. F. Herd, and R. A. W. Watt. February 11th, 1924. (235,254.)

3,678. "Electric motor control systems." A. H. Jackson. February 12th, 1924. (235,258.)

3,880. "Electric switches." A. Page. February 14th, 1924. (235,260.)

5,462. "Direct-current electricity meters." S. Z. De Ferranti and Ferranti, Ltd. March 3rd, 1924. (235,267.)

5,604. "Electro-deposition of metals." T. W. S. Hutchins. March 4th, 1924. (Addition to 197,066.) (235,272.)

5,673. "Magneto-electric machines." R. B. North and A. Massey-Allen. March 5th, 1924. (235,274.)

5,719. "Receivers for electrical transmission, particularly wireless transmission." W. H. Fulford. March 6th, 1924. (235,275.)

5,863. "High-frequency telephony or telegraphy." Electrical Improvements, Ltd., Newcastle-upon-Tyne Electric Supply Co., Ltd., and L. C. Grant. March 7th, 1924. (235,278.)

5,882. "Variable electric condensers and like rotary instruments." C. C. Phillips. March 7th, 1924. (235,279.)

6,025. "Systems of charging and discharging storage batteries." A. D. Riccia. March 8th, 1924. (Patent of addition not granted.) (235,282.)

6,032. "Sound-recording, transmitting, receiving, and reproducing devices." F. C. Townshend and V. J. P. Clifford. March 8th, 1924. (235,283.)

6,148. "Inductance coils, transformers, and like wireless accessories." H. C. Weston. March 10th, 1924. (235,292.)

6,155. "Thermionic valves." H. J. Round. March 10th, 1924. (235,295.)

6,170. "Inductance coils and the method of producing the same." J. G. Snowball. March 11th, 1924. (Cognate application, 10,549/24.) (235,296.)

6,214. "Electromagnetic apparatus, specially suitable for use as a relay, switch, motor, or like device." Creed & Co., Ltd., and F. G. Creed. March 11th, 1924. (235,300.)

6,376. "Electric inductance coils." Major & Co., Ltd., and W. A. M. Valon. March 12th, 1924. (235,303.)

6,409. "Circuits of thermionic amplifiers." Burndept, Ltd., and C. F. Phillips. March 12th, 1924. (235,307.)

6,423. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. August 25th, 1923. (220,923.)

6,476. "Electric brake and solenoid-type magnets." Crompton & Co., Ltd., and W. F. Jones. March 13th, 1924. (235,310.)

6,477. "Electromagnetic switches for rheostats and regulating gear." Crompton & Co., Ltd., and W. F. Jones. March 13th, 1924. (235,311.)

6,520. "Coupling of detecting and aerial circuits in wireless receiving apparatus." K. D. Rogers and G. V. Dowding. March 13th, 1924. (235,312.)

6,645. "An interlocking arrangement for two or more devices applicable, for instance, to electric switchgear." British Thomson-Houston Co., Ltd., and C. W. Wood. March 14th, 1924. (235,319.)

7,499. "Portable wireless headphone cabinet." J. H. Christian. March 24th, 1924. (Cognate appplication, 24,999/24.) (235,327.)

8,064. "Detectors for wireless telephony." A. G. J. F. Clutterbuck and F. A. Soden. March 31st, 1924. (235,332.)

10,552. "Electrical methods of igniting in internal-combustion engines." H. P. T. Lefroy. April 29th, 1924. (235,351.)

11,097. "Electric converting apparatus." J. E. Calverley and W. E. Highfield. May 5th, 1924. (235,361.)

12,087. "Telephone systems." Western Electric Co., Ltd. July 31st, 1923. (219,942.)

12,522. "Electrical signalling systems or annunciators, chiefly for hotels." International Electric Co., Ltd., and F. R. Baldock. May 21st, 1924. (235,368.)

12,894. "Electric hot-plate or boiling ring." H. Aumann. May 26th, 1924. (235,374.)

13,415. "Connection of electric conductors." J. Lucas, Ltd., and O. Lucas. May 31st, 1924. (235,378.)

13,698. "Impulse-sending devices of the dial type." Automatic Telephone Manufacturing Co., Ltd. December 10th, 1923. (226,152.)

14,467. "Apparatus for applying electrical currents to the body." M. Smart. June 14th, 1924. (235,388.)

14,666. "Device for measuring the voltage, load, and work on the high-voltage side of high-tension plants." Sachsenwerk Licht-Und-Kraft Akt.-Ges. November 30th, 1923. (225,508.)

16,299. "Wireless aerials." J. H. Herzog. July 7th, 1924. (235,407.)

17,328. "Electrically-heated hand-irons." D. Donaldson. July 19th, 1924. (235,412.)

18,434. "Method of, and means for controlling and distributing electric current." British Thomson-Houston Co., Ltd. (General Electric Co.). August 1st, 1924. (235,417.)

22,130. "Electric inductance coils for locating metals which are being carried away." R. H. Gefficken, R. H. Richter, and Geb. Wetzel. November 26th, 1923. (225,517.)

23,939. "Electric measuring instruments." British Thomson-Houston Co., Ltd. October 9th, 1923. (223,240.)

24,011. "Electrical switches." H. B. Old. October 10th, 1924. (235,442.)

25,562. "Electrical condensers for ignition circuits." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (235,448.)

26,807. "Delay-action overload relay devices for high-tension electric circuits." H. M. Smith. November 16th, 1923. (224,888.)

27,606. "Loud-speakers for radio receiving apparatus and the like instruments." Edison Swan Electric Co., Ltd., and W. J. Davis. November 18th, 1924. (235,465.)

27,787. "Electrodes for use in electrolytic systems for protecting boilers or the like." A. Kirkaldy. November 20th, 1923. (225,222.)

29,124. "Method of reducing disturbing currents induced in signalling lines by neighbouring power lines." International General Electric Co., Inc. December 4th, 1923. (225,861.)

29,326. "Telephone receivers." Westinghouse Electric and Manufacturing Co. December 7th, 1923. (225,874.)

30,121. "Electrical apparatus." British Thomson-Houston Co., Ltd. December 15th, 1923. (226,237.)

30,157. "Electric fuse and like fittings." W. T. Henley's Telegraph Works Co., Ltd., and H. W. Breeze. December 15th, 1924. (Addition to 217,010.) (235,476.)

30,453. "Reinforced-concrete sleepers for the permanent-way of railways and tramways." V. Isern Y. Dominguez and F. P. De Los Cobos Y Cerda. December 18th, 1924. (235,478.)

1925.

321. "Frame aerials for wireless telegraphy and telephony." K. Burk. January 23rd, 1924. (228,135.)

704. "Overhead lamps." Dr. K. Markau. January 9th, 1924. (227,461.)

1,612. "Vacuum-tube oscillation generators." Westinghouse Electric and Manufacturing Co. January 25th, 1924. (228,160.)

1,720. "Electrically-heated annealing furnaces." Akt.-Ges. Brown, Boveri et Cie. August 13th, 1924. (235,490.)

6,523. "Alternating electric-current relays and circuit arrangements therefor for protective purposes." International General Electric Co., Inc. March 10th, 1924. (230,501.)

6,669. "Electrolytic production of aluminium." Aluminium Co. of America. April 10th, 1924. (232,189.)

The

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Electricity Supply, 1920—1923.

IT is not often that a reviewer comes across a book containing 580 pages of tables out of a total of 628 pages, inclusive of the index, which he can honestly say is interesting. That such a book is imposing goes without saying, that it is valuable may be assumed, but that it is a book difficult to lay down when once one has dipped into it is a statement which may require justification. Yet this may truthfully be said of the "Return of Engineering and Financial Statistics of the Electricity Commission."* Upon any one connected with the electrical industry, and particularly with the central-station side of it, this volume exercises the same kind of fascination as does "Who's Who" or "Debrett" upon those whose titles to fame have been recently recorded. From the performances of his own undertaking, which he knows by heart already, the engineer will turn to those of the Newcastle-upon-Tyne E. S. Co. or of the Mynyddislwyn Urban District Council, whichever makes the most appropriate comparison, to see how they have been doing. It will then occur to him to look up the records of Little Puddlington-on-the-Marsh to see whether his old friend, John Dogsbody, really is running on 2 lb. of coal per kWh, as he said he was. Name after name will catch his eye, for the records of every authorised undertaking in Great Britain are given with "nothing extenuate nor aught set down in malice," and there will always be just one more undertaking whose records he wants to look at before he lays the volume aside.

At the risk of being tedious, it will be well to state as briefly as possible what the book contains. It covers the three years ending December 31st, 1922, or March 31st, 1923; one could have wished that it brought things down a little nearer to the present, but as the Commissioners are to issue a further Return as soon as possible, and hope to make the publication an up-to-date annual, criticism on this score is unjustified, particularly in view of the immense amount of labour involved in getting the work going at all. Concerning the subject-matter, it may be said that the return includes in all 543 separate authorised undertakings, of which 326 are local authorities and 217 are companies, though not all of these had started supply at the dates mentioned. What may be called the main tables occupy 549 pages of the volume. There are four main tables, the first two relating to engineering matters of local authorities and companies respectively, and the second pair to financial matters. The undertakings are arranged alphabetically for England, Scotland, and Wales, and each has an index number to facilitate cross reference.

* H.M. Stationery Office. Price 15s. net.

The engineering statistics comprise: (1) Nature and frequency of current; (2) voltage at generators and at consumers' terminals; (3) evaporative capacity of boiler plant; (4) type, capacity, and number of main generators; (5) maximum load on station during the year; (6) connected load at end of the year; (7) load factor of undertaking. This information is given on two facing pages. The next pair of pages contains: (8) lb. of fuel (coal or oil) per kWh generated; (9) units generated, purchased, and total; (10) units used in works; (11) units lost and unaccounted for; (12) units sold for (*a*) lighting and domestic purposes, (*b*) public lighting, (*c*) traction, (*d*) power, (*e*) bulk supplies, and (*f*) total. Next comes (13) population of supply area; and (14) units per head of population.

Still at the risk of tediousness, but out of fairness to the Commissioners, the contents of the financial tables must be mentioned. In these tables as many as six pages are required to accommodate the line of figures belonging to each local authority or company. As there are no fewer than 69 different columns of financial statistics, it is necessary to summarise them. Under the heading of "Expenditure Charged to Capital Account" we have 15 columns of details. The next pair of pages are devoted to revenue. We have the quantities of energy sold under the six headings of domestic purposes, public lighting, traction, power, bulk, and total, with, in each case, the revenue obtained and the price per unit. This accounts for eighteen columns, and the remainder on the page deal with revenue from maintenance of public lamps, rental of apparatus, sale of fittings, &c. The final pair of pages deal with expenditure on revenue account and appropriation of gross surplus. Generating costs are only subdivided into "cost of fuel" and "other costs." These, together with "current purchased," make up "total cost of energy," which is given in lump and per unit sold. Adding the figures for "distribution" and "management," we get columns for total working costs, both lump and per unit sold. Other columns give the expenditure on lamp maintenance, rent, rates and taxes, &c. Finally, there is a column for the gross surplus, followed by five more showing how it is disposed of.

One could really hardly ask for more in a work of this description. In the engineering tables it will be noted that there is no mention of the calorific value of the fuel nor of the thermal efficiency of the plant. In omitting data on these points the Commissioners are certainly wise. Nobody believes either the calorific value or the thermal efficiency declared by any station other than his own. The quantity of coal consumed per kWh is, however, an easily ascertainable figure, and as coal has to be paid for, the quantity burnt has to be known accurately. If the consumption of any particular station is high because a low-grade coal is used, the merit of the performance can be appraised by reference to the cost of coal per kWh generated, or sold, which, after all, is the real test.

The tables which form the bulk of the book have been referred to first, because they are of special interest to those concerned with the performance of individual undertakings. There is, however, a broader aspect of electricity supply which appeals strongly to those who, whether connected with the industry or not, are nevertheless interested in the progress being made in its development. Such readers will find their greatest pleasure in the thirty-two "summary tables" which come in the early part of the volume. These are extraordinarily good. Whoever laid down the lines of the book knew exactly what kind of information the general student of the electricity situation would like, and he has saved such students the trouble of digging out the data from a mass of irrelevant figures by doing it all for them.

The first of these summary tables classifies the whole of the 468 generating stations in Great Britain into 22 groups according to size, and gives the number falling into each group. It may be mentioned with regret that the largest group of 53 stations contains plant of between 1,000 and 2,000 kW capacity only, and that 328 stations, or over 70 per cent. of the total, are of less than 5,000 kW capacity. We then come to tables showing the number of steam turbines, reciprocating steam engines, gas engines, oil engines, and water-power plants installed. Another table gives the number of generating sets of various sizes; then we have particulars of the various voltages, frequencies, &c., in the country, and of the units generated, purchased and sold for three consecutive years. Other tables tell us how much of the total was generated by steam, gas, oil, or water. Undertakings are then classified in 13 groups according to annual output, and again in 15 groups according to units sold per head in their respective areas. Further tables show the number of undertakings with various maximum loads and various load factors. We are also told by tables how many plants there are in various groups, classified according to their fuel consumptions, and a dozen or more financial tables deal with expenditure and revenue. Among these, one, giving the number of undertakings selling electricity at various average prices, is particularly interesting. There is indeed hardly a table in the book a discussion of which would not form a subject for a long article. Such articles may be written later. The present object is merely to call attention to the existence of the book and to indicate the nature of its contents. It is a production which is a credit to the Commissioners in every way, and the enormous labour which its compilation must have cost is abundantly justified. Taking it in conjunction with the Return of Administrative Particulars issued in January last, we have to thank the Commissioners for placing at the disposal of the electrical industry the most exhaustive information with regard to the statutory electricity supply undertakings of Great Britain that could possibly be obtained.

Prosperity and Problems.

In his annual speech to shareholders of the General Electric Co., Ltd., which is reported elsewhere in this issue, Sir Hugo Hirst, the chairman, mentioned with justifiable satisfaction that the profit for the year had reached a record, standing for the first time at over a million sterling. The company has resisted the temptation to make a large distribution on the ordinary shares, preferring rather to hold liquid resources at command in readiness for taking advantage of the opportunities which a progressive industry presents for re-investment. The speaker hinted at some scheme or other which may be introduced at a not too distant date for lightening the heavy burden of debenture charges. He also once more expressed the view that is held by all the best-informed minds that, "electrically speaking, we are only at the beginning of things." If that description of the situation be correct when the company operates profitably with a capital of £9,000,000, it is impossible to suggest to what figure the capital of this and other such concerns may ultimately reach as the vast anticipated electrical progress reaches it full development. We cannot, however, look only to the future, for present problems press heavily and demand attention. Sir Hugo Hirst and his colleague, Mr. Railing, have been investigating Continental industrial working conditions, and some of the conclusions arrived at are stated in our report. But most noteworthy of all the subjects touched upon in the speech was that of international electrical co-operation to which we have referred on several occasions in these pages. It is considered that whether we succeed in solving our present difficulties or not, the fact must not be ignored that the absorbing power of the world at the moment is insufficient when compared with the power of production which under war-needs each country increased to double its normal requirements. Sir Hugo advocated international collaboration in facing this situation. What he termed "industrial steadiness" can be gradually recovered and steady recovery of the world be helped, only by the big industries of the principal countries putting their heads

together to discuss standardisation, working conditions, and the sharing of markets. He referred to the difficulties, political and industrial, that might be anticipated if "wild competition" between countries were to be allowed to go on unchecked and in the spirit of the "survival of the fittest."

Argentina—An Important Market.

THE statistics relating to Argentina's imports, which are given in this issue, show that there was a large and fairly general increase during 1923 as compared with 1922. Upon the whole, however, the share of the United Kingdom was not of such satisfactory dimensions as in 1922; both Germany and the United States appear to have increased their proportions at a much greater rate. In some cases we lost ground during the year, notably with regard to accumulators. In this case our exports to Argentina were about halved, while the United States' share was doubled, although we remained the principal suppliers. As regards electrical accessories, in 1923 we ceded the first place to Germany, who increased her contribution by over 60 per cent., while our increase amounted to only about 20 per cent. The United States passed us in the telephone apparatus section, although both our own and Germany's contributions showed a considerable increase. Our supplies of porcelain insulators were almost on a par with Germany's in 1922, but in 1923 our competitors left us far behind. On the other hand, we made a satisfactory advance in respect of the largest item—wires and cables. Although in actual figures Germany's increase was greater, proportionally the position was much more satisfactory as the United Kingdom's share was more than doubled. This country again headed the list in the item "Materials for cells or storage batteries," and a larger advance than those of our principal competitors was recorded. Under the heading "Insulating tubes" we increased our exports by 72,000 pesos, thus ousting Germany from the first place; and the United States fell behind the United Kingdom in the case of switchboards, we having exported six times the 1922 value. We remained behind Germany, Italy, and the United States in our exports of dynamos and motors, the outstanding feature of this section being a very large increase in the German share. We managed to supply more incandescent lamps during 1923, but our figures are small compared with those of Germany and Holland. In another large item, unspecified electrical material, we kept pace with Germany and the United States. The method of classification adopted appears to lead to overlapping or redundancy in some cases, but it must be remembered that it is the official Argentine system.

Electro-Farming at the Chester Royal Show.

IT is a noteworthy sign of the times that so much attention has been paid to the applications of electricity at the farmers' premier show—that of the Royal Agricultural Society of England—at Chester this year. For the first time in the history of this important event a complete public service of electricity was available, and more than 50 stands were using electric current in one way or another. (Of course, there was no demand for lighting in a midsummer show that closed at 8 p.m.) Of the enormous crowd that attended the show, hardly any noticed the overhead distribution lines, which blended well with the low stands, and relieved any feeling of flatness. Incidentally, the Chester Corporation supplies a large rural area, and already has 30 farmers connected to its system. This enterprise is due to Mr. S. E. Britton, city electrical engineer of Chester and ex-president of the I.M.E.A. As Sir Hugo Hirst is on the Committee for next year's Royal Show—which is to be held at Reading—we may rest assured that electricity will be well represented there also.

Another landmark associated with this show was the holding of the first British Electro-Farming Conference in the main conference tent of the Society. The meeting was organised by E.D.A. The chair was taken by the Right Hon. Lord Bledisloe (Secretary in the House of Lords to the Minister of Agriculture). Mr. S. E. Britton opened on behalf of the electricity supply industry, and Sir John Russell (head of the Rothamstead Agricultural Experimental Institute) put the case from the point of view of the agriculturist. Mr. R. Borlase Matthews followed with some notes based upon the actual practical use of electricity in farming work, incidentally announcing a new commercial discovery in connection with the use of electric light for stimulating plant growth. Mr. J. W. Beauchamp then explained the underlying basis of the Conference. Most countries now have special electro-farming conferences, and it is pleasing that this country is not neglecting the matter. There are rumours of an International Electro-Farming and Rural Electrification Conference being held, and it is hoped that it will take place here, now that a start has been made with a home meeting.

In the current issue of the *Journal* of the Royal Agricultural Society of England, a report made by Mr. C. Dampier Whetham appears, as the result of an inquiry made by the Research Committee of the Society. This is another straw which shows which way the wind is blowing. It is a very painstaking and impartial summary of the position of electro-farming in England, though it goes a little astray when questions of electricity supply are considered.

In the columns of the ELECTRICAL REVIEW the case for electro-farming has always been supported. There have been many doubters, and there is still a long row to hoe; however, this Chester Show has focused attention on the subject, and should give great encouragement to the pioneers in this important work. Moreover, the electrical industry generally has been given a very broad hint as to the huge field of work that is opening out for it.

The Southern Railway Electrification.

THE inauguration of the new electric train services on three sections of the Southern Railway on Sunday last was a notable event, opening a new era for one of our oldest railway systems—that known as the South-Eastern and Chatham Railway before it was absorbed in the amalgamation scheme. The South-Eastern suburban system for many years stood in need of conversion to electrical operation, but suffered from lack of capital and credit which prevented the directors from embarking on so costly an enterprise. Latterly its rolling stock depreciated to a marked extent—not only the locomotives but also the passenger coaches, many of which were of antiquated design and construction, and were most uncomfortable; much of the decay was due to the very heavy traffic which these railways had to cope with during the war. Consequently the introduction of brand-new easy-running coaches is almost as gratifying to the passengers as the adoption of electric haulage and the accompanying improvement in speed and in the scheduled service. In passing, we may say that whilst the old S.E.R. bore a bad reputation for time-keeping, it was far from justified, and the frequent jocular references to its leisurely ways were based upon conditions that long ago ceased to exist; we can vouch for its generally high standard of punctuality.

The operation record of the first week-day was unfortunately marred by a number of hitches, none of which was of importance, but which gave rise to a good deal of inconvenience and delay; the trouble was partly due to the simultaneous introduction of a new time-table, which added to the difficulties of the railway staff. There were nine failures of apparatus in 450 journeys, and most of these were attributed to the binding of the brake mechanism, with the result that the trains could not be restarted, and in some cases the main fuses in the motor compartment were blown owing to the attempt to get away overloading the motors. In the course of a week or two the equipment will be in better running order, and we anticipate that the electrification will prove as successful as that of the other Metropolitan services. It is satisfactory to record that there was no failure of the power supply, which is derived from the Deptford generating station of the London Electric Supply Corporation.

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The Science Exhibits at Wembley.

The Royal Society's Display in the Government Pavilion.

THE Science Exhibition at Wembley forms part of the British Government's participation in the British Empire Exhibition, having been organised, with funds provided through the Department of Overseas Trade, by a committee appointed by the Royal Society under the chairmanship (1925) of Mr. F. E. Smith, C.B.E., F.R.S. In many cases the exhibits, the majority of which are working demonstrations, are shown by the gentlemen actually engaged in the work and are supplemented by apparatus loaned by some of the leading scientific instrument makers.

The arrangement of the principal section of the physical exhibits is based on the extended spectrum of electro-magnetic oscillations and radiations, the experiments illustrating the phenomena met with in the different regions of the spectrum. As a key a large chart shows, in a manner which appeals to the eye, the whole range of radiations now known to be electro-magnetic. According to classical theory, all the types of radiation mentioned on the chart are propagated as strains in the ether of space with a constant velocity which is approximately equal to 30,000,000,000 centimetres per second. There is every reason to believe that the radiations shown on the chart, from the shortest gamma-ray having a wave-length of only 0.000,000,000,2 centimetre up to "wireless" waves having a wave-length of 500,000 centimetres, travel in space with this fixed velocity and that, although their effects are very diverse, the only fundamental difference between the many types of radiation studied lies in the wave-length. The whole range of radiations is divided for convenience into groups; within any group the radiations are similar in their characteristic effects and properties, and the same methods may be employed to detect and produce a wave of any length within a group.

Since a chart in which the lengths of the lines are made proportional to the wave-length would circle the earth very many times, a scale of octaves has been chosen, an octave implying that the numerical value of the wave-length has been doubled. The chart shows about 60 such octaves, and there is an unbroken series of radiations increasing in wave-length from gamma- to X-rays, through the ultra-violet and the visible rays to the infra-red, so to the Hertzian and "wireless" waves, finally ending with the very long waves corresponding to relatively slow electrical oscillations. The wave-lengths are given in centimetres and in Angström units. One Angström unit is equal to 0.000,000,01 centimetre. It is only recently that radiations have been discovered corresponding to all the wave-lengths shown on the chart.

"Wireless" Waves.

Prof. R. Whiddington, F.R.S., demonstrates standing electric waves on a pair of taut wires by association with a closed circuit excited by a spark gap and transformer, *i.e.*, Lecher's system, making use of continuous oscillations sustained by valves. The length of the wires has been chosen for resonance (wave-length, 1 metre), and the standing waves are detected by bridging the wires with a flash lamp. In the usual case of a radio aerial, only part of one wave is formed.

Amongst the numerous exhibits of the National Physical Laboratory is apparatus for determining frequency and wave form (Mr. D. W. Dye). A steadily vibrating tuning-fork, having a frequency of 1,000 vibrations per second, produces, with the aid of a valve amplifier, a circularly-rotating ray in a cathode ray tube which forms the time base. The source of "wireless" frequency oscillations is caused to operate on the ray so that, in the absence of the large circular movement, a small circular movement of the ray is produced at the "wireless" frequency; by carefully adjusting the latter, the light spot in performing its looped journey round the time circle can be caused to arrive at exactly the point from which it started. When this occurs the light spot continually retraces the same path, forming a stationary looped figure. If the two circular motions of the light spot are in the same direction, the ratio of the frequencies is equal to the number of loops minus one. The setting of the "wireless" frequency to a known value consists, therefore, in producing a stationary looped pattern, counting the number of loops, and adding one. By suitable means the time trace can be made a long ellipse. If the "wireless" displacement is adjusted to be a straight line perpendicular to the long axis of the ellipse, the wave form can be examined. Other apparatus (Dr. R. L. Smith-Rose) illustrates the principle of a rotating closed-coil direction finder, while Dr. R. L. Smith-Rose demonstrates the heating effect of the currents induced in a coil by a "wireless" wave by the inclusion of a small glow lamp in the circuit of a receiving coil; the magnitude of the current is approximately indicated by the temperature of the filament.

Other N.P.L. exhibits are a wave-meter showing resonance, rectification by crystals, and the delineation of damped radio waves, while interference is shown between two wave forms from two independent valve oscillators, which are simultaneously projected upon the screen of an oscillograph. If the two frequencies are adjusted so that each is an integral multiple of the tuning-fork frequency, they will interfere with a difference frequency, which is also an integral multiple of the fork frequency. The pattern produced will therefore be stationary and hence visible. By making the amplitudes of the two waves equal, the combined wave will swell up to a maximum and then die down to zero as the waves first reinforce and then oppose one another. If the two waves are unequal, there is a swelling-up and dying-down of the wave of a kind very similar to that produced by modulation at the frequency equal to the difference between the two radio frequencies.

The research laboratories of the General Electric Co., Ltd., shows the bombardment of the anodes of two-electrode valves by electrons and also the change in temperature distribution along an emitting filament. A long thin filament is surrounded by an anode of grid form, and is heated by d.c., being normally of uniform temperature; when a d.c. voltage is applied between filament and anode, and an emission current is taken from the filament, the temperature at the negative end increases visibly and decreases at the positive end. This effect may have serious consequences on the life of a filament. A rectifier is shown rectifying alternating current, and the filament is heated from the same source, but the phase of the filament current can be changed by means of a phase-shifting transformer. When the filament current is in phase with the anode voltage, one end of the filament is always negative when emission current is flowing, and consequently is overheated. When the phase is shifted 90 deg., overheating disappears, for now each end of the filament is equally negative and positive when the emission current is flowing. On shifting the phase another 90 deg., the other end of the filament becomes overheated. A modern development of the original Wehnelt cathode is shown in the form of a cylinder of nickel, coated with mixed oxides of the alkaline earths, heated to a dull red by radiation from an enclosed tungsten filament.

Dr. J. A. Fleming, F.R.S., has a show-case containing specimens of his original rectifying valves, together with examples of modern valves of various types and sizes, contributed by the Mullard, Edison Swan,

B.T.-H., and M.O. Valve Companies. An interesting specimen is the M.O. dull-emitter type DET2 transmitter, which is capable of dissipating 40 watts continuously; its filament voltage is 6 V and current 1.9 A, with an anode voltage of 1,000, a voltage amplification factor of 8.5, and an anode impedance of 5,000 ohms. As a contrast, mention may be made of the Philips-Mullard metal-glass, water-cooled, type Z82 valve that has a maximum output of 50 kW; its filament voltage is 17 V and current 80 A, the anode voltage being from 5,000 to 15,000 V.

Prof. R. Whiddington, F.R.S., exhibits an electrical ultra-micrometer that was devised in 1919-20, which represents one of the many possible applications of the thermionic valve to physical measurement. The principle involved is extremely simple; when the distance between the plates of a parallel-plate condenser is slightly altered, its capacity changes in a way readily calculable, the capacity change being the greater the closer the plates. This change in the present case is observed by noting the change in the high-frequency oscillations maintained by a three-electrode valve in an inductive circuit containing the condenser. The condenser is linked to a spherical ball bearing, so that variations of the diameter of the ball in different directions may be observed. A null method is employed, and by the restoration of the original frequency of oscillation the diameter variation may be computed. The manner in which the restoration is effected is to apply a small bending moment to the stiff bar carrying the movable condenser plate by depressing one end of another much lighter bar through an observed amount. From the observed depression required to restore the original frequency the diameter change can be calculated. While the instrument shown is intended only to indicate changes of about one-tenth millionth of an inch, it has been found possible under favourable conditions, with apparatus of different design, to detect changes of so little as 1/200 millionth of an inch.

(To be concluded.)

An All-Electric Housing Scheme.

The Gateshead Corporation Enterprise.

CONSIDERABLE enterprise has been shown by the Corporation of Gateshead in providing all-electric labour-saving dwellings at inclusive rentals covering the whole of the electrical equipment. Provision has been made for the erection of 200 such houses, 38 of which have already been completed and are occupied. We learn also that at a recent meeting of the Gateshead Corporation it was decided to equip a further 138 houses on "all-electric" lines.

Different sized dwellings, comprising three-, four-, and five-apartment houses, constitute the general scheme. The average cost of building the houses is approximately £530, and they are let at rentals, inclusive of rates and electrical apparatus, of from 10s. 6d. to 15s. 6d. per week according to size. Each house is equipped with eight to ten lighting pendants (according to size); a 15-A combined switch plug for heating in each room, and one 2-kW radiator for heating; an electric cooker suitable for the requirements of a family of six persons; an electric domestic wash boiler; and a 25-gallon hot-water storage tank, this being fed from a boiler behind the semi-parlour-type of coal-fired range installed in the kitchen, and equipped with a 3-heat control auxiliary electric water heater. Both the wash boiler and the water heater are controlled by main and regulating switches, mounted on the same board as the cooker main switch, in the scullery. An "Osglim" lamp is arranged in circuit to indicate when the wash boiler and the water heater are in circuit.



Portion of Kitchen, Showing the Heating and Water-Heating Apparatus.

The whole of the installations were carried out by direct labour, and have been fitted in accordance with the very latest practice, only the best of materials and workmanship being employed. Energy is supplied at 250 V a.c., and a special sub-station, fed at 6,000 V, has been erected near the centre of the area occupied by the housing scheme. A separate transformer, together with an automatic time switch for its control, is part of the sub-station equipment to provide a street-lighting network at 110 V.

The scheme was prepared by the County of Durham Electrical Power Distribution Co., Ltd., and its successful conclusion may be attributed in a very large measure to the foresight of the Gateshead Corporation Housing Committee, of which Alderman H. Kegie is chairman. Credit is also due to the borough surveyor, Mr. M. P. Pattinson, and his assistants responsible for the actual building operations and electrical installations.

A portion of a kitchen, showing the semi-parlour type coal range, electric fire, and the electric circulating-water heater installed in the cupboard, is seen in the accompanying illustration.

The following are figures of the tariffs extended to the tenants and the estimated consumptions and costs which can be taken as fairly reliable for average conditions. These expenditures are compensated for by the saving effected by the elimination of fireplaces, chimney breasts, flues, and alternative equipment.

TARIFFS.

	Fixed monthly charge.	1—2,040 kWh.	kWh beyond 2,040.
5-roomed house ...	4s. 6d.	1d.	¾d.
4-roomed house ...	4s. 0d.	1d.	¾d.
3-roomed house ...	3s. 6d.	1d.	¾d.

ESTIMATED CONSUMPTIONS AND COSTS.

	Ltg. kWh	Ckg. kWh	Boiler. kWh	Elec. iron. kWh	Total kWh	Cost per week.
5-roomed house	133	1,830	250	26	2,239	4s. 10d.
4-roomed house	112	1,650	250	26	2,038	4s. 2d.
3-roomed house	98	1,500	250	26	1,874	3s. 10d.

Whilst heating and water heating are not included in the estimated costs, it is important to note that these may come within the lower charge of ¾d. per unit.

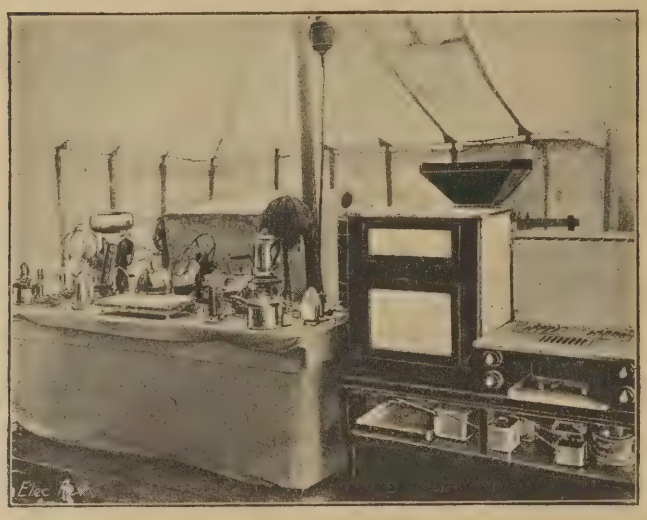
The actual costs of the complete electrical equipment, including wiring, &c., for the different types of dwellings are:—

5-apartment house	£47 12s. 6d.
4-apartment house	£45 0s. 0d.
3-apartment house	£42 7s. 6d.

Electricity at the Royal Agricultural Show.

Practical Demonstrations of Electrical Methods of Farming.

THIS year's Royal Show, held at Chester last week, has established direct contact between the electrical engineering and the agricultural industry, from which, it is hoped, far-reaching results will accrue. There was a profusion of electrical exhibits and working machines, and on the morning of Wednesday, July 8th, an important Conference on Electro-Farming was held on the Show Ground under the chairmanship of Lord Bledisloe. At this Conference several points of view converged: those of the electrical engineer, as expressed by Mr. R. Borlase Matthews; the agricultural scientific experimenter, Sir John Russell; and the agriculturist, Lord Bledisloe. The Conference was attended by several agriculturists interested in the possibilities of the application of electricity to the farm. Viewing the discussions in perspective, one is compelled to take



Part of the Exhibit of the Chester Corporation Electricity Department.

cognisance of the gap that exists between the points of view of the electrical engineer and the farmer, and it seems that only in proportion to the narrowing of this gap is progress in farm installations likely to be registered. Interviews with people attending the Conference confirmed this impression, and although varied opinions were expressed as to the probable outcome of the Conference, upon one point there was noteworthy unanimity, namely, that electrical engineers will have to tackle their problems with the fact in mind that the average farm worker is unversed in even simple mechanics. The engineer's problem is to evolve appliances which are simple, reliable, foolproof, cheap, and almost proof against rough usage. Another important point is flexibility. The horse, it was explained, is so adaptable to farm service that it has become the unit by which are judged the relative merits of the various forms of power, and if electricity can be proved to be quite as elastic and cheaper, there is no gainsaying that there is an enormous scope for it.

This year's Royal Show was epoch-making from another standpoint: it was the first show at which electricity was supplied for driving machinery. The Chester Corporation, on the recommendation of the City electrical engineer, Mr. S. E. Britton, supplied energy free of charge, and close on two miles of overhead lines were erected. Agriculturists had the opportunity of comparing the electrically driven unit with that driven by oil engines, tractors, &c. One suggestion might here be usefully made, namely, that at subsequent shows manufacturers of electrical appliances should arrange among themselves for a compact exhibit showing under one roof what can be done by electric power. Why not a model dairy, electrically equipped? In view of the stimulus that is being applied to the dairying industry to provide Grade A milk, the employment of electrically driven plant would be almost continuous, and not subject to those factors of irregularity frequently unavoidable with other farming processes.

The up-to-date farmer uses machinery for practically every purpose of the field, dairy, and shippon, and although horse power has not yet been superseded, apparently there is a great divergence of opinion amongst farmers as to which is the most suitable form of motive power—gas, oil, or electricity. In the development of farm machinery the Royal Show has always had a great influence, and at this year's Show there were no fewer than 30 entries of entirely new patents. The implement stands attracted great attention, and those that were equipped with electricity for driving exhibits formed quite a pleasant contrast to those distinguishable by the noisy thud-thud of oil engines. Exhibitors of machinery with the electrical drive had abundant opportunity of giving demonstrations to farmers of the positive advantages of electricity on the farmstead, and if for no other than propaganda purposes, the sources of information which were thus opened should yield, if not immediate, then certainly ultimate, positive results. Motors for practically every purpose were on view, and although the electrical exhibits lacked compactness through being so scattered, the start which has been made to show the usefulness of the electric drive for every farm purpose will no doubt lead to improvement at subsequent shows.

The Chester Corporation did its share of the pioneering work with a spirit of generosity. Not only did it run up transmission lines the whole length of the showground, but it also supplied motors and numerous accessories, together with energy free of charge to exhibitors. The Corporation's own stand was visited by thousands of persons each day. This tent was surrounded by a practical demonstration of the construction of 6,600-volt overhead transmission lines, the pressure being transformed down to 400 volts, and the current afterwards distributed by low-pressure lines equipped with the necessary switchgear. If anything, the Corporation's exhibit, at which were given demonstrations in the use of cookers, washing machines, vacuum cleaners, ironers, &c., was rather too small for the crowds that visited it. Not only was an appeal made to the interest of the housewife, but also to the farmer, amongst the machinery on view being a chaff cutter, root cutter, churns, milk separator and refrigerator belt-driven from electrically driven shafting.

Although space will not permit in this issue of giving a detailed description of the numerous stands, one of them, that of Messrs. Young, Osmond & Young was outstanding. It was almost completely electrical, there being close on two dozen electrical exhibits, chief amongst which was a 15-h.p. motor running at 420 V d.c., and an alternator supplying current for operating (1) a 3-h.p. squirrel-cage motor for driving a combined grinding and crushing machine; (2) a 5-h.p. squirrel-cage motor driving barn machinery.

From this source of power there were numerous other applications, such as a shearing machine, electrically heated incubator, a kibbler, electrically heated hay-drying equipment, a pump, a butter churn, fans, irons, kettles, refrigerators, milking machines, &c. An electric tractor with caterpillar tracks was also shown; a length of cable was employed, paid out or wound up according to the position of the tractor. This machine is to undergo practical field trials after the Royal Show. Another interesting exhibit was that of Messrs. Ransomes, Sims & Jefferies. They showed a 15-h.p. motor driving a thrashing and finishing machine.

(To be continued.)

The Use of Gas Coke for Raising Steam.

The Results obtainable on a Commercial Basis.

By E. W. DICKINSON, M.I.E.E.

THE closer accord during the past few months between the prices of gas coke and steam coal is once more arousing interest as to the possibility of using coke for raising steam. Since this relationship is likely to be maintained as a result of steadier Continental conditions, an even greater interest is to be expected in industrial circles generally and amongst power-station engineers especially.

A few notes, therefore, on the properties of gas coke and some information as to the conditions needed for efficient combustion as found in actual practice on chain-grate or travelling-grate stokers of the class now used in most power stations will not be out of place, and may form a guide to those engineers contemplating its introduction as a steam raiser.

It is perhaps asking a little too much of a responsible engineer in the present-day stress of close competition from all quarters to approach the question of burning coke solely from a "national fuel conservation" point of view when this view does not coincide with some immediate or not too remote advantage to the undertaking over which he has charge. Nevertheless, he can always have the national point of view in mind, so that, whenever national and individual interests synchronise, he will be prepared to grasp the opportunity as it arises. It must be admitted that national economies in our fuel reserves can only be made by national action, and this action requires both healthy public opinion and purse as a preliminary to effective legislation.

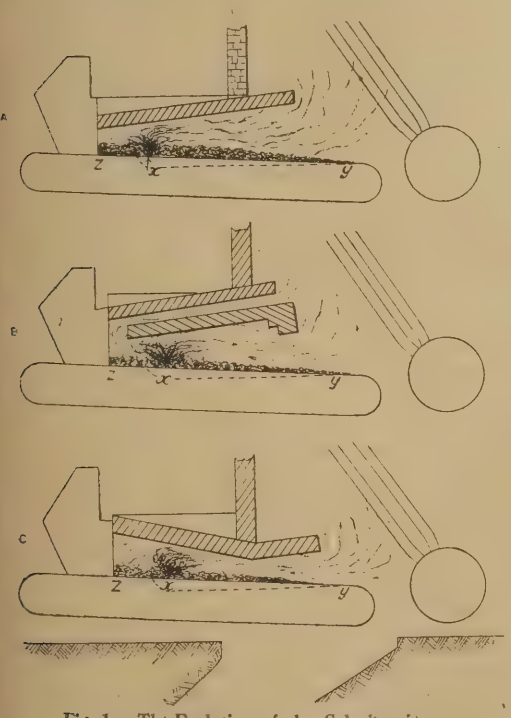


Fig. 1.—The Evolution of the Coke-burning Furnace (Coke alone).

Any extension of the uses of coke is to be welcomed not only as an outlet for an occasional, but inevitable, surplus production, but also as a means of reducing the cost of steam raising for manufacturing purposes, and at the same time conserving the nation's fuel resources.

Gas coke is an important product of gas manufacture, containing over 50 per cent. of the thermal value of the coal carbonised and in itself having a calorific value of 12,500 British thermal units per lb. when dry. The physical form and characteristics of coke as it leaves the gas retort are well known, and need not here be stated at any length. It is, after quenching (with regrettable loss of sensible heat), a hard and gritty substance, the fragments being usually of considerable size and requiring to be broken or cut to approximately the size of a walnut before being suitable for burning on chain- or travelling-grate stokers. Coke of this size requires about 75 cu. ft. per ton storage accommodation, and has an angle of rest of about 40 deg. with the horizontal. It requires approximately an ignition temperature of 1,200 deg. F. A typical analysis of gas coke made from Durham coal and arrived at from determinations taken over a considerable period is as follows:—

	Per cent.
Moisture	8.50
Volatile matter	1.85
Fixed carbon	77.80
Ash	11.85
	100.00

Calorific value, dry, 12,550 B.th.u. per lb.
Calorific value, as received, 11,480 B.th.u. per lb.
Calorific value, net, 11,370 B.th.u. per lb.

The point arresting attention is the low volatile content of this fuel, for whereas steam-raising coal as a rule is found to contain about 30 per cent. of volatile matter, that of gas coke ranges from 1.5 to 2½ per cent. This is at the same time both a disadvantage and an advantage. It is a disadvantage, when considering the adoption of coke alone, because volatile matter distilled from green coal and properly burnt forms a quick and easy means of keeping the furnace brickwork at the required temperature level for igniting the constantly incoming fuel, as it is drawn into the furnace by the stoker mechanism. On the other hand, provided that ignition difficulties are overcome, the absence of hydrocarbons eliminates one of the chief difficulties of fuel combustion. It is one of the ever-present problems of the combustion engineer so to regulate the air supply to coal distillates as to obtain intimate contact throughout between the oxygen of the air and the hydrocarbons. He must not, however, overdo it and bring down with excess air both his CO_2 and his furnace temperature. This difficulty, when coke is burnt alone, being surmounted, very high CO_2 readings are obtainable with resultant good evaporation.

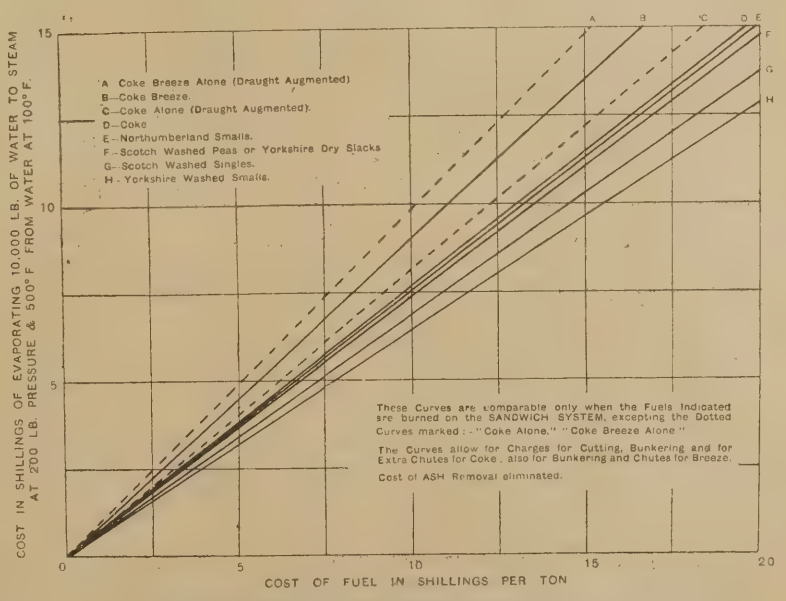


Fig. 2.—The Evaporative Value of Coke compared with that of other Fuels, burnt on travelling grates, with natural draught.

The problem of burning coke alone was approached by the writer in 1916 when in control of a London power station. In 1917 four 5-drum Stirling boilers, each having a heating surface, including superheater, of 3,650 sq. ft. and running at a steam pressure of 200 lb. per sq. in., were equipped with two Underfeed class "A" travelling-grate stokers, each stoker having a grate area of 50 sq. ft. The furnace brickwork setting, being an attempt to design a furnace to burn other fuels as well as coke, was first arranged as per sketch "A," fig. 1, being a simple arch 9 ft. long, rising from a height above grate-level of 10 in. at the hopper end to 30 in. at the boiler tube end; the forced-draught air supply of $1\frac{1}{8}$ to $1\frac{1}{4}$ inches of water was at a maximum at the portion of the grate marked *x*, tailing off to zero at the point *y*, as indicated by the dotted line, and standing at zero between *x* and the hopper end *z*. After preliminary heating of the brickwork by means of a coal fire to ensure a satisfactory start, the brickwork nearest the hopper, unfortunately, gradually cooled down owing to more heat being extracted from the brickwork by the fresh fuel entering than was returned by the reflected heat from incandescent fuel at the rear end of the grate. This resulted in the fire going out after a few hours' run.

Difficulty in maintaining preliminary ignition of the coke as it entered the furnace led to the use of a contra-flow design (arrangement B, fig. 1), by means of which the hot gases of combustion were led to impinge on the incoming fuel, with greatly improved results in so far as it was possible with care to maintain ignition. Finally, by the more simple means of a reverse inclined arch (arrangement C, fig. 1), which reflected the heat from the more intensely incandescent portion of the fire bed at *x* to point *z*, the difficulty was entirely overcome. There remained then only a minor problem, but one that had been manifest during the trials, *viz.*, that of the more complete combustion of the unburned carbon in the ash. This problem was well on the way to solution when in March, 1918, the experiments in burning coke alone were abandoned in favour of the more fruitful method of burning coke on the now well-known "sandwich system," in which a layer of coal is superimposed on the bed of coke. It should be noted, however, in passing that the complete practicability of burning gas coke alone on travelling-grate or chain-grate stokers with forced and chimney draught had been satisfactorily established.

The use of the sandwich system cleared the air of any trace of ignition difficulty, and minimised the loss of unburnt carbon in the ash. It introduced, however, the need for double chutes to each boiler hopper, with consequent capital expenditure. Thus the problem was brought to the commercial issue of an offer for coke at such a price as would cover the cost of breaking, bunkering, and any extra repairs and maintenance due to abrasion that might take place, and justifying any capital expenditure on further chutes. In the case under review this expense was estimated to be covered by an addition of from $7\frac{1}{2}$ to 10 per cent. to the then market price of coke. Orders were placed and resulted in definite economies.

It is satisfactory to record that the use of the sandwich system has introduced a new line of thought in fuel combustion, since not only coal and coke, but coals of varying thermal values and physical properties may be blended, to the advantage of both the commercial and national interests. By trial some advantageous mixture, having regard to market prices, stocks, and other factors, is soon determined, bringing into relief the elasticity of such a system when backed by a suitably divided bunker, chutes, and hoppers.

As a preliminary to gauging the position held by coke as a steam raiser relative to 2 or 3 of our well-known steam-raising coals, it is essential to ascertain as closely as possible the cost of evaporating 10,000 lb. of water by means of these various fuels burnt under the conditions obtaining in the factory. A normal set of conditions is here taken, being those usually present in a steam-driven power station, *viz.*, water-tube boiler, and chain- or travelling-grate stokers, with natural draught. The fuels selected are set out in Table I, with (*a*) their calorific value (*i.e.*, deductions being made for moisture weight and moisture evaporation), (*b*) their evaporative power from and at 212 deg. F, and (*c*) the "actual" year-in year-out boiler-house efficiency. The boiler-house efficiency here given is the ratio of the net calorific value of the fuel burnt, in thermal units, to the thermal units delivered to the water between hotwell temperature, and the resulting steam ready at the turbine stop valves. This efficiency is in many stations, it may be remarked, in close accord with the average "boiler and superheater" performance under test conditions.

Class of fuel.	Per lb. fuel calorific value. Typical analyses. Dry.	Net.	Boiler house efficiency. Fuel burnt on Sandwich System.	Evaporation per lb. of fuel from and at 212° F.	Evaporation per lb. fuel from water at 100° F. to steam at 200 lbs. pressure and 500° F. temperature.
				Lb. of water.	Lb. of water.
Scotch washed peas	12,480	10,060	72	7·46	6·03
Northumberland smalls ...	12,150	10,770	68·5	7·38	5·96
Coke	12,550	11,370	68	7·97	6·44
Coke breeze ...	11,030	9,320	67	6·44	5·20
Yorkshire washed smalls	13,620	11,540	72	8·57	6·92

These figures, having been carefully prepared and checked with due regard to all known factors, should now be set out in some convenient form for reference, as in fig. 2, for the more rapid determination of values with varying costs per ton of fuel delivered into boiler-house bunkers.

The point of intersection of any horizontal line with the curves of the various fuels will show equal evaporating value at varying costs per ton, depending on the fuel used. For instance, it will cost just as much (10s.) to evaporate 1,000 gals. of water by means of coke breeze bought at 11s. 3d. per ton as it will by means of washed slack bought at 15s. 6d. a ton. The point of intersection of any vertical line with the fuel curves gives a varying evaporative value with a given cost of fuel per ton, and it is seen that coke breeze at 10s. per ton will evaporate 1,000 gals. of water at a cost of 8.9s., whereas Yorkshire washed slack at the same price would do the same work at a cost of only 6.4s. The diagram reveals many points of interest. It is apparent on the basis assumed that with coal prices ranging between 11s. 6d. and 14s. a ton, it would pay to adopt breeze as a fuel if it were obtainable at slightly under 2s. a ton less than Scotch washed peas, and at slightly under 4s. 6d. per ton less than Yorkshire washed slack. With coal prices ranging as above, large coke should be obtainable at 2 or 3 pence less than Scotch washed peas, 3s. 6d. less than Yorkshire washed slack, and at about the same price or a little less than Northumberland slack.

As will be noted also an advantage is gained by using *coke on the sandwich system* as against *coke alone* of about 1s. per ton with coal prices ranging as above, the figure in the case of coke breeze being 1s. 6d.

The saving to be expected by using a combination of *coal* and *coke* on the sandwich system may be gauged by taking an example. The grates we will assume are run on natural draught. An offer of coke delivered free is obtainable at 17s. 6d. a ton. This would evaporate 1,000 gallons of water at a cost of 13.4s. Northumberland smalls, let us say, are being burnt at 22s. a ton, giving a like cost of 16.7s. Assuming an evaporation of 500 gallons for each fuel, the cost will be $13.4/2 + 16.7/2 = 15.05$s. Compared with the figure of 16.7, this shows a saving of over 6 per cent. not obtainable without the use of this system. Even if forced draught stokers were available and coke could thereby be burnt alone, the saving would not be so great.

In conclusion, it may safely be stated that by a wise selection of fuel from a field thus extended by the introduction of another class in the form of coke and coke

breeze, and the expenditure of quite a reasonable sum for chutes, &c., many undertakings would derive benefit through lowered cost of power production, which in time would be passed on to the consumer. This would have a beneficial effect ultimately on other industries whose costs of production would thereby be lowered. Having established that such fuel can be burnt as a commercial success under large-capacity steam boilers by mechanical means, the economical utilisation of the nation's fuel resources is at once placed in a more favourable position than heretofore, as under a comprehensive scheme of fuel and power supply to a large community, bituminous coal could be carbonised at existing gas works situated in or near large industrial centres, the gas and valuable by-products recovered and distributed, and the residual coke burnt directly as fuel to produce electricity for power and lighting purposes either in near or more distant areas.

The Incorporated Municipal Electrical Association.

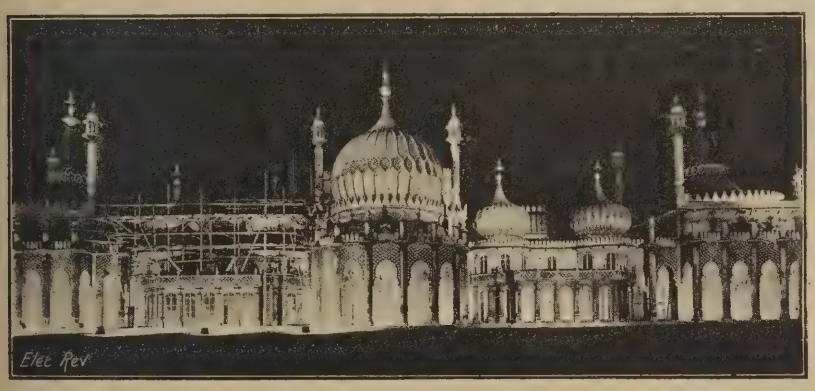
Annual Convention at Brighton.

(*Concluded from p. 75.*)

The Exhibition of Apparatus.

The exhibition of cooking and heating apparatus, which was held in the Corn Exchange, was the most complete and attractive that has yet been held in connection with the Convention; this feature is yearly increasing in value and importance, and we were pleased to see that the manufacturers had made full use of the excellent opportunity afforded them to bring their latest devices before the eyes of supply authorities and of the local public—in some cases new designs were shown which had not yet reached the stage of production in quantity.

The most picturesque display was undoubtedly a striking demonstration of up-to-date shop window lighting, arranged by the Electric Lamp Manufacturers' Association. A draper's window, dressed with dainty fabrics, flowers, and models, was illuminated from the sides and from the top by independent circuits with light of constantly changing colours, the possible combinations of tints being infinite in number and the gradual melting of one into another producing exquisite effects. A telling little pamphlet, showing how shop windows are lighted at present, and how they ought to be lighted, was specially prepared for the Convention, and should prove very fruitful in educating not only the public, but also electrical men, in this new and important art.



The Royal Pavilion Illuminated.

The lighting of the reception rooms of the Royal Pavilion, and the flood-lighting of its eastern front (here illustrated), were also efficiently organised by E.L.M.A.

Messrs. Bastian & Allen showed their water heaters, fitted with "Quartzalite" elements, and working on the thermal storage principle, maintaining a constant supply of water at scalding temperature. An outside terminal box is used, and the water connections have been improved so that no leakage under the wood lagging is possible. A "boosting" heater of the same wattage as the constant heater is provided, for use when extra demands for hot water occur. We understand that 300 of these geysers are installed in Wimbledon. Other interesting exhibits were the Rex "Little Wonder" grill-oven, taking 1,500 W, and capable of boiling, baking, grilling, or keeping food warm, the capacity being 15 by 9½ by 10 in. high; the Rex "Imperator" radiator, taking 1,000 W; and the Bastian furnace.

Messrs. Benham & Sons, Ltd., showed their "electro-vapour" radiators, in various types and sizes; a 10-kW boiler for tea and coffee, and smaller electric urns; a 3-kW geyser, and a variety of cooking apparatus.

Messrs. Belling & Co., Ltd., in addition to their well-known fires and cookers, and immersion heaters, had an entirely new feature on view—their No. 6 cooker, fitted with the "Honeycomb" boiling plate. This plate differs from any other in that it is built up of rectangular-section bars of fireclay, through each of which the nickel-chrome heating element is threaded. The bars are packed close together, and form a flat plate in direct contact with the cooking utensil; the spirals are of thicker wire than usual, and are protected by the fireclay bars from moving air, and from spilt liquids and solids, so that their life ought to be very long, whilst the sectional construction of the plate allows of free expansion and contraction. Moreover, it is impossible to short-circuit or get a shock from the wholly-enclosed spirals, and the plate can be scrubbed with impunity. A plate loaded at 2.5 kW is said to boil two pints of water from cold in six minutes, and a further two pints in three minutes.

Other improvements have been introduced in the new oven, which is fitted with top and bottom heat, the latter element doing all the general cooking, whilst the top heat speeds up the initial heating and gives the finishing touch. The top heater is also suitable for grilling. Each element is of 1 kW loading, with three heats, on separate switches. The corners of the oven are rounded, and the whole of the elements, grids, and runners can be completely removed for cleaning the inside. All the elements on the cooker are of the plug-in type, with standard "M K" spring sockets, entirely outside the heat zones. The switches are of the "Tok," English make.

The British Electric Transformer Co., Ltd., had two groups of exhibits: the "Sunray" radiators, and the "Tricity" cookers. The former were shown in a little suite of furnished rooms, the æsthetic qualities of the system being an important feature. The "Sunray" is a tubular glow-lamp of special design, housed in a copper reflector, in a variety of patterns, some of the radiators containing as many as five lamps, mounted in a horizontal position. Pedestal, wall-bracket, and four-legged types, as well as mahogany stands nearly six feet high, with silk surrounds, were shown. The loading is 200 W per lamp, and the effect of the warm glow is very pleasing, combining light and heat in a manner likened to that of sunshine.

On the company's stand were shown three types of "Tricity" cooker for hiring out, as well as a new small cooker for three persons; this consists of an oven of about one cubic foot capacity, with top and bottom heat, and two 7 by 6 in. rectangular boiling plates mounted close together, so that they can be used as one large plate. One of these plates has single-heat control, with a two-way switch which connects either the plate or the grill, but not both at once. The plates are of the protected open type, loaded to 1,200 watts, and the elements are interchangeable. Cookers for 6 and 10 persons and other appliances were also exhibited.

Carron Company had a good show of cookers, of various sizes and types, and a new wash-boiler in rustless cast iron; this was fitted with very substantial immersion heaters, and the whole made a very sound job.

On the stand of the Credenda Conduits Co., Ltd., in addition to the "Kaybee" and "Creda" electric boilers, fires, and various cookers, a special feature was the "Protector" kettle; this is fitted with a device which, in the event of the kettle being allowed to boil dry, cuts off the current before damage is done. The operation is effected by the melting of a small fuse, which releases a quick-break switch contained in the base of the kettle. A signal at a small window notifies the fact, and a new fuse can be inserted with ease. The device is quite new, and is being protected.

On the "Creda" cookers, plug-in elements are used; the boiling plates are open-topped, and may be provided with cast grids to deflect liquids, &c., from the spirals. The fuses are

enclosed, and the whole of the oven interior is removable. A notable feature of the oven is the facility with which either top and bottom or side heating can be provided, the bus bars being ready drilled for the elements to be attached.

The General Electric Co., Ltd., showed a number of "Magnet" electric cookers, of various sizes, some of which were specially designed for hiring-out. A new hob has been adopted, giving ample space for warming dishes. Other exhibits included a wash boiler, "Magnet" kettles, a variety of small domestic appliances, fires, &c.

Messrs. L. G. Hawkins & Co., Ltd., had a varied exhibit of their "Universal" appliances, including a new electric cooker of polished aluminium, of what we may call the "Prentice" type, and cookers of the range pattern with removable elements and removable interior. A new type of heating element was shown. Besides electric irons and an electric trouser press, there was an electric ironing machine for table use, taking 1,500 W; this was a very handy machine. A "Vio Ray" high-frequency outfit was also exhibited.

The Hotpoint Electric Appliance Co., Ltd., had a comprehensive exhibit of "Hotpoint-Falco" cookers, in which a number of recent improvements were incorporated. The "Standard" model, No. 5,280, designed for the modern electric home, has open boiling plates mounted in a hinged hob; A neat table model was shown, with the same loadings. Hundreds of these cookers have been supplied to the Liverpool Corporation for its 1,000-house scheme, as well as 2-kW immersion heaters which are fixed in the hot-water tanks. Glasgow Corporation is installing the No. 5,280 cooker and the 4-kW wash boiler in a similar 1,000-house scheme.

The Jackson Electric Stove Co., Ltd., showed a number of their cookers, fitted with standard boiling plates over which are grids of an alloy which, it is claimed, neither buckles nor scales. A large hot-cupboard space is provided, and liquids falling through the plates are caught on a reflector plate so that they do not fall into the hot-cupboard. At half heat, the hot portion of the boiling plate is concentrated so as to be suitable for heating a small pan. The Jackson wash boiler was also shown. We were informed that 3,000 cookers had been supplied to five supply undertakings.

On the stand of Metro-Vick Supplies, Ltd., two of the new "Cosmos" cookers were shown. These are fitted with totally-enclosed (B. & K.) or semi-enclosed boiling plates, which are interchangeable with ease, and have the feature that one coil is concentrated in the middle. The semi-enclosed plate has two spiral coils lying in grooves in a glazed porcelain block, slotted to allow liquids to fall through, with a protecting grid of a special metal covering the spirals. The oven is heated at top and bottom with coils on small porcelain bobbins attached to a metal reflector plate, and the grill element is of similar construction. A hinged top plate gives access to the wiring. A large hot cupboard, with a door is provided.

A new pattern of 2-kW Cosmos fire, with two bars, was shown; the spirals are arranged longitudinally, in parabolic grooves, and are not in continuous contact with the porcelain bars, so that they glow directly they are switched on. Other exhibits were the Cosmos Home iron, a table grill and toaster, and a 3¼-pint copper kettle in the construction of which a special hard solder is used which does not melt like soft solder directly the kettle boils dry, the Cadillac vacuum cleaner, a washing machine, &c.

Messrs. George Nobbs, Ltd., showed their "Genii" copper wash boilers, with immersion heaters, the "Vectis" water heater for continuous heating at light load (250 W, with a 1,500-W booster), a 10-gallon urn in nickel alloy, and their towel rails and hot-water radiators. The portable "Vectis" heater, of ¾-gallon capacity, can be run off a lighting circuit, and supplies 5 gallons of hot water per day. Geysers of 9-kW loading, and the "Genii National" calorifier, which is used for a closed system under pressure, and can be automatically controlled, were other features of the exhibit.

A series of "Xcel" cookers was shown by the Siemens and English Electric Lamp Co., Ltd. The cooker is an entirely new pattern, with plug-in boiling ring and grill elements, and easily replaceable oven elements; the grill serves also as a hot-plate and boiling ring. The heating element of the boiling rings is of a new design, consisting of a circular earthenware plate with holes through which the spiral is threaded; pans can stand on the plate itself, or if preferred a solid top can be used. The "Xcel" irons carry a perpetual guarantee.

Messrs. McClary, a Canadian firm, had an interesting exhibit of cookers as used for many years in Canada; these are fitted with "Tor-red" heating elements, in which the spiral is embedded directly in an earthenware plate which will stand running at red heat, the utensils being placed on the plate itself. A cylindrical oven is a popular Canadian type, with top and bottom heat, and dial temperature indicators are fixed in the oven doors. The table pattern has four boiling plates; the elements are of the plug-in type, and the oven interior is seamless, with rounded corners.

An interesting exhibit was an improved pattern of the "Tungar" rectifier of the British Thomson-Houston Co., Ltd. This is now of entirely British make, and we understand that the demand exceeds the supply; it has been adapted to charge high-pressure as well as low-pressure batteries for radio-telephony, giving 2 A at 7.5 V, 1 A at 15 V, 0.1 A at 75 V, and 0.06 A at 100 V. A mistake-proof plug is provided for the change-over.

Several demonstrations were also given in the town. At the "Electric Shop" of Messrs. Galliers, Ltd., North Street, the windows were dressed with G.E.C. "Magnet" irons, "Freezor" fans, washing machines, &c., and the "Gecoray" system of shop-window lighting was installed. Messrs. Hanningtons, Ltd., had an excellent shop-window lighting scheme in use near the Royal Pavilion, and Messrs. Page & Miles, Ltd., also used the "Gecoray" reflectors to advantage. The Hurley Machine Co. had a large exhibit of "Thor" electric washers and wringers, the "Thor" automatic ironing machine and vacuum cleaner, and a small ironing machine, which occupied a space of only 22 by 26 in. when turned up.

A feature of the exhibition was the "Magicoal" fire of Messrs. Berry's Electric, Ltd., of which two admirable examples were shown in operation, looking extremely realistic. Mr. H. H. Berry also welcomed visitors at his electric flat in King's Gardens, Hove, of which we gave a description in our issue of June 12th, p. 943; we found the equipment of the flat even more remarkable than was there indicated, and carefully planned so as to reduce the labour of housekeeping to the minimum.

A Visit to the Electric Farm.

DURING the Convention week an open invitation was extended by Mr. R. Borlase Matthews to all interested to view the farm near East Grinstead, where he puts into practice his well-known theories on the uses of electricity in agriculture. The visitors numbered nearly forty, among whom were included Dr. and Mrs. Ferranti. They were taken through the light and airy cowsheds, where they saw the certified herd and noted the equipment of electrical milking machines. Next, passing to the dairy, they were shown the bottle-sealing and washing machines and the butter-making machines, the power for all of which was electrical. They were particularly interested in the hay-curing equipment, by means of which it is possible to transform green grass into properly-cured hay without the aid of the sun. This has been proved to be very acceptable to cattle, at a lower cost per acre than ordinary hay—thus the farmer can both economise and dodge the "clerk of the weather."

In the poultry-houses the keenest attention was given to the mammoth incubator, capable of hatching 2,400 chicks at once, the success of which lies chiefly in the fact that the warmed air is distributed mechanically by means of electric fans; 3,400 little chicks were cheeping in the brooder or foster-mother house. In the poultry-houses themselves, by means of electric light, the hens are persuaded into thinking that the sun has not set, and thus under the rays of artificial sunlight they continue feeding (instead of having to starve through a long night). As a result, they reward their owner by laying 20 per cent. more eggs in the winter, when their efforts are most lucrative.

An electro-culture high-pressure apparatus for discharge over crops was also viewed, and an electric thrashing machine, an electric plough, and an electric clipping and shearing machine—in all, some 67 different applications of electricity.

In the repair shop of the farm the visitors examined a wireless set specially designed for the use of the farmer, the simplicity of which renders it capable of unskilled manipulation over a very wide range of conditions.

Special Libraries and Information Bureaux.—Following a highly successful conference held at Hoddesdon last year of those interested in special libraries and agencies for the collection, treatment and distribution of information, a representative standing committee was appointed to ensure continuity of the work, and to arrange for a second conference. This committee has been fortunate in obtaining assistance from the Carnegie United Kingdom Trustees, and the proceedings of the first conference have just been issued. The committee has decided to name the body thus called into being "The Association of Special Libraries and Information Bureaux."

The second conference of the Association will be held at Balliol College, Oxford, during the week-end, September 25th to 28th, 1925; full particulars can be obtained from the organising secretary at the offices of the Association, 38, Bloomsbury Square, London, W.C.1.

One of the main functions of A.S.L.I.B. will be to furnish a master-key to our storehouses of knowledge, whether libraries or otherwise. To this end it will aim at co-ordinating in the general interest, the various specialised libraries now in existence, promoting the formation of new libraries where this seems to be necessary; and, as a principle, effecting and aiding liaison between centres of information whatever their scope. It should, however, be noted that A.S.L.I.B. has no intention of building up a vast centralised institution forming a physical location for information, but an expert organisation designed to give the *bona fide* inquirer quick and accurate guidance as to the best and most reliable sources of information available. It will not directly furnish specific information (which would necessitate an enormous staff), but will function rather as a clearing house for sources of information, and as a medium of inter-communication for those engaged in the development and use of informational sources.

New Technical College at Middlesbrough.—The Middlesbrough Corporation has decided on a site for a new technical college, to be erected through the munificence of the Constantine family of shipowners at a cost of £80,000, close to the railway station. The design for the building is by Mr. Graham R. Dawbarn.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The "Electrical Review" Index. — The Index for the last half-yearly volume of the ELECTRICAL REVIEW (January to June, 1925), is now being printed. Copies will be forwarded post free to those requiring them for binding or for reference purposes, if they will make application to the Publisher, ELECTRICAL REVIEW, 4, Ludgate Hill, E.C.4.

The Electricity Supply Commercial Association. — Mr. G. R. Smith, the general secretary of this Association, writes as follows:—"Quite recently an advertisement appeared in your columns inviting commercial and clerical workers who have had any experience of municipal or company electricity undertaking work to send particulars of their qualifications and experience for enrolment in the Association's Unemployment Register. I may say that the response has been very good and is a tribute to the advertising power of your publication. At the same time I should like to point out that a large number of the applicants possessed engineering qualifications only. Also several correspondents are under the impression that the advertisement also applied to the manufacturing industry. To those who have had clerical experience in the manufacturing industry, of course, employment on costing and accountancy would be very similar, but I should like to have received more replies from those who have been, or are, actually engaged in a municipal or company electricity supply undertaking. May I take this opportunity of thanking all those who responded to the advertisement and to assure them that not only will their names be recorded in the Association's Register, but that in the event of the Association being in a position to notify them of a post, they will receive full particulars as the occasion may arise? Will they also note that my address is now 'Beaulieu,' Bean Road, Bexleyheath?"

Bankruptcy Proceedings.—D. D. RAYNER, 6, Wilson Street, Derby, engineer.—With reference to the report of this public examination published in our issue of July 3rd (p. 12), Mr. Rayner informs us that the first business, *i.e.*, Rayner and Heald, Ltd., was not, as reported, started by him on "borrowed" money, but with money put up by Mr. Platts, who eventually became chairman of the company. From a number of newspaper reports that have been placed before us it appears that in 1919, shortly after the commencement of the company, Mr. Rayner borrowed from Mr. Platts £300 to enable him to acquire a house in Derby for his residence and a promissory note was given for that amount, it being arranged that debtor's share of commission on the profits of the business should be applied toward the liquidation of this debt. Judgment was given against debtor on the promissory note in respect of the £300 borrowed for the purchase of the house, and £200 costs had to be paid. At the public examination debtor said that an action by him against Rayner & Heald, Ltd., was pending. He filed his petition when execution was levied following the Leeds judgment.

S. C. RAPSON, C. L. BURRILL, and A. J. HEFFER (trading as the Suburban Electrical & Maintenance Company), electricians 2, Plough Yard, Shoreditch, E.—A joint statement of the debtors' affairs has now been filed, and it discloses ranking liabilities of £2,813 and established net assets of £677. The following are the chief creditors:—

	£		£
Berry's Electric, Ltd. ...	22	Metallic Seamless Tube Co., Ltd.	423
Day, Mrs. C. H.	109	Rapson, Miss E. L. ...	187
E.E.E. Carbon Co., Ltd.	24	Rapson, Miss E. M. ...	669
Falk, Stadelmann & Co., Ltd.	26	Rapson, E. J.	110
General Electric Co., Ltd.	437	Record, Oswald	34
Hackbridge Cable Co., Ltd.	40	Walsall Hardware Co., Ltd.	488
Leach, S. G., & Co., Ltd.	148	Bird, J.	20

C. B. MAURICE, cable supplier and importer of electrical goods, late of Windsor House, Victoria Street, Westminster, S.W.—The first meeting of creditors in this case was held on July 7th at the London Bankruptcy Court, when accounts were submitted showing liabilities of £745, against assets of 7s. 2d. The receiving order was made on the petition of the C. A. T. Cable Co., Ltd., creditors for £85. It appeared that in 1919 the debtor became director of a limited company carrying on business as merchants. Some five years later he began business on his own account in the same line with a capital of between £100 and £200. He imported electrical goods from Germany, and the business proved a success for six months, but he afterwards experienced difficulty in obtaining delivery of goods, with the result that he lost markets. He lost £500 on horse racing. He attributed his failure to lack of capital, loss of trade, to loss incurred as a bookmaker, and to a judgment given against him in an action brought by the petitioning creditors, and also his counterclaim against them. The estate was left in the hands of the Official Receiver.

S. T. HOSKEN, wireless accessories manufacturer and factor, 153, Fleet Street, E.C.4.—The public examination of this debtor was held on July 10th at the London Bankruptcy Court, the accounts showing liabilities of £953, against net assets valued at £33, after deducting £70 for the payment of preferential claims. Replying to the Official Receiver, debtor said he served with the Royal Air Force during the war, and from April, 1919, to March, 1923, he was in employment. In the latter month he commenced business at 19, Eagle Street, removing in the following November to Fleet Street, where he traded until the receiving order was made against him last May. He attributed his insolvency to bad trade and other causes. The examination was concluded.

A. JONES, electrical engineer, 2, Robert Street, Ynysybwl, Glamorgan.—Trustee, Mr. E. Owen, Official Receiver, 34, Park Place, Cardiff, released June 24th.

D. E. JONES (D. E. Jones & Co.), electrical contractor, 29, Carne Street, Pentre, Glam.—Trustee, Mr. E. Owen, Official Receiver, 34 Park Place, Cardiff, released June 23rd.

W. K. M. WILSON, electrician and wireless apparatus dealer, 1, Mount Street, Heanor, Derby.—Receiving order made July 3rd on debtor's own petition.

F. W. CASELEY (The Radiograph Co.), wireless engineer, 5, Hepworth Arcade, Kingston-upon-Hull.—First meeting, July 15th at the Official Receiver's office, 37, Scale Lane, Hull. Public examination, July 20th, at the Guildhall, Hull.

J. HUMPHREYS, plumber and electrical engineer, the yard behind the Plough Inn, Oldham Road, Rochdale.—First meeting, July 14th at the Official Receiver's offices, Byrom Street, Manchester. Public examination, July 24th, at the County Police Court, Rochdale.

R. S. MAGSON & Co., electrical engineer 10, Stoney Stanton Road, Coventry.—Trustee, Mr. C. J. Band, Official Receiver, 9-11, High Street, Coventry, released June 12th.

A. T. WILLIAMS and W. J. BEVAN (Electrical and General Engineering Co.), electrical engineers, 49, Commercial Street, Aberdare.—Trustee, Mr. E. Owen, Official Receiver, 34, Park Place, Cardiff, released June 25th, 1925.

S. L. BAPTY and N. MILES (The Wireless Instrument Manufacturing Co.), wireless instrument manufacturers, Avenue Works, Avenue Road, Willesden, N.W.—Second and final dividend of 2s. 10d. in the £, payable at Messrs. Poppleton, Appleby and Hawkins, 4, Charterhouse Square, E.C.1.

A. H. DUFFIN and G. KERSHAW (A. H. Duffin & Co.), electrical engineers and contractors, Provincial Buildings, Conway Road, Colwyn Bay.—Second and final dividend of 2s. 10d. in the £, payable July 29th at Mostyn Chambers, Colwyn Bay.

J. S. YEOMANS, 11, Hill View Terrace, Chapel Allerton, Leeds.—Receiving order made July 8th on debtor's own petition.

Private Arrangements.—CAPT. W. L. GRAY, 9, Victoria Parade, Muswell Hill, N., wireless and electrical dealer.—A meeting of the principal creditors in this matter was held on July 6th at the offices of the Marconiphone Co., Ltd., when the chair was occupied by the representative of that company, which was the largest trade creditor. A statement of affairs was presented which showed liabilities of £2,485, of which £2,455 was due to unsecured creditors, and there was a bank overdraft of £30. The assets were estimated to realise £2,950, or a surplus of assets over liabilities, subject to realisation, of £465. It was reported that the debtor came to England in 1922 after serving in the war, and commenced the present business in the December of that year. He had a gratuity of £750 and investments worth £550. Those investments had been realised some time ago at a slight loss. His wife also had £200 and the whole of the moneys were put into the business. After the first fifteen months' trading the debtor made a little under £700 profit from the business which, after drawing about £400 for his personal expenses, left a net profit of £300. The debtor then decided to go into the wholesale business; and that also was quite profitable. Owing to certain conditions of the National Association of Radio Manufacturers the debtor was undersold by at least 10 per cent. in different parts of the country and consequently lost a considerable amount of trade. The chief cause of the present position, however, was that a sum of £800 was owing from a certain gentleman who had promised to pay £200 in the course of a few days and to repay the balance by instalments. If the debtor continued in business he proposed to do away with the wholesale side altogether. On behalf of the debtor a solicitor made an offer of 10s. in the £, payable as to 3s. 4d. in November, 1925, 3s. 4d. in January, 1926, and 3s. 4d. in May, 1926. The largest creditors resolved to advise the acceptance of the offer. A committee of creditors was appointed, and it was agreed that the committee should be vested with the power to advise the debtor to do whatever it thought right. The following are creditors:—

	£		£
British Thomson-Houston Co., Ltd.	85	Igranic Electric Co., Ltd. ...	155
Brown, S. G., Ltd.	183	Marconiphone Co., Ltd.	415
Burndept, Ltd.	182	Metropolitan - Vickers Electrical Co., Ltd.	21
Chloride Electrical Storage Co., Ltd.	255	Non Aeril Manufacturing Co. ...	28
Dubilier Condenser Co., Ltd. ...	107	Radio Communication Co., Ltd.	36
Edison Swan Electric Co., Ltd.	52	Robinson, L., & Co.	134
Ever-Ready Co., Ltd.	126	Sterling Telephone Co., Ltd. ...	85
Fuller's United Electrical Works, Ltd.	29	Silverex, Ltd.	21
General Electric Co., Ltd. ...	116	Troupe, Curtis & Co.	47
Graham & Co.	91	Watmel Wireless Co., Ltd. ...	22
Greenslade & Brown	23	Watshams, Ltd.	73
		Thomas & Co.	20

Thomas Barton, electrical and radio engineer, Electric Works, Ainsworth Street, Blackburn.—The creditors interested herein were called together on July 7th, at Manchester, when a statement of affairs was submitted which showed ranking liabilities of £3,686, all due to unsecured creditors. In addition, there were first and second mortgages on the works to the extent of £3,200. The works were valued at £5,000, leaving a surplus of £1,800. The bank was shown as a creditor for £1,744 in respect of an overdraft, but as security it held a dwelling house of the value of £1,100, and two policies on the life of the debtor of the surrender value of £546, and for the purposes of the statement the bank was treated as being fully secured. The assets were estimated to realise £4,007, from which had to be deducted £50 for preferential claims, leaving net assets of £3,957, or a surplus of £270. Mr. Howarth, solicitor, who occupied the chair, reported that a deed of assignment was executed by the debtor on June 29th to Mr. G. Waterworth, C.A., of Blackburn. The chairman added that the debtor was aged 72, and was probably one of the oldest, as well as the most respected electrical engineers in Lancashire. There was a prospective purchaser for the works. The stock-in-trade was a somewhat difficult one to dispose of, but it was believed that it would realise £1,500. The creditors passed a resolution confirming the deed of assignment already executed to Mr. Waterworth, whilst a committee was also appointed consisting of the representatives of the Greengate & Irwell Rubber Co., Ltd., the General Electric Co., Ltd., and Cryselco, Ltd. The following are creditors:—

	£		£
Anderson, W. A.	137	Kirk & Co.	37
Barton, Miss E.	390	Lancashire Dynamo Co.	94
Beardsell & Co.	54	Lupton, H. E.	59
British Insulated & Helsby Cables, Ltd.	60	Metro-Vick Supplies, Ltd.	53
Beaton Metal Co.	28	Northern District Co.	44
Baxendale & Co.	23	Oldham & Son	36
Carter & Sons	34	Pope, E.	48
Cryselco, Ltd.	120	Regent Trust, Ltd.	110
Crabtree & Co.	47	Smith, F	30
Condor Lamps	21	Siemens Bros. & Co., Ltd.	69
Electrical Apparatus Co.	35	Standard Press	26
Eldridge & Morris	122	Smith & Ansell	22
Falk, Stadelmann & Co.	44	Sun Electrical Co., Ltd.	24
Graham & Co.	23	Samuel & Freedman	180
Greengate & Irwell Rubber Co.	109	James, S. & F. S.	200
General Electric Co., Ltd.	101	Toulmin & Co.	20
Gaskell, T.	58	Wandsworth Electric Co.	29
Harris Electric Co.	132	Waddie & Co.	43
Higginson Bros.	44	Whittle & Son	47

Company Liquidations.—Marine and Mechanical Electric Welding Co., Ltd.—Particulars of claims to the liquidator, Mr. L. C. F. Robson, 146, Bishopsgate, E.C.2, by August 15th.

H. Joseph & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. N. Bell, 26-27, Bush Lane, E.C.; meeting of creditors, July 21st, at the Institute of Chartered Accountants, Moorgate Place, E.C. Particulars of claims to the liquidator by August 9th.

Gas and Electric Securities, Ltd.—A petition for the winding up of the above-named company has been presented to the High Court by the Northern Exploration Co., Ltd., of 62, London Wall, E.C., and will be heard in London on July 21st.

Dissolutions of Partnership.—Coleman & Warren, wholesale electrical suppliers, 66, Victoria Street, S.W.—Mr. H. E. Clerk and Mr. W. J. Warren have dissolved partnership.

Gilfillan Bros., radio manufacturers and dealers in radio apparatus, 63, High Holborn, W.C.1.—Mr. K. Gilfillan and Mr. H. W. Cook have dissolved partnership. Debts will be attended to by Mr. Cook, who will continue the business under the same style.

Oram & Lakin, The Showman's Stores, and The Scenic Electrical Co., dealers in showman's accessories, 67, Besley Street, Streatham, S.W.—Messrs. A. Oram and R. J. Lakin have dissolved partnership. Mr. Lakin will attend to debts and continue the business.

Main & Woodward, electrical engineers and contractors, 11, High Street, Barnet, and 11, Abingdon Road, Finchley.—Mr. A. W. Main and Mr. C. L. Woodward have dissolved partnership. Debts will be attended to by Messrs. Boyes & Son, solicitors, Barnet. Each partner will in future trade independently in his own name.

Local Exhibition.—Holmfirth.—As a prelude to the institution of a scheme for the hiring of domestic electrical appliances, the Urban District Council recently organised an electrical exhibition in the Council Chamber. The Jackson Electric Stove Co., Ltd., provided demonstrators for the cooking and other appliances which are being supplied by the company to the Council for its scheme. Alderman Mrs. Hammer (Hackney), chairman of the Electrical Association for Women, attended the opening ceremony and gave an address on the advantages of electricity in the home. The engineer and manager of the undertaking (Mr. J. W. Fawcett) informs us that one result of the exhibition was the placing of a number of definite orders for appliances, including 18 cookers.

Social Events.—The staff of the Willesden Council Electricity Department held its annual outing at Southend-on-Sea on July 4th. There was a record attendance and the party was accompanied by the chief of the Department, Mr. A. W. Blake.

On June 27th the staff of the Dagenite Works of Messrs. Pritchett & Gold and E.P.S. Co., Ltd., with which is incorporated the business of Peto & Radford, spent a very enjoyable day at Brighton. A party of between four and five hundred attended a lunch at the Corn Exchange. Short speeches were made by Sir Archibald Gold, and Messrs. Peto and Roberson.

On July 4th, the employés of the Wallasey Electricity Department held their annual picnic. The outing took the form of a drive through Mold and Loggerheads to Cerrig-y-Druiden, where luncheon was served. The party, numbering about 150, then proceeded, *via* the bank of the River Conway, to Colwyn Bay, where tea was taken, the return journey being made *via* Abergele, St. Asaph, Holywell, and Queensferry. The party included Councillor Hughes, chairman of the Electricity Committee, Mr. B. T. Hawkins, the borough electrical engineer, and his deputy, Mr. E. Cook.

The annual outing of the employés of Messrs. Cunningham, Ltd., Edgware Road, was held on July 12th, when the party went by charabanc to Abingdon.

A Submarine Cable Film.—On July 8th, a large gathering of Press representatives witnessed a film produced under the auspices of the Federation of British Industries with the co-operation of the Eastern Associated Telegraph Companies. The film is designed to impart a knowledge of the nature of cable communication and is divided into three parts. The first section shows the manufacture of a submarine cable in the factory of the Telegraph Construction & Maintenance Co., Ltd. The laying on of the gutta-percha, brass tape, jute, and iron armouring, are shown stage by stage and their functions are explained. The second part deals with the laying and repair of a submarine cable. The officers of a cable-repairing ship are pictured taking the necessary bearings to locate the cable and the repair of a break is carried out. The final section depicts the activities of the staff at Electra House, Moorgate, E.C., the headquarters of the companies. There the organisation for dealing with messages is shown operating at full speed. The film is likely to have a wide popular appeal but more could have been done if it were not for the fact that it is destined to form but a small part of a kinema programme, and is thus confined to a certain length.

Cricket Match.—The Birmingham Electrical Contractors' Association recently challenged the outside representatives of the Birmingham branch of the General Electric Co., Ltd., to a cricket match. The match was played on the ground of the Magnet Club, Witton Works, Mr. A. Berkeley acting as umpire for the contractors. The G.E.C. team compiled a score of 97, and the contractors had amassed 113 for the loss of five wickets when the game was brought to an end by failing light. A social evening at the Magnet Club followed the match.

The Position of the Iron and Steel Industry.—Speaking at Dudley recently, the Home Secretary (Sir Wm. Joynson-Hicks) made mention of the fact that whereas before the war this country imported only a seventh of its wrought-iron requirements, now a third of the requirements was obtained from abroad. He also referred to the position of other branches of the iron and steel industry, and said that if we were to continue to import foreign products made under worse conditions than obtained in this country, we could not expect to be able to compete. Apart from the imposition of import duties, there were only two ways of saving the situation—by inducing French and Belgian trade unions to insist on better wages or conditions, or by the reduction of wages in this country to the level of those of our competitors, which was not desirable.

Trade Announcements.—Messrs. Philips Lamps, Ltd., have opened a branch office at 21, Stoney Street, Nottingham, with Mr. Howard V. Crisp as manager.

Messrs. W. E. Burnand & Co. have completed the removal to the Duo Works, 66-106, Shoreham Street, Sheffield. The new works are more centrally situated than the old, and four times the area is available.

Messrs. James Scott & Co., electrical and radio engineers, have opened new showrooms at Queen Anne Street, Dunfermline, and are showing a selection of the latest electrical fittings, shades, radiators, &c.

The telephone numbers of the Birmingham (Moor Street) branch of the General Electric Co., Ltd., have been altered to "Central 7944/51" (eight lines).

Messrs. George Green & Co. have removed from George Street to larger premises at 40, Aybrook Street, Manchester Square, London, W.1.

Messrs. Creed & Co., Ltd., inform us that they have purchased Mr. Donald Murray's telegraph business, including the Murray telegraph patents, and they will in future manufacture and supply the Murray Multiplex and other Murray apparatus. Mr. Murray will for a time give them the benefit of his valuable experience in the telegraph field.

The Budleigh Salterton Electric Light & Power Co., Ltd., has opened a showroom and office at Fore Street, Budleigh Salterton, and is desirous of receiving catalogues of wiring materials, fittings, and accessories.

The business of Mr. S. Levett, of Gravesend, has been reformed under the style of the Gravesend Welding and Electrical Engineering Works, and new premises have been taken in Crete Hall Road.

Engineering Developments, Ltd., has removed from Victoria Street to 13, Page Street, Grosvenor Road, S.W.1.

The Monomarking of Goods.—British Monomarks, Ltd., is the name of a company which has been formed, with offices at 19, Abingdon Street, London, S.W.1, to secure the wide-

spread adoption of Monomarks—an idea that originated with and has been developed by Mr. William Morris and which has the approval of a large number of well-known business men, including representatives of big associations. It is believed that by the adoption of a Monomark—a symbol of four characters—which will be duly registered at Monomark House (to cover two acres in London), manufacturers, traders, and private individuals will be able to have an exclusive mark of their own with which to mark their products, their private belongings—if they will, even themselves. We have not space to elaborate the possible applications of the idea, for the more one thinks of them the more numerous they become, but we may indicate one for the information of business people. A firm of British manufacturers making switches or other electrical articles supplies them to a factor, an exporter, or an overseas agent. They may find their way into the hands of somebody in some remote corner of the globe who knows nobody who can replace them or sell further articles of the kind. The article, however, bears the registered Monomark of the maker, say B.M./K.N.4S., and the customer sends a letter addressed to that mark, c/o London. By arrangement it will be delivered by the Post Office authorities here to Monomark House, where the name and address will be recorded and the letter forwarded to the right place, thus placing the user in direct touch with the maker or the supplier, whichever has adopted the said mark. It is considered that such a system, if widely adopted, for a registration fee of 5s. per annum, will materially facilitate the flow of trade. Readers frequently ask us for the name of the maker of goods bearing a certain trade mark. Our task in this connection would be greatly simplified if there were some universal system of Monomarking. Those who are interested in the matter—and it unquestionably is very interesting and seems to have great possibilities if it is taken up on a sufficiently large scale—should apply to Mr. Morris at the above address for the literature that is available.

Catalogues and Lists.—THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—"The Benjamin Reflector," containing illustrations and notes on lighting service, &c.

ELECTRICITY SERVICES, LTD., 27, Martin Lane, Cannon Street, E.C.4.—An illustrated folder dealing with efficient shop-window lighting.

THE EFFICIENCY LAMP SHADE CO., 3 Took's Court, Furnival Street, Holborn Circus E.C.4.—Two illustrated pamphlets advertising the firm's lamp shades with removable glass panels.

THE BRUSH ELECTRICAL ENGINEERING CO., LTD., Falcon Works, Loughborough.—Catalogue 608, illustrating and describing in detail the company's salient pole alternators for engine or water-wheel drive.

THE D.P. BATTERY CO., LTD., Bakewell, Derbyshire.—An illustrated pamphlet dealing with "Kathanode" batteries for electric battery locomotives.

THE CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, near Manchester.—An illustrated pamphlet describing the battery installation at a country house.

MR. HARRY MOSS, 82, Leeds Road, Bradford.—An illustrated pamphlet dealing with shop window lighting and a postcard advertising the "Whitecap" electric washing machine.

THE IRON & NICKEL BATTERY CO., LTD., 301, Abbey House, Victoria Street, S.W.1.—A leaflet illustrating the "Ionic" nickel-iron accumulator for omnibus lighting.

Book Notices.—"Scientific Papers of the U.S.A. Bureau of Standards."—No. 504, "A Method of Studying Electrode Potentials and Polarization" (15 cents). No. 505, "Critical Potentials Associated with Excitation of Alkali Spark Spectra" (10 cents).

"Publications of the Massachusetts Institute of Technology."—Contribution from the Electrical Engineering Research Division, Serial No. 44, October, 1924 "Regulator Settings for Long Lines—Automatic Voltage Regulator can be used to arrive at desired operating characteristics.—Theory of Performance, Example of Application, and Analysis of Requirements."

"Combustion and Atmosphere and Their Relation to Disease," by Dr. W. Vernon Sinclair. Pp. 47. London: J. Bale, Sons & Danielsson, Ltd. Price, 2s. net.

"Costruzioni Elettromeccaniche," Vol. II, Sec. 2.—"Transformatori-Motori-Commutatrici Gruppi Varii" by E. Morelli. Turin: Unione Tipografico-editrice Torinese. Price 100 lire.

"Transactions of the Institution of Engineers, Australia." Vol. III, 1922.—Sydney, N.S.W.: The Institution.

"Phases of Modern Science," published in connection with the Science Exhibit arranged by a committee of the Royal Society in the Pavilion of H.M. Government at the British Empire Exhibition, 1925. London: A. & F. Denny, Ltd. Price 3s. 6d.

"The British Engine, Boiler and Electrical Insurance Co. Technical Report for 1924." xxxvii + 161; figs. 127.—Contains many interesting illustrations of defective plant, &c. Published by the Company. Price 7s. 6d. net.

"Approved Wireless Service."—We are informed that the Radio Association, of Sentinel House, Southampton Row, W.C., is issuing a sign to approved wireless dealers able to satisfy the Association's Technical Committee of their standing. It is intended that the sign shall be a guarantee to the public that the firm displaying it can render an authenticated technical service. The sign is an enamelled reproduction of the Association badge.

Australian Municipal Electrical Engineers' Salaries.—The Municipal Officers' Association of Australia has prepared and circulated a new list of salaries, to apply to its members throughout Australia. The salaries claimed for electrical engineers of municipal supply undertakings are as follows:—Supervising electrical engineer, £900; electrical engineer £750; assistant electrical engineer, £600. Under the present award the salaries of these officials vary according to the revenue of the supply undertaking to which they are attached. With revenue varying between £1,500 and £50,000 per annum, the award for a supervising electrical engineer-in-charge varies from £364 to £676; with revenue varying between £1,500 and £30,000, the salaries of an electrical engineer-in-charge and of an assistant electrical engineer respectively vary from £312 to £468 and from £250 to £360. When the list comes up for discussion a sliding scale, somewhat on the lines of the one at present in force, will doubtless be adopted.—*Electrical Engineer of Australia and New Zealand.*

Proposed New Electricity Offices and Showrooms.—The Cardiff Electricity Committee has decided to make an offer of £12,500 for the purchase of premises in Castle Street for the purpose of offices and showrooms for the department.

British Trade Mark Applications. — The following are among the recent applications for British Trade marks. Objections against any of the proposed marks may be lodged within one month from July 8th. In the case of foreign applications, the names and addresses of the British representatives are also given:—

Harmonola. No. 458,687. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—E. A. Graham, trading as Alfred Graham and Co.

C. & E. S. (lettering and design). No. 457,596. All goods in Class 8, but not including electric accumulators or goods of a like kind.—A. B. W. Bergl, trading as the Cable and Electrical Supplies, 234, Pentonville Road, N.1.

Governor. No. 449,313. Class 18. Electric fires, electric hot plates, &c.—John Shaw & Sons (Wolverhampton), Ltd.

Design only. No. 457,868. Class 8. Electric cables.—Naamlooze Venootschap Hackethal Kabel en Thermophoon Maatschappij, 25, Javastraat, The Hague, Holland (A. A. Thornton, Quality Court, Chancery Lane, W.C.2).

Octopus (lettering and design). No. 458,314. Class 8. Fixed electrical condensers, not being parts of machines.—B. Haine, trading as Radio Stocks (B. Haine), 89, Newman Street, W.1.

Magnaton Aerial Encircles The World (lettering and design). No. 458,557. Class 8.—Aerials Sparklets, Ltd., Angel Road, Upper Edmonton, N.18.

Sunray. No. 458,889. Class 8. Bright and dull emitter valves for radio-telephony.—D. Newton, 9, North Park Road, Roundhay, Leeds.

Tanic (lettering and design). No. 459,184. Class 13. Electric relay cables.—La Société Télémécanique, 5, Rue St. Remy, Liége, Belgium (Feeny and Feeny, 73a, Queen Victoria Street, E.C.4).

Our Foreign Trade.—JUNE FIGURES.—The following were the values of imports and exports of electrical goods and machinery during June, 1925:—

	June, 1925. £	Inc. or dec. £	6 months 1925.
Imports.—			
Electrical goods and apparatus ...	290,734	+ 83,657	+ 658,226
Machinery	933,135	+ 84,544	+ 841,471
(Electrical machinery)	80,273	− 15,353	+ 8,742
Exports.—			
Electrical goods and apparatus ...	845,222	+185,960	+1,382,353
Machinery	3,879,708	+343,419	+3,066,835
(Electrical machinery)	439,951	+ 73,674	+ 535,423
Re-exports.—			
Electrical goods and apparatus ...	14,668	+ 1,425	+ 51,982
Machinery	116,112	+ 30 521	+ 111,546
(Electrical machinery)	4,820	− 3,422	− 16,493

Dutch Interests in Belgium.—The directors of the Lampe Belge propose to increase the capital from 5,000,000 fr. to 10,000,000 fr. by the issue of 10,000 new preference shares and 5,000 ordinary shares. Of the former 8,000 are to be allotted to the N. V. Philips' Gloeilampen Fabrieken, of Eindhoven, in return for the supply of machines and the grant of a licence to utilise patents.

British Manufacturers and Australian Tariffs. — An *Exchange Telegraph* message says that representatives of British manufacturers have urged the Minister of Customs to extend the protection given under the new clause, and pointed out that over 50 anti-dumping orders have been made under section 9. With reference to unfair foreign competition, they suggested that the protective machinery of the Industries' Preservation Act except where it was designed to protect Australian goods against unfair competition from whatever source, should be extended to British interests, thus conferring tariff preference at a time when British public opinion was increasingly favouring Imperial Preference. The Minister replied that the Government fully realised the desirability of fostering British trade with Australia. The position created by the changed currency conditions in Germany was under review, and the Government would shortly introduce into Parliament proposals meeting the deputation's wishes.

The Sydney Council and Tenders for Plant.—In connection with the purchase of plant and machinery for the new power house which the Sydney (N.S.W.) Council proposes to erect, Mr. Forbes Mackay, the city electrical engineer recently recommended that it should be incumbent upon tendering firms to prove that they had had experience in the manufacture of generating sets of 20,000-kW capacity. The Council has decided, however, that as this would exclude Australian firms, none of which has built a machine of this size, it cannot impose any restriction of the nature suggested.

Works Visit.—On July 4th, members of the Derby Railway Institute Radio Society and their friends paid a visit to the works of the D.P. Battery Co., Ltd., Bakewell. The visitors saw in course of production large Post Office batteries and "Kathanode" submarine batteries to a total weight of about 300 tons. Interest was aroused by the water wheels which generate most of the electricity used in the forming and charging processes.

A Change-over of Supply.—A dinner was held at Preston, on July 9th, to mark the official "change-over" from the generating plant at the Dick, Kerr works of the English Electric Co., to the Corporation supply from the Ribble power station. The works plant was only installed two years ago. Henceforth the works will take 1,100 kW from the Corporation; they are the town's first large customer. The existing generating station will be converted into a receiving substation. Among those present at the dinner were Councillor Heaney, Sir Arnold Gridley (general works manager of the English Electric Co., Ltd.), Mr. Livingstone (manager of the Dick, Kerr works), Mr. J. Simpson, the borough electrical engineer, and several textile employers.

For Sale.—By order of the Trustee in Bankruptcy, Mr. E. H. Hawkins, Messrs. Trubshaw & Taylor will sell by auction at 9, Weardale Road, Lee, on July 28th, the stock-in-trade of Moir & Watts, electrical and wireless engineers. By order of the Chief Ordnance Officer, Messrs. Horne & Co. will sell by auction on July 29th, at the Central Ordnance Depôt, Chilwell, Notts, engineering and laundry machinery, wireless stores, &c. By order of the receiver for the debenture holder, *re* Messrs. W. S. Jeal & Ebury Engineering Co., Ltd., of Union Wharf, Redhill Street, N.W.1, Messrs. H. Butcher and Co. will sell by auction at the Victoria Hotel, Mornington Road, on July 22nd, the electric accumulator manufacturing plant and stock, &c. (See our advertisement pages to-day.)

Copper, Lead, and Rubber Prices.—Messrs. F. Smith and Co. report, July 14th:—Copper (electrolytic) bars, £65 15s., 10s. inc.; ditto, ditto sheets, no change; ditto, ditto wire rods, £75 15s., 10s. inc.; ditto, ditto h.c. wire, 9½d., 3/16d. inc.

Messrs. James & Shakespeare report, July 14th:—No change in the price of copper bars (best selected), sheet and rod; English pig lead, £35 15s. 10s. inc.

Messrs. E. Till & Co. report, July 14th:—India rubber, Para, fine, 3s. 9d., 8d. inc.

The Swiss Glow Lamp Industry.—The Licht A.G., of Goldau, which has absorbed all the Swiss glow lamp makers under the leading of the Osram Company, of Berlin, and the Dutch firm of Philips, has changed its title to the Licht A.G. Ver. Gluhlampen Fabriken, and increased its share capital from 1,400,000 fr. to 2,800,000 fr.

Russian Orders for England.—It was reported last week that M. Rakovsky, the Russian *chargé d'affaires* in Great Britain, had returned from Russia with orders for English firms to the aggregate value of £15,000,000. Specific mention was made of electrical, agricultural, and textile machinery.

Metal Workers and Longer Working Hours.—At the annual meeting of the British Section of the International Metal Workers' Federation, at York on July 11th, a resolution was passed viewing "with much concern" the proposals of the Engineering and Allied Employers' Federation for the extension of the working week. The resolution further called upon the British and other Governments to give effect to the Washington Convention on working hours. Another resolution called attention to the probable effect upon the British metal industries of the attempt by Belgian employers to further decrease the wages of workers in that country's metal trades.

Great Britain and Latin-American Trade.—In addressing a meeting of representatives of the British and Latin-American Chamber of Commerce and visitors from South America at Wembley on July 11th, Sir Douglas Newton, M.P., said, according to a *Financial News* report, that we seemed to be losing from preventable causes some of the trade which we ought to be doing with Latin-American countries. In 1913 the export trade to Latin-America represented something like 9½ per cent. of our export trade, and in 1922 that trade had very considerably dwindled. He hoped that an influx in the Latin-American countries of British capital would be encouraged. Already we had some £1,500,000,000 invested in those countries, and that capital must receive fair treatment because trade could only develop with that.

A French Electrical Syndicate.—The Syndicat Professionnel des Industries Electriques has decided to convert this organisation into the "Syndicat Général de la Construction Electrique." The object of the new association is to group together all the syndicates in the various branches of electrical construction. The combinations already constituted and belonging to the new body are the *chambre syndicale* of makers of heavy machines and the syndicates of makers of other machines, apparatus, and lamps. Other combinations are expected to join. The representatives of the four syndicates mentioned have established a provisional office for the general syndicate, with M. Charles Laurent as the president.

Large German Cable Order.—The *Financial Times* reports that the Felten & Guillaume Co. has received the order for a submarine cable from Emden to the Azores. This will occupy the Nordhammer works of the company for about a year.

Lighting and Power Notes.

Accrington.—Electricity in Bulk.—The Corporation has been asked for the terms upon which it would be prepared to furnish a bulk supply of electricity to Burnley. The matter has been referred to a special committee for consideration.

Algeria.—Biskra.—The Société d'Electricité de Biskra is in negotiation with the municipal authorities of that town with regard to the extension of the concession for a further 40 years.

Basingstoke.—Year's Working.—The accounts for the past year's working of the undertaking (engineer: Mr. F. Swarbrick) show a total revenue of £15,040, as compared with £13,945 for 1923-4. The working costs were £7,705, against £5,885, leaving a gross surplus of £7,334 (£8,060). After deducting the capital charges, a net profit of £2,387 is shown, excluding £500 placed to the reserve and renewal fund, against £3,606 for the preceding year. The capital expenses for the year were £4,180, including £2,533 for mains, making a total capital expenditure of £65,683. The energy sales for the year amounted to 1,027,155 kWh, and the maximum demand on the station was 637 kW.

Brighton.—Loan Sanctioned.—The Electricity Committee has obtained sanction to borrow £22,400 in connection with the supply of electricity to Rottingdean and the Portobello districts.

Birmingham.—Loan Sanctioned.—The Electricity Committee has obtained sanction to borrow £550,000 for plant and £100,000 for buildings.

Caerphilly.—Electricity Supply.—The Urban Council, after considering a scheme of electric lighting submitted by Messrs. Arthur Ellis & Partners, consulting engineers, has decided not to embark upon an electricity scheme for Tredegar.

Canterbury.—Loan Sanctioned.—The Town Council has received sanction to a loan of £3,000 for a new feeder cable from the electricity works to Wincheap Street.

Chesterfield.—Extension of Supply.—The Electricity Committee has been informed of a proposal to form the Whittington and District Electricity Supply Co. for the purpose of supplying electricity to New Whittington and District. The town clerk has replied that the Corporation has decided to extend its mains to New Whittington, and that therefore consent to the proposed company's affording a supply cannot be given.

Continental.—Belgium.—At the recent annual meeting in Brussels of the Société d'Electricité du Nord de Belgique it was stated that the company's power station was now supplying electrical energy to no fewer than 100 localities with a total population of 526,000. During the past year the company's distributing mains had been extended to a total of 1,030 miles, of which 476 miles was primary and 554 miles secondary mains. Fifty-five miles of 50,000-V aerial transmission lines had also been completed between Louvain and Tirlemont and between Malines and Baesrode.

Switzerland.—The Brown Boveri Co., of Baden, has commenced work on the establishment of a h.p. main to connect the hydro-electric stations at Laufenburg and Murgental. The cable will be carried on masts ranging in height from 82 to 94 ft., and spaced at intervals of about 220 yards. The line is later to be extended to the Ruhr coal mining area so that in periods of plentiful water supply energy can be exported to Germany, and in water shortage periods electricity can be supplied from the power stations in the Ruhr coal area.

Coventry.—Year's Working.—The accounts of the Corporation electricity undertaking (engineer: Mr. G. Tough) record a total revenue of £258,665, as compared with £221,417 in 1923-24. Against this was charged working expenditure of £158,279, as against £116,415, leaving a gross profit of £100,385 (£105,002). After deducting capital and other charges, there was a net surplus of £37,175, as compared with £47,944 in the preceding year. The capital expenditure during the year amounted to £44,194, the chief item being £30,910 for mains and services. The amount of energy sold was 55,137,602 kWh, an increase of 27.2 per cent., and the average price per kWh obtained fell from 1.224d. to 1.126d. The number of consumers increased from 11,283 to 12,529.

Cuckfield.—Objection to Overhead Lines.—The Urban Council having maintained its objection to the overhead system of supplying electricity to the town, the Haywards Heath Electric Supply Co. has intimated to the Council that an appeal is being made to the Ministry of Transport for consent to use overhead lines.

Dover.—Electricity in Bulk.—An agreement has been reached between the Town Council and the Folkestone Electricity Supply Co. for a mutual supply of electricity in bulk. The supply is to be by overhead cable along the Dover-Folkestone road.

Douglas (I. of M.).—Year's Working.—The report on the working of the Corporation electricity undertaking (engineer: Mr. B. Kelly) for the year ended March 31st last shows a total income of £13,878, as compared with £7,254 in the preceding year in which the supply was commenced. Working expenses amounted to £7,529 (£3,045), leaving a gross profit of £6,349 (£4,408). After providing for capital charges, there was a

net surplus of £2,966, as against £1,103 in 1923-24. The capital expenditure, which included £13,737 for machinery, amounted to £28,549. The sales of electrical energy increased from 265,583 to 554,031 kWh.

Dumfries.—PROPOSED HYDRO-ELECTRIC SCHEME.—The Town Council proposes to proceed with a scheme for harnessing the River Nith for generating electricity, and a deputation is to visit Chester to inspect a similar scheme in operation there. The ultimate cost of the undertaking will be £15,000, but it is only proposed to proceed with a portion at first at a cost of £2,500.

Eastbourne.—INQUIRY.—The Ministry of Transport is to hold an inquiry with regard to the application of the Corporation to erect overhead lines in Willingdon.

East Anglia.—ELECTRICITY IN BULK.—Conferences between the authorities of Norwich, Great Yarmouth, and Lowestoft are to be called to further consider the question of the bulk supplies between the towns.

Faversham.—APPLICATION FOR LOAN.—The Town Council has decided to apply to the Electricity Commissioners for a loan of £2,822 for mains renewals.

NEW PLANT.—The new plant at the electricity works, which includes two Browett-Lindley engines, a balancer and dynamo, an oil purifier, and water-cooling plant, was formally inaugurated by the mayor on July 8th.

Grange.—ELECTRICITY IN BULK.—The Urban Council having sealed agreements for a supply of electricity in bulk from Barrow-in-Furness, has issued instructions for the preparation of a distribution scheme for approval so that tenders may be in hand immediately sanction to the scheme is obtained.

Hastings.—STREET LIGHTING.—The Town Council is to convert the remaining street gas lamps to electricity, and is applying for sanction to a loan of £17,850 for the necessary mains.

Huddersfield and Halifax.—Y. E. P. PROPOSAL.—The Yorkshire Electric Power Co. has intimated to the Huddersfield and Halifax Corporations that unnecessary expenditure in connection with the proposal to lay h.p. mains to connect the electricity undertakings of the two towns may be avoided by utilising the company's mains.

Hull.—YEAR'S WORKING.—In the accounts for the 32nd year's working of the Kingston-upon-Hull electricity undertaking (engineer: Mr. H. Bell), the total revenue is shown as £312,694, against £295,732 for the year 1923-24. The working expenses amounted to £183,079, against £163,727, leaving a gross profit of £129,615 (£132,005). After deducting the capital charges, the net surplus is £29,347, against £59,685 for the previous year. The total capital expenditure at the end of the year stood at considerably over £1,400,000. The kWh generated amounted to over 60 million.

India.—ELECTRICAL DEVELOPMENT IN MUSSOORIE.—There is a proposal to extend the supply of electrical energy in the important hill station of Mussoorie in the United Provinces at a cost of rupees 10 lacs. The municipal hydro-electric undertaking has reached the limit of its capacity and the demands for industrial and other purposes are increasing. Sources of further supply were recently examined by a committee of experts, which decided on the erection of an installation at Dehra Dun, using Diesel engines, linked with the hydro-electric undertaking of the Mussoorie Municipality.

EXTENSIONS IN CALCUTTA.—Electrical extensions are being carried out in Calcutta. The power house of the Gourpore Jute Mill is one of the biggest in Bengal, and it is now proposed to supply the towns of Hooghly Chinsurah, Chandernagar, and Serampore with electricity from this power house for lighting purposes. Under this project, the East Indian Electric Supply & Traction Co. will take its supply in bulk from the jute mill and link up Gourpore and the other towns. The Gourpore Jute Mill power house has five generators with a total capacity of 12,400 kW. The system is a.c., 6,600 V, 50-cycles.

CAUVERY FALLS SCHEME.—Sir Albion Banerji, the Dewan of Mysore, has announced the scheme for a seventh installation at the Cauvery Falls. The estimated cost of additional plant and the distribution of the extra 14,000 h.p. is Rs. 34,37,254. It is proposed to finance this scheme from the general capital resources without recourse to public borrowing, and the grant allowed for this in the next year is Rs. 20 lacs.

Ipswich.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. A. S. Black) for the year ended March 31st show a total income of £97,170, as compared with £87,867 in 1923-24. The working expenditure amounted to £57,340, as against £50,507, leaving a gross surplus of £39,830 (£37,360). After deducting capital charges there was a net profit of £28,025, as against £26,610. The capital expenditure amounted to £37,800, the chief items being £16,154 for machinery and £13,456 for mains. The sales of electrical energy increased by 14.7 per cent. to 7,835,309 kWh, and the maximum supply demanded rose from 4,844 to 5,150 kW. During the year an order was placed for a 5,000-kW Brush-Ljungström turbo-alternator, which it is hoped to put in commission for next winter's load.

Kendal.—BATTERY INSTALLATION.—The Town Council has decided to install at the electricity works a battery as an auxiliary to the present plant, at an estimated cost of £6,000. This is in consequence of the failure of negotiations to secure a supply of electricity in bulk from a local firm.

Kirkcaldy.—YEAR'S WORKING.—The report of the burgh electrical engineer (Mr. O. F. Francis) on the working of the electricity undertaking for the year ended May 15th last shows a total revenue of £43,650, and working expenses of £26,089, leaving a gross profit of £17,561. In the previous year the income was £35,986, working expenses £23,050, and gross profit £12,936. After allowing for interest and other charges, there was a net surplus of £812, as against £2,485 in 1923-24. The electrical energy sold increased from 4,581,030 to 6,076,063 kWh, and the average price per kWh obtained fell from 1.88d. to 1.71d. The maximum supply demanded rose from 2,040 to 2,600 kW.

Korea. — HYDRO-ELECTRIC DEVELOPMENT. — According to *Eastern Engineering*, an application has been filed with the South Kamkyo provincial office, Korea, by several Japanese business men for permission to organise a company to generate electricity by means of the water of the Choshin and Fusen rivers, and undertake electro-chemical industry. The plan is to generate 217,070 kW by means of the River Choshin and 130,156 kW by means of the River Fusen, the electricity thus produced being supplied to the five provinces of South Kankyo, North Kankyo, Kogen, Keiki, and South Heian. Four hydro-electric power stations will be established on the Choshin and four on the Fusen, while transformer stations will be erected at various sites. The proposed company is to be capitalised at 200 million yen, and contemplates the establishment of an electro-chemical factory at a cost of 13 million yen.

Lincoln.—YEAR'S WORKING.—The report of Mr. S. Clegg, city electrical engineer, on the working of the electricity undertaking for the year ended March 31st last records a total revenue of £83,602, as compared with £76,752 in 1923-24. Working expenses were greater by £4,584 at £40,279, and the gross profit was £43,323 (£41,056). After deducting capital charges, there was a net surplus of £7,955, as compared with £6,186 in the previous year. The capital expenditure during the year amounted to £24,200, the chief item being £13,043 for mains and services. The electrical energy sold amounted to 16,388,362 kWh, an increase of 10.8 per cent., and the maximum supply demanded rose from 6,500 to 7,050 kW.

Lowestoft.—APPLICATION FOR LOAN.—The Electricity Committee is to seek sanction for a loan of £3,300 for the provision of a feeder cable to Oulton Broad.

Leeds.—PREMISES PURCHASED.—The Electricity Committee has purchased 28 and 29, Acre Street, for electricity purposes, at a cost of £12,000.

London.—POPLAR.—The report on the working of the borough electricity undertaking (engineer: Mr. J. H. Bowden) for the year ended March 31st last records a total revenue of £204,240, as compared with £139,270 in 1923-24. The working expenditure increased by £1,841 to £115,851, leaving a gross profit of £88,390 (£75,260), to which was added revenue from other sources, making a total of £90,933. After deducting capital charges, there was a net surplus of £30,977, as compared with £20,404 in the preceding year. The capital expenditure during the year amounted to £80,774, and the amount now spent on the undertaking stands at £958,480. The sales of electrical energy increased from 29,579,434 to 32,537,196 kWh, and the average price per kWh obtained fell from 1.53d. to 1.50d. The maximum supply demanded rose from 13,200 to 14,200 kW.

Maidenhead.—APPLICATION FOR LOANS.—The Town Council has applied to the Electricity Commissioners for loans of £5,000 for mains and services, and £3,500 in respect of the cost of the first section of converting equipment and alterations to the boiler room in connection with the bulk supply of electricity.

Marlborough.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £2,425 for electricity purposes.

North Wales.—WATER-POWER DEVELOPMENT.—According to *The Times Trade and Engineering Supplement*, rapid progress is being made with the new hydro-electric works of the North Wales Power Co. The new pipe line at Dolgarrog is completed and undergoing test before being taken over, while the work on the series of lakes to provide additional water has been advanced. The building of a new dam at Maentwrog for a new power station is well under way and a tunnel is also to be constructed to connect the two lakes. Meanwhile the construction of the overhead cables is making rapid progress, and the main cable lines to supply the London, Midland and Scottish Railway works at Crewe are approaching that centre.

Newcastle-under-Lyme.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. A. J. C. De Renzi) for the year ended March 31st last show a total revenue of £12,147, as compared with £10,306 in the preceding year. Working expenses were £6,359, as against £5,208, leaving a gross profit of £5,788 (£5,098). After deducting capital charges, a net profit of £1,220 remained, as compared with a surplus of £705 in 1923-24. The sales of electrical energy increased from 462,106 to 824,688 kWh.

Northern Ireland.—AUGHNACLOY (Co. TYRONE).—The Town Council is to consider at its next meeting a proposal to light the town by electricity.

RATHFRILAND, (Co. DOWN).—The ratepayers recently met to consider the question of adopting a system of electric lighting for the town. The question arose in consequence of an application to the Newry No. 1 Rural District Council for permission to erect poles and supply electricity. It was resolved, with one dissentient, to recommend the District Council to grant facilities for the electric lighting of the town.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—The Ontario Government has authorised the Hydro-Electric Power Commission to develop power on the Ottawa River to meet the demands of the southern portion of the province. The Order in Council specifies five different sites as offering possibilities of successful power development.

Penmaenmawr.—INAUGURATION OF SUPPLY.—The electricity supply for the district was inaugurated by the chairman of the Urban Council on July 7th. The charges are 8d. per kWh for lighting and 3d. per kWh for power. Electricity is obtained in bulk from the North Wales Power Co. The Electricity Committee has recommended that electricity be adopted for street lighting, at an estimated cost of £1,327.

Peterborough.—YEAR'S WORKING.—The report on the working of the city electricity undertaking (engineer: Mr. H. A. Nevill) for the year ended March 31st last shows a total income of £53,876, and working expenditure of £26,716, leaving a gross profit of £27,160. The previous year's figures were:—Income, £40,371; expenditure, £20,985; gross profit, £19,386. After deducting capital charges, and capital outlay charged to revenue, a surplus of £246 was carried forward. The previous year's working resulted in a deficit of £5,664. The electrical energy sold increased from 4,273,955 to 6,817,669 kWh, and the maximum supply demanded from 2,800 to 3,400 kW.

Plymouth.—MAINS EXTENSIONS.—The Electricity Committee has authorised cable extensions at a cost of £2,491.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

NEWCASTLE-UNDER-LYME.—Lighting: Flat rate, 7d. per kWh; alternative rate for basement premises, £8 per kW per annum, plus 2d. per kWh; slot meters, 8d. per kWh. Power: Flat rate—first 200 kWh per quarter, 3½d. per kWh; all energy in excess, 3d. per kWh. Maximum demand system: Consumers with motors totalling more than 20 h.p., £5 per kW, plus 1d. per kWh. Heating and domestic purposes: Flat rate of 2d. per kWh, with a minimum charge of 10s. per quarter for the winter quarters, and 5s. for the summer quarters.

BURTON-ON-TRENT.—Lighting: From 6½d. to 6d. per kWh. Power: From 60 to 50 per cent. above the pre-war rate.

GLASGOW.—Except for domestic lighting, the charges have been reduced by ½d. per kWh.

HECKMONDWIKE.—Lighting: Reduced by 1d. to 6d. per kWh.

WORCESTER.—Lighting: Flat rate, from 6½d. to 6d. per kWh. Power, theatres and kinemas: The percentage increase reduced from 40 to 30. All charges subject to a discount of 10 per cent. for prompt payment of accounts.

Retford.—ELECTRICITY SUPPLY.—The Town Council has resolved to proceed with a scheme for generating its own electricity in conjunction with the gas undertaking. Two schemes have been prepared by Mr. H. Seabrook, one costing £10,050 and the other £17,200. It is anticipated that the station will be in operation by June, 1926.

Ross.—STREET LIGHTING.—The Urban District Council is asking the local Gas Company and Electric Light Co. to submit tenders for the lighting of its area.

Sheffield.—ELECTRICITY EXTENSIONS.—The Electricity Committee has approved extensions of works at an estimated cost of £7,446 and extensions of mains for general distribution purposes at an estimated cost of £11,179.

PURCHASE OF UNDERTAKING.—The Yorkshire Electric Power Co. and the Sheffield Corporation have agreed to appoint Mr. W. H. Patchell, consulting engineer, of London, as sole arbitrator, to settle the amount of the purchase money to be paid by the Corporation for the purchase of the undertaking of the company in the area of Wadsley.

Silsden.—ELECTRICITY SUPPLY.—The Urban District Council has entered into negotiations with the Keighley Corporation with a view to a supply of electricity being obtained for the district.

Sleaford.—NEW PLANT.—The Urban District Council is to install two oil engines at the electricity works with accessories, at an estimated cost of £8,207, and application is to be made for sanction to a loan to cover the expenditure.

Southport.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. E. Moxon) for the year ended March 31st last record a total revenue of £89,339, as compared with £84,076 in the preceding year. Working expenses were £42,550, as against £37,209, leaving a gross profit of £46,789 (£46,867). Capital charges absorbed £28,134, and there was a net profit of £18,656, as compared with £18,225 in 1923-24. The amount spent on capital account was £24,433, and included £13,902 for mains and services. The sales of electrical energy increased from 5,514,115 to 6,018 541 kWh, and the maximum supply demanded from 3,152 to 3,681 kW. The extension of the boiler plant was commenced during the year, and it is hoped to have the work completed in time for next winter's load. The Birkdale District Electric Supply Co., Ltd., commenced taking a bulk supply in January last.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation, Special Orders made by them for the supply of electricity in the following districts: The urban districts of Sutton-in-Ashfield, Huthwaite and Kirby-in-Ashfield, and parts of the rural districts of Basford and Skegley, by the Derbyshire and Notts. Electric Power Co.; the urban district of Grange by the Council; the urban district of Ashford and the rural district of West Ashfield, by the Urban District Council; in various parts of the County of Renfrewshire, by the Strathclyde Electricity Supply Co., Ltd.

Application has been made by the Urban District Council of Portmadoc for an Order to supply electricity in its area.

Application is being made by the Corporation of Gloucester to supply electricity within the Rural District of Gloucester; the Corporation of Birmingham to supply electricity within the Rural District of Solihull and part of the Rural District of Meriden; the Southern Counties Electric Light and Power Supply, Ltd., to supply electricity within the Rural District of Sturminster, Dorset.

Stockton.—ASSISTED WIRING SCHEMES.—The Town Council has issued instructions for assisted wiring schemes for private houses to be put into operation.

MAINS EXTENSIONS.—The Electricity Committee has approved of the proposal to lay a high-pressure main from the works to the Durham Road area, and erect a small outdoor sub-station at an estimated cost of £5,500. The manager is to report again when anticipated developments take place.

Sunderland.—STREET LIGHTING.—The Corporation has received sanction to a loan of £100,000 for mains in connection with the conversion of the street lamps from gas to electricity.

Thrapston.—OPPOSITION TO SCHEME WITHDRAWN.—The Rural District Council has consented to the application of the Rushden and District Electric Supply Co., Ltd., for permission to use overhead h.p. and l.p. mains in the Council's area. The Council had previously declined to consent to the use of overhead lines.

Tunbridge Wells.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £6,500 for extensions to the electricity works.

Walsall.—YEAR'S WORKING.—The accounts of the electricity undertaking (engineer: Mr. H. A. Howie) for the year ended March 31st, 1925, record a total revenue of £100,151, against £92,744 for the preceding year. The working expenditure amounted to £53,955, against £43,228, leaving a gross profit of £46,196 (£49,516). The deduction of capital charges leaves a net profit of £14,830, as compared with £18,824 for the year 1923-4. The capital expenditure during the year amounted to £40,027, making a total of £429,167. The sales of electrical energy increased from 12,087,881 to 13,953,947 kWh, and the average price per kWh decreased from 1.84d. to 1.72d. The maximum supply demand for the year was 5,700 kW, representing an increase of 500 kW.

Watford.—APPLICATION FOR LOAN.—The Town Council has applied to the Electricity Commissioners for loans amounting to £55,550 for additional plant at the electricity works.

Wimbledon.—YEAR'S WORKING.—We have received from Mr. A. E. McKenzie, borough electrical engineer, a copy of his report on the working of the electricity undertaking for the year ended March 31st last. The revenue account shows a total income of £116,147, as compared with £107,826 in the preceding year. The working expenditure was £61,012, as against £50,625, leaving a gross profit of £55,134 (£57,201). Capital charges, &c., absorbed £31,587, and there was a net surplus of £23,971, as compared with £30,408 in 1923-24. A total of £75,857 was spent on capital account during the year; this included £31,145 for machinery and £25,947 for mains and services. The total sales of electrical energy increased from 8,570,130 to 11,010,062 kWh, and the average price obtained per kWh fell from 2.882d. to 2.381d. The second 3,000-kW turbo-alternator was installed during the year, and an order was placed for a new 50,000-lb. boiler and economiser.

Woolwich.—ELECTRICITY EXTENSIONS.—The Town Council has adopted a recommendation to carry out extensions to the electricity works, at an estimated cost of £110,000.

Worcester.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer: Mr. C. M. Shaw) for the year ended March 31st last shows a total revenue of £57,543, as compared with £45,867 in the preceding year. Working expenses amounted to £32,299, as against £27,490, leaving a gross profit of £25,243 (£18,377). After allowing for capital charges, there was a net surplus of £7,581, as compared with £2,714 in 1923-24. During the year £26,377 was spent on capital account, and included £18,780 for mains and services. The electrical energy sold amounted to 6,942,757 kWh, an increase of 742,574 kWh, and the maximum supply demanded rose from 4,214 to 4,443 kW.

EXTENSION OF SUPPLY.—The Electricity Committee has recommended to the City Council that applications be made for

sanction to a loan of £33,000 to cover the cost of extending the electricity supply in an area of about 33 square miles, a Special Order for which has already been obtained. The engineer, Mr. Shaw has suggested that the greater part of the transmission and distribution should be carried out on the overhead system.

Worksop.—ELECTRICITY SUPPLY.—The Urban District Council has decided to extend its existing power station and is therefore abandoning negotiations for a bulk supply of electricity from Rotherham Corporation.

Tramway and Railway Notes.

Continental.—SWEDEN.—Work is well in hand on the electrification of the Stockholm-Gothenburg section of the Swedish State Railways, and it is expected that the whole line, a distance of about 286 miles, will be completed by the end of the present year. Single-phase current at a frequency of 16 2/3 cycles and 16,000 V is being used, the energy being taken from the State-owned system of main three-phase transmission lines at various sub-stations. The three-phase lines have pressures varying from 50,000 to 130,000 V, which will be transformed down to 6,000 V. The single-phase energy will be generated at 3,000 V and stepped up to 16,000 V. Of the 50 electric locomotives ordered, 10 will be allotted for passenger and 40 for goods service. The cost of the electrification work on the line is estimated at about £2,149,000, including £578,500 for the necessary locomotives, while the power consumption is estimated at 50 million kWh per year.

BELGIUM.—A new electric tramway is approaching completion between the Central railway station in Antwerp and Dam.

The Société des Tramways Electriques du Pays de Charleroi has applied for a concession for an extension of its electric tramways to provide a connection between the railway station at Couillet-Montignies and Chatelet.

Chesterfield.—RAILLESS CARS.—The Town Council has decided to adopt a railless-car system in place of the present tramway system, but has postponed the beginning of the work for twelve months. The tender for the conversion of the overhead equipment and the supply of 14 vehicles was £27,548.

Hull.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (general manager: Mr. E. S. Rayner) for the year ended March 31st last shows a total income of £326,549, as compared with £328,698 in 1923-24. Working expenses totalled £255,986, as against £236,288, leaving a gross profit of £70,563 (£93,773), to which was added interest from various sources, and a grant of £1,050 from the Unemployment Grants Committee, making a total of £74,293. This was dealt with as follows:—Interest, £20,918; loan instalments, £17,383; annual contribution in respect of cost of widening streets on tramway routes, £2,981; income tax, £9,978; borough fund, £12,000; deficit on motor-omnibuses, £4,777; reserve fund, £6,255. During the year £75,991 was spent on capital account, the chief item being £64,266 on permanent-way. The number of passengers carried increased from 60,316,860 to 62,387,677, and the car-miles run from 4,529,379 to 4,570,277.

Irish Free State.—DUBLIN.—The offer of the Dublin United (Electric) Tramway Co., Ltd., to take over the recently-closed Dublin and Lucan Tramway has been considered by the Dublin City Commissioners. While they are favourable to the proposal, the Commissioners state that they cannot undertake the responsibility of postponing for 42 years the date upon which the tramway may be acquired by the Corporation. With regard to the supply of electricity by the late Dublin and Lucan Tramway Co., the Commissioners say that this supply was non-statutory, but they are willing to agree to its continuance, it being understood that this in no way prejudices the Corporation's rights in the event of an extension of the city boundaries.

London.—SOUTHWARK BRIDGE EXTENSION.—The extension of the L.C.C. tramway across Southwark Bridge was opened by the Lord Mayor of London, Sir Alfred Bower, on Tuesday last. The extension has cost nearly £56,000.

Lostock Light Railway.—EXTENSION OF TIME.—The Minister of Transport has extended the time for the completion of Lostock Light Railway by 12 months until June, 1926.

Liverpool.—YEAR'S WORKING.—We have received from Mr. P. Priestley, general manager of the city tramway undertaking, a copy of his report, together with the accounts for the year ended March 31st last. The total revenue amounted to £1,337,805, as compared with £1,394,986 in 1923-24, the falling off in receipts being due to the reduction of fares during the latter part of 1923. The working expenditure was £1,142,975, as against £1,063,324, leaving a gross surplus of £194,830 (£331,062), to which was added interest from various sources, and a contribution from the Unemployment Grants Committee, making a total of £217,791. After deducting capital charges, a surplus of £119,111 was carried to reserve, renewal and depreciation account. The previous year's working resulted in a profit of £240,427. The capital expenditure during the year amounted to £197,510, and included £105,889 for permanent-way reconstruction, £44,660 for cars, and £27,310 for land, buildings, and fixtures. The number of passengers carried increased by 27,235,955 to 234,906,356, and constitutes a record for the undertaking. The car-miles run increased from 15,731,411 to 16,789,321. During the year four new routes were opened for traffic, and Orders have been obtained to construct tramways along five additional routes. About 26 miles of trolley wire has been renewed, and 15 miles erected in connection with extensions, &c.

Northampton.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (general manager: Mr. J. F. Cameron) for the year ended March 31st last records a total revenue of £83,596, as compared with £80,287 in the preceding year. Working expenses totalled £59,504, as against £54,231, leaving a gross profit of £24,091 (£26,056), to which were added contributions from the Museum and Education Committees, making a total of £24,418. After providing for capital charges there was a net surplus of £13,172, as compared with £15,053 in 1923-24. The number of passengers carried increased from 12,121,947 to 13,163,318, and the car-miles run from 822,141 to 841,840.

Sheffield.—NEW TRAMCARS.—The Finance Committee of the City Council has approved the purchase of 50 new tramcars.

Southern Railway. — ELECTRIFICATION EXTENSIONS. — On Thursday, July 9th, the electrification of the line from Waterloo to Guildford, was officially inaugurated; and on Sunday, July 12th, three branches of the South-Eastern sections of the suburban lines, Victoria and Holborn Viaduct to Orpington, St. Paul's to Shortlands *via* Catford), and St. Paul's to the Crystal Palace (high level), were run electrically for the first time. These extensions amount to nearly 200 track miles. There were a few minor breakdowns and a certain amount of delay on July 13th, the first full-traffic day.

Telegraph and Telephone Notes.

China.—TELEPHONE PROGRESS.—The Chekiang authorities have decided to set up a long-distance telephone service between Ningpo and Hangchow (Chekiang provincial capital); to save expense the wires are to be strung on telegraph posts. The long-distance telephone service between Tsingtao and Tsinan (Shantung provincial capital) has been opened. The successful operation of a long-distance service between Canton and Fatshan has caused the military authorities at Kongmoon to request similar lines for five West River districts which centre about Kongmoon; the line to be built first will be to Sunchong. A public telephone service between Hunchun and Hsiaosanch'ak'ou (Kirin province) has been established.

RADIO STATIONS.—A commercial "wireless" company is being formed in Canton; all stations at present at Canton, or in the vicinity, are controlled by the Government. The Tientsin station, built under the auspices of the Tientsin Telephone Administration for commercial purposes, has inaugurated its service; the wavelength is 1,000 metres.—*Eastern Engineering.*

Japan.—OSAKA TELEPHONES.—The Osaka Bureau of Communications has decided on the number of telephones to be installed in the eight prefectures under its jurisdiction in the new financial year. The telephones installed in the district last fiscal year were but 530; in the current year the number has, however, been increased to 3,300. Consideration has been given to the towns and suburban districts, where the price of the instrument is high. High prices rule in Ashiya, Mikage, Tengachaya, Sumiyoshi, &c., and in these places from eight to ten times more telephones than last year have been allocated, so as to regulate the market price. The actual expenses to be contributed to the Bureau by applicants for the installation of telephones are still kept strictly secret, but it is understood that in a place where the charge was 550 yen last year it will put up to 800 yen, &c.—*Eastern Engineering.*

South Africa.—RADIO COMMUNICATION.—In the course of a debate in the House of Assembly on the Post Office vote on July 6th, Mr. Boydell, Minister of Posts and Telegraphs and Public Works, stated that he anticipated that beam radio stations in South Africa and England would be ready for operation about November. The Union, he added, would be represented on the Committee in England for fixing rates for the Dominions' wireless services.—*Reuter* (Cape Town).

Sweden.—RADIO TELEGRAPHY.—The Grimeton radio station on the west coast of Sweden, which was put into operation a few months ago, appears to have gained the support of the public; 95 per cent. of the Swedish telegraph messages to the United States are transmitted by Grimeton, while it receives about 40 per cent. of the Swedish telegrams from that country. The new station is handicapped on the American side by the fact that the cable company has stations all over the States, which do not accept telegrams for transmission by "wireless." Nevertheless, there is a notable increase of messages carried in this direction also. According to *Swedish Export*, the new service has reduced the rates of the cable companies

to 33 per cent. below pre-war charges, while the installation and operating costs have turned out lower than estimated, and the business has been larger than was hoped for. The authorities at no time reckoned with more than 2 per cent. on the investment.

The Telephone Service.—Additional Trunk Lines.—The Postmaster-General announces that additional trunk telephone lines are now available for communication between London and Glasgow.

Glasgow Automatics.—The Glasgow Corporation proposes to replace the present telephone system in the City Chambers by an automatic system with provision for "dialling" direct to the central exchange.

Telegraph Developments.—Press Union Statements.—At a recent meeting of the Empire Press Union Sir Robert Donald is reported to have said that wireless telegraphy—and possibly even radio telephony—would be operative between England and the Dominions within about eight months. Sir John Denison-Pender, president of the Eastern Telegraph Co., detailed the work of his company since the war, involving the expenditure of £10,500,000 on new cables and the repair of old lines. Mr. Goddard, representing the Western Union Telegraph Co. of America, indicated that their latest development in cable improvements would practically amount to an eight-fold increased carrying capacity. Sir John Denison-Pender said that additional capacity provided to deal with the "rush" hours left them with a margin of capacity during non-rush hours, which had been utilised by the introduction of a new class of traffic at quarter rates—daily letter telegrams, subject to delivery after 48 hours—which had provided a new source of revenue. His company had decided to lay a loaded cable between Perth (Western Australia) and Cocos Island, and it was estimated that they should be able to get a capacity of over 2,000 letters per minute in one direction, as against 600 letters per minute with an unloaded cable. On his company's system the Press messages amounted in words to 22 per cent. of their total traffic, while the revenue from those messages was only two per cent. of the total receipts. Sir Campbell Stuart, member of the Pacific Cable Board, announced that from July 7th the Press rate for messages by the Pacific cable route would be reduced from 7½d. to 6d. per word.

Turkey.—New Radio Stations.—The Post Office has concluded an agreement with a French company for the installation of radio transmission and reception stations at Angora and Constantinople, the work to be completed in one year.—*Reuter* (Constantinople).

Telegraph Operators' Strike.—A simultaneous strike on the part of telegraph operators at Adana, Erzeroum, and Samsoun, which crippled the communications between these places and the interior, led the Government to take strong action against the strikers. or, although the alleged motive of their action was the obtaining of an increase of salary, the authorities believed that the simultaneous outbreak of the strike was prompted by Communists. The ringleaders have been arrested and dispatched under escort to Angora, where they will be tried.—*Reuter* (Constantinople).

Radio Notes.

Australia.—Labour Council's Station.—The Postal Department has decided to grant the application of the New South Wales Labour Council for a licence to establish a broadcasting station, and has allotted the proposed station a wave-length of 280 metres. The secretary of the Postal Department, Mr. H. P. Brown, has stated that the Council has undertaken to conduct the station in accordance with the regulations and not to commit any breach of the Telephone Act by using it for the transmission of information which, legally, can be transferred only by the Postmaster-General.

Germany.—It is reported that the broadcasting station at Munich increased its transmitting power on July 15th from approximately 1 to 10 kW, and it is practically certain, says the *Evening News*, that the other German stations will similarly increase their power in the near future.

Hospital Equipment.—The Colchester Board of Guardians has decided to install a broadcast receiving set in the Workhouse Infirmary for the benefit of the patients. Maidstone Rotarians are to equip two local hospitals with receiving apparatus.

International Radio Conference.—Geneva Meeting.—Representatives of France, Great Britain, Italy, Germany, Sweden, Switzerland, and Czecho-Slovakia took part in the above Conference, which opened at Geneva on July 6th. Great Britain was represented by Admiral Carpendale, president of the International Wireless Union, and Captain Eckersley, chief engineer to the British Broadcasting Co. Captain Eckersley presented a memorandum on the redistribution of the wave-lengths employed in Europe, and a sub-commission of seven members was appointed to draw up a scheme. He was elected president of the Conference, which concluded its labours on July 8th. Certain changes have been decided upon, but the necessity of keeping the older and more important stations on their present wave-lengths has been constantly kept in view. A fresh scheme for the distribution of wave-lengths was drawn up; on or about September 1st, certain transmitting stations in Europe will change their wave-lengths, and an experiment will be made in transmission after the hours of regular broadcasting so as to test the new scheme. A second trial will take place a fortnight later, and the results obtained will serve as a basis for the final discussion, which will take place in Geneva.

The Council of the International Wireless Telephony Union, sitting on July 9th, ratified the decisions reached during the Conference, and agreed to approach the various European Governments, through the Communications and Transit Section of the League of Nations, for permission to conduct experiments early in September. In the event of such permission being granted, a further conference of technical experts will be held at Geneva on September 21st and 22nd to examine the data collected by the office of International Wireless Telephony as a result of the experiment. In order that the decisions then made may be put into effect with the minimum of delay, the Council of the Union will assemble again on September 23rd and 24th.—*Reuter* (Geneva).

Musical Committee.—Advisory Body.—A Musical Committee has been appointed by the British Broadcasting Co. to advise on the musical programmes to be broadcast, with a view to associating still more closely the work of the company with the musical profession.

The B.B. Co.—Year's Working.—The accounts of the British Broadcasting Co. for the year ended March 31st last show that the excess of revenue over expenditure was £84,138, as compared with £8,812 a year ago. The maximum dividend of 7½ per cent. is recommended, and the balance of £79,685, against £723, is carried forward. During the year licence fees to the amount of £488,881 were received; the proportion of the tariffs received to date and allocated to the past year was £35,688, while sundry revenue, including the profit on the *Radio Times*, was £13,958. The cost of the programmes and operating and administration expenses totalled £414,199.

United States.—Wave-Band Increase.—While European broadcasting authorities are discussing wave-lengths with a view to a proper allocation between various countries, the U.S.A. have evolved a scheme to overcome similar difficulties of their own. The plan is to broaden the present band (300 to 546) to between 150 and 546 metres. The proposal will provide accommodation for 600 stations, allowing room for 40 more in addition to the present number. The idea is to separate the broadcasting stations by grouping the high- and low-power stations in different sections of the band.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—Sydney.—July 27th. Municipal Council. One 5,000-kVA, 5,000/33,000-V step-up transformer; supply of gas-filled lamps. Specifications from the office of the Construction Engineer, Electricity Department, Town Hall, Sydney.

Postmaster-General's Department.—Automatic c.b. telephone exchange equipment, Canberra exchange.

New South Wales Public Works Department. September 14th. Electrical equipment, machinery, &c., for bascule bridge over Cook's River at General Holmes' Drive.*

September 21st. Material and apparatus for complete communication system, Barrenjack hydro-electric scheme.

Melbourne.—August 3rd. Electricity Commission of Victoria. Switchgear and accessories.

September 14th. 3,000-kVA transformers and spares. Particulars from the Purchasing Section of the Commission, William Street, Melbourne.

Postmaster-General's Department. August 11th. (Sched. C. 26), plugs and sleeves (switchboard). (Sched. C. 25), switchboard cords.

September 15th. Lamps, lamp caps, and lamp sockets. Tender forms from High Commissioner, London.

Barking.—July 28th. Electricity and Tramways Department. One 1,000-kW and one 500-kW rotary converters, with oil-cooled transformers and synchronising panels or, alternatively, one 1,000-kW and one 500-kW motor-converters (La Cour type), with starting and synchronising panels, e.h.p. switchboard, 3-wire d.c. switchboard and traction board. (July 10th.)

Belgium.—June 22nd. Belgian State Railway authorities (Office de l'Electricité), 25, Rue de la Charité, Brussels. Two lots of 160,000 metres of electric wire and four lots, totalling 110,000 metres, of specially-insulated wire. Particulars (Cahier des Charges Special No. 4-257) for 1 fr.

July 29th. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Thirty-eight lots of miscellaneous telephone material, including tables, jacks, 5,000 hand telephones, 100 voltmeters, and 5 000 condensers. Particulars on application to Cahier des Charges Special No. 3-126.

Bristol.—August 10th. Docks Committee. Four 3-ton movable electric jib wharf cranes for the Royal Edward Dock, Avonmouth. Spec. (£3) from Mr. T. A. Peace, chief engineer, Avonmouth Docks.

(*Continued on page 103.*)

Electricity Supply in Yorkshire.

The Yorkshire Electric Power Co.'s Development and Station Extensions.

SINCE it is now almost 21 years since the Yorkshire Electric Power Co. commenced to supply electricity in the West Riding, having obtained its Parliamentary powers in 1901, a brief record of its achievements will serve a useful purpose, particularly as the magnitude of the undertaking is not generally realised. The fundamental guiding principles have been the facts that the economical supply of electricity involves production on a large scale and distribution for all purposes by a single organisation over a wide area, the superseding of small inefficient generating stations, coal economy, and the standardisation of the system of supply. The company's area of 1,800 sq. miles, with a population of over 3,000,000 people, is one of the most industrialised districts of this country, and it includes one of the most important of the English coalfields, in which great developments are taking place; colliery supplies of electricity represent 38 per cent. of the Y.E.P. Co.'s output. Yorkshire is the seat of the textile industry. The first worsted-spinning mill to be driven electrically from a public supply was connected to the Y.E.P. Co.'s mains in 1905, and to-day 16 per cent. of the company's output is utilised in textile mills. In the steel trade the electric drive has proved to be particularly suitable, while the merits of electric furnaces need no emphasis. One of the largest steel-rolling mills in the world is driven by a 19,000-h.p. motor, fed from the company's mains. General power users purchase 26 per cent. of the electricity produced by the company.

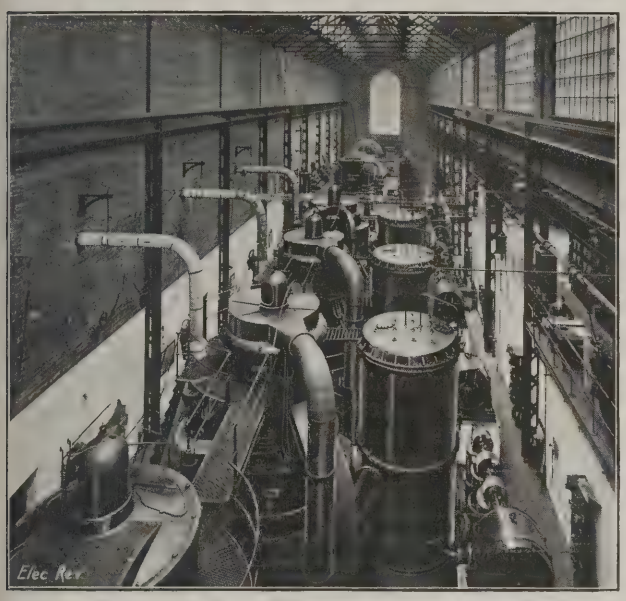


Fig. 1.—Original B.T.-H. Vertical Turbo-generators.

In addition to meeting the requirements of diverse industries, the domestic needs of a large population are catered for by the Y.E.P. Co.'s associated organisation, Electrical Distribution of Yorkshire, Ltd. Since the war many housing schemes have been completed, particularly in the coalfield, where entirely new villages have been built, the houses being supplied with electricity and the new streets electrically lighted. In all 70 distributing undertakings operate in the Y.E.P. Co.'s area, the availability of bulk supplies having enabled many of them to carry out their work without the necessity of building generating stations; in fact, those which had previously established generating plant have dispensed with it, with consequent economy. About 20 per cent. of the electricity produced by the company is disposed of in bulk, but it nevertheless supplies consumers direct in many cases. To do so in every case (as the company would prefer) is not, however, permitted owing to the form which legislation took in the past; the establishment of E.D. of Y., Ltd., was therefore a necessary step towards development, and the close co-operation of the two organisations has made electricity available in scattered districts which would otherwise be without it.



Fig. 2.—Thornhill Power Station, June, 1925.

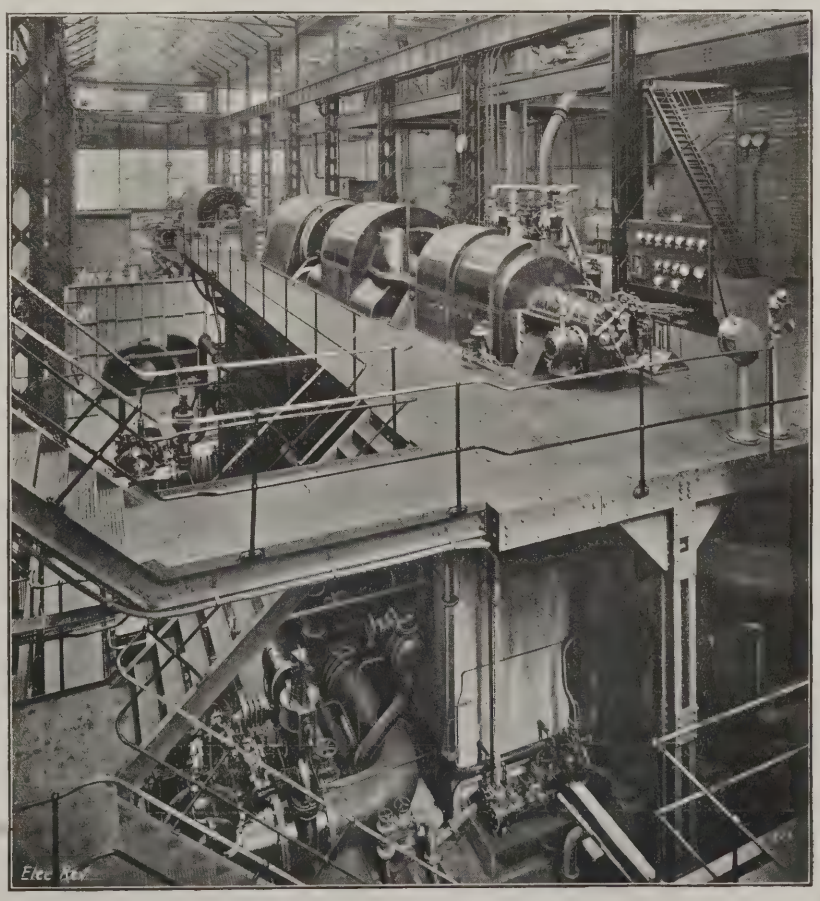


Fig. 3.—Thornhill Turbine Room, June, 1925.

The original steam generating station at Thornhill commenced to supply electricity to a colliery in December, 1904. The station originally contained three

1,500-kW, 1,000-r.p.m. British Thomson-Houston vertical turbo-alternators, fig. 1, with surface condensers and Edwards air pumps. The alternators generated three-phase current at a terminal pressure of 11,000 volts and a frequency of 50 cycles per second; 20 years ago it was somewhat unusual to find stations generating at such a high voltage, and the frequency then adopted by the company has since become the national standard. This original part of the station still exists, and now forms the centre block, and with the addition of a fourth British Thomson-Houston vertical turbo-alternator is now only used for stand-by purposes.

The station was gradually extended until in 1915 the urgent demands for electric power for munition making purposes called for the addition of two 6,000-kW British Thomson-Houston turbo-alternators, running at 1,500 r.p.m. and generating three-phase current at 11,000 volts, with surface condensers and steam-jet air pumps by Hick, Hargreaves & Co.

A second boiler house (No. 2) was built adjoining the turbine house extension. It contains at present three Stirling water-tube boilers, each having a normal evaporation of 39,000 lb. of water per hour, and two larger Stirling boilers of the tri-drum type, each having a normal evaporation of 50,000 lb., with Green horizontal tri-tube economisers. The working pressure is 200 lb. per sq. in., and superheaters raise its temperature from 382 to 600 deg. F. The boilers are fitted with chain-grate mechanical stokers and induced-draught



Fig. 4.—One of the Thornhill Boiler Houses.

plant. A further 50,000-lb. boiler, of the Babcock and Wilcox C.T.M. type is now under construction in this house. The boilers are fed by two 200,000-lb., 6,000-r.p.m. Weir pumps. The latest extensions are shown in cross section in fig. 10. They comprise a further extension to the turbine room, a new boiler house (No. 3) on the railway side, and a new switch house on the river side, which form part of a scheme for the complete remodelling of the station. The two new 12,500-kW Parsons turbo-alternators, fig. 3, are of the tandem reaction type with double-flow low-pressure cylinders, which exhaust into twin surface condensers. At their most economical rating of 10,000 kW, the steam consumption is 11.1 lb. per kWh. Each condenser has a cooling surface of 9,500 sq. ft., together with its own turbine-driven circulating water pump and motor-driven condensate pumps in duplicate; steam-jet air pumps of the two-stage type in duplicate are provided for each machine. The circulating-water pump turbines discharge into heaters through which the condensate is passed. Provision is also made for passing steam from the low-pressure stages of the turbines into feed heaters, thus further increasing the temperature of the condensate.

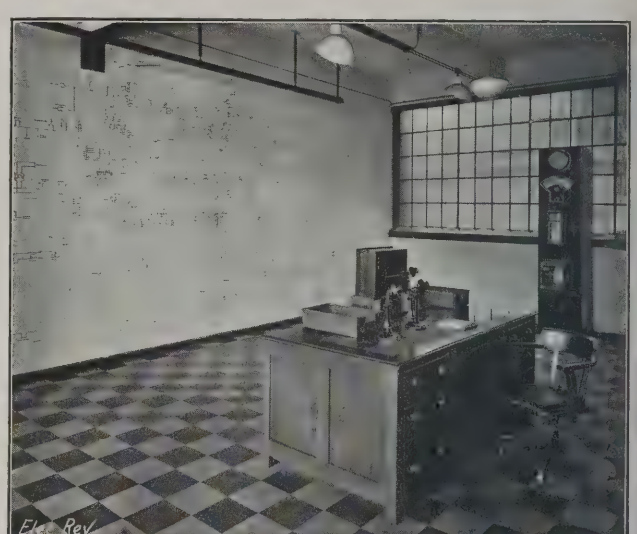


Fig. 5.—Control Room; System Diagram.

The alternators generate three-phase current at 11,000 volts, and run at a speed of 3,000 r.p.m. They are provided with external fans and a closed system of ventilation, the air being cooled by coolers inserted in the foundation block and supplied with cooling water from the circulating system. Alongside the turbines are the boiler feed pumps and hotwells. The feed pumps are of the Weir single-stage type, driven by steam turbines at 6,000 r.p.m., and each is capable of delivering 250,000 lb. of water per hour against a total pressure of 250 lb. per sq. in. The exhaust steam from the turbines is passed straight into the hotwells.

No. 3 boiler house, fig. 4, will supersede No. 1 boiler house entirely in one direction, and be also extended at the other end. It contains at present four steel-cased water-tube boilers, with economisers, chain-grate mechanical stokers, and induced-draught plant. Three of these boilers are of the Babcock and Wilcox C.T.M. type, each having 10,040 sq. ft. heating surface and 250 sq. ft. grate area; the fourth is of the Clayton & Shuttleworth bent-tube type, with a Bennis grate; each has a normal evaporation of 50,000 lb. of water per hour, and a working pressure of 200 lb. per sq. in., with a total temperature of from 600 to 650 deg. F. Each pair of boilers is arranged with a double drive for the chain grates, a motor being connected at each



Fig. 6.—Thornhill Switch Control Room.

end of a continuous driving shaft equipped with a separating coupling between the two boilers. The new

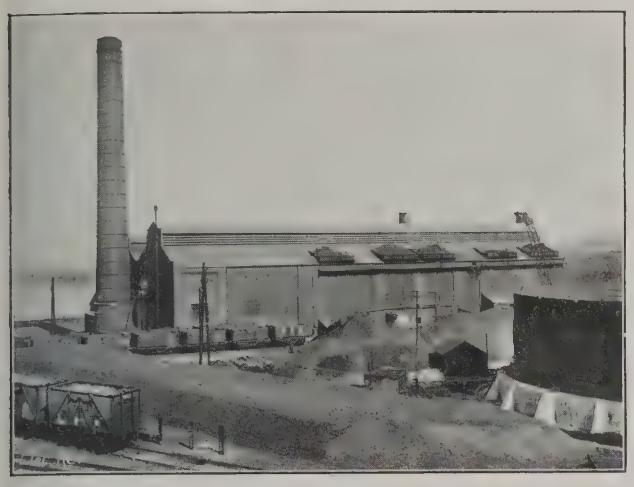


Fig. 7.—Barugh "Waste Gas" Power Station.

boilers have a thermal efficiency of 85 per cent. on the net calorific value of the fuel as fired. The boiler basement is constructed to accommodate a yard locomotive. The ashes are transported to low-lying ground on the site by electric vehicles. The overhead bunkers are filled with coal from siding hoppers by means of gravity bucket conveyors. Provision is made in the elevator tower for two conveyors, each having a capacity of 50 tons per hour; facilities exist for the reception of coal either by rail or canal. The coal consumption of the station is about 1,200 tons per week.

The new switch house and control room, figs. 5 and 6, are equipped with a 9-panel distribution board and a 13-panel generating board. The instrument scales on the former are distinctively coloured, those of the voltmeters being pink; ammeters, white; power factor meters, red; and the wattmeters blue and pink; the blue side indicating outgoing energy and the pink incoming. The main generator and feeder oil switches, of the totally-enclosed ironclad Reyrolle pattern, are on the first floor of the building. Each switch has a rupturing capacity of over 500,000 kVA at 11,000 volts, being operated remotely from the panels in the control room immediately above. A complete system of telephones and telegraphs connects the control room with the turbine and boiler houses and the other power stations on the system. Two large charts, one geographical and the other diagrammatical, fig. 5, showing the whole of the company's distribution mains, enable the control engineer to see at a glance the position of the controlling switches of all sub and generating stations, and he is thereby in touch with the whole of a system which covers an area of 1,800 square miles. The foundations for a new 33,000-V switch house are already down.

The Thornhill station is situated on the bank of the River Calder, and the screens are of the self-cleaning revolving open-disk type. Two new screens have been erected vertically, it having been decided that no advantage was gained by using the sloping screen. A lime-soda treating plant of 3,500 gallons per hour capacity is installed near the screens. Whereas in 1904 the site occupied 15 acres, the present area amounts to 85 acres. The duplication of all essential apparatus is one of the notable features, and applies to the auxiliary machinery for the turbo-alternators, the circulating pumps, and switchgear. The new station generates a kWh of electricity for less than 2 lb. of coal, the turbine steam consumption being 11.1 lb. per kWh. The company's engineer and manager, Mr. W. B. Woodhouse (president of the Institution of Electrical Engineers), being fully appreciative of the economies to be derived from the use of "waste heat," it is not surprising that his Barugh power station (figs. 7 and 9), near Barnsley, utilises a large quantity of coke-oven gas, as indicated in fig. 8, in addition to a considerable amount of coal. This station has now reached a capacity of 20,000 h.p., and the use of surplus gas, which would otherwise be wasted, results in a saving of some 20,000 tons of coal per year, the station being, for its size and due to the particular conditions of working, more economical than many larger ones. The company's latest development is the establishment of a station at Ferrybridge, which is at present under construction, fig. 11. It is situated on the River Aire, near Knottingley, and will ultimately be of 200,000 kW capacity, the first machines being of 26,000 h.p. each.

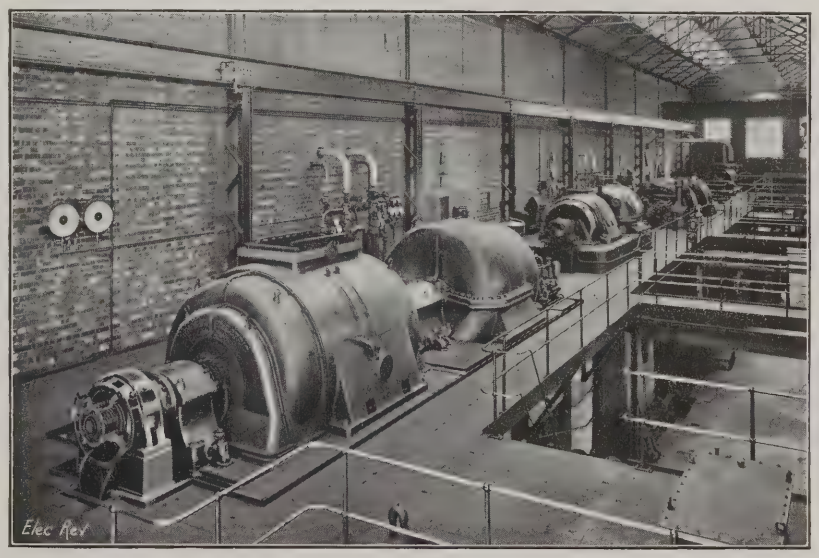


Fig. 9.—Barugh Turbine Room, June, 1925.

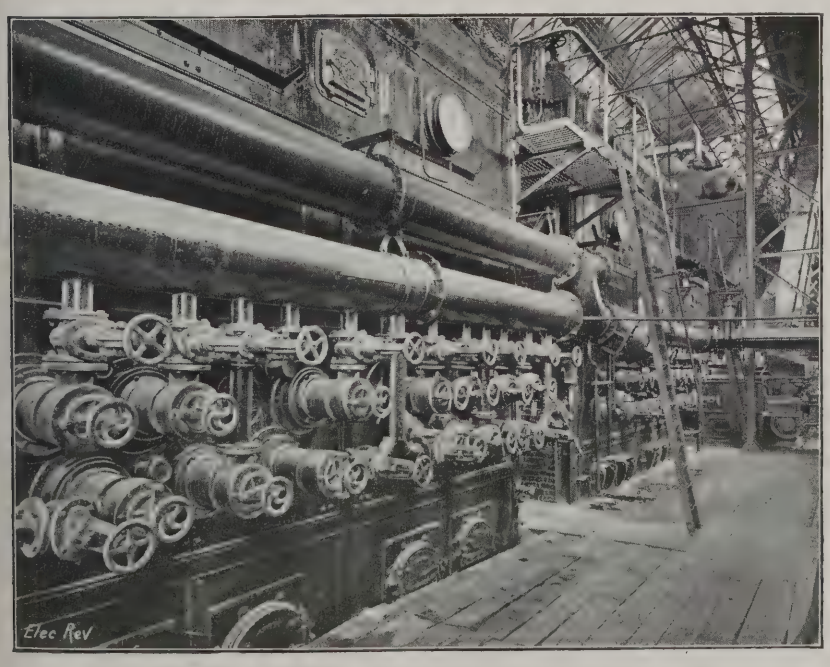


Fig. 8.— Barugh Coke Oven Gas-fired Boilers.

The h.p. transmission network consists of both underground and overhead lines, fig. 14, being an example of the latter, and inter-

connectors are being laid between the main stations for 33,000- and 44,000-V transmission, one for 44,000 V being in service between the Ferrybridge and Mexborough stations. Some 300 sub-stations are in use, (see Elec. Rev., June 5th, 1925, pp. 890-891) development plans will be proceeded with.

In the company's area of supply there are no less than 70 electricity undertakings, of which 31 (cover-



Fig. 10.—Cross-Sectional View of Latest Extension; Thornhill Power Station, 1925.

figs. 12 to 13 illustrating typical examples, while fig. 16 shows a mercury-arc rectifier situated in a glass works. Fig. 15 is indicative of the rural distribution system, designed to aid industrial redistribution and thus

ing an area of 650 square miles and a population of 556,750) are owned by Electrical Distribution of Yorkshire, Ltd. Of the remainder, the company has working arrangements or agreements with 27, and

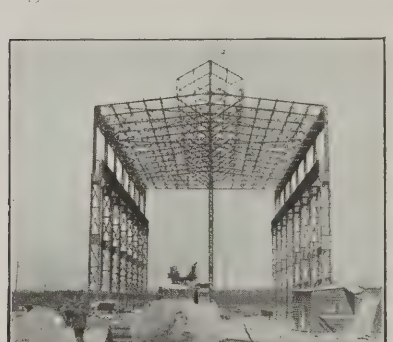


Fig. 11.—Ferrybridge Capital Station, April, 1925.



Fig. 12.—Typical 500-kW Sub-station.



Fig. 13.—Typical 10,000-kW Sub-station.

relieve congestion in the large manufacturing centres. In accordance with its policy of co-operation in the interests of economy, arrangements exist for the purchase of electricity by the Y.E.P. Co. from the Cor-

the following are somewhat striking examples of what has been already done:—The Elland Urban District Council shut down its generating station in 1921, prior to which the undertaking had been a burden on

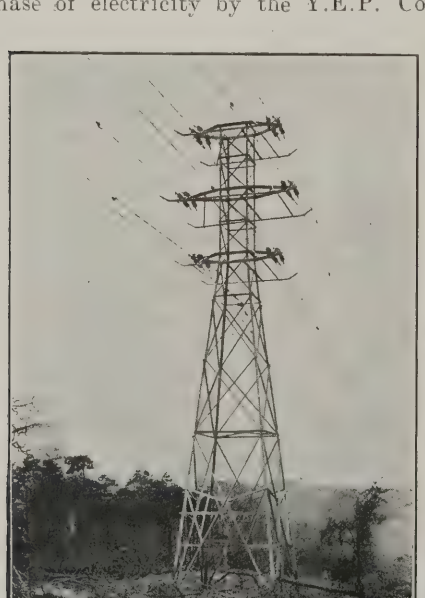


Fig. 14.—Overhead Transmission Line Tower.



Fig. 15.—Rural Sub-station and Overhead Line.

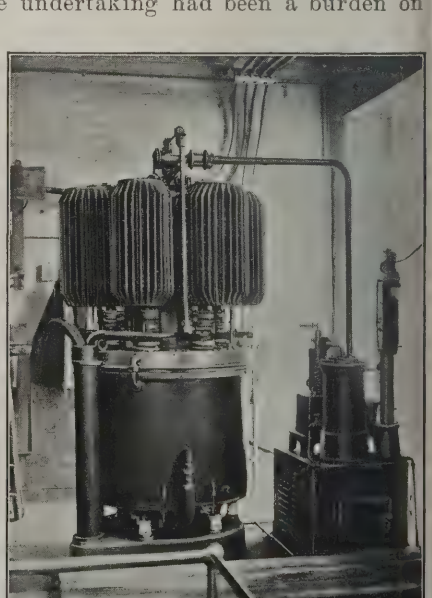


Fig. 16.—Mercury Arc Rectifier in Glass Works.

porations of Bradford, Leeds, Rotherham, and Sheffield, from generating plant that would otherwise be unoccupied. Now that certain legislative delays are ended

the rates; during the first year that a bulk supply was taken from the Y.E.P. Co. a gross deficit of £3,200 was turned into a gross profit of £1,138, thus enabling the

ouncil to make an immediate reduction of 12½ per ent. in its tariffs. The gross profit for 1923 and 1924 as averaged £5,200, and the reductions in the charges ow amount to nearly 30 per cent. in all since a bulk upply was first taken. During the same period the number of units consumed per head of population in the istrict has nearly been doubled. During the eight ears ended March, 1922, the Heckmondwike Urban District Council suffered an average annual loss of £1,547 n its undertaking, the equivalent of a 7d. or 8d. rate. ince that date the Council has been taking a bulk upply entirely from the Company, resulting in economies amounting to £3,000 or £4,000 per annum and a eduction of about 20 per cent. in the tariffs.

Another interesting case is that of the undertaking of he Holmfirth Urban District Council, which for the even years preceding 1923 made an average loss of 600 per annum, but after taking a bulk supply, a gross rofit of £1,700 was made in the first year, enabling he charges to be reduced forthwith. In the last three ears the consumption per head of population in the istrict has been more than doubled.

A further example is the undertaking of the Todmorden Corporation, which during the year prior to aking a bulk supply incurred a loss of £2,350. In he first year afterwards this loss was transformed into profit of £3,383, the revenue having increased by ver £2,000, and the operating costs decreased by 3,600. The profit for 1924 increased to £6,361, while he total reduction in the tariffs since the bulk supply as taken now exceeds 33 per cent. These reductions ave an immediate impetus to consumption, which has nore than trebled itself in the last three years.

The foregoing examples of what has been done for hese local authorities in the West Riding, who now urchase their supplies of electricity in bulk from the orkshire Electric Power Company, are a remarkable estimony to the efficiency of the large central generating station operating over a wide area.

Contracts Open and Closed

(*Continued from page 98.*)

Open.

Glasgow.—July 24th. Corporation. Electrical installation at the Belvedere housing scheme. Specification from the ngineer.

Grimsby.—August 1st. Electricity Department. Storage attery, booster, and switchgear. (July 10th.)

Leeds.—Library and Arts Committee. Electric lighting nstallation at the Public Library, Cardigan Road, Burley. Particulars from Mr. G. B. Howcroft, architect, Uppermill, ear Oldham.

London.—ST. PANCRAS.—September 3rd. Electricity Department. One 10,000-kW steam turbine, alternator, condensing lant, pipes, &c. (See this issue.)

BETHNAL GREEN.—July 20th. Electricity Department. L.p. ables and switchgear. (July 10th.)

ST. MARYLEBONE.—August 31st. Highways Department. One 200-kW turbo-alternator set with surface condenser and uxiliaries; one second-hand 200-kW, 200/220-d.c. generator et. (See this issue.)

H.M. OFFICE OF WORKS.—July 31st. Incandescent lamps. See this issue.)

Liverpool.—Waterworks Committee. Small electrically-lriven centrifugal pumps at Prescot, Lancs. Mr. J. R. Davidon, water engineer, 55, Dale Street, Liverpool. (£2 2s.)

Manchester.—July 20th. Electricity Department. Electric cooking ranges, and switches and cut-outs for 12 months. July 3rd.)

Electricity Department. Three-phase, 6,600-V switchgear or Dickinson Street and 6,600-V switchgear for Bowker Vale. See this issue.)

New Zealand.—WELLINGTON.—August 18th. Posts and Telegraph Department. Switchboard plugs.*

INVERCARGILL.—August 17th. Electricity Department. Four 67-kVA single-phase transformers.*

MARLBOROUGH.—September 22nd. Electric Power Board. Turbines, generators, and switchgear. (B.X. 1,904.)*

Nottingham.—August 7th. Electricity Department. One 0,000-kW turbo-alternator, with exciter, condenser, air pumps, il coolers, air coolers, and auxiliary plant. (See this issue.)

South Africa.—JOHANNESBURG.—August 1st. Municipal Council. Twelve a.c. power relays.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Brighton.—Electricity Committee. Accepted:—
Pulverised fuel firing equipment (£1,970).—Underfeed Stoker Co., Ltd.

Chesterfield.—Electricity Committee. Accepted:—
Three Cope's feed-water regulators for boilers.—James Gordon & Co., Ltd.

Glasgow.—Baths and Wash-houses Committee. Accepted:—
Electrical installation at Whiteinch Baths (£694).—Johnston, Park & Co.

Tramways Committee. Accepted:—
Special track work.—Hadfields, Ltd.
V.i.r. cable.—Siemens Bros. & Co., Ltd.

Guildford.—Electricity Committee. Accepted:—
Cable.—British Insulated & Helsby Cables, Ltd.

Hastings.—Electricity Committee. Recommended:—
Two 2,000-kVA transformers (£2,973).—Ferranti, Ltd.

Irish Free State.—Contracts placed by the Commissioner of Public Works, Dublin, during the month of June:—
Provision of a h.p. main, Governor-General's residence.—City Electrical Engineer, Dublin.
Altering and extending electric lighting system, Governor-General's residence.—Brooks, Thomas & Co., Ltd.
Electrical works and supplies, Dublin district.—Handley & Robinson, Ltd.—*Irish Builder and Engineer.*

DUBLIN.—Commissioners for the County Borough.—Nine firms submitted tenders for the supply of the Electricity Department's requirements of arc lamp carbons for the coming year, viz.:—

	9 mm. x 15 in. per 1,000 carbons.	9 mm. and 8 mm. x 15 in. per 1,000 carbons.	18 mm. and 12 mm. x 12 in. per 1,000 pairs.
	£ s. d.	£ s. d.	£ s. d.
Beacon Carbons, Ltd. ...	3 12 0	6 12 3	15 0 0
E. A. Langrish & Co. ...	4 10 0	7 7 6	9 12 6
W. Geipel & Co.	3 13 6	6 15 6	11 10 0
Henrion Carbons, Ltd. ...	3 13 6	6 15 6	11 10 0
General Electric Co., Ltd.	4 12 0	8 8 6	11 7 0
Sloan Electrical Co. ...	4 14 6	7 9 6	11 6 3
Electric Equipment & Carbon Co., Ltd. ...	5 4 0	9 2 0	15 16 0
Siemens-Schuckert ...	5 6 0	9 6 0	16 7 6
Chapman & Chapman ...	6 6 0	10 7 3	18 10 0

The lowest tenders in each case have been accepted, namely:—Beacon Carbons, Ltd., for 9-mm. x 15-in. and 9-mm. and 8-mm. x 15-in. carbons. E. A. Langrish & Co., for 18-mm. and 12-mm. x 12-in. carbons.—*Irish Builder and Engineer.*

Lamp Contracts.—The London, Midland & Scottish Railway Co. has renewed its contract with the Siemens & English Electric Lamp Co., Ltd., for Siemens gasfilled lamps; and the London & North-Eastern Railway Co. has placed a contract for six months' supply of metal-filament lamps with the Edison Swan Electric Co., Ltd. The General Electric Co., Ltd., has received a three-years' War Office contract for "Osram" vacuum and gasfilled lamps, and a six months' contract from the L. & N.E. Railway for "Osram" vacuum and gasfilled lamps and Robertson carbon-filament lamps.

London.—LAMBETH.—Board of Guardians. Accepted:—
Special electric light fittings for the board room.—Owen, Barnes & Co.

LONDON COUNTY COUNCIL.—Housing Committee.
Wiring and fittings for electric lighting in five block of tenements, East Hill estate:—

Heath-Pritchard, Ltd. (Accepted.)	**£1,656**
T. Clarke & Co., Ltd.	1,766
Smethurst & Co. (London), Ltd.	1,863
Alpha Manufacturing & Electrical Co., Ltd.	1,891
A. Meckhonik	1,896
Stegman & Co.	1,970
A. Hawkins & Sons	2,099
Tredegars (1923), Ltd.	2,127
British Electrical Installations Co.	2,136
H. J. Cash & Co., Ltd.	2,229
Commercial Telephone & Electrical Co., Ltd.	2,310
Power Contracts, Ltd.	2,501
T. H. Smerdon	2,600
Griggs & Sons	2,740
Belgravia Electrical Co., Ltd.	2,867
G. A. Weston	3,731
W. E. Heath & Co.	4,174

Fire Brigade Committee. Accepted:—
Wiring and fitting for electric lighting new fire station, Peckham Road (£180).—Commercial Telephone & Electrical Co., Ltd.
Installation of motor generators, Bayswater fire station, and Peckham Road new fire station.—Crypto Electrical Co., Ltd.

Highways Committee. Accepted:—
Twelve months' supply of "Bitite" grout (3,000-4,000 tons).—Dussek Bitumen Co., Ltd.

Education Committee. Recommended:—
Electric lighting and equipment, London Printing School (£318).—A. Hawkins & Sons.

Reading.—Board of Guardians. Accepted:—
Electrical work in connection with the equipment of a new laundry at Battle Infirmary.—Haden & Sons, Ltd.

Spenborough.—Urban District Council. Accepted:—
Electrician's work required in connection with the new public abattoirs.—Butler & Horn.

Housing Committee. Accepted:—
Electrical installation in 60 houses now being erected for the Council.—Stead & Firth.

Stafford.—Staffs. Education Committee. Accepted:—
Installing electric light at Corporation Street schools (£213).—W. Hampton.

Uxbridge.—Fire Committee. Recommended:—
Installation of electric siren (£168).—Walters & Co.

Winchester.—Town Council. Accepted:—
Supply of electricity meters for 1 year.—Chamberlain & Hookham, Ltd.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

NER-A-LITE shop-window fittings.

Notes.

The Women's Engineering Society.—AN INTERNATIONAL CONFERENCE.—At the British Empire Exhibition, Wembley, this week, an "international conference of women in science, industry, and commerce," is being held, under the auspices of the Women's Engineering Society and kindred bodies, including the Electrical Association for Women. The conference was to be opened on Wednesday by the President, H.R.H. the Duchess of York, with Lady Astor, M.P., in the chair, and after luncheon there was to be a tour of the Exhibition. The speakers and delegates were to be entertained to luncheon at the Wembley Garden Club by the President and Council of the British Electrical Development Association (Inc.), and amongst those present were to be Miss Margaret Bondfield, J.P., Mr. W. E. Woodhouse, Pres. I.E.E., and Miss V. Holmes, A.M.I.Mech.E. On Thursday the morning session was to be devoted to "Engineering, Chemistry, and Research," Miss C. Griff, A.M.I.A.E., presiding, and one of the papers was entitled "Electricity Applied to Mining," by Miss H. M. Davis; the subject for the afternoon was "Industrial Welfare and Factory Inspection," with Mrs. Willson, M.B.E., in the chair, and a reception was arranged for the evening. To-day, Mrs. Hoster will preside at the morning session, on "Commerce and Salesmanship," papers being read by Miss G. Burlton, B.A., on "Salesmanship" and by Miss L. F. Nettlefold, LL.B., on "The place of the Wholesaler in the Scheme of Distribution"; and in the afternoon, with Alderman Mrs. Hammer in the chair, the subject will be "Electricity—Domestic Science," papers being read on "Producing and Distributing Electricity" by Miss M. Partridge, B.Sc., and "At Home with Electricity," by Miss T. J. Dillon, B.Sc. and accompanied by a special demonstration of electrical apparatus. In the evening there will be a dance.

The L.C.C. Tramways.—The accounts of the London County Council tramways for the past year (which were summarised in our last issue, p. 80) came before the Council at its meeting on July 7th. Mr. Angus Scott attributed the deficit which had been incurred to unrestricted and wasteful omnibus competition. He pointed out, too, that a seventh of the tramway revenue was derived from workmen's fares which were unremunerative; the 'buses offered no such facilities. Although the undertaking had not covered all its charges, it was absurd to talk of scrapping a system which still had a £9,000,000 debt outstanding. He denied that the tramways were bankrupt; they were still a valuable asset to London.

Mr. J. C. Dalton considered that the system had outlived its usefulness. Nothing further should be spent on it and its abolition should be looked to.

Mr. J. P. Blake thought that it was impossible for the tramway to succeed if the view of the last speaker was that of the controlling party on the Council. He wanted to see the tramways working out their own salvation rather than receiving any form of "protection."

Mr. Gatti, chairman of the Finance Committee could not agree with the proposal which was often put forward that the tramway should be relieved of rates and road maintenance. He thought that the present serious position would be got over and the tramways restored to the position of prosperity which they occupied until recently.

Appointments Vacant.—Temporary vacancies in the Wireless and Electrical Branch of the Aeronautical Inspection Directorate (£235). Clerk (70s.), for the Sevenoaks and District Electricity Co., Ltd. Meter fixer and plumber-jointer, for the Workington Corporation. (See our advertisements pages to-day.)

The Manchester Annual Report.—A very bad error occurred in our review of the report upon the Manchester electricity undertaking (June 19th, p. 996), it being stated that the energy sold had increased from 24,905,469 kWh to 26,816,400 kWh. These figures are obviously incorrect for an undertaking the size of Manchester's; the correct figures are respectively 222,203,023 kWh and 257,352,920 kWh.

Smoke Abatement.—For the benefit of the delegates attending the Harrogate Advertising Convention a smoke abatement demonstration and lecture were given at the Harrogate electricity works by Mr. W. H. Casmey, of Burley-in-Wharfedale. The demonstration was arranged by Captain H. R. Webster (chairman of the Electricity Committee) and Mr. George Wilkinson (manager of the works) presided. Two Lancashire boilers were used for the demonstration.

Educational.—UNIVERSITY OF LONDON.—In the Faculty Engineering at University College diplomas in Electrical Eng neering have been awarded to Messrs. A. C. Beck, C. Mood S. R. Witt (with distinction), and W. A. P. Wykeham.

POLYTECHNIC EXTENSIONS.—Important items were consider by the London County Council Education Committee at i meeting on July 15th. A building grant of £50,000 towar the cost of the erection and equipment of a new polytechnic St. Pancras is proposed; the total cost is estimated at £112,74 This polytechnic will include a commercial department a a junior technical school for light engineering trades, says *T Times*. Among the grants recommended are a maintenan grant of £27,000 per annum for five years to the Imperial C lege of Science and Technology, South Kensington, and a bui ing grant of £30,000 for the extension of the Regent Stre Polytechnic. The governors of the Polytechnic contempla spending £250,000 in all on enlargements. They report th the Polytechnic has now over 12,000 students and 300 teache and that the demand on the accommodation has increased nearly 90 per cent. during the last 12 years, with the resu that many students have had to be refused admission.

Institution Notes.

Institution of Electrical Engineers.—A.M.I.E.E. EXAMIN TION.—The next examination will be held on October 29t 30th, and 31st, 1925. Candidates must be either Students Graduates of the Institution, or have lodged with the secreta a duly completed form "E" for election as Associate Membe Entry forms for the examination, which must be completed a returned by September 1st, and particulars regarding electi to membership of the Institution may be had on applicati to the secretary, The Institution of Electrical Engineers, Sav Place, Victoria Embankment, W.C.2.

Diesel Engine Users' Association.—MECHANICAL INJECTIO —At the July meeting of the Association, held at Maidenhea some notes on the "Working of the Ruston Mechanical Inj tion Oil Engine" were presented by Mr. C. O. Milton, and d cussed. The author gave detailed information concerning experience in the working of such engines, and explain the conditions and special circumstances which he had to ta into account when ordering this particular type of engi One of the engines had already been at work for over 8,0 hours. Prior to the meeting members took the opportunity visiting the Maidenhead electricity works to see the t mechanical high-compression engines which are installed the

Permanent-way Institution.—SHEFFIELD CONFERENCE.—T business proceedings at the annual conference of the P manent-way Institution, held last week at Sheffield, were int spersed with a considerable round of social functions and vis to local works. The delegates numbered about 150 from branches in Great Britain and the Colonies. Following t annual meeting on the first day of the convention, Mr. E. Wilson, of the Metropolitan Railway, presided at the annu dinner, at which Mr. Fearnley, manager of the Sheffield tra ways, referring to a suggestion that as Sheffield was the hor of so much that went to the making of a successful tramw system, the introduction of a "stainless car" should be co sidered, remarked that at last they had been successful getting stainless steel fittings in order to do away with t brasswork. Some sets had now been fitted, and they hop considerable economy would result. Mr. Joseph Ward t how the first steel rails came to be laid, and among the esta lishments visited by the delegates during the week were th of Messrs. Samuel Osborn & Co., Ltd., and the Titan Trac work Co., Ltd., where the visitors saw moulds for trackwo for railways and tramways, and were particularly interest in a big lay-out for the Sheffield tramways, as well as othe in process of construction. A 30-cwt. electric furnace w shown in operation, and the visitors were entertained luncheon by the directors, with Mr. Fredk. Osborn in t chair.

The Faraday Society.—At the annual general meeting the above Society, held on July 6th, the following officers a members of the Council were elected:—President: Profess F. G. Donnan. Past-presidents: Sir Robert Hadfield, Pr Alfred W. Porter, and Sir Robert Robertson. Vice-president Mr. W. R. Bousfield, Prof. C. H. Desch, Dr. W. H. Hatfiel Prof. W. C. Lewis, Mr. C. C. Paterson, Prof. A. O. Rankin and Dr. E. K. Rideal. Treasurer: Mr. R. L. Mond. Counci Prof. E. N. da C. Andrade, Mr. C. R. Darling, Dr. J. Coates, Dr. F. A. Freeth, Dr. B. A. Keen, Dr. E. H. Rayne Dr. F. C. Toy, Mr. H. T. Tizard, Dr. R. S. Willows, and Pr E. C. Williams. The report of the Council draws attention the fact that general discussions on the following subjects we held during 1924:—"Fluxes and Slags in Metal Melting a Working," "Physical and Physico-Chemical Problems Rel ing to Textile Fibres," "The Physical Chemistry of Igneo Rock Formation," "Base Exchange in Soils." It is t policy of the Society to co-operate wherever possible with oth scientific societies, and three of these discussions were he jointly. The policy of co-operation is also extended to t American Electrochemical Society, in that by a mutual arrang ment, the transactions of each society are supplied to t members of the other society at a special rate. In addition the general discussions, four ordinary meetings were hel During the year 33 new members were admitted to the Societ

There was an adverse balance of £293 on the year's work, due to the great amount of material published. While loath to diminish the Society's activities, it has been decided to limit the general discussions for the time being to two a year, and it is expected, as a result, to balance income and expenditure during the present year.

Institution of Mechanical Engineers.—NEWCASTLE MEETING.—In commemoration of the Centenary of the opening of the Stockton and Darlington Railway, members of the Institution of Mechanical Engineers, who met recently in Newcastle-on-Tyne, paid a visit on July 8th to the Faverdale works of the L. & N.E.R. Co. at Darlington, and there inspected the exhibition of locomotives and railway appliances. Luncheon was given by the L. & N.E.R. Co. to the visitors, who were presided over by Mr. H. N. Gresley, chief engineer of the L. and N.E.R. Co. Sir Hugh Bell, extending a welcome on behalf of the Railway Company, proposed the health of the Institution, and coupled with it the name of the president, Sir Vincent Raven. He regretted, he said, that the North-Eastern Railway Co.—not the L. & N.E.R.—was not the absolute pioneer in main-line electrification. That they had run the first railway in the kingdom was not bad; that they should have run an express electrical train from Newcastle to York would have been a fitting thing for them to have done. Sir Vincent, responding, said it was more economical to run trains electrically than by steam. He had pursued that line, and had visited other countries, which had gone ahead of us in that direction, mentioning America and Germany in particular. He believed that before he left the N.E.R. Co. he had persuaded Sir Hugh Bell and also Sir Arthur Pease that, given certain conditions—density of traffic and cheap electricity—it would be a great advance. He thought it would be only a question of time before they would see something done in that direction.

A number of members visited the works of Messrs. A. Reyrolle & Co., Ltd. Hebburn-on-Tyne. They were received by Mr. Norbert Merz, Mr. H. W. Clothier, Mr. H. W. Miller, and members of the staff at the New Town Works, where they were able to see a practical demonstration of the company's very thoroughly organised system of production. The party then proceeded to the Old Town Works, where specimens of Messrs. Reyrolle's well-known apparatus were inspected, amongst which was switchgear for mining and industrial service, together with sub-station, power-station, and super-power station panels. A very interesting programme of experiments was arranged in the laboratory, and high-voltage phenomena produced by a 450,000-V testing transformer were much appreciated. The visitors were entertained to tea by the company, and Mr. Chas. Day, on behalf of the Institution, in the course of his remarks, commented specially upon the fine layout of the equipment of Messrs. Reyrolle's works.

Institution of Public Lighting Engineers.—The second annual general meeting will be held at Leeds on September 14th to 16th, 1925, under the presidency of Mr. S. B. Langlands, J.P., and the new president, Mr. C. S. Shapley. One of the papers to be read is entitled "Electric Street Lighting in Rural Areas," by Mr. E. C. Lennox, of the Newcastle-on-Tyne Electric Supply Co., Ltd. The hon. secretary, Capt. W. J. Liberty, Guildhall, London, has received the implied sanction of the Ministry of Health for the payment of the expenses of delegates to the meeting by local authorities. Full particulars can be obtained from Capt. Liberty.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

At the recent Convention at San Francisco, Mr. JAMES E. DAVIDSON, vice-president and general manager of the Nebraska Power Co., was elected president of the National Electric Light Association.

A meeting of representatives of the South-East Lancashire Electricity Advisory Board, and undertakings in the North-West Midlands area, took place at the Manchester Town Hall on July 7th, in order to make a presentation to Mr. S. L. PEARCE, who is relinquishing the office of chief electrical engineer of the Manchester municipal electricity undertaking to become an Electricity Commissioner. The presentation took the form of a mahogany writing table and a chair to match. The top of the table bore a silver plate on which the following inscription was engraved:—"This desk was presented to S. L. PEARCE, Esq., C.B.E. M.Sc.Tech., as a mark of professional and personal esteem, on the occasion of his appointment to the Electricity Commission, by the constituent authorities of the South-East Lancashire Electricity Advisory Board and the authorised undertakers in the North-Western area, in appreciation of his services to such board and his conciliation work for the industry. 7th July, 1925." Alderman W. T. Dagnall, chairman of the Advisory Board, in making the presentation, spoke of Mr. Pearce's work in connection with the technical development of the area and especially in the formation of the Board and its predecessors. Alderman Dagnall said that Mr. Pearce occupied the chair of the Engineering Advisory Committee of the Board not by virtue of his being the the chief engineer of the largest undertaking in the area, but on account of his professional and personal qualities and his reputation for fairness and impartiality. He regretted that they were losing Mr. Pearce, but they wished him happiness and success in his new and wider sphere of usefulness. Alderman Higham, chairman of the employers' side of the District Joint Industrial Council for the area, supported Alderman Dagnall's appreciation and referred to Mr. Pearce's conciliation work. Alderman Clark, chairman of the employers' side of the District Joint Board, also testified to Mr. Pearce's important part in the technical and conciliation work of the area. In replying, Mr. Pearce said that the technical success with which he had been credited had only been achieved with the loyal and unstinted help always received from his colleagues. He thought that the Board had accomplished a great deal of useful work in the realisation of the spirit of the Electricity (Supply) Act of 1919. He asked those present to believe that the qualities of fairness which they had kindly attributed to him would always be fully exercised in the carrying out of his new duties. After briefly mentioning the activities of the Joint Board and Industrial Council, Mr. Pearce concluded by thanking the chairman for the writing table and chair, expressing the hope that he would not lose touch with those with whom he had worked so long.

Mr. H. C. HAMBRO has joined the board of the Eastern Telegraph Co., Ltd.

Mr. LESLIE C. SHARP, son of Mr. Ernest E. Sharp, will on Monday next, 20th inst., join his father in the business of Venner Time Switches, Ltd. For some years past he has been securing practical experience in certain branches of electrical manufacturing work and in central electricity supply station work, which should stand him in good stead in devoting his attentions to the outside work of the above company.

The Chesterfield Electricity Committee has appointed Mr. S. H. FOWLES, technical assistant at the electricity works, as station superintendent, and Mr. G. H. DAVIES as assistant station superintendent and relief shift engineer.

The marriage took place at All Saints' Church, Benhilton, Sutton, Surrey, on June 27th, of Mr. LEONARD H. SHORT, M.C., of the English Electric Co., and Miss GLADYS BOX.

Mr. D. MACLENNAN manager of the Alloa electricity works, who has been appointed manager of the Inverness Corporation electricity works has been presented with a Westminster chiming clock by the Alloa Town Council in appreciation of his services during the past five years.

The Keighley Corporation Tramways Committee, after interviewing five out of the 67 applicants for the post of manager of the Tramways Department, has recommended the appointment of Mr. RONALD A. FEARNLEY, chief assistant engineer to the Sheffield Corporation Tramways and Motor-bus Department, and son of the manager of the Sheffield Tramways.

The marriage took place on July 11th at All Souls, Langham Place, London, of Mr. FRANK A. NEWINGTON, of Bircholme, Hawkhurst, Kent, to Janie, only daughter of the late Dr. and Mrs. Ross Watt, Arnisfield, Ayr.

Modern Transport states that the directors of the Southern Railway have appointed Mr. A. Raworth electrical engineer for new works and to co-operate with Mr. Herbert Jones, the company's electrical engineer, with regard to the preparation of electrification schemes. Mr. Raworth, prior to grouping, was electrical engineer of the former South-Eastern and Chatham Railway, and as engineer of the South-Eastern and Chatham Construction and Power Company (a subsidiary company formed to carry out the electrification of the company's suburban lines) he has been responsible for the designs and execution of the scheme, the first three sections of which were formally opened to electric traction on July 12th.

Hove Town Council has appointed Mr. ALAN PROPERT assistant engineer at the Corporation electricity works.

Mr. A. M. SAMUEL, M.P., Parliamentary Secretary of the Department of Overseas Trade, has appointed SIR RICHARD REDMAYNE K.C.B., formerly chairman of the Imperial Mineral Resources Bureau, which has now been amalgamated with the Imperial Institute, to be Director of the Imperial Institute for a short period in order that he may supervise the amalgamation of the two bodies.

The Worcester City Council has granted extended leave (six weeks, in August and September) to Mr. C. W. SHAW, the city electrical engineer, to enable him to visit the United States at the invitation of the President of the Detroit Edison Electric Supply Co. The Council at the same meeting approved of the proposal to increase Mr. Shaw's salary from £800 to £1,000 per annum in fulfilment of a pledge that the question of his remuneration should be considered when the Order giving the Corporation powers over a larger area, was through.

The Harrogate Electricity Committee on Monday recommended the Council to increase the salary of Mr. GEORGE WILKINSON, the borough electrical engineer, by £150 per annum to £950 on condition that he gives up all private practice and consulting work.

The Wolverhampton Town Council on Monday decided to increase the salary of the tramway manager (Mr. OWEN SILVERS) from £850 to £950 per annum.

As was briefly announced in our last issue Dr. T. F. WALL has been appointed head of the Electrical Engineering Department of Sheffield University. Dr. Wall was educated at the Liverpool Grammar School and Liverpool University College. He graduated in the Honours School of Engineering in the Victoria University of Manchester. He was special research scholar in electrical engineering in the then newly-established University of Liverpool and was subsequently elected to the "1851 Exhibition Scholarship," which he held for two years in the Elektrotechnisches Institut, Karlsruhe, Germany, where he was engaged on research work in the laboratories of the late Dr. Englebert Arnold. In 1912 the degree of Doctor of Science was conferred on him by the Victoria University of

Manchester, and in 1914 the degree of Doctor of Engineering by the University of Liverpool, for research work in electrical engineering. He served as an apprentice in the shops and drawing office of Messrs. Boothroyd, Hyslop & Co., Bootle, mechanical and electrical engineers, and subsequently acted as electrical designer to that firm. He was then engaged as an electrical designer with Siemens Brothers Dynamo Works, Ltd., Stafford. For several years he was lecturer and organising supervisor of the electrical engineering laboratories in the University of Birmingham under the late Prof. Gisbert Kapp. During the war he held a commission as lieutenant in the Royal Naval Volunteer Reserve and was particularly engaged on the development of electrical apparatus which he had invented for signalling to submerged submarines and for which an award was made by the Admiralty Council. The Admiralty has subsequently acquired several patents of his relative to applications of electricity for naval purposes. He has contributed a large number of original communications to the leading technical journals and to the British Association—in particular, the outline of a proposal for the long-distance transmission of electrical energy in connection with the Severn barrage scheme. In the year 1921 Messrs. Methuen published his book on "Electrical Engineering." Dr. Wall has been external examiner in electrical engineering to Queen's University, Belfast, and local examiner in the Midlands for the Institution of Mining Electrical Engineers. He is a member of the local committee of the Institution of Electrical Engineers, and an Associate Member of the Institutions of Civil and Electrical Engineers. Since going to Sheffield University, Dr. Wall has been responsible for the design and equipment of the "Edgar Allen Research Laboratory," in which a large amount of research work has been carried out and extensive investigations of a fundamental nature are now in progress.



Dr. T. F. Wall,
Head of the Electrical Engineering Department, Sheffield University.

Mr. Guy Burney, managing director of the Sterling Telephone & Electric Co., Ltd., informs us that he has decided to retire from that business, and at the end of this month will go to France for a holiday. He has no further plans, but if, after a long rest, he undertakes any other commercial venture, it will be of a less strenuous character. Mr. Burney founded the business in 1900, as a branch of the Berliner Telephone Mfg. Co., of Hanover, and in collaboration with that company's engineers, introduced the "Era" telephone, which, he claims was the first commercial multiple automatic interphone to be put on the market; it was this apparatus that brought the company into prominence. In 1909 works were acquired at Dagenham, and the business, which continued to expand rapidly, was converted into a private limited liability company. On the outbreak of war Mr. Burney offered the works *en bloc* to the War Office and Admiralty for use in any capacity; the offer was not accepted, but the company carried out large contracts for the Government departments and at the end of the war was employing 2,200 people day and night on the production of fuses and field telephones. Mr. Burney received the thanks of the War Office, Air Ministry, and Ministry of Munitions for his services. At an early stage in the war the German shareholding was acquired by British investors, through the Public Trustee. The Dagenham works now cover 12 acres, and are engaged in the production of Post Office and domestic telephones, and wireless apparatus, employing 2,600 people in the busy season.

Mr. Burney was founder and first chairman of the Telephone Manufacturers' Association and of the National Association of Radio Manufacturers, and is a member of the P.M.G.'s Advisory Committee on broadcasting. He took an active interest in labour problems during the war, and has always provided for the comfort and welfare of the workers, including the athletic and social side. In business his slogan was "Aim high!" and his policy progressive, demanding a high standard of quality in the products of his company, the success of which has been largely due to the energy and ability with which he has conducted its affairs and the foresight which enabled him to anticipate and provide for the requirements of the market.



Mr. Guy Burney,
Founder and managing director of Sterling Telephone and Electric Co., Ltd.

Mr. Harold Hobson, who has been appointed joint manager of the County of London Electric Supply Co., Ltd., and whose portrait accompanies this note, was educated at King's College, London, where he took the degree of B.Sc. (Engineering).



Elliott & Fry **Mr. Harold Hobson,** *[London.*
Joint manager of the County of London Electric Supply Co., Ltd.

His practical training was received at the Rugby works of the British Thomson-Houston Co., Ltd., and elsewhere. In 1914 he became assistant engineer at the Darlington office of Messrs. Merz & McLellan, and later went to their Middlesbrough office. In 1920 he became personal assistant in London to one of the partners of the firm, and recently he has occupied the position of engineer-in-charge of the construction of the Barking station and other work for the County of London Co.

Mr. H. C. LAMB, the new chief of the Manchester electricity undertaking, has been elected to the employers' side of the No. 3 District Council (North-Western Area) Electricity Supply industry, in succession to Mr. S. L. Pearce.

Obituary.—MR. JOERGENSEN.—A *Reuter* dispatch from Helsingfors states that on July 9th, while Mr. Joergensen, the manager of the Great Northern Telegraph Company in Finland, was sailing in his yacht near Nystad the yacht was struck by lightning. All those on board were killed, with the exception of one of Mr. Joergensen's daughters.

MR. S. DEAN.—Mr. Samuel Dean, who was the first electrician to be appointed by Lever Bros., Port Sunlight, whom he served 34 years, died at Port Sunlight last week at the age of 60.

Wills.—The late Major FREDERICK COUTTS, general manager of the Yorkshire (West Riding) Electric Tramways Co., left £12,670.

Mr. W. A. HARPER, of Harper Bros. & Co., consulting engineers, left £3,843 gross and £2,420 net personalty.

New Companies Registered.

Giljay Patents, Ltd. (207,053).—Private company. Registered July 3rd. Capital, £500 in £1 shares. To acquire and turn to account any patents, rights, *brevets d'invention*, licences, protection, privileges and concessions, and to carry on the business of electricians, electrical and mechanical engineers, &c. The permanent directors are:—N. W. Gilbert, "Aucklands," Lapworth, Warwickshire, electrical engineer; A. E. Jabet, 59, Hazelwood Road, Acocks Green, Birmingham, electrical engineer; J. H. Kitchen, 85, Featherstone Road, King's Heath, Birmingham, solicitor. Solicitor: J. H. Kitchen. Registered office: King's Road, Hay Mills, Birmingham.

Davis, Cash & Co., Ltd. (207,032).—Private company. Registered July 3rd. Capital, £10,000 in 5,000 7½ per cent. cumulative preference and 4,900 ordinary shares of £1 each and 2,000 founders' shares of 1s. each. Objects: To carry on the business of designers and craftsmen in metals and electrical accessories carried on by C. H. Davis and F. T. Cash at 47, Mount Pleasant, London. The directors are:—C. H. Davis (chairman), Bushcroft, Wormley, Hertford; F. T. Cash, Normancroft, Elm Road, Sidcup, Kent (both permanent joint managing directors). Secretary: E. A. Cash. Solicitors: Godwin & Son, 26, Cannon Street, E.C.4. Registered office: 47, Mount Pleasant, Clerkenwell, E.C.1.

Rapinet, Ltd. (207,112).—Private company. Registered July 6th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of wireless instruments and accessories, &c. The directors are:—D. J. Phillips, "San Marino," Upper Tooting Park, S.W.17; H. P. Rapinet, 19, Westbourne Terrace Road, W.2. Qualification, 1 share. Remuneration, £150 each per annum. Registered office: 39-47, Groton Road, Earlsfield, S.W.18.

Power Development Co., Ltd. (207,12).—Registered as a private company on July 6th, with a nominal capital of £22,000 in 20,000 preference shares of £1 and 40,000 ordinary shares of 1s. The preference shares confer the right to a fixed cumulative preferential dividend of 6 per cent., and in a winding up to have the assets available for distribution applied first in paying off capital and arrears of dividend, but do not confer any further right to participation in profits or assets. Objects: To form, promote, subsidise and assist companies, syndicates, and partnerships, to carry on or carrying on all or any of the businesses of electrical and general engineers, and manufacturers and maintainers of plant for the generation, accumulation, transmission, and supply of electrical energy for the purposes of light, heat, power or otherwise; to carry on business as bankers, capitalists, financiers, concessionnaires and merchants, &c. The subscribers (each with one preference share) are:—J. S. Mellor, Kennans House, Crown Court, Cheapside, E.C.2, solicitor; H. R. Turner, Kennans House, Crown Court, Cheapside, E.C.2. The first directors are to be appointed by the subscribers. Qualification, 500 preference or ordinary shares. Remuneration as fixed by the company. Solicitors: Wild, Collins & Crosse, Kennans House, Crown Court, Cheapside, E.C.2. Registered office: 6, Old Jewry, E.C.

New Wireless League, Ltd. (207,185).—Private company. Registered July 10th. Capital, £100 in £1 shares. To look after the interests that may arise (legal or otherwise) of the members of the company, to formulate an insurance scheme, and to act in any other way that may seem beneficial to the directors on behalf of the members, &c. The first directors are:—W. A. McAlonan, 16, Elm Park Road, Winchmore Hill, N.21, publisher; W. B. Cooper, 64, Clarendon Road, Walthamstow, advertising manager; J. M. Grey, 26, Palmerston Road, Westcliff-on-Sea, publisher. Qualification, 10 shares. Solicitors: Firth & Co., 5, Chancery Lane, W.C.2. Registered office: Astor House, Aldwych, W.C.2.

Woodfyt Sales, Ltd. (207,152).—Private company. Registered July 8th. Capital, £2,550 in £1 shares. Objects: To carry on business as selling agents primarily supplied by Woodfyt Manufacturing Co., Ltd., to act as agents for other companies or persons interested in electrical furnishing equipment or in furniture and fittings of any other description, &c. The directors are:—C. G. North, 22, Blagdon Road, New Malden, wood work manufacturer (permanent); Charles Abbotts Smith, 12, Selwood Road, Addiscombe, sales manager; Charles Allin Smith, 12, Selwood Road, Addiscombe, company secretary. Qualification, £50. Solicitor: N. E. Carey, 2, Verulam Buildings, Gray's Inn, W.C.1. Registered office: 8, Diana Place, Euston Road, N.W.

Electrical Sunlight and Bergonie Co., Ltd. (207,154).—Private company. Registered July 9th. Capital, £750 in £1 shares. Objects: To acquire the business of an electro-therapeutic institute carried on by Mabel C. Collins at 2, Seaford Court, Great Portland Street, W., and to carry on business as an institute for the treatment of disorders and diseases by electricity, electric, or other scientific lights or rays in all their applications, and such other treatment of an electrical, medicinal or other nature as may be prescribed by qualified medical men and under their supervision, &c. The directors are:—E. F. Pratt, M.D., 15, Clarges Street, W., permanent chairman and managing director; Mrs. E. E. Rechnitzer, 35, Charles Street, W. Qualification, £100. Remuneration as fixed by the company. Secretary: Mrs. M. E. R. Fisher, 10a, Castleton Road, West Kensington, W. Solicitors: John T. Lewis & Woods, 54, Chancery Lane, W.C. Registered office: 54, Chancery Lane, W.C.

Climax Radio Electric, Ltd. (207,078).—Private company. Registered July 4th. Capital, £5,250 in 5,000 7½ per cent. non-cumulative preference shares of £1 and 5,000 ordinary shares of 1s. Objects: To manufacture, erect, maintain, repair and deal in wireless, telegraphic and telephonic apparatus, valves, instruments, equipment, accessories, electrical, magnetic, scientific and radioactive instruments and apparatus, vehicles and buildings for demonstrating and exhibiting the same, and books and literature relating thereto, &c. The life directors are:—C. H. Stave, 182, Church Street, Kensington, electrical engineer (director of Climax Patents, Ltd.); P. W. Baker, 2, Durlston Road, Kingston, electrical engineer; R. M. Ellis, Chop Cherry, Chinnor, Oxon, electrical engineer (director of Climax Patents, Ltd., and Chellis, Ltd.). Qualification, 100 shares. Registered office: 38, Quill Lane, Putney, S.W.15.

Hawk Coil Co., Ltd. (207,105).—Private company. Registered July 6th. Capital, £1,500 in £1 shares. Objects: To acquire the business of manufacturers of and dealers in wireless specialities and components, &c., carried on at St. Mary's Road, Surbiton, as the Hawk Coil Co., together with all or part of the rights, title, and interest in or appertaining to Patent Office Specifications, No. 20,283, relating to inductance coils, and No. 25,371, relating to wireless receiving apparatus (both 1924), and also the registered trade mark "Hawk," No. 421,325. The directors are:—R. J Coley, 189, Richmond Road, Kingston-on-Thames, engineer; H. J. Rochester, 13, Adelaide Road, Richmond, secretary. Qualification: £5. Secretary: H. J Rochester. Registered office: St. Mary's Road, Surbiton.

Official Returns of Electrical Companies.

Horstman, Ltd. — Mortgage on deeds and documents mentioned in the schedule thereto, premises, plant, machinery, and the company's undertaking and property, present and future, including uncalled capital, dated June 29th, 1925; to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd.

Mersey Power Co., Ltd.—Security, constituting a second charge on the company's undertaking and property, present and future, including uncalled capital, dated June 23rd, 1925, to secure all moneys due or to become due from the company to the Westminster Bank, Ltd., not exceeding £200,000, ranking after first charge dated November 27th, 1918.

Altrincham Electric Supply, Ltd.—Second mortgage debenture dated June 24th, 1925, to secure £100,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Solicitor to H.M. Treasury.

Rose Bros. Electrical Co., Ltd.—Particulars filed of £3,000 debentures authorised July 1st, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,000.

Rushden and District Electric Supply Co., Ltd.—Issue on June 25th, 1925, of £25,000 debentures, part of a series already registered.

Vaughan Crane Co., Ltd.—Satisfaction in full on June 29th, 1925, of mortgage and debenture dated April 17th, 1900, securing £5,000.

Brotherton Ediswan Tubes and Conduits, Ltd.—R. H. Johnston, of 49, Queen Street, Wolverhampton, ceased to act as receiver or manager on June 13th, 1925, in respect of the appointments of June 14th, 1922, and October 16th, 1924.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

General Electric Co., Ltd.

The annual general meeting was held on July 8th at Magnet House, Kingsway, Sir Hugo Hirst, Bt., presiding. In moving the adoption of the report (*vide* ELEC. REV., June 26th, p. 1026) the chairman said that the company had overcome the difficulties caused by the aftermath of the war. They felt some sense of pride that their prevision as to the services which the electrical industry could render had been justified by their expanding business and corresponding results. The profits, which for the first time in their history exceeded the million-pound mark, were nearly £200,000 in excess of those of last year. Those results were not only due to a greater demand for their goods; they reflected also the increasing efficiency of their recent enterprises, but they were mainly due to the comparative industrial calm which they had enjoyed during the last 12 months. The balance sheet showed great improvement. The items freehold land and buildings and fixed plant and machinery remained stationary as, by a coincidence, depreciations and additions equalised. They were able to keep loose plant, fixtures and installations and goodwill and patents at the nominal sum of £1, which was most satisfactory considering the enhancement of the value of the latter owing to the creation of their research laboratories and the generous allocation made to them. The outstanding feature on the credit side of the balance sheet was the disappearance of the item premium on purchase of Fraser & Chalmers, amounting to £110,000, and the item expenses of debenture stock issue amounting to £409,000. Their liquid resources had increased by nearly £600,000, a very considerable amount, but none too big for the opportunities of re-investment which the progress of the electrical industry would demand—certainly none too big whilst they carried the present onerous load of their debenture issue. He hoped that, at not too distant a date, it might be possible to lighten that charge by some means. If things continued as they had every reason to hope they would, the ordinary shareholders would in the long run be rewarded for their restraint but a concern such as theirs, which was assuming great national importance, must first of all fight for absolute safety. They had to realise that they were employing directly approximately 20,000 workers, apart from those engaged in other industries and in distribution. They must realise that in the electrical industry new ideas were constantly being evolved and capital must be available to study and develop them. The value to the community at large of a company like theirs showed itself in other directions. The quality of its productions was mainly based on home raw material and home labour: what they produced did really add substantially to the wealth of the country. Their exports, amounting to several millions, were much more valuable exports than those of much bigger concerns who must, by the nature of their business, rely largely on importation. They had by no means

arrived at the limit of their possibilities. Though the company was formed in 1889 with a capital of £30,000 and had to-day a capital of £9,000,000, he felt that, electrically speaking, they were still only at the beginning of things. The supply of electricity in the London area by some 70 or 80 authorities had involved a capital expenditure of over 30 millions. If the engineers of those authorities were given the chance of a modern lay-out of a big power station, they could, for less than half that capital, give a bigger output at a considerably reduced cost of production. That was just an indication of what would happen sooner or later to 90 per cent. of the existing power stations in the country. They could imagine how reduced cost of production would stimulate the application of electrical apparatus in industrial and private service. There was an enormous scope in the telephone industry, one of the essential means of modern communication. Great Britain was very much behind in this respect. Good reasons could be given for that slow development, but an industrial trading country, such as Great Britain, had no business to be so low down in the scale, and he was glad to know that the Government had realised for some time the need for speeding up a big development programme. The company was well equipped to meet the demand for automatic or any other kind of telephone service. A similar state of affairs existed still in the lighting industry. The improvement of lamps and the study of better lighting methods had led to a considerable increase in the use of electric light during the last few years, and he was satisfied that the combined efforts of the industry to educate the public in the proper use of lighting, how to light houses, shops, streets and factories, would mean a considerable growth of that industry in which they held an important place. Similar pictures could be painted of every other branch of the electrical industry—domestic or industrial. Last year he dwelt on their hopes of what railway electrification, ship propulsion, &c., had in store for them. But of course it was impossible to expect continued prosperity of one industry, however qualified that industry might be for progress, if the rest of the country was ailing. It would be wrong not to admit that this country was suffering from many ailments. Unless we worked as hard as other nations and as efficiently, we must drift farther back. Our prosperity depended upon the possibility of a big export. The recent investigation which his colleague, Mr. Railing, and he had made of working conditions on the Continent, satisfied them that most industries in most Continental countries worked up to 55 hours and more. Whilst there was such a tremendous difference in the working hours of our people compared with the foreigner, our greater skill and efficiency could not make up the difference: we must realise that we must meet the situation in this direction somehow, particularly in the basic industries of coal, steel and iron on which almost every other industry depended. Even, however, if we settled all our difficulties, even if we worked as long as the foreigner, he still felt that the power of production was too great for the absorbing power of the world at the present moment. The great needs of the war developed the power of production of each country to at least double what it required: if wild competition between countries was allowed to go on unchecked, it would lead to political difficulties and to great industrial crises, first in the weaker countries, but eventually to the detriment of all, and particularly to the detriment of the wage earners. He could not but feel that the big industries of the principal countries would have to put their heads together in a spirit of collaboration rather than in a spirit of the "survival of the fittest." They would have to discuss standardisation, working conditions and sharing of markets. Only by such collaboration could industrial steadiness gradually be obtained, and the steady recovery of the world be helped. Mr. E. G. Byng seconded the motion, which was carried without discussion.

Crompton and Co., Ltd.

The annual general meeting was held on July 9th, Mr. A. A. Campbell Swinton, F.R.S., presiding. In proposing the adoption of the report (*vide* our last issue, p.'69), the chairman said that last year they were only able to show a small profit amounting to £1,713, after paying debenture interest, &c. This year they showed a profit of £20,316, which although not entirely satisfactory was a distinct improvement. During the year their turnover had increased, but on the whole at lower prices. Competition, particularly in the export trade, was making it difficult to secure business at remunerative figures, and he saw little prospect of getting satisfactory prices until trade conditions abroad improved generally. There were distinct signs of improvement in the case of one of the most important of their overseas connections. With regard to the home trade the depression in the colliery, iron and steel, and shipbuilding industries naturally had an adverse affect on other trades and they could hardly look for an all-round improvement until the position of those important industries changed for the better. Another very important factor influencing the trade of the country was the high cost of living and high wages paid, particularly to unskilled labour in protected trades. A reduction in those two items, which were interdependent was very necessary. High wages and a high cost of living were just as much a disadvantage to the working classes as they were to the trading community. They commenced the current year with very nearly the same volume of orders in hand as they had at the commencement of last year. He hesitated to express any opinion as to the probable profits for the current year, as so much depended upon their output, which in turn depended upon the volume of orders that they might be able to secure. That part of their works at Chelmsford which before the war was used for the manufacture of arc lamps was fully employed while the war lasted on orders for searchlights for the Government. When peace was declared they were faced with the difficulty of finding remunerative work to fill the shop. He was glad to say that their efforts in that direction had met with success and at the present time the whole shop was occupied in the manufacture of instruments, switchgear of all descriptions, small motors, &c., and they were actually employing more men than they had ever employed before. Although in some cases the prices obtained for the goods manufactured there were not all they could desire, they would appreciate that when the shop was occupied to its full capacity their costs automatically came down, with a corresponding rise in their percentage of profits. In their main shop they were at present unable to obtain as many orders as they wanted for standard industrial motors. The company's patent auto-synchronous motor, which was of particular interest to station engineers desirous of improving their load factor, had met with a good deal of success and they were receiving many repeat orders for it. The board would have liked to have been able to recommend a dividend on the ordinary shares, but after careful consideration it had been thought wiser to adopt a conservative policy and carry the balance forward.

Victoria Falls and Transvaal Power Co., Ltd.

The report for the year ended December 31st, 1924, states that after providing for debenture interest and premium (£145,268) and depreciation and income tax (£382,423), there remains a net profit of £349,853; to this is added £105,094 brought forward, making £454,947. Preference dividends totalling 10 per cent. for the year have been paid and the ordinary shares have received a total of 12½ per cent.; £50,000 is transferred to reserve; and the balance (£117,657) is carried forward. At the close of the year the share capital amounted to £3,000,000, and the debentures outstanding to £2,264,190, a total of £95,480 having been redeemed during the year. A dividend of 3 per cent. has been declared on the preference shares in respect of the first half of the current year. Meeting, July 23rd.

Fuller's United Electric Works, Ltd.

The net trading profit for the year ended March 31st last was £31,027, to this was added £1,495 brought forward, making £32,522. Provision is made for debenture interest, depreciation, reconstruction costs, and doubtful debts and a balance of £2,602 is carried forward. The last accounts covered a period of 14 months and showed a net profit of £19,109. The report shows that in spite of the prevailing bad trade conditions the company's trading increased by a third. The company has extended its operations owing to the carrying out of the important developments foreshadowed in the last report; these developments are expected to continue on a satisfactory basis.

French Companies.

The *Compagnie pour l'Exploitation en France des Téléphones Automatiques* reports a loss for 1924.

The *Compagnie d'Electricité Industrielle*, of Paris, while recording a large increase in the turnover in 1924, reports a loss for the year.

The *Ateliers de Constructions Electriques de Lyon et du Dauphine* reports an increase of 35 per cent. in the turnover in 1924 and a further advance has taken place in the current year. The accounts, however, show a loss on working in 1924.

The report of the *Compagnie Française Thomson-Houston*, which has carried forward the balance of net profits earned last year, states that 1924 witnessed the completion of the programme entered upon in 1919 for the regrouping of the works and the establishment of new works. While the first half of 1924 was characterised by progress in all branches, the State Treasury crisis and the crisis in the paper security market suddenly caused a suspension of the large schemes which had been marked for immediate execution. The shops producing plant for the railway electrification were the principal sufferers from this situation. Notwithstanding this, a considerable stream of work was maintained, and the orders booked since the beginning of 1925 represent an increase of 25 per cent. over those in the corresponding period of 1924. But the industry could not hope to progress in the near future unless its chief customers were able to procure the necessary capital. With this object the company had participated in the constitution of the Société Financière pour le Developpement de l'Electricité en France, which had since received applications representing over 300,000,000 fr. It had also been considered necessary to extend the services which were entrusted with the development of the export trade, and the telephone business had been transferred to a special company.

The *Compagnie Française des Câbles Télégraphiques* reports an increase in net profits from 5,445,000 fr. in 1923 to 6,036,000 fr. last year. It is proposed to raise the rate of distribution on the ordinary shares from 24.95 fr. per share to 26.71 fr. per share.

La Société d'Eclairage et de Force par l'Electricité, of Paris, reports a net profit of 2,118,711 fr. for the last financial year, as compared with 1,397,086 fr. in 1923.

Belgian Companies.

The *Société Intercommunale Belge d'Electricité*, of Brussels, is increasing its capital to the extent of 35,000,000 fr., and has invited applications from existing shareholders for 70,000 new shares of 500 fr. each, at 700 fr. each.

La Société de l'Electricité du Bassin de Charleroi is increasing its capital from 14 to 15 million fr.

German Companies.

The *Prometheus Electric Heating Apparatus Company*, of Frankfort-on-Main, which is associated with the Voigt and Haeffner Company, has carried forward net profits of 20,000 marks earned in 1924. Export prices last year resulted in a loss, and efforts to adapt the export prices to the costs of production have led to a complete stagnation in the foreign trade.

The *North German Cable Works Company*, of Berlin, states that the degree of activity in the second half of 1924 was favourable. Out of the net profits of 100,000 marks it is intended to pay a dividend at the rate of 5 per cent. on the share capital of 1,750,000 marks. The present course of business is stated to be favourable.

The *C. Lorenz Telephone and Telegraph Works Company*, of Berlin, reports that home orders were satisfactory last year, but export orders were scarce. Contracts for automatic telephone stations were entered into with the Reich authorities and orders were booked for radio transmitting stations, but business in receiving apparatus was difficult owing to competition. It is proposed to pay a dividend at the rate of 4 per cent. out of net profits of 788,000 marks on share capital of 6,270,000 marks.

The *High-Frequency Machine Co.*, of Berlin, states that, as compared with a liquidation value of 2,600,000 marks of the holding of Marconi shares the Reich Government has paid 1,117 marks as compensation, and the total amount of the compensation obtainable has been put by the Ministry of Finance at 16,000 marks. The comparatively small claims on America have not yet been settled. A dividend at the rate of 4 per cent. has been declared out of net profits of 86,000 marks for 1924.

The *Saxony Light and Power Works Co.*, of Dresden, states that the dullness of business in the first half of 1924 led to severe competition and frequently inadequate prices. It was only in the second half that conditions improved. After writing off 651,000 marks for depreciation, a dividend at the rate of 7 per cent. has been declared on the preference shares.

The *Baden Electricity Company*, of Mannheim, reports that orders were unsatisfactory in 1924, large constructional contracts frequently failing to mature owing to the impossibility of prospective customers to finance them. The small profits earned last year have been carried forward. An improvement in the orders booked has taken place this year, affording occupation for a long time forward.

The *Robert Bosch Company*, of Stuttgart, reports a considerable increase in the turnover last year; the diminution in the home trade was compensated for by an increase in the exports. The turnover of the companies representing the German company in England and the United States further improved; altogether the company now has 21 sales houses abroad. The accounts record a net profit of 7 940,000 marks and the dividend is at the rate of 8 per cent. for 1924.

Austrian Companies.

The *A.E.G.-Union Electricity Company*, of Vienna, states that development in 1924 was hindered by the general economic situation and by a two months' stoppage through a strike. The export trade was hampered by the isolation measures of the Succession States, but despite this fact the turnover rose to the level of the best pre-war year, the home sales compensating for the deficiency in the exports. The paper net profits allow of the payment of a dividend at the rate of 4,000 crowns per share as in the previous year.

The report of the *Felten and Guilleaume Company*, of Vienna, states that a slight improvement took place in the home sales in 1924, but the export trade declined, oversea deliveries in particular having been difficult to carry out since the end of the crisis in the Ruhr. The net profits permit of an increase in the rate of dividend from 15,000 paper crowns per share in 1923 to 20,000 crowns last year. As to the present year it is stated that the not too favourable prospects manifested at the beginning have now changed for the better.

The *A.E.G. Union Electricitäts Gesellschaft*, of Vienna, reports a net profit of 8,774 million crowns for the last financial year, as compared with 8,219 million crowns in 1923. It is stated that the company has negotiated a loan of 1½ million dollars with an American financial group to bear interest at 7½ per cent. per annum and to be repaid within 20 years.

British Broadcasting Co., Ltd.—The second annual report of this company shows that the amount received in respect of licence fees during the year ended March 31st last was £488,881. In the last accounts, covering a period of 15 months, the amount was only £176,934. After allocating £10,000 to the staff provident fund and reserving £28,400 for taxation, there was a profit of £84,857. The maximum dividend (7½ per cent.) is paid, and a balance of £79,685 is carried forward. It is stated that the surplus is only a "paper" one, as about £59,000 has already been utilised in the construction and improvement of stations. The meeting was to be held yesterday (Thursday).

Altrincham Electric Supply, Ltd.—The report for the year ended December 31st, 1924, records net profits of £23,348. The balance, after deducting directors' fees and preference dividends, was £19,939. It was proposed to transfer £14,000 to reserve and to pay dividends of 7½ per cent. on the ordinary shares and 5s. per share on the deferred shares, as in the previous year.

Petters, Ltd.—Out of the net profit of £30,884 for the past year (including £5,797 brought forward) it is proposed to pay the preference dividend for a further six months, leaving it three years in arrear. The reserve fund receives £20,000 and £24,908 is carried forward. The report states that the improvement in the company's position is continuing. A meeting is to be held on July 23rd for the purpose of considering proposals for the issue of funding certificates to the preference shareholders in satisfaction of the arrears of dividend, amounting to £45,000.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Adelaide Electric Supply Co.—181,322 six and a-half per cent. "C" cumulative preference shares of £1 each, fully paid, Nos. 68,679 to 250,000.

County of London Electric Supply Co.—826,500 new six per cent. cumulative preference shares of £1 each, issued at £1 0s. 6d. per share, fully paid, Nos. 2,725,001 to 3,551,500 (conversion shares); 1,173,500 new six per cent. cumulative preference shares of £1 each, issued at £1 0s. 6d. per share, partly paid and fully paid, Nos. 3,551,601 to 4,725,000 (instalment shares).

Rees Roturbo Manufacturing Co., Ltd.—The accounts for the year ended September 30th, 1924, show a loss of £1,922 after crediting £582 brought forward and £10,000 from reserve. It is stated that the severe competition in home and foreign markets has resulted in an insufficient volume of orders, and the acceptance of orders at unremunerative prices.

Associated Gas and Electric Co.—A preliminary statement of the results for the year 1924-25, combining the Associated and Manila undertakings, shows a gross revenue of $11,428,461 and net earnings of $4,749,908. After meeting fixed charges, and preferred dividends amounting to $345,698, there remains a balance of $1,738,544 for allocations to reserves and for classes A and B dividends and surplus.

Sligo Lighting and Electric Power Co.—The report for 1924 shows a loss of £800. After providing for preference interest at 4½ per cent. out of a balance from previous account, £1,101 remained at credit of profit and loss and a dividend at the rate of 5 per cent. per annum is recommended on the ordinary shares, leaving £741 to be carried forward.

Greenwood & Batley, Ltd.—The report for the year ended March 31st last records a net profit of £30,679 as compared with £30,237 in 1923-24. Of this amount £6,000 is allocated to depreciation and after the payment of a final ordinary dividend of 2½ per cent. (making 5 per cent. for the year as in the previous year), £15,502 is carried forward. Meeting, July 22nd.

Czecho-Slovakian Companies.—The *Prague Accumulator Co.* is increasing its capital from 6 000,000 to 7,500,000 crowns.

The "*Telegrafia*" *Co.*, of Prague, manufacturers of telegraphic and telephonic apparatus, has declared a dividend of 10 per cent. for last year. The net earnings amounted to 2,058,965 crowns, as compared with 1,753,884 crowns in 1923.

Swiss Companies.—The directors of *Brown, Boveri & Co.*, Baden, are recommending a dividend of 6 per cent. for the year ended March 31st last. The *Société d'Electricité Alioth*, of Basle, an affiliated concern, reports a net profit of 352,000 fr. for the last financial year. The dividend is being maintained at 5 per cent. on the capital of 6 million fr.

The *Société Suisse d'Industrie Electrique*, of Glarus, reports a net profit of 2,636,679 fr. for the last financial year, as compared with 1,790,826 fr. in 1923. The dividend is being increased from 6 to 8 per cent.

Dutch East Indian Company.—The *Allgemeene Nederlandsch-Indische Electriciteit Maatschappij*, of Soerabaya, reports a net profit of 1,302,857 guilders for the last financial year, as compared with 1,174,285 guilders in 1923. The dividend is being increased from 11 to 12 per cent. on a capital of 9 million guilders.

Electrolytic Zinc Co. of Australasia.—The *Financial Times* reports that a dividend at the rate of 12 per cent. has been declared on the preference, ordinary, and deferred ordinary shares in respect of the six months ended June 30th.

Bournemouth and Poole Electricity Supply Co., Ltd.—The following interim dividends have been declared:—Preference shares, 2½ per cent.; second preference shares, 3 per cent.; ordinary shares, 4½ per cent.

Greek Company.—The report of the *Compagnie Hellenique d'Electricité*, of Athens, for last year shows a net profit of only 1,420,995 drachmae, as compared with 2,136,650 drachmae in 1923.

Liverpool Overhead Railway, Ltd.—The directors state that they are unable to declare interim dividends on the preference and ordinary shares.

Dublin United Tramways Co., Ltd.—Interim dividends at the rate of 6 per cent. on the preference stock and 4 per cent. on the ordinary stock have been declared, as in 1924.

Smithfield Markets Electric Supply Co., Ltd.—An interim dividend of 3 per cent. has been declared on the ordinary shares.

Marconi International Marine Communication Co., Ltd.—It is proposed to pay a final dividend of 2½ per cent., making 7½ per cent. for the past year.

Clontarf and Hill of Howth Tramroad Co.—An interim dividend of 3s. per share has been declared, as in 1924.

Stocks and Shares.

MONDAY EVENING.

THE rubber boom is the feature of the Stock Exchange markets at the present time. All departments are subservient to the one popular market in which thousands of people are taking an interest. Stocks and shares in other investments are being sold in order that their possessors may engage in the rubber excitement. Those who are called upon to deal with the business in rubber shares find their energies taxed to the physical utmost in order to keep pace with the demands made upon them. The crisis that has developed in the mining and the railway industries has the effect of causing restraint upon business in the shares of companies connected either nearly or remotely with those two branches of trade.

The War Loan keeps steadily at about 100 and sets the tone to purely investment securities. The recent torrent of new issues which threatened the prices of sound securities, and brought about a moderate fall in many gilt-edged stocks, has been stayed, and the floating supply is being taken by the permanent investor, with the result that prices show a faint tendency to improve. However, there is talk of a renewal of the new issue plethora in the near future, before the holiday season starts in real earnest.

Electricity supply shares are disposed to be dull; it is argued that the industry stands to be unfavourably affected by the disputes in the coal and railway worlds alike. City Lights are a trifle easier, and several other shares show moderate declines. Bournemouth and Poole rose to 56s. 3d., and County of London Electric recovered to 53s. Allotment letters in respect of the new County preference came out this week. The shares were heavily over-subscribed, and the price opened at a small premium over and above the 20s. 6d. at which they were offered. Shareholders received preferential treatment in an allotment conducted upon very just and reasonable lines. In such matters, however, all experience teaches that to please everybody is a sheer impossibility.

Victoria Falls and Transvaal Power ordinary shares have risen to 43s. 6d. on the increase in the dividend to 12½ per cent. The company's annual report seldom errs on the side of diffuseness, and the present document maintains the usual tradition. The figures are, however, decidedly satisfactory, and shareholders will anticipate, with reason, a higher figure for their interests.

Edmundsons' report records a favourable past year, the profits again showing material improvement. The company is building up a strong reserve. While the ordinary shares are unchanged at 23s., the preference have recovered the dividend deducted last week.

The British Broadcasting Co. is going ahead by leaps and bounds. Last year's gross revenue of over half a million sterling was 2½ times greater than that shown by the accounts of the previous fifteen-month period. As the dividend on the cumulative ordinary shares is not allowed to exceed 7½ per cent., the benefit of the surplus goes very largely to the owners of wireless sets. For one thing, nearly £60,000 has been spent during the past year upon the stations, new and less new, and more money is to be laid out in the same way in the year now current. Marconi shares are dullish at 27s. 6d., and Marconi Marines fell, the other day, to 18s. 9d., though the price rallied nominally to £1. The fall led to uneasiness as to what the forthcoming dividend declaration is likely to prove.

Cable stocks are somewhat heavy. Western Telegraphs rose to 16¼, shares being picked up by people who changed into them from Eastern Extensions and Globe ordinary. The dividends upon all these, as upon Eastern ordinary, are 10 per cent., free of tax; duly marked, by the way, in our tables. This serves as a reminder—also by the way—that the indicative asterisk against the Siemens dividend last week must have crept in, may it be charitably supposed, as the result of a printer's error. The last dividend was paid less tax.

Siemens are a few pence lower at 25s. General Electric ordinary, quoted ex-dividend, are 24s. middle. At this price the yield on the money comes to 6¼ per cent., on the basis of the lately-declared 7½ per cent. dividend. At the company's meeting last week, the chairman spoke in vein, prophetically optimistic, of the increasing activities that must lie in front of an industry which he sees is but in its infancy. Sir Hugo Hirst's speech displayed a breadth of vision that will appeal to those who can foresee the extraordinary developments that lie ahead of electrical expansion when it escapes from the parochialism and pettiness that have fretted its energies in the past, and the effect of which still hampers its progress. Brush ordinary went back to 19s. 6d. British Aluminium hardened to 28s. 9d. Callenders are 1/16th off to 2⅛, and Telegraph Constructions at 26½, while quotably 10s. lower, are ex the dividend of 6s. net.

British Columbia Electric deferred and preferred are both 3 points down. Mexican Light preferred shed 2, to 59. Brazilian Tractions at 58 are 1½ higher, and Anglo-Argentine Trams show a firmer tone. In the London traction list, London and Suburban preference fell back to 5s.

Home Rails are heavy and dispirited. Metropolitan Consolidated has gone down to 68½; Underground shilling shares to 7s. Districts at 45½ are ex dividend. The market is weak all round. Investors have been selling their Home Rails in order to buy rubber shares. The exuberance in the market for these latter grew intense. Business has broadened out into boom conditions. People have been speculating in names, and gambling upon the price of the produce. It is all very exhilarating, exhausting, and exciting while it lasts.

Share List of Electrical Companie

	Nom.	Dividend. 1923.	1924.	Price July 18, 1925.	Rise or fall.	Yie p.c
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole	£1	18	14	2⅛	+ 1/16	5 6
Brompton Ordinary	1	10	10	1¾	—	*5 14
Charing Cross Ordinary	1	14½	15	46/9	—	6 8
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2
Chelsea	1	12	12	1⅞	—	6 8
City of London	1	15	15	45 9	— 1/16	5 1
do. do. 5% Pref.	1	6	6	23/	—	5 4
Clyde Valley	1	8	8	31/-	—	5 3
County of London	1	15	15	53/-	+ 6d.	5 13
do. do. 6% Pref.	1	6	6	22/6		5 6
Edmundson's Ordinary	1	7	7	23/-	—	6 1
do. 7% Pref.	1	6	7	22/- xd	+ 8d.	6 7
Elec. Supply Corporation	1	10	10	33/3	—	6 0
Kensington Ordinary	5	14	15	12⅝	—	5 16
Lancs. Light and Power	1	7½	7½	25 6	— 1/-	5 17
London Electric	1	10	10	31/-	— 1/-	5 17
do. do. 6% Pref.	5	6	6	5⅝	—	5 6
Metropolitan	1	10	11	38/8	—	5 15
do. 4½% Pref.	1	4½	4½	17/-	—	5 5
Midland Counties	1	5½	6	23/3	—	5 4
Newcastle-on-Tyne Ordinary	1	6	7	22/6	+ 6d.	6 4
do. 5% Pref.	1	5	5	18/3	—	5 9
do. 7% Pref.	1	7	7	24/-	— 1/-	5 16
Notting Hill 6% Pref.	10	6	6	10	—	6 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9
St. James' and Pall Mall	5	17½	17½	13⅝	— ⅛	6 8
South London	1	15	15	2⅞	—	6 8
South Metropolitan Pref.		7	7	1¼	—	5 12
Urban Ordinary	1	4	4	17/-	—	4 14
do. 6% Pref.	1	6	6	20/-	—	6 0
Westminster Ordinary	1	15	15	45/6	— 1/-	6 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/6	—	7 13
Yorkshire Elec.	1	8	8	31/-	—	6 9
HOME RAILS.						
Central London Ord. Assented Stock		4	4	68	—	5 17
Metropolitan		4	5	68½	— 1½	7 5
do. District		8½	8½	45½ xd	—	7 13
Underground Electric Ordinary	10	Nil	Nil	2½	—	Nil
do. do. "A"	1/-	Nil	Nil	7/-	— 6d.	Nil
do. do. Income Bonds	£	6	6	98	—	*6 2
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	104½	— ½	5 14
do. Def.		1½	1½	24½	—	6 8
Automatic Telephone	1	3	6	2 1/16	—	2 18
Chili Telephone	5	6	5	5⅛	—	*5 10
Cuba Sub. Ord.	10	5	5	6⅜	—	7 8
Eastern Extension	10	10	10	17xd	—	*5 17
Eastern Tel. Ord.	Stock	10	10	172½xd	—	*5 15
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 14
do. do. Pref.	10	6	6	11⅞	—	6 10
Great Northern Tel.	10	22	22	31	— ¾	7 1
Indo-European	25	7	8½	41½	—	*3 4
Marconi	1	10	—	1 1/16	—	6 19
Marconi Marine	1	10	—	1	—	10 0
Oriental Telephone Ord.	1	12	12	9½	—	*5 12
United R. Plate Tel.	5	8	8	7⅝	—	*5 12
Western Telegraph	10	10	10	16¼	+ ¼	*6 3
HOME AND FOREIGN TRAMS, &C.						
Anglo-Arg. Trams First Pref.	£5	5½	5½	3½	—	8 16
do. do. 2nd Pref.	5	6	6	2 1/16	+ 1/16	10 4
do. do. 5% Deb.	Stock	5	7	73	—1	6 15
British Electric Traction Ord.		6	6	112	—	5 7
do. do. 6% Pref.		6	6	104	—	5 15
Brazil Traction	100	4	4	58	+1½	6 17
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	89½xd	—	5 11
do. do. Preferred		96/-	96/-	83½	—3	*5 15
do. do. Deferred		129/5	129/5	103½	—3	*6 5
do. do. Deb.		4½	4½	75½	—	5 19
Lond. & Sub. Trac. 5% Pref.	£1	2½	—	5/-	— 1/-	Ni
London United Tram. Deb.	Stock	4	4	42½	—	9 8
Mexico Trams, 5% Bonds	—	5	5	62½	—	8 0
Mexican Light Common	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	59	— 2	Nil
do. 1st Bonds	—	5	5	65½	—	7 12
Yorkshire (West Riding)	£1	5	—	18/9	—	5 6
MANUFACTURING COMPANIES.						
Babcock & Wilcox	£1	12	12	2 7/16	—	*4 18
British Aluminium Ord.	1	5	10	28/9	—6d.	6 19
British Elec. Transformer Pref.	1	Nil	7	17/6	—	...
British Insulated Ord.	1	15	15	8½	—	4 10
Brush Ord.	1	10	10	19/6	—6d.	10 5
Callenders	1	15	15	2⅝	— 1/16	5 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9
Crompton Ord.	1	Nil	Nil	⅝	—	...
Edison-Swan	£1	10	10	8/-	—	5 0
do. 5% Deb.	Stock	5	5	80½	—	6 4
Electric Construction	1	10	10	1⅝	—	6 8
Enfield Cable, Pref.	1	7½	7½	1¼	—	6
English Electric	1	5	5	18/9	—	5 6
do. do. Pref.	1	6	6	21/-	—	5 14
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10
do. Ord.	1	5	7½	24/-xd	—	6 5
Henley	1	15	16	8	—	5 0
do. 4½% Pref.	5	4½	4½	4¼	—	5 6
India-Rubber	1	5	5	1	—	*5 0
Johnson & Phillips	1	10	10	2 1/16	—	4 17
Met-Vickers, Ord.	1	8	8	31/3	—	7 0
do. Pref.	2	8	8	2⅝	—	6 14
Siemens Ord.	1	—	—	25/-	—6d.	4 0
Telegraph Construction	12	20	20	2 ½xd	—	4 10

* Dividends paid free of Income Tax.

The First International Congress of Radiology.

International Units and Standards.

(*Continued from p. 50.*)

DR. SIDNEY RUSS (Middlesex Hospital, London) said that, although it should not be long before they had a system of international units, there appeared to be a little difference of opinion between English and German physicists as to what was most urgently required. At the same time, he was glad there was unanimity of opinion between those in the various countries as to what should really be measured, *viz.*, the ionisation in air, quite apart from any secondary phenomena which might take place. Although a certain result was obtained with a certain beam of X-rays, it was not known what would happen when another beam of X-rays was allowed to enter the same space, although there might be the same ionisation; that was an obvious difficulty which had to be met because, although the same actual ionisation with two wave-lengths was obtained, there would not be the same intensity. Therefore, it was necessary to decide upon some definite wave-length as the standard. Again, great difficulties arose when considering a unit of dosage, and even if that were decided upon, they would still be a very long way from specifying the beams that were being used, assuming that the electrostatic charge was that corresponding to the unit of dosage which had been suggested.

DR. GLASSER (United States) referred to the work that was being done by the Standardisation Committee recently appointed by the Radiological Society of North America, and spoke of the construction of ionisation chambers there for the purpose of standardisation.

PROF. W. FRIEDRICH (Frieberg, Germany) said that whilst it would be an ideal thing, from the absolute point of view, to measure the energy of the X-ray and the energy absorbed by any human tissue, the attempts made to do so had not been very successful. Therefore, he agreed with the proposal to form an International Committee to go into the whole problem of units. Perhaps the adoption of a physical unit would be the simplest from the point of view of the radiologist.

DR. HANS HOLFELDER (Frankfurt), referring to certain differences which had been alleged to exist between the tentative standards adopted in France and Germany, suggested that the experimental work carried out in France relating to the comparison between the two systems might not have been done with sufficient exactitude, and said it would be unwise to draw definite conclusions from only one or two comparative experiments, as seemed to have been the case. There was no evidence that the same quality X-rays had been used in the two cases, for instance. The statement had been made that the French dose was 25 times the German dose, but the experimental work should be carefully checked before that statement was accepted.

PROF. H. HOLTHUSEN (Hamburg) urged the necessity for choosing a unit which could be defined as shortly as possible; that was the reason why German scientists had not seen their way to follow what had been suggested by the French workers some years ago. He doubted whether it would be possible to calibrate ionisation chambers by radium having regard to the fact that the ionisation effect of gamma rays in any given instrument consisted, first, of the ionisation in the chamber itself and also of ionisation in the other parts of the instrument. On the other hand, he agreed with the French that for the purpose of standardisation of apparatus they should adopt a constant source of ray of short wave-length.

PROF. CROWTHER suggested that for the purpose of standardisation they had all that was required, or could be hoped for at present, in the electrostatic unit. He hoped the unit would not be fixed in terms of radium, because the gamma rays of radium were so extraordinarily penetrating that it was impossible to shield the ionisation chamber from the gamma rays sufficiently.

This closed the discussion.

During the meeting of the Physics Section on Friday, July 3rd, the CHAIRMAN (Mr. C. E. S. Phillips), referring to the proposal to form an International Committee to deal with units and standardisation, said that the matter had since been given careful consideration, and a resolution would be placed before the Section, with the approval of Dr. Béclere and Dr. Finzi. In order to make the resolution quite clear, he mentioned that the British X-ray Unit Committee was formed in February, 1923, and had been doing a good deal of hard work. The members of the Committee were Sir William Bragg, F.R.S., Prof. A. W. Porter (Professor of Physics, University College, London), Prof. Sidney Russ (Physicist at the Middlesex Hospital), Dr. E. A. Owen (National Physical Laboratory), Mr. C. E. S. Phillips (Physicist to the Cancer Hospital), and Dr. F. L. Hopwood (Physicist at St. Bartholomew's Hospital).

The resolution was as follows:—

"That in order to give effect to the resolution passed at the joint meeting of the Physics and Radiological Sections on July 1st, the British X-Ray Unit Committee, formed in February, 1923, be requested to communicate directly with the physical and radiological societies of the principal countries throughout the world with a view to the nomination by those societies of representatives to constitute such an International Committee."

The resolution was passed, and subsequently came before the Radiological Section, and was also agreed to.

The Silvanus Thompson Memorial Lecture.

On Wednesday evening, July 1st, the eighth Silvanus Thompson Memorial Lecture was given by M. le Duc de Broglie, one of the most distinguished French physicists. The chair was taken by the President of the Congress, who explained that the lectures had been instituted by the Roentgen Society to perpetuate the memory of the late Prof. Silvanus P. Thompson, the founder and first president of the Society, which was the oldest Society in the world connected with the discovery of X-rays.

The subject of the lecture was "Absorption of X and γ Radiations and the Secondary Radiations which accompany them," and a reference was first made to the difficulty of finding explanations for the different effects of Roentgen and γ-rays. The electromagnetic theory of light, said the author, gave them a picture of wave forms as propagating electric and magnetic forces, and enabled them to understand something of the actions which might be expected when light fell on matter, but the process of these actions still remained very obscure. The interpretation of observed effects was rendered still more difficult by the fact that a given radiation could never be regarded as working alone, but was in almost all cases able to exist owing to the fluorescence of matter. For instance, when they used a beam of X-rays, they produced at the same time in the illuminated substance some softer rays giving a small amount of ultra-violet light and possibly some visible light. Although a great deal of work had been done in this connection, they were only just beginning to obtain and use reliable data for various rays of different hardnesses.

Reviewing some of the properties of X- and γ-rays, the lecturer sketched briefly the general ideas existing at the present time with regard to the electron theory, mentioning the beautiful work of Mr. C. T. R. Wilson, who discovered that the ionisation properties of Roentgen rays were not due to the rays themselves, but due to the secondary β-rays. In this way it had been shown generally that the electrical, physical, and biological effects of X-rays might be mainly due to the secondary electrons. Therefore, one of the first things to study was the direct action of the β-rays. As a matter of fact, recent work in France had shown that it was the β-rays which were responsible for the noxious action of X-rays on microbes and that some microbes were more susceptible to the action of these rays than others. The law of absorption of β-rays, however, was not yet fully understood, and it was a very complicated matter, although recent work had thrown considerable light upon it. They were completely ignorant of what occurred when an atom was absorbing radiation, but experiment had shown that this peculiar phenomenon was subject to the quantum law, and something of the same kind had been suggested in connection with Y-rays. The absorption of Y-rays closely resembled that of X-rays, but there were certain features which enabled an explanation to be given of the differences between the two.

After sketching briefly some of the features of the absorption process in the two cases, the lecturer said it was possible to conceive a trigger effect of radiation on living cells—in addition to the transfer of energy to matter by radiation. At the same time, the β-ray action made it difficult to account for low-frequency radiation, such as infra-red rays, and they could only confess their present ignorance concerning such deep problems. Nevertheless, they must not be discouraged, for the work that was being done was assisting them to make progress, and the joint efforts of bilologists and physicists would, sooner or later, enable a conception to be evolved out of the present obscurity.

The Silvanus Thompson medal was handed to the lecturer at the close, and he was warmly thanked by the President of the Congress and the President of the Roentgen Society, as well as by his audience.

Protection from X-rays.

An interesting discussion took place on July 2nd in the Physics Section on "Protective and Manipulative Methods in Relation to X-rays and Radium."

Dr. G. W. C. KAYE (National Physical Laboratory), who opened the discussion, recalled the unfortunate disasters which occurred to early X-ray workers and the endeavours made to secure protection for radiologists. As the result of the recommendations of the X-ray Protection Committee which was formed in 1921, the standard of protection had been considerably improved during recent years, and it was hoped that the long list of X-ray martyrs would be brought to an end. On February 1st, 1924, the Home Secretary issued an Order under the Workmen's Compensation Act, extending the scope of that Act to those who were injured in their occupation of administering and working with X-rays. Recommendations for the protection of X-ray workers had been drawn up in other countries. The National Physical Laboratory in this country had from the outset worked in conjunction with the X-ray Protection Committee, and the inspection of X-ray departments, from the point of view of conforming with the Committee's recommendations, had been added to the activities of the N.P.L. In the course of this work, naturally, some important points had been brought to light. For instance, with regard to

drawing up regulations, consideration had to be given to the fact that some operators were much more susceptible than others, whilst consideration also had to be given to the size of the department in question, the length of working hours, holidays and so on. Therefore, it was necessary to cater for the individual of least immunity in drafting regulations. Foolhardiness, also, could never be left wholly out of account. The X-ray worker did not always fully appreciate the magnitude of scattered radiation, which was many times the intensity of the primary beam. It was desirable to surround the tube with as much protective material as possible, but where that could not be done, the operator should be situated behind a screen or wall fitted with the necessary protection. The X-ray Protection Committee had laid down certain thicknesses of lead, according to the conditions, but it was essential to test the protective apparatus before use, against leakage. Quite unexpected things had happened through the lack of this precaution. The open bowl form of protection ought not to be used, and it was a pity that it was still being used in some cases, because tests had shown that it was possible to take a radiogram in any part of the room when this apparatus was employed. Again, there must be adequate ventilation of the room in which the operator was working, and generous ventilation was regarded as second only in importance to the actual protection itself, on account of the tendency for the generation of ozone and nitrous fumes. Further, the X-ray department should be in a place where there was plenty of sunshine and fresh air and not, as unfortunately was frequently the case in the early days, in the cellar. The floor area should be large, and any overhead wires should be corona-less, being run in tubes of adequate size. The minimum height for the ceilings of the rooms should be 11 ft. and the minimum height of any conductors 9 ft. Seven working hours per day were recommended by the Protection Committee, with four weeks' holiday a year and Sunday and two half-days per week off. The aim, said Dr. Kaye, should be to make the taking of an X-ray photograph as simple, easy, and innocuous as taking an ordinary photograph.

In the United States there had been three reports dealing with the subject of protection, and the Bureau of Standards had agreed to undertake the standardisation of protective material. Generally, the regulations were similar to those in this country. Much the same applied to Norway and Russia, and he wished to submit a proposal that the Congress should take steps to secure international agreement on the main question of protective measures for X-ray workers. Such a step would have obvious advantages when buying apparatus from abroad.

Dr. E. A. Owen (National Physical Laboratory) gave some details of the measurements made at the N.P.L., of protective materials up to 200,000 volts. He added that probably scattering took place more at the higher voltages, but not a great deal of progress had yet been made in the study of this. With the new form of bulb which Messrs. Philips had brought out, described by Dr. Bouwers, it seemed to him that the protection problem would take quite a different aspect. At the present time very large protective boxes had to be used, with tackle to move them about, but in the case of the new Philips lamps the protection formed part of the bulb, practically speaking, which was ideal. The protection problem should be looked at on the lines of the development of this new tube.

Dr. H. P. Pilon (Paris) urged the necessity for protection against both primary and secondary radiations, and expressed the view that the ordinary enclosure in boxes was unsatisfactory. A brief description was given of a new tube enclosed in a special type of lead-lined box, water or oil cooling being adopted. This tube was capable of working up to 200,000 volts, d.c., and it was claimed that the life of the tube was considerably lengthened in this way. The whole outfit was carried on a small runway and could be brought over the patient at any desired spot or angle, the rays being focused in a manner to prevent secondary radiations.

Dr. Glasser (United States) raised the question whether the protection afforded by lead or lead glass was sufficient. Experiments which he had carried out had shown that rays sometimes came through this material.

Dr. Ferroux (Paris) said that protection from radium rays was well worth consideration.

Dr. V. E. Pullin also emphasised the importance of ventilation in X-ray rooms. X-ray operators had complained of headaches and sickness, and he thought that this was due in some measure to the ionisation of the atmosphere. When forced ventilation was applied these symptoms disappeared. As to running tubes in oil, he had always experienced difficulty in doing this when using rectified a.c. The tubes referred to by Dr. Pilon were for running on d.c.

Dr. H. Moore (London) said he always believed in getting as far away from the X-ray generator and tubes as possible; indeed, he had relied upon that more than upon lead screens.

Dr. Kaye, in a brief reply to the discussion, said his whole object was to unify standards of X-ray protection. He moved that the Congress be asked to take definite steps in this direction in conjunction with other countries. Dr. Pullen seconded the proposal, which was adopted.

Determining the Capacity of X-ray Tubes.

In a paper by Dr. A. Frankel (Berlin), methods for determining the capacity of X-ray tubes were described, and a table was exhibited which enabled the user of X-ray tubes to determine the maximum current which a tube would carry.

Dr. A. Bouwers (Holland) said that every tube maker would thank Dr. Frankel for the work he had done; a table such as he had devised would eliminate all guesswork.

Dr. Morrison (London) also congratulated the author on devising something which would be of real practical use; it should result in tubes lasting much longer than they did at present. At the same time, the reliability of tubes to-day was remarkable; he knew of cases in which 30,000 radiograms had been taken with one tube, and the tube was still working. The Kodak people had provided means for arriving at the accurate exposure, and now the author presented them with a means for preventing damage to the tubes by overcharging. It looked as if X-ray photography would soon be as simple as ordinary snap-shotting.

(To be continued.)

Developing Community Activities.*

Advice to Municipal Electricity Suppliers.

By V. W. DALE.

All community activities, and also the public utility services owned and controlled by municipalities, depend for their creation and maintenance upon a favourably prepared public opinion. In spite of the World Convention last year which assisted considerably to establish advertising as a profession in this country, it still remains a task for the advertising world to overcome the barriers of civic dignity, legislative restriction and an entirely false economy which to-day compel the public to "walk in darkness" so far as many of our costly communal services are concerned. Advertising by municipalities affords a vast potential field for the advertising profession; this particularly applies to electricity supply. During the next few years the public service of electricity will by its own momentum inevitably progress; its influence, in industrial and domestic spheres particularly, will most certainly bring about a beneficent revolution in the lives of men and women. The supply of electricity is *not* so completely a monopoly as it is generally supposed to be because, although a municipality may have a monopoly in the supply of electricity, it is not really *electricity* that the people want, but light, heat, or power, which can be obtained also from other sources. The sooner and more generally that is properly recognised by those in authority the better for the industry.

* Abstract of a paper read before the British Advertising Convention, Harrogate.

Educational Advertising Necessary.

It is absolutely essential that a reasonable proportion of the revenue of the electricity supply undertakings should be devoted to educational advertising. Uninteresting official notices inserted in local papers and unreadable statements on circulars and accounts are not the methods to adopt to get the desired information into the mind of the average member of the public. At the same time it must be borne in mind that public utility advertising must essentially be of an informative character. Vision in these matters must extend beyond the boundaries of the Town Clerk's office; the assistance of the expert commercial artist and the expert copy writer must be enlisted to turn cold statements of fact and information into live "copy"—warm, attractive, bold, appealing and readily understandable. Unless every person of only average intelligence in any particular area is able to grasp the leading particulars of the facilities which his own public utility service offers him, then that body has failed to fulfil its duty to the public to whom it is supposed to be under legal obligation to serve. The need for such scientific advertising can be seen with regard to the price of electricity for lighting and heating. There are few, if any undertakings in this country that do not offer a lower rate for heating than for lighting. Nevertheless, hundreds of people using electricity in Greater London, including journalists and people occupying public positions, are entirely unaware that they can get electricity in their houses at more than one price. This is because the municipalities merely announce, they do not advertise, and as a result the public is condemned to suffer the inconvenience of an incomplete and unsatisfactory service while the revenues of the undertakings are also adversely affected and good business is lost.

The Engineer as Salesman.

Another curious disability against which the commercial velopment of the electricity supply has been obliged to ruggle for many years has actually been the absorbing nature the engineering side of the work. During the early years anagement of the undertakings was very rightly placed in e hands of engineers men who by training and experience id outlook had nothing in common with anything so vulgar "trade." Selling was regarded as unprofessional, and if a ospective consumer required a supply of electricity he was pected to almost beg for it; the industry rarely sought him. day, the position is rapidly changing. The efficiency and liability of electrical plant, improved organisation, increased mpetition (and perhaps also the continuous evolution of an) finds the average central station engineer and manager en to embrace all the arts of selling as a means of getting e best out of the public money invested in his undertaking. he business of supplying electricity is now established on a und economic and scientific basis, and the commercial deve- pment of the undertakings is rapidly coming to engage the ajor portion of the suppliers' attention. At last it is even ing realised by many of the municipal councils and commit- es that those vital and indispensable forces, demand-creating id selling, have got to be exploited very fully if their trading epartments are to be developed.

The industry is awakening, but it has by no means visualised s yet all that is required of it. There are many undertakings erving communities of a million or more people, offering ectricity at rates which reflect the application of the ighest technical and engineering skill and generous financial olicies, affording opportunities for vast and immediate deve- pments, yet these undertakings very often have only a poor ppreciation of the power of publicity. A thoroughly en- ghtened manager is still the servant of his masters, and often nough is powerless to move a lay committee when its interest n communal trading is no wider and no deeper than its de- ire to grasp every penny of profits towards relieving general istrict rates, a short-sighted policy as grossly unbusinesslike s it is unfair and inequitable to the consumer. The only one ing that will induce the people in authority to apply a por- ion of their revenue to educational propaganda work is for dvertising men to show them that sound educational advertis- ig can increase the yield of their undertakings many times ver.

Wide Scope for Development.

The revenue of electricity supply undertakings in this ountry derived from the energy sold last year was of the order f £33,000,000, representing only about one-halfpenny per ead of population per day. These figures confirm the wonder- ul scope for expansion. There is a tremendous field for de- elopment in the 10,000,000 to 11,000,000 houses in these islands ven dealing with domestic applications only. Less than 12 er cent. of these houses are wired or using electricity at resent for any purpose at all. Yet the public service of elec- ricity is already available to 74 per cent. of the population. t is an absolute obligation devolving upon municipalities own- ng and controlling this important public service to utilise the ress, the hoardings, exhibitions, and other effective channels f publicity in order to educate and encourage the people to se this service upon which they have already raised and spent nore than £300,000,000.

It must be remembered that the conditions obtaining in one upply undertaking sometimes vary widely from those obtain- ng in another; each separate case will demand careful study nd investigation. Costly advertisements can only be effective hen their appeal is supported by reasonable economic charges, he existence of adequate distribution systems, easy facilities or wiring, &c., and for some classes of apparatus hiring and ire-purchase schemes, maintenance of showrooms and a eneral disposition to take load-building seriously and provide n all-round public service. Electricity undertakings should pend on advertising and publicity not less than 2 per cent. of heir revenue. Last year the revenue derived from electricity upply in this country was £33,000,000; this would have pro- vided over £600,000 for advertising, but it is doubtful whether the industry spent £60,000.

There is also a vast field for co-operative effort by a cor- porate body engaging itself in fertilising the soil in preparation for the coming harvest—educating the public concerning the vailability and use of various electrical appliances; enlighten- ing the people by educational propaganda concerning the eco- nomics of production and fair prices; attacking ignorance, re- moving fear, suspicion and apprehension, which still hinder development to an extraordinary extent; and generally supple- menting local and individual efforts.

Regarding the moral aspect of advertising two public and competing services, often owned and controlled by the same authority, particularly gas and electricity, keen competition and commercial rivalry between two or more producers or sup- pliers performing in some respects similar services is a state of affairs not only calculated to bring out the best, but is ulti- mately beneficial to the public. The Electrical Development Association has always held the view that it cannot be both judge and advocate; it prefers to be single-minded in its work, to push the use of electricity whenever it can and remain silent when it cannot, being content to leave the verdict to the people.

Tramway and Telephone Propaganda.

Tramway undertakings are able to advertise out of revenue, and they should set an example to the advertisers on their cars by employing only the best work in their own advertisements. The London County Council Tramways have done some excel- lent work in the way of Press advertisements, posters, leaflets, sport fixture cards, pocket maps, time-tables and other pub- licity.

There is a vast amount of work to be done in this country towards popularising the telephone. Great Britain actually stands fourteenth in its number of telephones per 100 of popu- lation. This state of affairs constitutes not only an appreciable handicap to the nation's trade and to national efficiency, but restricts individual comfort and convenience. In this country the telephone scarcely exists outside industrial and business life. To reach the density of telephone users compared with the population of Switzerland will require an additional 1,041,000 telephone stations at a capital cost of £52,000,000; to reach the Norwegian density will require an addition of 1,763,000 stations at a capital cost of £88,000,000; to reach the Danish density will require a capital outlay of £150,000,000 and the annual capital then required in the latter case to meet annual normal growth will be some £16 000,000, or double the present expenditure. The effect of these figures upon employment not only in actual telephone service but upon construction, maintenance, operation and administration, and also amongst many intermediate manufacturers of cable, lead, paper, cotton, timber, brass, iron, copper, rubber and silk, will readily be appreciated. Telephone development can only be accelerated by educating the public in the advantages of the telephone service. We shall probably see considerable activity in this direction in the near future; hardly any public utility gives advertising greater scope for ingenuity in its presentation.

The Glasgow Corporation Tramways.

Report for 1924-25.

We have received from the general manager of the Glasgow Corporation Tramways (Mr. J. Dalrymple) a copy of his report for the year ended May 31st, 1925. This shows an increase in the revenue from £2,323,246 to £2,352,470. The working ex- penses increased to a greater extent *viz.*, from £1,691,171 to £1,746,000, reducing the gross surplus from £632,075 to £606,470. The addition of interest on investments made avail- able £634,408. The charges against this were considerably heavier than those of the preceding year, amounting in all to £714,684 as compared with £585,366. The loss on the subway section rose from £3,544 to £18,710; the 'buses incurred a loss of £5,115; interest and sinking fund increased from £69,773 to £121,952; income tax from £40,481 to £75,931; and the con- tribution to the permanent-way renewal fund from £203,319 to £252 853. The net result was a deficit of £80,276, as com- pared with a profit of £49,199 in 1923-24. From a table show- ing the financial results from 1901 to date it is seen that this is only the second occasion on which a deficit has been in- curred. In the previous case the adverse balance was carried forward and wiped out in the succeeding year.

The capital account shows an expenditure of £474,043 during the year, bringing the total up to £6,500,207. The year's ex- penditure includes £145,803 on the permanent way; £124,502 on the electrical equipment of the lines; and £48,554 on power- station and sub-station plant.

The traffic statistics record a car-mileage of 30,937,196, an increase of 1,292,098, while the number of passengers carried rose from 430,226,561 to 439,340,730. The consumption of elec- trical energy was 2,549,115 kWh higher at 51,324,436 kWh. The ratio of working expenses to traffic receipts rose from 72.94 to 74.36 per cent. The total length of route in operation at the close of the year was about 135 miles, an addition of about six miles since the last report. The number of cars was one less at 1,087.

A full analysis of the passengers carried and the revenue ob- tained from each fare is given in the report. From this it is seen that the penny fare is the most popular, 152,915,632 passengers, or 34.81 per cent., having travelled at this rate. The most revenue, however (30.72 per cent.), was brought in by 1½d. fares. Only 1.17 per cent. of the revenue was derived from fares over 3d. Another table shows the amounts paid in rates by the undertaking for each year since its inception; the figure for the past year shows a remarkable increase—from £40,481 to £75,931, but it is noted that this was due to a rise from £282,530 to £400,000 in the valuation of the undertaking, although the rate fell by 6d. in the pound.

A separate part of the report is devoted to the subway section which was acquired by the Corporation in August, 1923. There was a revenue of £99,269, but after the deduction of working expenses the surplus was only £769. To this was added interest, &c., making £3,192, but the deduction of capital charges resulted in a deficit of £18,710. The section carried 20,008,445 passengers and the car mileage was 1,266,713. The length of the track is 13.12 miles and 50 cars are operated.

The Electrical Imports of Argentina.

The Argentine Government has recently issued detailed statistics of the country's foreign trade in 1923 and 1922. These permit of a much more comprehensive survey of Argentine imports of electrical goods than has hitherto been possible. The following table shows the values of the various descriptions of electrical materials imported, together with a note of increases or decreases. The values are the Argentine Customs Tariff valuations; the gold peso = about 4s.

	Gold Pesos. 1922.	Gold Pesos. 1923.	Inc. or dec.
Accessories for underground cables.—			
Total	13,000	42,000	+ 29,000
From Germany	5,000	14,000	+ 9,000
,, United Kingdom	—	6 000	+ 6,000
,, United States	4,000	19,000	+ 15,000
Electrical accessories.—			
Total	448,000	610,000	+ 162,000
From Germany	162 000	264,000	+ 102,000
,, United States	93,000	105,000	+ 12,000
,, United Kingdom	187,000	223,000	+ 36,000
Accumulators.—			
Total	153,000	111,000	− 42,000
From United States	18,000	36,000	+ 18,000
,, United Kingdom	130 000	68,000	− 62,000
Insulators of earthenware, faience, or porcelain.—			
Total	73,000	173,000	+ 100,000
From United Kingdom	29,000	27,000	− 2,000
,, Germany	31,000	139,000	+ 108,000
Glass insulators.—			
Total	5,000	3,000	− 2,000
From United States	5,000	2,000	− 3,000
,, France	—	1,000	+ 1,000
Wires and cables.—			
Total	2,101,000	3,844,000	+1,743,000
From Germany	958,000	1,686,000	+ 728,000
,, United Kingdom	515,000	1,122,000	+ 607,000
,, United States	297,000	571,000	+ 274,000
Ammeters and voltmeters.—			
Total	44,000	79,000	+ 35,000
From Germany	21,000	22,000	+ 1,000
,, United States	18,000	48,000	+ 30,000
,, United Kingdom	3,000	6,000	+ 3,000
Telephone apparatus.—			
Total	58,000	224,000	+ 166,000
From Germany	10,000	60,000	+ 50,000
,, United States	10,000	84,000	+ 74 000
,, United Kingdom	26,000	66,000	+ 40,000
Telephone material.—			
Total	182,000	714,000	+ 532,000
From Germany	11,000	73,000	+ 62,000
,, United States	126,000	404,000	+ 278,000
,, France	8,000	127,000	+ 119,000
Telegraph material.—			
Total	95,000	126,000	+ 31,000
From Germany	45,000	98,000	+ 53,000
,, United Kingdom	10,000	15 000	+ 5,000
,, United States	8,000	8,000	—
,, France	30,000	4,000	26,000
Clamps or porcelain tubes.—			
Total *	15,000	28,000	+ 13,000
Pushes and electric bells (returned by dozens).—			
Total *	6,000	5,000	− 1,000
Electric bells (returned by units).—			
Total *	15 000	20,000	+ 5,000
Carbons for arc lamps.—			
Total *	6,000	5,000	− 1,000
Electric meters.—			
Total	331,000	487,000	+ 156,000
From Germany	210,000	409 000	+ 199,000
,, France	55,000	1,000	− 54,000
,, United Kingdom	39,000	31,000	− 8,000
Small electric motors for fans, &c.—			
Total	31,000	86,000	+ 55,000
From Germany	19,000	48,000	+ 29,000
,, United States	7,000	22,000	+ 15,000
,, United Kingdom	5,000	10,000	+ 5,000
Electric batteries.—			
Total	182,000	238,000	+ 56,000
From Germany	17,000	21,000	+ 4,000
,, United States	139,000	183,000	+ 44,000
,, United Kingdom	21,000	22,000	+ 1,000
Materials for cells or storage batteries.—			
Total	82,000	177,000	+ 95,000
From Germany	27,000	38,000	+ 11,000
,, United States	34,000	58,000	+ 24,000
,, United Kingdom	21,000	29,000	+ 8,000
Porous jars for batteries.—			
Total	5,000	8 000	+ 3,000
From United Kingdom	3,000	6,000	+ 3,000
,, France	2,000	2,000	—
Glass jars for cells and storage batteries.—			
Total *	4,000	5,000	+ 1,000
Plugs.—			
Total *	20,000	26,000	+ 6,000
Wall sockets.—			
Total *	13,000	8,000	− 5,000
Circuit breaking devices, such as "wall fuse sockets."—			
Total	6,000	10,000	+ 4,000
From Germany	3,000	7,000	+ 4,000
,, United Kingdom	—	1,000	+ 1,000
,, United States	2,000	2,000	—
Insulating tubes.—			
Total	153,000	349,000	+ 196,000
From Germany	71 000	125,000	+ 54,000
,, United States	27,000	68,000	+ 41,000
,, United Kingdom	55,000	127,000	+ 72,000
Lampholders.—			
Total	88,000	140,000	+ 52,000
From Germany	81,000	105,000	+ 24,000
,, United States	3 000	23,000	+ 20,000
,, United Kingdom	1,000	6,000	+ 5,000
Switchboards.—			
Total	13,000	23,000	+ 10,000
From Germany	2,000	6,000	+ 4,000
,, United States	9,000	4,000	− 5,000
,, United Kingdom	2,000	12,000	+ 10,000
Switches.—			
Total	93,000	112,000	+ 19,000
From Germany	61,000	90,000	+ 29,000
,, United Kingdom	3,000	4,000	+ 1,000
,, United States	20,000	13 000	− 7,000
Electric fans.—			
Total	38,000	19,000	− 19,000
From Germany	6,000	5,000	− 1,000
,, United States	9,000	3,000	− 6,000
,, Italy	17,000	8,000	− 9,000
,, United Kingdom	4 000	2,000	− 2,000
Insulating tape.—			
Total	77,000	66,000	− 11,000
From Germany	20,000	18,000	− 2,000
,, United Kingdom	4,000	3,000	− 1,000
,, United States	50,000	42,000	− 8,000
Commutators (returned by weight).—			
Total	5,000	1,000	− 4,000
From Germany	2,000	—	− 2,000
,, United Kingdom	3,000	1,000	− 2,000
Commutators (returned by no.).—			
Total	10,000	11,000	+ 1,000
From United Kingdom	3,000	8,000	+ 5,000
,, Sweden	3,000	2,000	− 1,000
,, Belgium	4,000	—	− 4,000
Cut-outs, safety fuses, and current breakers.—			
Total	9,000	21,000	+ 12,000
From Germany	4,000	14,000	+ 10 000
,, United Kingdom	1,000	1,000	—
,, United States	3,000	5,000	+ 2,000
Electric bell indicators and telephone switchboards.—			
Total (all from Germany)	4,000	5,000	+ 1,000
Vulcanised fibre.—			
Total	20,000	23,000	+ 3,000
From Germany	—	2,000	+ 2 000
,, United Kingdom	3,000	4,000	+ 1,000
,, United States	16,000	12,000	− 4,000
Dynamos and motors.—			
Total	652,000	1,129,000	+ 477,000
From Germany	366,000	652,000	+ 286,000
,, United States	97,000	124,000	+ 27,000
,, Italy	66,000	125,000	+ 59,000
,, United Kingdom	77,000	87,000	+ 10,000
Incandescent lamps.—			
Total	546,000	1,434,000	+ 888,000
From Germany	236,000	642,000	+ 406,000
,, Holland	229,000	689,000	+ 460,000
,, United States	40,000	41,000	+ 1 000
,, United Kingdom	22,000	26,000	+ 4,000
Electrical material not elsewhere mentioned.—			
Total	317,000	559,000	+ 242,000
From Germany	119,000	220,000	+ 101,000
,, United States	116,000	197,000	+ 81,000
,, United Kingdom	54,000	97,000	+ 43,000

* Mainly from Germany

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

New Foundation Construction for Transmission Poles.

The "Anchora" pole, a production of MESSRS. ARMSTRONG, EDISON & Co., 17, North Bridge Street, Sunderland, has been designed with a view to simplicity in construction and rigidity in service. The feature of the pole lies in the construction of the foundation, fig. 1. Main baulks are provided on both sides of the legs and anchor baulks are secured to the ends of these at right angles. The main baulks are placed at the extreme ends of the pole butts and galvanised wrought iron ties are provided for transferring the upward pull on the legs to the foundation; these ties connect either the main or anchor baulks to the legs at a convenient distance above the main baulks and below ground level. Bent metal plates of channel section are provided for transferring the compression load

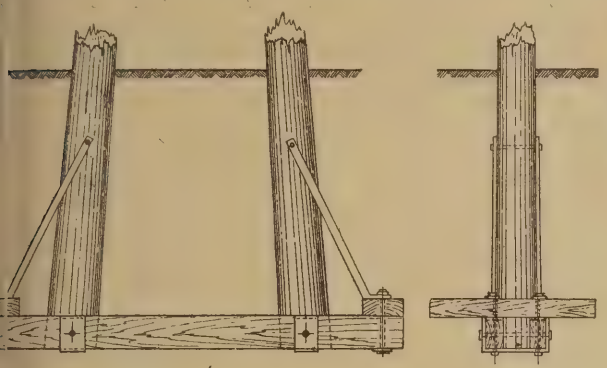


Fig. 1.—Showing Foundation Construction of the Anchora Pole.

from the legs to the foundation, passing over the top of the main baulks and underneath the pole butt. In excavating for the foundations, the hole should, where possible, be under-cut at each side to receive the anchor baulks connecting the lower ends of the legs after the latter have been placed into position, the solid undisturbed earth above the baulks offering increased resistance against overturning.

Both 'A" and "H" poles are constructed on these foundations. An "A" pole, with the "Anchora" construction, under test is said to have been loaded up to 3½ tons at a point 31 ft. above the ground level.

A New Electric Ironer.

The accompanying illustration, fig. 2, is of the "Grand" electric ironer, a new product of the COFFIELD WASHER CO., Dayton, Ohio, U.S.A., which is being marketed in this country by MESSRS. L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, Kingsway, London, and which was exhibited at the I.M.E.A. Convention at Brighton in June. The machine is light and

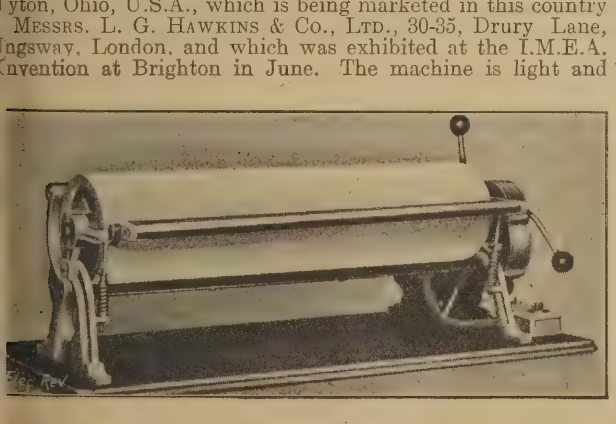


Fig. 2.—The "Grand" Electric Ironer.

portable, it weighs 76 lb., and its roller measures 26 in. in length. It is both operated and heated electrically, a small motor being provided for the operating. Both the motor and the heating elements are controlled by switches conveniently placed at one end of the base board, and mechanical control levers are provided at one end of the roller for its operation.

Electric Furnace Regulators.

For the control of electric arc furnaces employed for making calcium carbide, abrasives, alloys, &c., the GENERAL ELECTRIC Co., Schenectady, N.Y., has placed on the market, according to *Chemical and Metallurgical Engineering*, some new types of regulators for use with one-, two- and three-electrode equipments for which an auxiliary control panel is required. The advantage claimed is a decrease of the time interval between any change in current and the functioning of the equipment to overcome the change, in order to maintain a constant current. This is accomplished by the use of new punched frame contactors, inherently quick acting. The dynamic braking circuit is also completed in a shorter interval of time after the power is removed from the motor, thus decreasing to a minimum any over-travel of the electrode. Another advantage is the elimination of bearings or parts subject to wear.

A new voltage relay has been used to prevent the lowering of the electrode into the furnace in the case of supply failure or unbalanced conditions in the furnace. This relay permits a very low calibrating value, allowing the arc voltage to decrease to about 25 V before opening the control circuit to the lowering contactor.

A Mechanical Cable Union.

What should prove of value in the connecting of cables to "live" bus-bars or in making connections in places where it is dangerous to use molten metal, is a device which has been



Fig. 3.—Section through the Mechanical Union.

designed by MR. C. TURNOCK, 41, High Street, Aston, Birmingham, in the form of a mechanical cable union which can be adapted for use with terminal lugs or couplings.

Fig. 3 is of a section through the union. It consists principally of two main parts, a gland A which is threaded into a trunk B, and each part is constructed with an internal bevel edge. A split ring which is placed under the outer layer of conductors creates a bulge on the cable core which is gripped between the gland and the trunk at the bevel edges. Both the gland and the trunk are hexagon shaped, so that the union can be tightened up by means of a couple of spanners. This device is very strongly constructed and the joint can be made very speedily. The maker claims that contact is made at four points, the butt end, the end circumference, and each side of the cone or bulge on the cable core.

In the case of the cable lug the union trunk forms a projection of the lug as in an ordinary sweated terminal, and in the case of the coupling a double union is used, one at each end of the trunk.

A New Lamp Fitting.

The accompanying illustration, fig. 4, is of a new design of lamp fitting, the "Wigan" prismatic, recently put on the market by HEYES & Co., LTD., Water-Heyes Electrical Works, Wigan. It carries a prismatic glass moulding, by which the light is said to have a reflected area of 180 deg. from the plane of the fitting. It occupies about the same space as the standard type of bulkhead fitting, and the makers claim that it

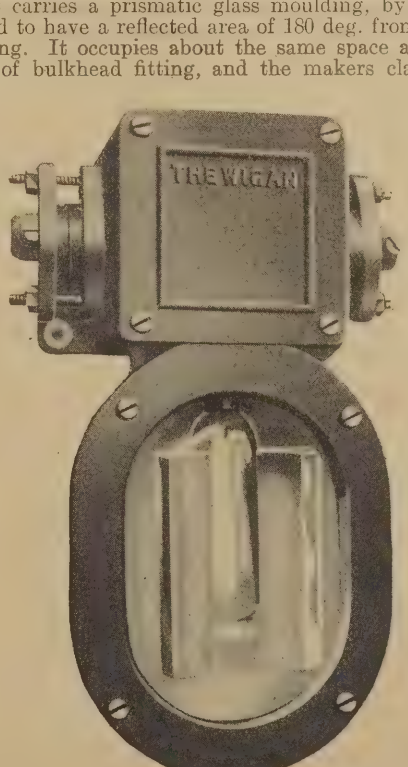


Fig. 4.—The "Wigan Prismatic Lamp Fitting.

gives a normal front with an increased side illumination, and is suitable for use in place of the standard bulkhead fitting. It can be supplied with or without the joint box attached.

The International Railway Congress.

A Review of some of the Electrical Features.

(Concluded from page 72.)

High-Speed Electric Locomotives: *Discussion (continued).*

The next point discussed was to what figure had the maintenance of d.c. and a.c. motors been reduced, and what mileage had been found possible without examination requiring more than one day.

Mr. BIANCHI said that in Italy there were machines which had been in service 15 or 20 years, and had not required repair so far as the electrical part was concerned. The only repairs necessary were to the frame of the engine.

Mr. WALLIS said that in the United States they believed that the cost of a.c. single-phase motors, as compared with d.c. motors, was slightly greater, but that experience was based on cars rather than on locomotives.

Mr. STEINER considered that the single-phase a.c. motor was often unjustly criticised, and that it would not cost much more to maintain than would the d.c. motor. Very varying results had been obtained with commutators.

Mr. PARODI maintained that the motors built 20 years ago were better than the new motors from the point of view of construction, though the new motors were better designed.

Mr. BIANCHI said he had some d.c. motors which had been in service for 25 years, and were still running well; he considered them the best motors he had, and agreed that modern motors were not so satisfactory. The latter were smaller and more heavily loaded, using forced ventilation, and consequently were more liable to cause trouble, particularly if the fan failed.

Mr. WALLIS said there was a disposition in America to sell a smaller motor for a given h.p. than was the case 10 years ago.

The remainder of the discussion was devoted to a comparison of the mean distance run by electric and steam locomotives of the same class, and the steps being taken for operating electric locomotives by a single man.

Mr. WALLIS said that steam locomotives in America were running as much as 500 miles on one trip. There was no experience as to how electric locomotives would compare with them under such circumstances, but they were expected to cover at least 30 per cent. more mileage in a month than the steam locomotives on normal service.

Mr. WEISS said that on the Simplon line in Switzerland they were able to get 15,000 km. (9,400 miles) monthly out of each electric locomotive, whereas the mileage when the line was steam operated was from 10,000 to 12,000 km. per month (from 6,000 to 7,500 miles).

Mr. WALLIS said he was informed that on the New York, New Haven, and Hartford Railroad the average mileage with all the electric locomotives was 200 per day, and they had obtained 500 miles a day with a single locomotive.

Mr. WEISS referred to a Swiss line on which both steam and electric locomotives were used, the latter being of the 3-phase type, but the high-speed trains were drawn by the electric locomotives.

Mr. BIANCHI pointed to the different results obtained with different locomotives. In Italy, with the 3-phase locomotives, the time during which they were stopped for repairs was between 25 and 50 days annually, whereas the d.c. motors ran for two years without serious repairs being necessary.

Mr. WEISS, replying to a question by Mr. C. Renevey (Alsace-Lorraine) said that, from the point of view of heavy repairs, electric locomotives showed better results than the steam, but, from the point of view of small running-shed repairs, the steam locomotives were better, probably due to the fact that electric locomotives were still new.

Mr. BIANCHI said that, in Italy, cars were driven by one man only, the "dead man's" handle being used. It was hoped to apply to high-speed electric locomotives shortly an arrangement which would enable the driver to leave the handle for a period not exceeding a minute, or half a minute, after which period the current would automatically be cut off.

Mr. L. M. BARNET-LYON (Holland) said that, although it was easy to control an electric locomotive, there were other duties to be carried out on a locomotive, and it was open to question whether one man would be sufficient.

Mr. WALLIS said that it was the universal practice in America to have two men on electric locomotives, but one man only on multiple-unit car trains.

Mr. H. N. GRESLEY, C.B.E. (L. & N.E. Railway) said that that practice was also universal in this country.

Summary of Conclusions.

On Monday morning (June 29th) the conclusions arrived at as the result of Friday's discussion were considered by the meeting, and summaries of the views expressed on the nine questions submitted for discussion were adopted by the meeting.

On the first question the summary put forward for consideration stated that the tram and gearless types of drive could be used on high-speed locomotives, and give good running. It was, however, necessary, taking into account the weight not spring-borne and the relatively low centre of gravity, t reduce as far as possible the weight per axle. Mr. M JAPIOT (Paris, Lyons and Mediterranean Railway) consider it would be dangerous to put in a clause saying that it w desirable to reduce the weight per axle. No evidence ha been given showing that this was really necessary. If t summary were adopted in the form suggested, permanen way men might make a stand against it, and might wish limit the axle weight to about 12 tons per axle, but if t weight were 15 or 20 tons, he would be content. Finally t resolution was passed in the following form:—

1. "The tram and gearless types of transmission can used on high-speed locomotives, and give good running. has been found advisable, when taking into account t weight not spring-borne and the relatively low centre gravity, to limit the weight per axle to reasonable limits."

Resolutions relating to the remaining questions were adopte as follows:—

2. "The quill drive can be, and is used on high-speed loc motives. The quill and driving shaft should be kept as f as practicable concentric, and the condition of the track shou be good. The difficulty of maintaining concentricity increas with the number of axles on one frame."

3. "It would be as well, in the case of high-speed locom tives driven by rods, to incorporate shock absorbers in t transmission. The fitting of the rods should be careful maintained in all cases."

4. "Different types of transmission, with oil or grea lubrication, are actually in use on high-speed locomotives, ar generally give satisfactory results."

5. "There is insufficient experience so far to enable recon mendations to be made as between the rod and the dire drive for high-speed locomotives, both types being actual in use. Bissel trucks or bogies only appear to be required locomotives running at very high speeds."

6. "The use of oil switches and transformers is gener on high-speed locomotives working an a.c., and do not appe so far to have given risen to any particular trouble."

7. "The electro-pneumatic control appears to be the one th should give the best results on electric locomotives."

8. "Electric traction by high-speed locomotives has not be in use long enough to enable any judgment to be arrived as to the difference in cost of upkeep of the various type motors, but it appears that it will be small."

9. "The working is arranged so differently on the pri cipal railways so far as the use of high-speed steam and ele tric locomotives is concerned, that it is not possible to con to any definite conclusions as to the relative mileage the engines can run between heavy repairs. Up to date, bo experience and calculation indicate that the electric locomoti will give a better mileage than the steam locomotive."

With regard to the question of the steps that had be taken to operate electric locomotives by one man, a summa was suggested to the effect that nobody had yet operat high-speed electric locomotives with one man, either with without safety devices, although this question was under co sideration in different countries. It was stated, in this co nection, by M. Lacoin (Paris-Orleans Railway) that tw French railways had passenger and freight locomotives th were capable of a speed of 90 km. (56 miles) per hour, a they intended to work them with only one man. He su gested, therefore, that the proposed resolution should made to refer to "very" high-speed locomotives. After son discussion, however, it was suggested by Mr. J. T. Wall (Pennsylvania Railroad) that this was a labour question, a did not concern engineering, and that the summary shou not be put forward at all, which course was agreed to.

Miscellaneous Proceedings.

During the second week of the Congress the questions und discussion by the various Sections in connection with a numb of aspects of railway administration were disposed of, a more time was devoted to visiting railway works in vario parts of the country. Among the questions discussed by Se tion V (Light Railways and Colonial Railways) was that "Traction for Light Railways." This turned largely upon t merits of traction by steam and by internal-combustion e gines and there was little discussion with regard to electricit The adoption of electric traction depended essentially financial considerations; in proportion as initial expenditu and working expenses diminished, it would be possible develop the use of this system.

In connection with a discussion on the breaking of rails Section I. (Ways and Works), a report was presented fro Japan describing an apparatus called "The Magnetic Ra Defectoscope," for examining from the outside, without spo ing the rail, internal defects such as local segregations of in purities, &c. The principle of this apparatus is as follows When a ferromagnetic substance, such as iron or steel, placed in the magnetic field, it is at once magnetised by ma netic induction. When the magnetic permeability is invariab

over the whole length of rail, the magnetism induced by a constant magnetising force is invariable, but if the permeability varies owing to some fault existing in the rail, the variation in the induced magnetism in that part causes a leakage of magnetic flux, the amount of which can be shown by testing with an exploring coil. The measurement is carried out by placing a horse-shoe magnet on the rail head and sliding it along from one end to the other. An exploring coil is fitted on the surface of the rail between the two poles, and slides with the magnet so as to cut the leakage flux. The reading of the galvanometer is taken on a recorder.

According to the programme of the Congress, the closing ceremony should have taken place on Thursday morning, July 9th, but, no doubt in order to allow the delegates more time to get to Darlington for the railway centenary celebrations this ceremony took place on Wednesday. It was preceded by a general meeting, at which the question of the re-admission of ex-enemy countries and Russia to the Congress was discussed. A request for re-admission had been received from Russia, but it was decided that the situation in Russia, particularly from the railway standpoint, was not sufficiently stabilised to justify re-admission to the Association of the railway administrations of that country. With regard to Germany, whilst no formal request for re-admission had been made, semi-official negotiations had been in progress. There was some discussion on this point, but finally, the voting of the delegates was in favour of the re-admission of Germany, on the same terms as other nations.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Installation Policy.

I have been deeply interested in reading the paper given by Mr. L. L. Robinson before the I.M.E.A. at the Brighton Convention; as the author's ideas and statements are such a mixed conglomeration, in fact a real "Irish stew," it is difficult to pick out the solid food and know what his policy really is.

On reading through his paper and taking things in general one gathers that there is no one capable of satisfactorily dealing with installation work but a municipal electric supply department with a highly paid chief at its head, a highly paid staff of experts (whatever this may mean), another staff of supervisors, and a large staff of competent workmen; and yet, although in Mr. Robinson's opinion the above is the right and proper way, he looks forward to the day when anyone can go to a "Robinson Woolworth & Co." bazaar and buy a complete wiring installation over the counter and erect it himself.

If the latter is what Mr. Robinson really does want, I would suggest that he leave his present padded armchair provided by the public, give up his handsome salary paid partly by electrical contractor ratepayers, start a Robinson Bazaar for the sale of house lighting sets in cardboard boxes and get the schoolboys of Hackney and district busy in electrifying the district; and we shall very soon have a second edition of the Great Fire of London. When this time arrives, I sincerely hope the Robinsonian Electrical Bazaar will be in the midst of it, but that the author and perpetrator of such a scheme will be spared to see the folly of his ways.

Now to more detail: although Mr. Robinson explains at the outset that he does not damn the electrical contractor, I consider his paper is a general condemnation of the contracting industry at the present time. He did not propose to deal with wiring and installation work, and yet he dived into wiring and installation work to the point of lowering it to the 6½d. bazaar level.

I would like to ask Mr. Robinson if he considers that the gas and waterworks departments of our Corporations should also carry out the whole of the installations of gas, lighting, heating, power and water distribution in the whole of the premises where these services are needed and used, as this would be on a par with part of his gospel.

If the objective of municipal electrical suppliers to give a perfect service, &c., without a loss, then Mr. Robinson has all his work cut out to do this consistent with the service being as cheap as it should be. What is wanted of Mr. Robinson and all suppliers is a cheap supply of electricity, and the contractors will see that the installations to use a cheap supply are put in at a reasonable rate, consistent with good-class workmanship, reliability, and satisfaction.

Mr. Robinson goes on to state that the primary object of a wiring contractor is to make a profit. This, Mr. Robinson, as far as the better-class contractor is concerned, is not the truth. Profit is only one part of his object, the other parts being a reliable and efficient installation, carried out with materials and apparatus suitable for the work it has to perform, thereby ensuring continuity of service, which the customer expects and is entitled to, and a satisfied client who will come again or recommend his friends. The profit portion is the last item, and if the contractor gets any after completing the job as above, he is rightly and justly entitled to it.

According to Mr. Robinson's statement, a wiring contractor will sell anything that carries a big profit, whether the best service is given to the consumer or not. This is one of the foulest libels ever levelled against the contractors, who have in their ranks a number of the ablest men in the industry to-day, and who are also honest.

If Mr. Robinson has the interests of the electrical industry at heart, I ask him, as a gentleman, to withdraw the innuendoes made in this clause of his paper.

Is it not sound policy to give a consumer an installation that is best suited to his requirements, consistent with safety and satisfaction in use, and at a reasonable cost to the user?

Requirements vary, and no one knows better than the contractor how much, and no one gives more time and thought to these matters than the contractor.

Mr. Robinson appears to be at daggers drawn with the contracting industry, whereas he should realise that the contractor is the best friend of the supply engineer, the unpaid canvasser of every undertaking, who instead of being kicked and blackballed should have his friendship and well-being cultivated.

Thank goodness we are still blessed with a majority of sensible and reasonable-minded central-station engineers, who appreciate the value of reliable contractors in their midst.

Instead of setting-up huge wiring departments with staffs of unproductive officials, as suggested by Mr. Robinson, far more good would be done by making more use of, and encouraging, the contractor, even if the supply authority went to the extent of subsidising him to the extent of one shilling per 60-watt lamp, and 10s. per kW of other plant that the contractor canvasses and works for and gets connected to the mains. After all, who benefits the most? Why, the central-station engineer, who has a customer for always once he is connected, whereas the contractor very rarely gets any more revenue from him except for a few lamps or a pair of brushes and a heating element occasionally.

A policy of close co-operation between the supply authority and the contractor is the best policy Mr. Robinson can adopt if he is desirous of extending the number of installations on his mains; above all let him cultivate co-operation with registered contractors, and not the "curbstoners" he raves so much about, the "here to-day and gone to-morrow" crowd.

Many interests have been striving during the last few years to develop a close co-operation between all sections of the electrical industry, which is all to the good, but Mr. Robinson's paper is a direct slur on all those excellent gentlemen who have given much time and thought to the furtherance of co-operation in the electrical industry.

Harry Moss, A.M.I.E.E.,
National Registered Electrical Contractor.

Bradford, *July 6th*, 1925.

I have read Mr. Robinson's paper in the ELECTRICAL REVIEW and his reply to criticisms.

He states that he is now working through contractors on the basis of schedule prices and specifications which have been drawn up in co-operation between contractors and himself.

As far as I know there are only two registered contractors within his area, one of which is the firm of which I am the principal. My own firm has not been approached regarding work for the Hackney Borough Council, neither have we done any contracting work for it since war time, when we were all short-handed. It appears to me, therefore, that the work he talks about as having been arranged and placed with contractors has all gone to one man, and as I have been a ratepayer within his borough for years, it is scarcely a fair way of dealing with such work.

Only about twelve months ago his staff took an order from a firm for whom we had worked for years. To get this order they must have undercut, as I quoted at estimated net cost, knowing that I was in competition with them. Is it to be wondered at that contractors hit back when such things occur?

Mr. Donald Munro's letter in last week's issue of the ELECTRICAL REVIEW expresses the opinion of the majority of electrical contractors. It points out plainly that such men as Mr. Robinson would not be in existence had not electrical contractors carried out the spade work, and prepared the way for them.

It is only of recent times that Mr. Robinson has seen fit to express views concerning contractors as he did at the convention of the I.M.E.A., and for what reason it is difficult to conceive. In this world I take it that no two people have exactly the same views on any subject, but two people having identical interests have no need to run down each other simply because they do not agree on certain fundamental questions concerning the methods of running their respective businesses, and I may remind him that neither party can work amicably with the other unless both make up their minds to agree to differ.

Unfortunately I am one of the small-minded contractors in the eastern area of London, who apparently are not the sort of men that ordinary engineers could associate with. This may be so, but I have dozens of electrical and mechanical friends who, I am certain, would go out of their way to help me, if I needed help, and I cannot suppose that they are all small-minded persons as well as myself.

The whole question of municipal trading appears to be one of money. Mr. Robinson's policy is to keep up the price of the unit and give free service, at the same time charging for laying services, which after all belong to the borough. Do other municipal engineers also agree with this, and is it policy to charge high prices for the commodity they have to sell, and cut the prices of installations? Surely their whole energy

should be devoted to making the price of current such that it would compete with all other classes of fuel and light, and then electrical energy would sell itself. They could well leave installation work to people who have devoted their lives to the subject, and like Ford cars, electricity would become universal.

Mr. Robinson states that contractors are out to make profits. Of course they are, otherwise they could not live, but is not his whole time spent in conceiving ways and means of making profits? He gives away on one hand to show a profit on the other, so where lies the difference between him, and the contractors of whom he speaks?

As far as my own firm is concerned, two or three years ago we stocked practically everything electrical. We were the first people here to stock, demonstrate, and sell electric washing machines, electric sewing machines and so on, and given fair play we should now have been doing good business in this direction. At that period the Hackney Borough Showrooms were equipped with a few motors and possibly a cooker, but very little besides, and just as we were beginning to make headway, an exhibition was organised by the Corporation at the Hackney Baths, but NO ELECTRICAL CONTRACTOR WAS ALLOWED A STAND. The Hackney Borough, of course, was there, but contractors had to content themselves with being spectators. Since that time our sales have gone down 100 per cent., and we have lost at least two or three good orders through the Council engineers. As I know my business thoroughly, it makes me very sore to think that on one hand the Council takes my rates, and on the other, takes away my means of paying them through absolutely no fault of my own.

H. Linzell, A.M.I.E.E.

London, *July 10th*, 1925.

Artificial Crop Drying.

I am afraid that personal differences can hardly be of interest to your readers, hence I do not think it worth while replying at length to Captain Owen's letter in your last issue.

His communication confuses several technical points. I agree with him that when hay is made artificially by a process which is an incomplete copy of mine, results are not good, as was proved at a very considerable expenditure of money by the full-size tests made recently by the Ministry of Agriculture.

Chemical analysis and tests by feeding to cattle have demonstrated that my process gives superior results to average weathered hay. This the Ministry has not had an opportunity of sampling, as even the test it ran on my farm was of a modified method.

My process covers both hot- and cold-air methods; this takes away a lot of the point of the letter.

I am pleased to say that at last I have received an indication that the Ministry is—somewhat tardily—going to recognise what others and myself have done in bringing to the fore this new development.

The Ministry and the Oxford Institute of Agricultural Engineering have done a great deal of most valuable laboratory research work in this subject. This has cleared up many empirical matters, and due credit should be given to Captain Owen for his share in this, also for the development of an excellent oil-fired pre-heater. This, however, does not alter the fact that if they had been willing to give due recognition to the pioneers, the country would have been saved some thousands of pounds which have been expended in useless experimental work. However, we all know the little ways of a Government Department.

R. Borlase Matthews.

East Grinstead, *July 11th*, 1925.

I regret that Mr. Borlase Matthews apparently finds several unpalatable truths in my recent article on the above subject. This hardly justifies the serious mis-statements which he makes on the hot-air system, which certainly has proved itself in practice, as your correspondent must know.

I worked the cold process for three seasons, on Mr. Matthews's own 600-acre farm and elsewhere, and I am therefore well acquainted with its practical difficulties and the unreliability of the product, but I have never yet seen a hay rick, good or bad, made by it which exceeded 17 tons finished weight. Surely it is better to succeed (as the hot-air process does) with real 10-ton stacks made on sound lines than to fail with mythical 25-ton ricks made on an unscientific and rule-of-thumb basis.

Your correspondent refers to clover or " seed " hay as a crop which possibly justifies the use of preheated air. He might have stated at once that he has never succeeded, nor have I, in making even passable seed hay by his cold-air process. In Scotland there have been repeated failures, and last year Dr. Hendrick, of Aberdeen, published a report describing these negative results, in which he condemned the system, root and branch.

I cannot imagine anyone who has really understood the nature of the problem presented by artificial crop drying ever rejecting the pre-heating idea, especially on theoretical grounds. It would be very interesting to have some definite reasons given for the alleged superiority of cold air. Your correspondent, I now understand, originally tried the hot-air system, and it is to be regretted that he did not succeed with it for crop drying.

I am sorry that I am unable to follow your correspondent's meaning when he states: " Equally good hay could be produced by either method, provided the methods adopted for the cold-air system are adopted in conjunction with the hot-air way." Perhaps it refers to the elimination of structures inside the rick and to the use of a plurality of cavities, spaced to give approximately equal air resistance, whereby larger ricks are possible, at least for cereals. This arrangement, suggested and developed by myself, is covered by Mr. Borlase Matthews's patent, but I am not sure that it would work very well with the higher air pressures used with the hot-blast process.

I do not admit that an error crept into my article regarding the preference which cattle show for hay made by pre-heated air. It is true, however, that no direct comparison has yet been made, perhaps because of the difficulty in getting cold-blast hay in sufficient quantity to run a proper test. His remarks, therefore, that the cheaper method, without pre-heating, should produce a slightly better hay, refer to a condition of things which hitherto has not obtained in practice. In any case, to call the " cold-blast " process " cheaper " is hardly justified so long as it works on an intermittent basis. The cost of inspecting thermometers and blowing for a short time daily must ultimately be greater than the one long blow which gives results. If your correspondent will study the experiments which have been made, particularly in America, by nutrition experts, he will realise that his " hay," even at the best, can never equal in feeding value that made without fermentation and the action of sun and rain. This is seen in the analyses given in my article. Hot-blast hay gave 2.1 per cent. nitrogen, while good sun-made hay showed 1.9 per cent.; fermented hay—the cold-blast process is based on the control of this supposed necessary process—had only 1.7 per cent., while the worst hay, weathered on the field, gave 1.5 per cent.

Mr. Matthews implies that his patent covers pre-heating, though I doubt if he is first in the field, for it is certainly an old idea, going back about 50 years. So far as I can see, any practical form of heating equipment used to-day for the purpose would infringe one or other of the many detail patents controlled by the Crop Drying Company. Your readers, therefore, need not fear that in buying equipment, made under that company's licence (and there is no other on the market at present in a practical form), they will be infringing your correspondent's patent.

H. A. Carney.

Lingfield, Surrey, *June 28th*, 1925.

Radio Trade Discounts.

I notice from an announcement which appeared in *The Radio Trade Journal* of July 4th that the N.A.R.M.A.T. has tardily recognised that the existing discount which its manufacturing members are allowed to offer is insufficient. The Wireless Retailers' Association has always contended that the terms are altogether inadequate and should be increased to the amount allowed in kindred trades, namely, 33⅓ per cent. Short of this figure reasonable profits cannot be made, since considerable deductions for overhead charges and service have to be allowed for by the dealer.

The small increases now promised will be welcomed as a move in the right direction, but the method of initiating them will be strongly deprecated by the great mass of dealers. In order to be eligible for these increases dealers must either be or become members of the N.A.R.M.A.T., which implies that they must among other things bind themselves not to deal in oversea apparatus.

Very rightly the average dealer feels that he is entitled to be and to remain a free agent. He holds the conviction that he should be untrammelled by arbitrary conditions imposed by manufacturers, and strongly objects to interference with his liberty of action. Even more resolutely is his face set against anything which may appear to tend in the direction of monopoly.

In making these remarks I speak as one who has had an exceptional opportunity of gauging the opinions of the retail trade.

The Executive of the N.A.R.M.A.T. appear to have overlooked the fact that the weapon they are employing is a double-edged one, and also that preferential treatment need not necessarily be confined only to one quarter; and I commend these considerations to their serious attention.

There are large numbers of manufacturers of apparatus of the highest class not associated with that body who are in entire sympathy with the W.R.A., and the demand for oversea apparatus is growing apace.

I am, however, disposed to believe that the consequences of this movement will be such that the N.A.R.M.A.T. will have no alternative to extending these increased discounts to dealers generally; but in the meantime they are alienating large numbers of retailers, and this at a moment when the crying need of the industry is for goodwill, harmony and co-operation.

Fredk. S. Horsey,

Chairman of The Wireless Retailers' Association.

London, *July 10th*, 1925.

The Dimensions of Commutators.

A friend who happened to be using the formulæ in my article relating to the dimensions of commutators, published in your issue of March 13th, 1925, has kindly pointed out to me that on page 405 the symbol L/λ has been wrongly printed as $L\lambda$ in two places: once in equation (5) in the right hand column, and again at the beginning of the fifth line from the foot of the same column. I would ask you to publish this note for the benefit of any readers who may be interested in the matter, so that they may insert a stroke between L and λ

oth places. I am sorry that these errors should have rred in important equations, presumably through incom- e alertness on my part in reading the proofs.

Thomas Carter.

ewcastle-on-Tyne, *July 10th*, 1925.

Celluloid in Accumulators.

common with your correspondents on the subject of the tion of celluloid cases, I appreciate the timely letter "Surveyor" of May 11th, followed by the valuable rded experiments in your issue of June 12th by Colonel H. Page and Mr. C. E. Hume; further corroboration of danger from fire was also given by "M.I.E.E., &c.," on e 26th.

he danger due to the ignition of celluloid cases I now avoid employing cells fitted in glass containers, which have the her advantage of the absence of acid frothing, with the al deterioration of the insulation.

pparently it is not generally known to your readers that A. F. A. Accumulator Co., Ltd., having realised the danger ire due to employing celluloid cases, have for several years t specialised in manufacturing cells fitted in toughened ss grooved containers, which are supplied from one-ampere- ur size. Obviously, if the A. F. A. type of cell in glass con- ners were generally employed, the present danger of fire ild be eliminated.

Chas. Lack.

hornton Heath, *July 7th*, 1925.

Special a.c. to d.c. Rectifiers.

shall be obliged if you or any reader can put me on to or two makers capable of turning out a fair number of ll rectifiers as per short specification given below:—

all capacity alternating-current rectifiers of full-wave type, deliver rectified, or direct, current from a.c. mains of the al service voltage, 220-230 V. The rectified current to be a voltage as near as practicable to the original a.c. supply 220-230 V, and the current in the neighbourhood of 0.1 e-tenth) of an ampere. The rectifier to be in as simple and mpact a form as possible, without moving parts, noise- s, and free from liquid, unless hermetically sealed, prefer- y of a type not requiring frequent renewals, such as tubes, bes, &c. The rectifier to be capable for functioning for iods of 6-8 hours continuously, and to require an absolute imum of attention. Price being a consideration, the sug- ted preferences depend on the cost involved.

Rectifier.

July 8th, 1925.

A British Institute of Radio Engineers.

May I be allowed to occupy your space for a few lines, to ply to Mr. Nelson's letter in this week's issue of the ELEC- CAL REVIEW?

Mr. Nelson says, ". . . surely if the Americans can run a cessful Institute of Radio Engineers as well as the American stitute of Electrical Engineers, we Britishers can do the ne." I would like to point out that the American Institute Electrical Engineers has no Section devoted especially to reless matters, and in fact, on looking through the pages of *Journal* of the A.I.E.E., one finds that wireless subjects very sparingly dealt with. In other words, the A.I.E.E. es not pretend to cater for wireless engineers to anything e the same extent as the Wireless Section of the I.E.E., and is not surprising, therefore, that a separate Society exists in erica for the reading of papers, &c., on wireless matters. this country, on the other hand, we have a technical body ich started its existence as the Society of Telegraph Engi- ers and Electricians, and to start a new Society of Telegraph gineers, which is what Mr. Nelson's proposal amounts to, ms to me a very undesirable step.

I still maintain that the qualifications necessary for mem- rship of the I.E.E. are necessary to a wireless engineer, and brand an engineer as a wireless engineer by giving him some ters to put after his name is a very dangerous practice unless ere is at the same time some guarantee that the engineer s had a thorough electrical training.

I would suggest to Mr. Nelson that there are quite a number people in this country who are members of the American stitute of Radio Engineers but who are not in any way pro- sionally engaged in wireless engineering: who are, in fact, nateurs. The I.E.E. is not open to amateurs, however skilled ey may be, and consequently they applied for and gained embership of the I.R.E. My only comment on this is to peat that amateurs should join an Amateur Society and not rive after professional honours unless they desire to become ofessionally engaged—in this case, in wireless engineering. is for this reason that the Radio Society of Great Britain s resolutely refrained from encouraging its members to call emselves M.R.S.G.B.

I am quite ready to admit that the constitution of the Wire- s Section of the I.E.E. might be revised so as to meet the quirements of Mr. Nelson's friends in some way, but I most phatically maintain that there is not room for *both* the esent Wireless Section of the I.E.E. and the proposed new ciety.

I am confident that this matter can be left in the hands of Committee of the Wireless Section of the I.E.E., for, after if this new body comes into being it is *their* funeral, not ine.

J. F. Stanley, B.Sc., A.C.G.I.

London, *July 13th*, 1925.

Legal.

Theft of Electricity.

ABEDNEGO JONES, described as a repairer, was fined 40s. at the Ebbw Vale Police Court on July 9th for the theft of electricity, the property of the Council. It was stated that an inspector discovered that the cable leading in to the defendant's premises had been pierced with a hatpin in such a way as to divert current from the meter.

A similar fine was imposed on Evan Evans, a fitter, on the same day for a like offence. In this case, although the meter had been disconnected, it was found that the defendant was still using electricity for lighting.

Claim for Injury through Electric Shock.

AT the Mayor's and City of London Court on July 6th, Ronald Evans, aged 20, of Lewisham, sought to recover compensation from H. W. Daniel, electrical engineer, Fetter Lane, E.C., under the Workmen's Compensation Act. For the applicant it was stated that he was cleaning electric light fittings at Smithfield Market in March, 1923, when he received a severe shock which made him jump a distance of nine feet and he was impaled upon a meat hook. The market was closed at the time but his cries attracted the attention of the police, who conveyed him to St. Bartholomew's Hospital. He remained in a convalescent home until June and then re-started work in August. Owing to nervous trouble he had to give up a fortnight later. Some time after applicant was examined and was found to have contracted phthisis, and medical witnesses attributed this to the effect of the accident upon the applicant's system. Another medical witness, who appeared for the respondent, said that the fact that the applicant had resumed work and had subsequently broken down led him to think that the accident was not the causative factor.

Judge SHEWELL COOPER, in making an award in favour of the applicant, said that the fact that he had never regained his normal health after leaving hospital, enabled him (His Honour) to say that there was reasonable probability that the applicant's present condition was due to the accident.

Guaranteed, Ltd., v. R. A. Williams.

IN the Shoreditch County Court, on Thursday, before Judge Cluer, Messrs. Guaranteed, Ltd., of 1-3, Sun Street, Finsbury, E.C., lamp shade and electrical fitting factors, sued R. A. Williams, of 33, Tottenham Lane, N., hardware and electrical fitting dealer, to recover £11 11s. 5d. for goods supplied.

An affidavit had been filed by Percy Evelyn Williams, which stated that he had been served with the summons, but he denied that he was R. A. Williams, and said the business belonged to his wife. He had never purchased goods from the plaintiffs.

Mr. ROBINSON, for the plaintiffs, said he admitted he was in a difficulty, but asked that the name of Mrs. Williams should be added to the summons, and that there should be an adjournment for him to make inquiries. If he accepted the affidavit of Mr. Williams, and sued the wife, then the wife might turn round and say that it was her husband's business.

Judge Cluer looked at the order, and found that it was signed in block letters, "R. A. Williams," and both Mr. Williams and his manager, Mr. Wright, having looked at it, denied having signed it, and also said that Mrs. Williams could not have signed it because she was ill in bed. Mr. Robinson said he had not the traveller there to prove the signature.

Judge CLUER said that a reasonable mistake had been made. He adjourned the case to enable the plaintiffs to make full inquiries.

Tucker v. Wandsworth Electric Mfg. Co., Ltd.

THE hearing of this case (*vide* our last issue, p. 53) was continued on July 7th before Mr. Justice Tomlin in the Chancery Division. Mr. J. B. Tucker asked for an injunction restraining the defendants from an alleged infringement of his patent for quick make-and-break tumbler switches.

The defendants, in support of their allegation of prior user and publication, said that switches had been made by Mr. Harry Rose, of Birmingham, before the plaintiff's invention, which contained the same features. Such switches had been used in H.M. ships and defendants alleged prior publication by McGeoch & Co., of Birmingham.

Mr. HOWARD MARRYAT, a member of the Institutions of Electrical and Mechanical Engineers, said he was an electrical contractor, and he remembered coming across the plaintiff's switch at a meeting of the Electrical Development Association in 1921, when it was passed round and discussed by the members. Before its introduction there were, he believed, no quick make-and-break switches with a positive action throughout. The provision of this motion was of great importance because if the spring failed and the switch had no positive motion throughout, the switch might be left in a very dangerous condition without that condition being obvious. The advantage of using a compression spring instead of a tension spring was that the latter was apt, if it broke, to fly into such a position as to cause a short circuit. The compression spring was not so liable and if it was guided it might remain in action if broken.

Mr. A. E. ILIFFE, sales manager of Metro-Vick Supplies, Ltd., said that he sold two models of tumbler switch, and one was the plaintiff's. In his experience the positive and quick make-and-break actions were a great advantage, and

the sale of such switches was likely to increase when the public became better acquainted with it. In cross-examination he said he knew that the Crabtree switch was largely sold. That had positive action at the start of the break and the start of the make.

This completed the case for the plaintiff, and Sir ARTHUR COLEFAX, K.C., making his submissions for the defence, said that the plaintiff's specification was not limited to tumbler switches at all, and there was not one word pointing out that the alleged invention was a particularly useful application in the case of a tumbler switch. So far as he could see the alleged invention purported to be something which was advantageously applicable, if at all, to all electrical switches of the quick make-and-break type of which there were others than the tumbler. This feature of the pivotal connection of a compression spring to the operating member and the contact arm was to be found in the Crabtree specification, which was old. The plaintiff's first claim was the mere addition of common knowledge to a device which was old. It included nothing but direct pivotal connection.

SIR DUGALD CLERK gave evidence with the object of showing that the defendants' switch did not contain anything of the plaintiff's invention.

On July 8th further evidence was called. The secretary of the defendant company said Mr. Rose called on him on October 4th, 1909, and produced specimens of a quick make-and-break switch and asked him to buy it or make it for him. He did not do so but gave him an order for a dozen, two of which were now produced.

Mr. H. W. COX, of Nottingham, said he held a patent of 1914 for improvements in electrical switches, and he supplied switches made to this specification to Harland & Wolff and the Air Ministry, and he had 30 men still making them.

The hearing was concluded on July 9th and his Lordship reserved judgment.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Automatic Signalling on the District Railway. — On February 6th Mr. W. THORNE asked the Minster of Transport if he was aware that there was a good deal of delay on the District Railway with regard to the early morning trains travelling between Barking and Bow Road, due to the absence of automatic signalling apparatus which was operating on the western section of the line; if he was aware that the London, Midland and Scottish Railway Company had promised to carry out this reform for some considerable time; and if he would state the cause of the delay in carrying out the suggested improvements.

Colonel ASHLEY said he understood that the plans and estimate for the automatic signalling work referred to were finally approved by the company last month, and that it was arranging to carry out the work as soon as possible.

Southern Railway Improvements.—On July 7th, Colonel Ashley informed Mr. BOWERMAN that the Southern Railway Company had stated that it proposed next year to re-open Deptford Station in connection with the introduction of electrical services. The railway company proposed to carry out improvements at New Cross costing about £9,000, and although in consequence of the numerous works already in hand it had been obliged to postpone consideration of effecting improvements at New Cross Gate, the desirability of carrying out such improvements would not be lost sight of.

Coal and Electricity.—On July 8th, during the discussion on the Vote for the Ministry of Labour, Sir A. STEEL-MAITLAND, giving reasons for the widespread unemployment in the coal trade, referred to the substitution of oil fuel for coal, and also to the substitution of water power for coal in the generation of electricity. He said that in Germany the utilisation of water-power had been increasing until nearly 1,250,000 h.p. was obtained from water, and every horse-power from water represented a loss of eight tons of coal annually. Taking the continuous power as a third of the full rating, the amount of coal replaced by water power in Germany was about 3,000,000 tons annually. The development of water power in France had been greater than in any other country, except, perhaps, Canada and the United States. No less than 2,500,000 horse-power had been developed from water power, with a corresponding substitution of coal. About one-third of the mileage of the French railways was now electrified, and with the exception of the district between Paris and Orleans he was informed that the whole of that was effected by electricity developed by water power.

Electrical Trade Position.—On July 9th, Sir P. CUNLIFFE-LISTER, the President of the Board of Trade in outlining the position in various industries, said that the exceptions to a general depression in the engineering trade were motors, which were booming, cycles, which were doing well, and the electrical industry, which was comparatively in a very prosperous position and was increasing its business largely, not only in the home market, but abroad.

Wireless Telegraphy (Explanation) Bill.—This Bill was read a second time in the House of Commons on July 10th.

Statutory Gas Companies (Electricity Supply Powers) Bill.—This Bill was read a third time in the House of Lords on July 9th.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the specification.
The numbers in parentheses are those under which the specifications printed and abridged, and all subsequent proceedings will be take

1924.

4,246. "Electromagnetic sound-reproducing devices." Fuller's Electric Works, Ltd., and A. P. Welch. February 19th, 1924. (235,60
4,391. "Pole-pieces for telephone receivers and a method of manufa the same." British Thomson-Houston Co., Ltd., and A. P. Young. F 20th, 1924. (235,612.)
6,363. "System of overcoming the time-lag in a selenium or other sensitive cell, used in a television or like system." J. L. Baird and W Day. March 12th, 1924. (235,619.)
6,721. "Train line conductor systems for electric traction vehicles." Ferguson and Metropolitan-Vickers Electrical Co., Ltd. March 15th, (235,624.)
6,931. "Variable electrostatic condensers." F. E. Collinson. March 1924. (235,633.)
6,989. "Crystal detectors for wireless receiving sets." T. Hall and Southorne. March 18th, 1924. (235,637.)
7,012. "Railway block telegraph instruments." J. Fleming. March 1924. (235,638.)
7,235. "Device for indicating the power and voltage of electrom C. Lott. March 21st, 1923. (213,275.)
7,264. "Means for reversing the direction of the windings of and for circuiting reaction coils." J. W. Tennant. March 21st, 1924. (235,651
7,279. "Variable inductance devices." Igranic Electric Co., Ltd., Curtis and G. F. Dandridge. March 21st, 1924. (235,654.)
7,369. "Rectifiers." A. E. White (Fansteel Products Co., Inc.). 22nd, 1924. (235,658.)
7,595. "Control of electric sub-stations." T. W. Ross, C. Ryde Metropolitan-Vickers Electrical Co., Ltd. March 25th, 1924. (235,660.)
7,631. "Multicore electric cables." Pirelli General Cable Works, B. Valori and R. Horley. March 25th, 1924. (235,661.)
7,653. "Terminals for electrical accessories." J. H. Tucker & Co. and J. E. Gaffney. March 26th, 1924. (235,662.)
7,741. "Sound transmitting or emitting apparatus." British Th Houston Co., Ltd. A. P. Young and J. H. Butcher. March 26th, (235,664.)
9,328. "Electro-responsive devices." British Thomson-Houston Co. April 12th, 1923. (214,271.)
11,042. "Control arrangements for electric lighting." Kent-Mitchell, and F. G. Galley. May 5th, 1924. (235,690.)
12,113. "Electric control system for repeating the movements of app operated by small power, such as gyroscopic compasses." E. Granat. 18th, 1923. (216,154.)
12,165. "Supports for electric lamps." H. Hibbert. May 17th, (235,691.)
12,289. "Protective arrangements for electrical installations." Modigliani. May 19th, 1924. (Addition to 208,542.) (235,694.)
12,949. "Automatic control of groups of dynamo-electric machines." lish Electric Co., Ltd., and R. A. R. Bolton. May 26th, 1924. (235,701
12,950. "Automatic control of groups of dynamo-electric machines." lish Electric Co., Ltd., and R. A. R. Bolton. May 26th, 1924. (235,702
13,673. "Electrical ignition systems for engines." P. Granclaude. 4th, 1924. (Convention date not granted.) (225,167.)
14,074. "Electrotherapeutic apparatus." Ajax, Ltd., D. F. Sell and Cooper. June 10th, 1924. (Addition to 217,720.) (235,709.)
14,145. "Automatic switches for telephone exchange systems." W Electric Co., Ltd. (G. Deakin). June 11th, 1924. (235,710.)
15,675. "Magneto-microphonic relays." W. Levy, H. Goodwin, C. F. Adolph. June 30th, 1924. (235,723.)
15,899. "Telephone receivers for use in connection with wireless telegr telephony, and the like." E. M. Styles. July 2nd, 1924. (235,725.)
16,715. "Electric power systems." British Thomson-Houston Co., July 26th, 1923. (219,679.)
16,790. "Systems of electric distribution." British Thomson-Houston Ltd. July 13th, 1923. (219,026.)
17,613. "Secret signalling systems." Western Electric Co., Ltd. D ber 18th, 1923. (Patent of addition not granted.) (226,488.)
17,801. "Instrument or fault detector for testing electric circ H. E. S. Holt. July 25th, 1924. (235,737.)
18,037. "Manufacture of cathodes for electric discharge tubes." looze Vennootschap Philips' Gloeilampenfabrieken. February 18th, (229,622.)
18,797. "Inspection fitting for electrical conduits." W. G. Young V. F. Cole. August 7th, 1924. (235,744.)
20,319. "Magneto-electric pocket lamps." I. Haggi. August 28th, (235,751.)
20,775. "Acoustic devices." Western Electric Co., Ltd. (Western E Co., Inc.). September 3rd, 1924. (235,754.)
21,376. "Manufacture of materials suitable for formation into elec resistors." Metropolitan-Vickers Electrical Co., Ltd. October 15th, (223,542.)
22,982. "Rotors for asynchronous motors." Siemens-Schuckertwerke October 1st, 1923. (222,860.)
23,103. "Contact device for key switches." Landis & Gyr Soc. October 10th, 1923. (223,220.)
24,042. "Electric operating mechanism." British Thomson-Houston Ltd. March 5th, 1924. (230,411.)
25,166. "Tramway and other vehicle trucks or under-carriages." Thomas and Peckham Truck and Engineering Co., Ltd. October 22nd, (235,768.)
25,186. "Fixed electric condensers." F. S. S. Wates. October 22nd, (235,769.)
25,785. "Electrical connectors." British Thomson-Houston Co., October 30th, 1923. (224,231.)
26,328. "Automatic or semi-automatic telephone systems." Auton Telephone Manufacturing Co., Ltd. March 19th, 1924. (Divided applic on 218,243.) (Convention date not granted.) (224,255.)

1925.

287. "Electrodes for electric furnaces." Norske Aktieselskab for trokemisk Industri Norsk Industri-Hypotekbank. January 17th, (227,820.)
933. "Electric circuit-controlling devices." British Thomson-Houston Ltd. January 12th, 1924. (227,473.)
1,188. "Illuminating appliances." W. A. Dorey. January 14th, (235,797.)
2,833. "Telephone repeater systems." International General Electric Inc. February 2nd, 1924. (228,570.)
3,253. "Holders for incandescent electric lamps." K. Kiyohara. Febr 5th, 1925. (235,806.)
5,788. "Shock absorber for electric sewing-machine light." Singer M facturing Co. April 18th, 1924. (232,559.)
6,386. "Terminal adapter for wireless 'phones or the like." A. A. F December 5th, 1924. (235,816.)
7,499. "Telephone systems." Automatic Telephone Manufacturing Ltd., and J. E. Ostline. March 14th, 1924. (Divided application on 233,0 (235,818.)
7,501. "Telephone systems." Automatic Telephone Manufacturing Ltd., and J. E. Ostline. March 14th, 1924. (Divided application on 233,0 (235,819.)
9,226. "Telephone systems." Coventry Automatic Telephones, Ltd., J. E. Collyer. April 7th, 1925. (235,824.)

The

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The Evolution of Electric Cookers.

THE excellent collection of cooking apparatus brought together at the Brighton Convention of the I.M.E.A., of which we gave some particulars in our issue of July 17th, was noteworthy not only as evidence of the commercial activity of the manufacturers represented, who realised the importance of the opportunity to get into close touch with the municipal delegates and the Brighton public, but also on account of the indications of progress and improvement in design which were to be noted on every hand.

There was a marked tendency towards the adoption of "plug-in" heating elements—a feature which we have long hoped for. In some cases not only the top-plate fittings, but also the oven elements were of this type. This movement by no means indicates a lack of reliability, for steady progress has been made in the design of heating elements for long life, and at least one maker guarantees his boiling plate for twelve months (and expects the elements to last three times as long). Our own experience in this connection has been thoroughly satisfactory, but failures are bound to occur sometimes, and ease of replacement is a feature of great importance to undertakings which hire-out and maintain cooking apparatus.

In most cases the open top—more or less screened by a grid—was preferred for the boiling plate, but solid tops were also shown, and there is much to be said for the latter; if the loading of the larger plate is 1,800 or 2,000 watts, it acts quickly enough for all practical purposes. But there were several examples of boiling plates of refractory material, in which the heating spirals were adequately protected and the pans could sit on the plates themselves, and this seems to be a very promising direction for progress. The use of separate strips of earthenware or porcelain for supporting the spirals was widely adopted, and ease of rewiring was generally provided for.

The hinged top plate which gives ready access to the heating elements is a feature of many designs, and facilitates maintenance; at the same time, it ought always to be provided with a reliable fastening. The inquisitive child at a loose end must be borne in mind—what

he can accomplish with a hairpin or a pair of scissors is almost unbelievable, and various kinds of serious accidents would be made possible if he could raise the hob.

The design of the oven showed many improvements in detail. The internal corners were usually rounded, and other provision was made to facilitate cleaning—an important point which has not always been kept in mind. In some cases the whole of the interior casing could be removed bodily. The old controversy between side heating and top-and-bottom heating is not yet settled; each method has its convinced advocates. The question depends somewhat upon local conditions, which vary widely in different parts of the country. Some makers were prepared to fit either type, and at least one effected a compromise, which may add a little to the cost of the cooker, but will certainly increase its elasticity in use.

An interesting question is the demand for thermometers; these are usually fitted when asked for, and one maker put the proportion at about 50 per cent., but generally it appears to be less than this. The cost of the thermometer varies widely; we think it should be kept as low as possible, to encourage the use of the instrument and thus secure not only better cooking, but also economy of energy. In some cases a simple dial indicator depending on the expansion of metal or gas is substituted for the mercury thermometer; the former is certainly preferable on the score of legibility, and it should be possible to attain sufficient accuracy for practical purposes.

If the makers of electrical cookers, &c., could now get together and agree upon a few fundamental standards, a great deal of future trouble would be avoided, and their business would be benefited. The rating of the hob fittings is already approaching uniformity; the sizes and loadings of ovens, the dimensions of plugs and sockets for heating elements, the diameters of boiling plate apertures and the sizes of hobs, could be standardised much more easily now than in a few years' time. If the makers will remember that the important thing is to make it easy for the public to use electric cookers, and will act accordingly, they will do the best for themselves and for the public. What is wanted is team work.

Wireless Waste.

ELSEWHERE in this issue we reproduce from the monthly *Journal* of the British Empire Chamber of Commerce in the U.S.A. some notes on the position and prospects of American trade in radio apparatus. Unhappy results have attended the operations of many wireless traders, especially of the smaller class, on this side of the Atlantic during the last few years, and the *Journal* shows that credulous people in the States have been suffering from the misfortune that has followed the exploitation of the speculative possibilities of the business there. Losses running into many millions of dollars have been experienced by those who put their money into the innumerable new companies. In this country there have been few public issues of capital on the large scale, and those that have taken place have been made on the basis of recorded results which may continue to be satisfactory for a time, but the electrical trade generally is more directly interested in the weekly arrival of new concerns, small it is true in the great majority of cases, and the weekly departure of traders or companies who have not managed to make a success of their operations, thus saddling those from whom they have made their purchases with a substantial volume of wireless bad debts. We may hope with the writer of the notes referred to that sooner or later the business will settle down on to a plain commercial basis. While the possibilities of the trade are still almost unlimited, it must be recognised as one of the inevitabilities that organisations which are badly financed and poorly managed "will pass out of existence," as they ought to do. Unfortunately, the trade suffers as well as the bad managers and the optimistic financiers—perhaps sometimes more so. That is why the movements for the safeguarding of the trade and of the traders of the country should receive support. The radio-apparatus trade has reached immense proportions in a remarkably short time, and that circumstance, together with the great inherent attractiveness and popularity of "listening-in," and the constant technical changes and improvements, have brought quick losses to some and quick fortunes to others. We hear more of the former than of the latter, but that is only natural. That the present situation in the trade is unsatisfactory is unquestioned. The problem is two-fold: the British manufacturer of material asks for the safeguarding of his business against the extremely low-priced competition from abroad; yet while these very cheap lines are in the shop-windows in their thousands, British retailers ask for support for their movement against price-cutting amongst their own class of trader. We published a letter from the chairman of the Wireless Retailers' Association in our last issue, in which the subject of increased trade discounts was discussed, and we now have before us a list of 119 firms of manufacturers who have already agreed to support the movement of that Association for dealing with undercutting. The list is to be officially published, and dealers are invited to place before the Association any price-cutting information that may come before them. It is hardly to be expected that permanence or finality of anything radio can be introduced at this stage, but stability and security for the industry are its most pressing and essential needs.

Problems of Trade and Industry.

INCLUDED amongst our commercial and industrial matter this week is a series of contributions relating to expert investigations of some of the most pressing problems affecting the life of the nation. "The Survey of Overseas Markets" which has been issued by the Balfour Committee on Trade and Industry should be in the hands of every present or prospective export trader. It will be of service to keep on the shelves as a work of reference, but before it is placed there its contents should be digested by those directly engaged in foreign trade activities; trade associations will doubtless make profitable use of it in the interests of their members. The statement by a Committee of the Federation of British Industries on the propositions to introduce subsidies to industries in place of doles to individuals, is interesting. It views any general subsidy scheme with marked disfavour for the very good reason that the progressive manufacturer may be placed at a disadvantage through the assistance rendered to the concern resting in a rut of inefficiency; but it indicates substantial reasons why the principle may be applied in particular industries to the national advantage. The third contribution which the student of industrial subjects will do well to read, is the statement made by the Federation in connection with the findings of its Economic Staff regarding some of the factors which have produced our present trade position.

Municipal Engineers and their Committees.

FEW engineers and managers of municipal electrical undertakings can adopt a definite policy without fear that changes in the *personnel* of the Committee or the Council may imperil its continuity. The most satisfactory systems are those in which the "chief" and the chairman of Committee have kept close company for many years together. Stability, harmony, and progress are possible under such circumstances. The chairman who knows a good engineer when he sees him will place confidence in his technical and other expert recommendations, and the engineer who has a wise and capable chairman knows that he can rely upon sound judgment being brought to bear when his propositions have to be considered from the standpoint of public policy. Nobody who has had an opportunity to study municipal electrical activity in this country at close quarters will suppose that relationships between engineers and their

councillors have always been, or are now, entirely happy. Indeed, there have been plenty of cases where things have been quite otherwise, but it must be admitted that of late one has heard fewer complaints of chiefs being eager to change over from municipal to private service. Perhaps electrical engineers are accorded a higher status than formerly in the local estimation as their undertakings grow in importance; perhaps councillors are more alive to the unwisdom of interfering with the details of operations requiring very specialised training and knowledge that they do not possess; possibly engineers themselves show a more accommodating spirit. But whatever the reason, we believe that discontent is rarer than it once was. We suppose that few things are so hampering to an engineer as uncertainty regarding the mind or the "policy" of his committee. However anxious he may be to make headway, there will be a brake upon his enterprise unless he can rely upon a consistent backing when he gives a sound lead.

The Sydney Engineer and his Aldermen.

In making the above comments, we are moved to express our sympathy with Mr. Forbes Mackay, the city electrical engineer of Sydney, New South Wales, who, if Press reports be correct, has been suffering from the disadvantages which sometimes attend changes in the Council. He complained recently that he was harassed in the performance of the duties of his office by the delays of the City Council in dealing with his recommendations. He quoted specific instances, to which we refer below. After matters had passed the Electricity Committee they were held up by the Council, and the efficient working of the department was hindered. In his criticism he had the support of the Town Clerk, who said that there had been occasions when not weeks, or months, but actually years, had been allowed to elapse before the Council had given its decision. Some of the Labour aldermen waxed indignant at the thought of a mere paid official daring to criticise their action or inaction, but another alderman held that it was in the best interests of the citizens that the senior officers of the Council should be at liberty to bring forward such a criticism if the work of their department was unreasonably interfered with. Mr. Mackay was allowed the special privilege of replying to his critics in the meeting, and from the Press reports to hand it appears that he had no difficulty in combining a full justification of his complaint with a reasonable appeal for the avoidance of delays. The Town Clerk's view was that if departments were to be efficiently controlled the Council must co-operate with the officers in charge of them by dealing expeditiously with the recommendations that they brought forward. But all the publicity given to the matter did not incline the Labour aldermen to drop their hostility, and they rejected Mr. Mackay's report.

Now for aldermen or city councillors to presume that their official position renders them immune from criticism is laughable. In our opinion, Mr. Mackay and the Town Clerk fulfilled a public duty by revealing what had been happening. In 1922, it seems, there was delay in filling the appointment of power house superintendent, and subsequently against the engineer's recommendation it was filled only temporarily. In October, 1924, he recommended the appointment of a "Safety Officer," and that matter had not been dealt with down to May last. Last December he reported a case of indiscipline in the department, but it had not been dealt with in April. Therefore, in the mildest of words, he said: "The work of the officer in charge of the Electricity Department is sometimes made more harassing than seems necessary by delay in finalising matters . . . brought forward by the head of the department."

The hopeful feature of the situation is that the aforesaid aldermen are annoyed that the matter has received so much publicity. The vigilance of the public, if it can be aroused, is a stimulus to efficiency, and that vigilance is frequently aroused by the ventilation of grievances.

An Engineer shall Lead Them.

The Sydney matter is interesting enough in itself, but it will probably give rise to many reflections in the minds of Mr. Mackay's *confrères* in this country who are faced with their own peculiar local circumstances. Everybody recognises that the question whether a borough electrical engineer and manager is or is not head over his own undertaking may depend largely upon personality or popularity. Given a weak man, his committee will manage him and manage his department too,—perhaps mismanage it. If he be a strong, sound, capable man he will co-operate with them if he can, and only manage them if he must. The engineer whose efforts to carry on successfully are deliberately thwarted by his elected employers can only speak in the Council chamber by consent. In the presence of the Council he is required to sit and listen in silence; only at his peril will he rise to his feet, or while seated throw out a hasty remark, impetuously to pay back in their own coin the duly appointed representatives of the people, however absurd their statements or misstatements. It is in the committee-room, or through the medium of his committeemen or other councillors, that he must ventilate his feelings and justify himself. Men have lost their "jobs," or have had to resign before they were ready to do so, after committing the unforgivable sin of taking the floor without permission. We have heard whispers of engineers of strong will and personality who rule their committees as with a rod of iron; others gently persuade them—so much depends upon the committee and so much upon the man. Some officials "sing small," curry favour, and even go against the dictates of conscience, in order to preserve peaceful relations; but they can never hold themselves in very high esteem for so doing—nor does anybody else whose opinion is worth having. On the whole, the courageous course as adopted at Sydney seems to be the right one because it was necessary that somebody should protest when the efficiency of the public service was suffering.

Monorail Trains Again.

Under this heading, with the subtitle "An Old Invention Perfected," a correspondent of the *Morning Post* states that Mr. Louis Brennan has "perfected the gyroscopic monorail system of transport," and quotes the inventor's glowing account of its virtues. We gave some particulars of the system 18 years ago and on later occasions; the fundamental idea is to maintain an electrically-driven coach upright on a single rail by means of a gyroscope. That this can be successfully accomplished is certain, but whether it is a practicable proposition is quite another matter. "All things are possible unto us, but not all things are expedient," and the monorail system, we think, falls in the latter category. We said in 1907: "As a 'scientific toy' . . . the Brennan monorail car is highly interesting; but that is probably the extent of its usefulness" and we have not modified that opinion in the interim.

A monorailway was actually installed in Ireland which did not employ gyroscopes; stability was secured by the use of two auxiliary rails, so that in reality it was a three-rail line. It was abandoned many years ago. On a line which, we believe, is still in operation in Germany, the cars are suspended from a single overhead rail, so that the system is inherently stable. Most extravagant claims were made for the Behr monorailway, which was to have been built from Manchester to London, but that project did not materialise. In point of fact, there is no need for such schemes, no matter how ingenious they be; the sweet simplicity of a track with two running rails and no stabilising mechanism but gravitation renders it immune from attack by any other railway system, and the only competitor that it has to fear at present is the open road. Mr. Brennan is putting forward his system for "Empire development," and does not advocate its use in densely populated countries such as this; his discretion is commendable.

D

Electricity Supply from the Pit Head.

The Pooley Hall Colliery Co.'s Undertaking.

A GREAT deal has been said in recent years regarding the advantages of generating electricity at the pit-head instead of carting coal to a large number of generating stations situated at varying distances from the coal areas. While it has not been decided whether this would really effect the anticipated economies if carried out on a large scale, the principle has been adopted with success in a number of smaller instances.

One case which has been recently brought to our notice is that of the Pooley Hall Colliery Co., Ltd., which is supplying electricity to the town of Tamworth, Staffordshire. Just over a year ago a committee of the Town Council was appointed to consider the question of a supply of electricity for the borough. The company then offered to provide the whole of the necessary capital and contract with individual residents for a supply to them. The Corporation accepted this proposal, with a provision that it should be able to take over the scheme at any time after the expiry of four years from the signing of the formal contract with the company.



Fig. 1.—The Pooley Hall Colliery.

The undertaking was formally inaugurated on October 1st last year, and has since been forging ahead. Fig. 1 is a general view of the Pooley Hall Co.'s colliery; the interior of the power house is illustrated in fig. 2. The company is devoting special attention to the development of the domestic load. It has a very attractive rate for electric heating and cooking (1¼d. per kWh), and has recently instituted a scheme for the hire of cooking equipment at reasonable quarterly rates varying from 6s. for a large cooker to 1s. 6d. for a grill. In order to bring this scheme before the public of the district an electrical exhibition was recently organised. In this matter the company had the benefit of the assistance of the Credenda Conduits Co., Ltd., whose apparatus is being employed under the scheme. As a result of the exhibition, orders were booked for a total of 132 cookers, and it is possible that another 40 will be required in connection with a local housing scheme.

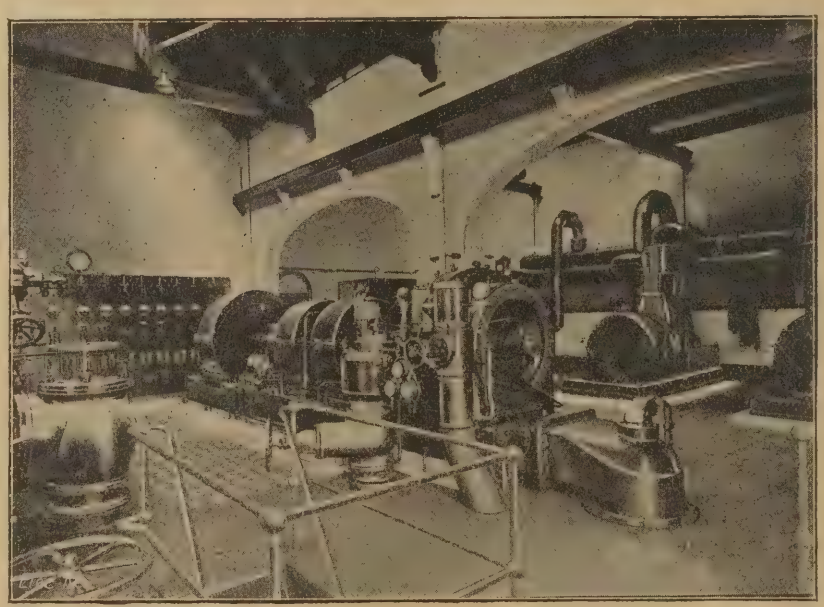


Fig. 2.—The Pooley Hall Power House.

The exhibition is illustrated in fig. 3. In addition to the Credenda Conduits Co., whose display is seen in the background, a number of leading electrical companies held stands. Reference is made to these in our "Business Notes" section. There were also two special exhibits, one of which was a "Hopkinson" electrically-driven coal-cutter, as used at the Pooley Hall Colliery, and the other an exhibit of applications of electricity to farming.



Fig. 3.—A View of the Tamworth Exhibition.

At the opening ceremony, Col. Chaytor, the chairman of the company, outlined the purposes of the exhibition, and mentioned the company's hiring scheme. The Mayor of Tamworth said that the rate for heating and cooking was a great concession for a town of the size of Tamworth. He congratulated the company on having connected up nearly 1,400 consumers since the inauguration of the supply.

The accomplishment of the company is indeed a matter for congratulation when it is seen from the last "Municipal Year Book" that the population of Tamworth is only just over 8,000. Not many towns can show such a large proportion of electricity consumers.

The Science Exhibits at Wembley.

The Royal Society's Display in the Government Pavilion.

(Concluded from page 85.)

The Atom.

Sir Joseph Thomson, O.M., F.R.S., is showing pparatus by which the existence of electrons was de-ected and their mass and velocity measured, and Sir rnest Rutherford, O.M., F.R.S., deals with some spects of radio-activity and their bearing on atomic tructure, including the production of radium emana-ion; the discovery of the nature of alpha particles, ounting and scattering them; and the artificial disin-egration of elements, &c. Mr. D. R. Hartree exhibits odels, made at the Manchester University physical aboratory, illustrating atomic structure.

Clarendon Laboratory, University Museum, Oxford Prof. F. A. Lindemann, F.R.S., Mr. T. C. Keeley, nd Mr. E. Bolton King) demonstrates a method of aking audible the movement of α- and β-particles n an electric field. Owing to the larger mass of α-articles, as compared with β-particles (7,000 to 1), oth of them, in spite of the difference in speed, possess uch the same energy. When one of these particles trikes an atom, it usually breaks off one or more of the uter electrons, leaving the mutilated atom (or ion) ith a positive charge. In an electric field these ions ove, thus transferring charge and thereby forming an lectric current. If the field is strong enough, the velo-ity of the ions rises to such a high value that they hemselves can break electrons off other atoms, forming ew ions which in their turn repeat the process. In his experiment, so powerful a field is maintained be-ween the two electrodes, that the ions formed by one ingle α- or β-particle produce sufficient new ions to ive a momentary current, which, when amplified, orks a loud-speaker.

Slow Oscillations.

The apparatus exhibited by the N.P.L. (Mr. D. W. ye) in this section consists of a triode generator of udio-frequency currents, a resonant circuit and various ndicating devices; currents from this source are made o flow through an inductive coil, and the resulting agnetic field is used to demonstrate resonance and elective absorption, and heating, directive, and coustical phenomena. The G.E.C. research labora-ory shows thermionic rectification, including an xperimental high-power rectifier for use on a 30,000-olt supply; the copper anode is cooled by a water acket, the electron emission from the filament being ver 5 amperes.

Gamma- and X-rays.

Mr. F. D. Edwards illustrates the beautiful effects btained by passing an electrical discharge through a ft. 6 in. glass tube during reduction from atmospheric ressure to high vacuum. A number of Crookes' and ther tubes are shown.

The National Physical Laboratory (Dr. E. A. Owen) emonstrates the penetration of metals by X-rays, and r. G. W. C. Kaye shows visually the relative trans-arency to X-rays of some half-dozen elements ranging rom carbon (graphite density 1.6) to lead (density 1.4), while the Röntgen Society has arranged a display f historic X-ray tubes selected from the collection at the cience Museum. Sir W. Bragg, K.B.E., F.R.S., llustrates the analysis of crystal structure by X-rays ith the aid of his ionisation spectrometer, a Müller pectograph and models representing the arrangement f the atoms in crystals.

Ultra-Violet Rays.

In this section the Clarendon Laboratory, University Museum, Oxford (Prof. F. A. Lindemann, F.R.S., and Messrs. T. C. Keeley and E. Bolton King) shows Schu-mann X-rays. The energy of electrons ejected from metals under the influence of radiation is equal initially to the energy of the quantum of the radiation concerned; this quantum is simply proportional to the frequency, so that red light ejects comparatively slow electrons, whereas violet light ejects electrons of twice the energy, or $\sqrt{2}$ times the velocity. If the metal exposed to the light is insulated, on losing electrons it acquires a positive charge which attracts the electrons and tends to slow them up, ultimately, when the charge is high enough, preventing them from escaping altogether. Hence, an insulated piece of metal will acquire a charge proportional to the frequency of the incident light. It is shown that an insulated electrode connected to an electrometer acquires a charge of some three volts when exposed to visible light. When exposed to radiation produced by stopping electrons the velocity of which corresponds to a potential drop of some hundred volts, the electrode charges up to a potential of the same order as that producing the radiation. Under the influence of X-rays, the electrode charges up to thousands of volts, and the radiation shown in this experiment is therefore of a frequency intermediate between X-rays and the ultra-violet. This is the region of the spectrum which in ill-informed circles is said to include the "death-ray." The whole experiment has to be carried out in a vacuum, as the slightest trace of air entirely absorbs radiation of this frequency.

Visible Rays.

The exhibit of the Clarendon Laboratory, Oxford, under this heading is designed to show that the emission of electrons under the influence of light, *i.e.*, the photo-electric effect, can be applied to a large number of scientific and industrial uses which involve comparison and measurement of light intensities, while Mr. T. H. Harrison indicates the method of colour matching that has been developed by the G.E.C. research staff and is being adopted at the N.P.L.

Prof. F. Horton, F.R.S., and Dr. Ann C. Davies show the excitation of the spectra of gases by electron impacts. The apparatus consists of a small glass vessel supported between the poles of an electromagnet. The vessel contains the gas to be experimented upon at a low pressure, usually a few tenths of a millimetre, and sealed into it are two parallel, lime-coated, platinum filaments which are heated electrically, one at a time, and supply the electrons for the bombardment of the gas. A short distance beneath the two filaments a circular grid of fine mesh platinum gauze is situated, while a circular disk of platinum is placed parallel to and concentric with the grid at a distance of about 1.5 cm. from it. The electrons from the filament are accelerated towards the grid by means of a potential difference supplied by a battery connected to these two electrodes outside the apparatus. Some of the electrons pass through the interstices of the gauze into the space between the grid and the disk, where they collide with gas atoms. The production of luminosity results from the recovery of the atoms after such impacts, and the magnetic field in which the apparatus is situated concentrates the luminosity into a bright central column between the grid and the disk; by watching for changes in the spectrum of the luminosity as the potential difference applied between the filament and the grid is gradually increased, the voltages necessary for the excitation of different groups of lines can be determined. For such an investigation, the grid and the disk would be connected together outside the apparatus.

Solar and Terrestrial Radiation.

This exhibit constitutes a link between the purely physical and geophysical sections, and is arranged to illustrate recent British contributions to meteorology, terrestrial magnetism, and atmospheric electricity (Dr. C. Chree and Mr. C. S. Wright) and seismology.

Conclusion.

In the botany section Prof. V. H. Blackman, F.R.S., shows electrical apparatus for determining the amount of water lost by a potted plant in the process of transpiration and for recording the rate of growth, while Dr. E. D. Adrian, F.R.S., has on view a selection of electrical measuring devices for research in physiology. The undermentioned firms have provided instruments and apparatus for demonstration purposes:—B.T.-H. Co., S. G. Brown, Ltd., Cambridge Instrument Co., Cox-Cavendish Co., Dubilier Condenser Co., Edison Swan Co., W. Edwards & Co., G.E.C., Adam Hilger, Ltd., M. O. Valve Co., Marconi's Co., Metropolitan-Vickers Co., Mullard Radio Valve Co., W. G. Pye and Co., Siemens Bros., H. W. Sullivan, Ltd., H. Tinsley and Co., Watson & Sons (Electro-Medical), Ltd., and the White Electrical Instrument Co., Ltd.

The Errors of Potential Transformers.

By G. W. STUBBINGS, B.Sc., A.Inst.P.

IN a previous article the writer dealt with the determination of the errors of series transformers by comparison with a standard transformer having known errors, and using apparatus of a kind found in test rooms of moderate size.* The method of comparison is very suitable for the determination of the errors of single-phase potential transformers, and the present article deals in detail with the conduct of such tests. It is assumed that there is available a standard potential transformer of identical ratio with that of the transformer to be tested, the errors of which are known when loaded with a voltmeter and a wattmeter potential coil. A single-phase induction meter can be substituted for the wattmeter if desired, and this will be quite suitable for the quadrature adjustments.

The errors of potential transformers are, as a rule, much smaller than those of series transformers, in that the applied voltage is practically constant, and the condition corresponding to a relatively small fraction of full-load current of a series transformer does not obtain. The secondary voltage will always be less than the primary voltage divided by the turns ratio, but it is possible to compensate for this ratio error for a given secondary burden with great exactitude by adjustment of the number of primary turns. The phase shift of the secondary voltage cannot, however, be corrected, nor is the direction of this



Fig. 1.

phase shift almost invariable as is the case with a series transformer. Referring to fig. 1*a*, we here have the vector diagram for a transformer with a non-inductive secondary burden. The exciting current i_e may be comparable in magnitude with the secondary current i_s but, as it traverses the primary winding only, it may be taken to cause one-half the drop of a similar current in the external circuit. The impedance drop in this case leads the secondary voltage, and the phase error of the transformer is lagging. In fig. 1*b* the secondary burden is inductive, as would be the case with the pressure circuit of an induction meter. In this case the lead of the impedance drop on the total equivalent current is less than the lag of this current and the primary vector lags the secondary.

The principle of the method of comparison will be clear from a consideration of fig. 2. The standard and the test transformers are each excited from the same e.h.p. voltage, the secondary of the former being connected to a voltmeter and a wattmeter, the latter being connected to its normal burden. The difference voltage is impressed on the potential coil of a second wattmeter, which can be excited by currents in phase with, or in quadrature with, the secondary voltage of the standard transformer. If w_1 i_1 and w_2 i_2 be the watts and current corresponding to these conditions with a secondary voltage v_s, then it is easy to see that the difference in the percentage ratio errors of the two transformers is $100w_1/i_1\ v_s$, and the difference in their phase angles is $w_2/i_2\ v_s$ radians or $57.3\ w_2/i_2\ v_s$ degs.

The diagram of connections, fig. 4, shows how this test can be carried out without the use of any special apparatus, and there are only one or two points requiring comment. The e.h.p. supply to the two trans-



Fig. 2.

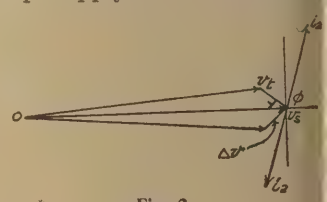


Fig. 3.

formers will probably be obtained from a third potential transformer inverted. The volt-ampere loading of the step-up transformer will not only include the secondary loads of the two transformers being compared, but also their exciting currents. There may, therefore, be a considerable drop in the step-up transformer, resulting in a h.p. voltage well below normal. If the iron of the transformers is worked near saturation, the exciting current may be comparable with the load current, and, moreover, the magnitude of the exciting current will be very sensitive to voltage changes. For this reason it may be necessary to give a small boost to the h.p. voltage on the transformers being compared, so that normal pressure, as indicated by the voltmeter connected to the standard transformer, is obtained. The method of boosting, by the use of an auto-transformer with a number of taps, is easily understood from the diagram. Failing an auto-transformer, some sort of potentiometer connection can easily be arranged to give the required boost, care being taken that the boosting voltage is from the same phase as supplies the h.p. side of the step-up transformer.

The method of obtaining the exciting currents for the difference wattmeter calls for a few remarks. From the diagram it will be seen that a 3-phase supply is available, and a bank of lamps, connected in star, is used to obtain the required currents. The position of the star point can be varied, by means of a slider rheostat, to obtain zero reading on wattmeter W_1, this indicating that the exciting current is in quadrature with the voltage v_s. To obtain the in-phase current, one leg of the star is switched out, the remaining legs of the star being in series across the phases supplying the step-up transformer. Provided there is a negligible phase shift in the step-up transformer, the exciting current so obtained will be nearly in phase with v_s. This can be tested in the following way: When the quadrature adjustment has been made, the potential on W_1 and V is

* ELEC. REV., April 18th, 1924.

changed over to the supply to the step-up transformer. If v_s, i_s, w_s are the watts, current, and voltage respectively under these conditions, $w_s/i_s v_s$ will give the sine of the angle of phase shift, and, if necessary, the determinations of ratio error difference can easily be corrected for the departure of the exciting current from the in-phase condition. Regarding the ratio test, it need hardly be said that the pressure circuit of w_1 should be opened before switching over the exciting current, if this be above the full rated current of the instrument.

The accuracy obtainable by this method is usually greater than with the corresponding method for series transformers, as only one voltage has to be dealt with, and this will usually be the full rated voltage of the wattmeter. If double full load current can be used for wattmeter excitation, 0.2 per cent. of the full scale reading on w_2 will correspond to a voltage difference of 0.1 per cent. Thus, differences in ratio error of 0.1 per cent., and of about 3½ minutes of phase angle, are easily observable with a suitable wattmeter.

The readings of the difference wattmeter will not indicate whether the errors of test transformer are greater or less than those of the standard. The direction of the difference can be determined by temporarily switching on to the test transformer a considerable extra non-inductive load, say, a 100-V 32-c.p. carbon-filament lamp and observing the effect on the difference wattmeter reading. The additional load will diminish the secondary voltage, and if therefore, for the ratio test, the reading of w_2 is increased by this extra load, this will indicate that the secondary voltage of the test transformer for the normal burden is less than that of the standard. If, however, the reading of w_2 is diminished or reversed, the standard transformer will have given the lower voltage. The same procedure applies to the phase error test. The effect of the non-inductive burden is to cause a lag of the secondary voltage. If, therefore, the connection of the additional load diminishes or reverses the reading of w_1, the test transformer voltage will have been leading that of the standard, and *vice versa*.

Modification of the connections to suit a 2-phase supply will not be difficult. It will, however, not be easy to obtain sufficient current in quadrature with the supply voltage when only a 1-phase supply is available, unless additional complications are introduced. If, however, by the use of choke coils the maximum permissible current of the wattmeters can be obtained with a lag of over 60 degrees, the phase error can be obtained easily by a short additional calculation. When the difference wattmeter is excited by the lagging current, the readings of w_1, V and A will enable the angle of this lag, ϕ, to be determined. Fig. 3 is the vector diagram for these conditions, i_2 being the exciting current of the wattmeter. The reading of w_2 is then given by—

$$w_2 = i_2 \triangle v \ (\sin \gamma \sin \phi \pm \cos \gamma \cos \phi).$$

The positive sign applying when v_t lags v_3 and *vice versa*, then $w_2/i_2 v = a \sin \phi \pm r \cos \phi$,

where a is the true phase angle difference in radians, and r is the ratio fractional difference as determined by the in-phase test. From this expression, a can be calculated, but the correction for the phase shift, if any, of the step-up transformer will be more difficult to make. The effect of an additional non-inductive burden will be to increase the lag of v_t and to diminish the reading of w_2 if the voltage of the test transformer leads that of the standard—the same rule applying as when a true quadrature current is used. The effect of the additional load will enable the requisite sign of $r \cos \phi$ in the above expression to be obtained.

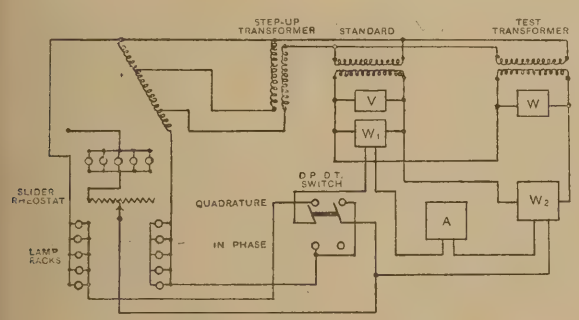


Fig. 4.

The effect of h.p. protective resistances on the errors of potential transformers can easily be determined by the method described above. If, however, the characteristics of the secondary burden and of the exciting current are known, these effects can easily be calculated. If the secondary current be i_s and its phase angle θ, the exciting current referred to the secondary i_e, with a phase angle β, and R the total resistance in series with the transformer, the phase error is $\frac{R}{n^2 v_s}(i_e \sin \beta + i_s \sin \theta)$ radians, the voltage on the transformer leading the supply voltage.

The ratio error is—

$$\frac{100R}{n^2 v_s}(i_e \cos \beta + i_s \cos \theta) = \frac{100R}{n^2 v_s}(w_e + w_s),$$

n being the ratio of transformation, and w_e and w_s the exciting and secondary watts respectively.

The case of three resistances for two potential transformers connected in open delta is not so simple, since the current in the resistance in the common lead is not in phase with that in the others. Knowing the ratio and phase errors occasioned by a single resistance in series with the primary, it is easy to calculate the total effect of the two resistances in circuit with each transformer. If r be the ratio error of the single resistance expressed as a fraction and not as a percentage, and a the phase angle in radians, then for the blue transformer, the equivalent errors are given by—

$$\text{Phase error} = \left(\frac{2+\sqrt{3}}{2}a + \frac{r}{2}\right) \text{ radians},$$

$$\text{Ratio error} = 100\left(\frac{3}{2}r - \frac{\sqrt{3}}{2}a\right) \text{ per cent.}$$

For the red transformer—

$$\text{Phase error} = \left(\frac{2+\sqrt{3}}{2}a - \frac{r}{2}\right) \text{ radians},$$

$$\text{Ratio error} = 100\left(\frac{3}{2}r + \frac{\sqrt{3}}{2}a\right) \text{ per cent.}$$

Referring again to fig. 1, it is readily seen that if the resistance and impedance of the transformer are known, in addition to the data regarding exciting and secondary currents, the total phase error of a single-phase transformer can be calculated from the formula—

$$a = \frac{z}{v}\left\{\frac{i_e}{2}\sin(\beta - a) + i_s \sin(\theta - a)\right\} \text{ radians},$$

z being the impedance of the transformer with a phase angle a and β the lag of the exciting current. The impedance data can be obtained by ordinary short circuit and resistance tests, if instruments of the required ranges are available. Unless the exact turns ratio is known, it is not possible to obtain the ratio error directly by this method.

B.E.S.A. Specifications.—The British Engineering Standards Association has issued the following specifications:—

No. 218, 1925, for brass bars and sections suitable for forgings and drop forgings. The copper content of this material is specified to be not less than 58 per cent., and the minimum tensile strength 20 tons per square inch with an elongation of not less than 25 per cent.

No. 219, 1925, for soft solders. This covers nine grades of tin-lead solder intended for electrical purposes, tinsmiths' and coppersmiths' work, steel tube joints, lead cable wiped joints, &c. Typical purposes for which the various grades are particularly suitable are mentioned in the table of analyses.

Copies of these new publications can be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d. each, post free.

Electricity at the Royal Agricultural Show.

Practical Demonstrations of Electrical Methods of Farming.

(*Continued from p. 86.*)

The main purposes for which electric power was demonstrated on the Chester showground in connection with farm pursuits were: refrigerating, milking and milk cooling, corn grinding and milling, conveyors, ploughing, mole draining, cultivators, winnowing, barley dressing, seed cleaning, churning and separators, thrashing machinery, water pumping, pasteurising, barn machinery, bottle washing, bacon slicing, oil refining, crop drying, lighting, heating, fans, and for general purposes.

The Institute of Agricultural Engineering of Oxford University aroused great interest by the employment of electric power for driving a blower which forces hot air into a stack of green material such as grass or cereals, for the purpose of artificial drying. The power consumed for this purpose is in the neighbourhood of 20 h.p. This demonstration shows the convenience of the use of electricity for this purpose. Tractors can also be used for the work, but where electric power is available, it is much better, on account of its being more reliable than the ordinary tractor, and free from fire risk.

An Electro-Farming Conference.

On the second day of the Royal Show an Electro-Farming Conference was held. The attendance of agriculturists was poor, having regard to the importance of the subject to be discussed and the expertness of the various speakers. Lord Bledisloe presided and said that the Conference had been called by the Electrical Development Association at the suggestion of Mr. R. Borlase Matthews. If their Continental and Transatlantic competitors were using electricity with good results, then British agriculturists would have to do the same, to improve the economic condition of agriculture in this country. Even the up-to-date experienced and enlightened farmer would approach the subject cautiously. He asked to be satisfied that electricity on the farm was a sound commercial proposition, likely to be profitable to him. It might be suggested that conditions were quite different in this country from what they were in Denmark and South Sweden, where electricity provided the bulk of the power, but it had to be admitted that this form of power was useful for a greater number of purposes than had been yet conceived. As an agriculturist, he felt that farmers had to move cautiously, but at the same time move forward. He had electricity on his farm for the purpose of grinding barley for his pigs, and he was now installing power for the mixing of pig foods. He calculated that the latter machine would save the services of one and a half men, and do the work more efficiently.

Mr. S. E. Britton then opened the discussion with a short paper on the use of electricity in agriculture, of which the following is an abstract:—

It is the custom of the Royal Agricultural Society to invite competition at its annual shows in specified classes of implements. These trials serve to direct the public mind to the development of the mechanical aids to agriculture which is continually in progress. Up to now the Society has not seen fit to invite competition involving the aid of electricity in agriculture. This meeting may be the means of a change in that direction. As each new form of power is evolved the question of its application to agriculture invariably follows, the inference being that the farmer is not satisfied with manual and horse power, and thinks there will be a more suitable substitute at his disposal ultimately.

There is a growing number of people who think that electricity will eventually be the power used on the farm. Whatever be the inherent good in associating electricity and agriculture, progress will be difficult, slow and costly, so long as there is no established route whereby the farmer and the electrical engineer can approach this subject on equal terms.

Although it has been possible to obtain powers to supply over wide areas both in bulk and to authorised distributors since 1900, very few supply authorities have attempted to supply in rural areas. Electricity cannot be taken into such areas by any other means than overhead lines if the supply is to be given at cheap rates, and every obstruction to the granting of consents tends to increase the cost and the price at which electricity can be sold. In negotiating wayleaves, distributing authorities must give the utmost consideration to the wishes of the land-owner and the occupier, and the purpose the land is put to.

Briefly, the present condition of the electricity supply industry, and the use of electricity in agriculture, is as follows:—

1. The Electricity (Supply) Act, 1919, enables electricity to be taken into the rural districts.
2. The conditions governing the setting-up of Distribution Authorities are not satisfactory or conducive to the most economical supply being given in rural districts.
3. There is an economic problem to be solved, to enable electricity to be transmitted from the source of supply to the potential users in the rural districts.
4. The Electricity Commissioners' Rules and Regulations governing the construction of overhead transmission and distribution lines set up too high a standard of perfection, thereby increasing the cost of overhead lines.
5. There is no technical or engineering problem to overcome in the application of electricity to the homestead for lighting, heating, cooking, and power in the house, the dairy, the shippon, the barn, the hen-house, the yard, and for the supply of water.
6. Practical demonstrations of electricity on the land for ploughing, cultivating, reaping, and the treatment of crops, have already been made. The results obtained, if not absolutely perfect, promise an early solution and the development of suitable electrical apparatus for such operations.
7. Electroculture is an extremely fascinating subject. It is being carefully explored by scientists, in the hope of developing something practical for the farm.
8. The cost of generating and distributing electricity under specified conditions is not difficult to ascertain. It is important to know how much the farmer can afford to pay for electricity for the various uses to which it can be economically applied. When that is ascertained a suitable tariff can be formulated.
9. There is a lack of co-operation between the agriculturist, implement makers, and the electrical industry. An organisation to bring them together is urgently needed.
10. Experience has shown that there is no visible limit to the application of electricity to all purposes. But hitherto electricity has not been called upon to take its place in the attempt to solve such problems as the intensive cultivation of the land, or to secure the stability of the noblest of industries, agriculture.

In the discussion Sir John Russell said that it was for the electrical engineer to bridge the gap now existing between the position taken up by the agriculturist and that of the electrical engineer. The latter had to bring his inventions down to the level at which they established contact with the farmer. For domestic purposes, lighting, power, heating, the pumping of water, the working of bacon factories, dairies, light railways, &c., the advantages of electricity to the agriculturist were so obvious that all that had to be done was to solve the problem of how to get the electricity where it was wanted. A second group of problems involved the use of power for traction purposes, operating cultivating implements, driving machinery in barns, and so on. Finally, there was a group of problems which, as yet, had not emerged from the laboratory; he referred to the electrical treatment of crops, the sterilisation of milk, the drying of crops, &c. With regard to the use of electric power on the farm, whilst the problem might have been solved from the engineering point of view, he was not satisfied that it had been from the farmer's point of view. Engineers should remember that farming devices were not worked by men of a mechanical turn of mind: they were accustomed to dealing with animals. Electrically-operated machinery intended for the farm must embody certain features which, to the skilled engineer, might appear unnecessary. The farmer had an incurable habit of leaving his machines out-of-doors and not lubricating them; electrical engineers had to think in terms of the men who were addicted to these habits. Again, electrical machinery must be flexible. If comparison were made between the cost of a unit of power, electricity and horse—electricity had an enormous advantage, yet the farmer continued to make great use of the horse. At Rothamstead it had been shown that the cost of ploughing an acre of land by tractor was considerably less than by horse: yet the horse was not being displaced to any great extent by the tractor. There was a time after the war when the tractor went ahead, but now there was a tendency for the horse to come back again, because the horse was a flexible unit which could do many classes of work. It would take a great deal of work on the part of the engineer to get the farmer to adopt electricity sufficiently to cope with the harvest and yet be able to employ it generally during the year. Electricity must be cheap. Farm machinery was not in use all the time. There might be weeks when it was lying idle, and the farmer could not afford to incur a big outlay on plant which did not show the probability of an early return. It was obvious that some jobs about the farm could very well be done, and would be done by electricity, and he expected considerable developments as soon as power was available. He referred specifically to machinery for cake

breaking, root-cutting, and other tasks which had to be done daily, regarding that as the most hopeful line of approach. Farmers usually hired thrashing machines, but there was a tendency for them to acquire their own instruments, and that held out the possibilities for an increasing use of electricity. He was not so hopeful with regard to the use of electricity for cultivating purposes. Farmers had to face the unknown factor of depreciation in expensive electrical equipment. In the use of tractors for ploughing purposes, depreciation turned out to be much heavier than was expected. It was a problem to which engineers must devote attention. The application of electricity to the drying of crops was now being studied; experiments had been made on a number of farms. This was a thing to watch, but not to advocate yet to farmers. The use of electricity for stimulating crop growth had been studied in great detail at Rothamstead. There had been increases in yields up to 20 per cent., but they did not know how these results were obtained. They could never say beforehand whether an increase could be obtained or not. They did not know when to apply electricity, or how long, or whether to apply a.c. or d.c. The possibility of reducing friction in ploughing by the use of electricity had been engaging attention, and favourable results had been attained. Engineers should bear in mind all the time that farmers had an economic problem to solve. As soon as it was directly obvious that electricity was cheaper and better than power from oil engines, they might expect to see progress.

Mr. BORLASE MATTHEWS said that on his 600-acre farm there were 67 applications of electricity, and he had only two horses. In the agricultural industry there were 200 applications of electricity. He thought they were at the beginning of an electrical era in agriculture. On the farms of the world there were nearly one million farmers using electricity; in this country there were only 400, but he hoped that within a year this number would be doubled. Electricity was used largely in every national industry except farming, and he considered that its possibilities in that connection should be investigated to determine how far it could be successfully applied. He agreed that the problem was a commercial one. One of the main avenues for the employment of electricity on the farm was for the lighting of stock sheds. It saved time every day. On dairy farms it paid to have electric light; in a good light there was less milk spilt. The daily spillages in time amounted to more than the cost of a good installation. At the present time there were 50 poultry farms using electric light, and they had registered results 43 per cent. better than when none was employed. There were also possibilities in electricity for the market gardener. When seedlings were transferred they were apt to fall down and become wilted next day; he had found that, when electric light was applied overnight, the seedlings became fresh and vigorous next morning—in fact, they developed a week's growth overnight. Plants in this way could be brought forward in a wonderful manner. Daffodils had flowered in four days and narcissus in seven days. The application of electric light had accomplished three or four weeks' growth in four to seven days. The first thing the farmer should do was to equip his chaffing machines with power. Some farmers were also employing centrifugal dust extractors; the extraction of this small dry dust was much better for stock. For the pumping of water electricity might also be usefully employed, and when a supply could be delivered at a pressure of 30 to 40 lb., instead of the ordinary farm trickle, the benefits to the farmer were obvious. In the installation of plant, he agreed that the farmer required robust machinery, but this was already available in the squirrel-cage induction type motor, which did not demand much attention. There were two forms of electric motor—(1) the industrial motor and (2) the agricultural electric motor. The latter had been designed so that it could be safely left out in the open, and it could always run when the farmer wanted it to run. The life of the industrial motor was a long one; some little time ago he was on a farm where the farmer told him that his motor had been running 25 years, and he bought it second-hand then. Electricity was not, and never would be, used simply because it was electricity; it had to be shown that it was cheaper and better than any other form of power. The farmer was essentially a business man, and it was open to remark that there was no business in which there were so few bankruptcies as in farming. The farmer in the past had been often imposed upon by inventions which purported to do what they did not; hence the farmer now proceeded very cautiously, and, before associating himself with revolutionary devices, had first of all to be assured that he was on safe ground. That was one reason why the electrical engineer had to get into closer touch with the farmer to ascertain his precise needs.

Mr. J. W. BEAUCHAMP, director of the Electrical Development Association, mentioned that it was hoped to arrange similar electrical conferences in different parts of the country. He believed that there was an electrical appliance for every job on the farm.

Mr. HOWARTH, an agriculturist who is now using electricity on his 400-acre farm, said that the farmer was mainly concerned with the economic possibilities of various forms of power, and many of them were coming to realise that electricity was cheaper than either oil or gas engines. He had been using electricity for several years, and since becoming connected to the Chester Corporation supply system he had been surprised at the great economies which had resulted.

Mr. C. T. ALLAN, of the South Wales Electric Power Co., said that in South Wales the mains passed a lot of farms, 200 of which were connected, most of them being of about 50 acres. His method of approach was not to the farmer but to the housewife, who, after all, was the hardest-worked person on the farm. They endeavoured to interest her in electric light, electric ironing, electric washing, and so on. After that they tried to get the farmer to install a 3-h.p. chaff cutter. As regarded ploughing, he thought that the local supply authority should undertake to plough fields on contract.

Mr. G. YOSHIDA, electrical engineer, of Tokio, gave particulars as to what had been done in Japan in connection with electric farming.

Mr. WALKER, a member of a firm of farming implement manufacturers, said that if progress was to be made in electric farming, there must be co-operation between the electrical engineer, the manufacturer, the farmer, and the supply authority. In the United States there were experimental electric farms. A similar venture should be made here.

Sir JOHN RUSSELL supported this idea. He suggested that engineers should equip a dairy farm and let it be worked by farmers, in order that engineers might ascertain and adequately appreciate the attitude of the agriculturist.

(To be continued.)

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

American Underwriters' Laboratories.

Through absence from England I have got rather behind with my reading, so have only just seen the Editorial on "Standards of Quality and Performance" in the ELECTRICAL REVIEW for July 3rd, and the request therein for particulars of the experience of any reader with the Underwriters' Laboratories of the U.S.A.

As I believe the matter is one which should be of general interest to British manufacturers, I am glad of this opportunity of giving the experiences I have had in connection with the time switch business in which I am interested.

It was in 1911 that I first came up against the Underwriters' Laboratories. I use the words "up against" intentionally because that is exactly how I felt when faced with the discovery that I could not sell in a British Dominion—Canada—without the approval of an American concern. It roused my British pride and I felt very defiant about it, but my Canadian friends rightly pointed out that as our English insurance companies had handed them over to American offices, they had to comply with the latter's requirements and were not going uninsured just to please their own, my, or anybody else's patriotism. It is as well for us all, over here, to understand this point of view, as it will save a lot of ruffled feelings.

Having recovered from this first antagonism, my next shock came when my firm submitted for approval a time switch that incorporated a tumbler switch. To an Englishman, brought up on tumbler switches, it came like a bolt from the blue when I was told that such switches were not allowed. This perhaps points to one of the dangers of a National Proving House—it may become more national than proving. I suppose, at the time of which I am writing, I was not the only one having a dig at the Underwriters' Laboratories. I seem to remember Messrs. Berry Skinner having a tilt at them. Anyway, they proved themselves quite reasonable people and Mr. Dana Pierce, now their president, came over here, studied things on the spot, and appointed Messrs. Heap & Digby to represent them and test for them any British goods submitted. One outcome was that tumbler switches are now not unknown in the States, where they were soon being advertised as a great discovery. Another was that we got our time switches approved and, in general, things went along very smoothly as far as I know. Since the war, Messrs. Heap & Digby have ceased to handle this business and I have found it rather a difficulty to get approvals through. This, however, I am bound to say is not due to any obstacles put in the way from the other side, but rather to slackness and lack of common sense, or technical ability, on this. My first thought was that the B.E.A.M.A. would like to take action for the common good of its members, but it declined. In the end, the Underwriters' Laboratories deputed the Fire Offices Committee here to make the tests, we supplying current, instruments, and other facilities—not an easy matter where, as in this instance, a current of 300 amperes at 500 volts, d.c., had to be switched on and off 50 times at the rates of six times per minute. For special cases (and this happened to be one of them) there are no cut and dried rules, and rules relating to the nearest apparatus are taken as a general basis. This is where I found on this side a want of understanding and reasonableness which makes me hope that if ever we have a proving house in England it will not be under the control of the fire insurance people. For any further approvals I may want, I should send the articles straight out to the States, where they have the facilities for testing almost anything electrical and do not seem to be unreasonable in their requirements.

In general, I am not enamoured of the proving house idea. I have already given some reasons—and fears—but the main point, and one on which I think all manufacturers will be agreed, is that it will either stop progress or be generally disregarded. We never really reach finality in manufacturing; always there are little alterations being made—different materials being used, slight re-arrangement of parts and similar changes in materials, methods and design—so that very few articles would be as per sample submitted by the time the approval came through. Are we, therefore, to stand still lest we incur the rejection of our goods because a letter-of-the-law official notices a cheese-headed screw where a rose-headed one occurs in the approved sample?

Your hope that a "Proving House would furnish a very much more effective protection of British manufacturers against cheap foreign accessories" I am afraid would not be realised. "Approval" never has been, and, I think, never will be, a guarantee of satisfactory operation.

I hope I have made it clear that so far from finding it "almost, if not quite, impossible for a British or other manufacturer to secure the services of the Bureau," I have always experienced courtesy and fairness from the Underwriters' Laboratories. That there are difficulties cannot be denied, but these are due to the differences in ideas that one finds between one country and another. For instance, we have to use a type of terminal to comply with their requirements which we do not think is so good as our English standard. Possibly if more British manufacturers were involved, or the B.E.A.M.A. were interested, conditions might become easier.

Ernest E. Sharp.

London, S.W.1, *July 17th*, 1925.

Is There an Age Limit?

I have read with interest the letter in your issue of July 10th, by Mr. L. P. Ives, on the question of age limit, in connection with the procuring of appointments in the electrical profession. My advice to Mr. Ives is to keep it as dark as possible about his thirty-three years' experience when applying for posts. What seems to be wanted nowadays by most employers in the electrical trade is a young man who has had practically no experience whatever, and who has never held a really big post in the electrical profession, but is "full of beans," and open to take a post only fit for an experienced man at a salary about half the figure the experienced man deserves and is well worthy of. No doubt quite a number of such youngsters fill the bill, but even if they don't, it does not worry them much if they have to move on to another job, as they are always getting experience and have not much at stake.

I should advise Mr. Ives to abstain from advertising his age and experience too much when he is applying for a post, unless he is certain that the advertisers want, and would appreciate, a man of sound and lengthy experience in engineering, and would be willing to pay a suitable salary to such an applicant. The old catchword "too old at forty" appears to be too much thought of by electrical employers, but if they would only think of recent conditions and the often blank ten years, since the war broke out, as regards business experience, put in by many young men who were with the forces, they would alter their ideas as to the most suitable age for the men they appoint to responsible posts. It is surprising, the number of men of 50, or even 60, who are nowadays more fit, mentally, morally, and physically, than the present type of young man of 30. I take the liberty of subscribing myself,

"Too Young at Forty."

July 14th, 1925.

An Illustrated Course of Lectures.

We wish, through the medium of your paper, to express our hearty thanks to Mr. A. M. Parkinson, B.Sc., A.M.I.E.E., for his very interesting series of lectures forming the "Summer Course," for which he used the kinematograph.

We are pleased to hear that it is to be used in future lectures, and wish Mr. Parkinson and the Battersea Polytechnic Institute every success in these.

A. G. S.

Fulham, *July 15th*, 1925.

Definitive Units.

With regard to your editorial Note on "Definitive Units" in the June 5th issue of the ELECTRICAL REVIEW, I enclose a leaflet on "Octic" arithmetic.

Units based on the decimal system will always have limited usage. Until we change our base for calculating from ten to eight we will not have universal units. The persistence of the English money system is due to its binary divisions. Twelve as a base is just as objectionable as ten. The first contains the odd factor three, while the second contains the odd factor five.

However, I have no illusions regarding the probability of a change from ten to eight. Nothing less than a miracle, something wholly unexpected, will bring the change.

E. M. Tingley.

Chicago, Ill., U.S.A.
July 7th, 1925.

The Faraday Society.

The Electrodeposition of Zinc.

Now that the winning of zinc by electrolysis is in commercial operation and the method is likely to extend as time goes on, a study of the conditions under which good deposits can be obtained is of considerable interest and importance. A paper embodying a careful experimental research on zinc deposition from acid zinc sulphate solutions (which in practice have almost, if not entirely, replaced the chloride solution) was communicated to the Faraday Society on July 6th by Dr. A. L. MARSHALL, now in America. The work, which was carried out at University College, London, was primarily designed to obtain a closer insight into the effect of temperature on the characteristics of a zinc cathode and also to study the variation of current efficiency with temperature.

At first sight it would appear impossible to deposit zinc from an acid solution, seeing that zinc is far more electropositive than hydrogen and it would be expected to dissolve readily. It is only on account of the high discharge potential of hydrogen at a zinc electrode, its "over-voltage" to use the current term, that the latter is preferentially deposited at the cathode from a solution containing both zinc and hydrogen ions. If the zinc ion concentration is low, or the solution contains small amounts of other metal ions, the overvoltage may be so modified that hydrogen will be deposited more readily than zinc, and it therefore becomes important to study the potential effects at a single zinc electrode, using a standard hydrogen electrode for reference. Dr. Marshall has carried out a useful series of experiments on this point, evaluating the potential of the zinc electrode at various current densities, at different temperatures and with electrolytes of varying zinc content. In all cases the potential was found not to exceed a certain (negative) limiting value. An explanation based on chemical polarisation is put forward of the variations observed and also of the increase in efficiency of zinc deposition with rising temperature.

In the experiments to determine the effects of varying temperature, current density, and the concentrations of zinc and acid on the current efficiency of zinc deposition, Dr. Marshall employed an aluminium cathode placed between two peroxidised lead anodes. The composition of the electrolyte was kept approximately constant by adding pure zinc oxide from time to time. As was to be expected from the experiments with the single zinc electrode, there was invariably found an increase of efficiency with rising temperature, the increase being more marked with solutions of lower zinc content. Metals such as nickel, cobalt, and iron have been found to show this behaviour even more markedly than zinc. The effect of varying temperature and concentration of zinc and acid on the power consumption of the zinc cell was also investigated and again it was shown how the efficiency of deposition increased with rising temperature.

Finally, Dr. Marshall has studied the effects of metallic impurities on the electrolyte on the efficiency of zinc deposition. In the case of iron, small quantities had little effect on the efficiency, but larger quantities were very harmful, although nothing like so baleful as small quantities of antimony. Manganese, under certain conditions, when not so much was present as to be suspended in the solution in the form of oxide, actually retards the formation of hydrogen and so increases the efficiency of the zinc deposition.

Incidentally, a copper coulometer was developed in the course of the experiments, which may be of some general interest. It consisted of a circular platinum gauze cathode which was rotated at about 1,000 r.p.m. and a heavy sheet copper anode. The latter was ring-shaped from a sheet of copper 4 inches by 18 inches; with a current of 12 amp. the anodic current density was 0.03 amp./cm.^{2} The coulometer solution consisted of 125 gm. hydrated copper sulphate, 50 gm. concentrated sulphuric acid, and 50 c.c. alcohol in a litre of water.

Tests made on this coulometer using a standard Weston ammeter to measure the current gave the following results:—

Time.	Current.	Weight Copper (Found).	Weight Copper (Calculated).
10 mins.	15 amp.	2.965	2.964
,,	,,	2.964	,,
,,	12 amp.	2.369	2.371

The copper deposit was beautifully hard and coherent. The results show that this is a very convenient method for measuring even comparatively large currents.

Irish Free State Electricity Supply Bill.—In moving the second reading of the Electricity Supply (Special Powers) Bill in the Dail last week, Mr. McGilligan, Minister of Industry and Commerce, said that the whole principle of the Bill was to prevent new plant being installed, and to allow undertakings which had a surplus of plant to supply undertakings requiring additional energy, pending the materialisation of the Shannon scheme. The second reading of the Bill was passed and the next stage is fixed for November 3rd.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Our Issue of August 7th.—Our Advertisement Department draws attention to the fact that, owing to the August Bank Holiday, new copy and alterations to existing advertisements for the issue of the ELECTRICAL REVIEW for August 7th must be received by Wednesday morning, July 29th, at the latest. All matter for our editorial pages will also require to be in our hands earlier than usual.

E.D.A. Activities.—Publication E.D.A. 566 which has recently been issued by the British Electrical Development Association illustrates and describes an ideal all-electric home. The booklet is written in a practical and interesting manner, while its pictures immediately create a most favourable impression of the cleanliness, convenience, and comfort of electrical service.

Electricity in Tin Mining.—In his speech at the recent annual meeting of the Sungei Besi Mines, Ltd., Mr. W. J. Payne said that larger dividends would have been paid had it not been for the necessity of reserving money to meet the cost of the new hydro-electric plant. A thorough investigation of the possibilities had been made, and a water licence had been secured from the Government of the Federated Malay States. It was hoped to make a commencement almost immediately, and there was no doubt that the scheme would result in lower production costs.

The Highland Show.—Electrical equipment for farm and dairy was prominent at the annual show of the Highland Society which was held in Glasgow last week. Among the exhibits were a windmill-generator for electric lighting and pumping shown by Messrs. McBain Bros., Ltd., of Tweedmouth; a 130-gallon cream separator with the driving motor incorporated in it, by Messrs. Watson, Laidlaw & Co., Ltd., Glasgow; crop-drying plant, shown and demonstrated by Messrs. Telford, Grier and Mackay; another wind-dynamo installation, for battery charging, made by Messrs. F. A. Wilkinson & Partners, Ltd., and shown by Mr. A. M. Russell, Edinburgh; and various apparatus exhibited by Messrs. McKenzie and Moncur, Ltd.

Employment during June.—The July *Ministry of Labour Gazette* shows that employment in the electrical engineering industry continued good during June. While the total proportion of unemployed for all branches of engineering was 11 per cent., in the electrical branch the figure was on 5.6 per cent. In the heavy engineering industries the proportion of unemployed was 12.3 per cent. Unemployment decreased in the electrical wiring and contracting industry, and in electrical cable, wire and lamp manufacturing, by 0.8 and 0.1 per cent., respectively.

Insuring against Bad Debts in Export Trade.—Mr. A. M. Samuel, M.P., the Parliamentary Secretary of the Department of Overseas Trade, has appointed a Committee, under the chairmanship of Colonel the Hon. Sidney Peel, to consider the question of insurance against bad debts in export trade. The Committee comprises representatives of the banks, accepting houses, insurance companies, Lloyd's, the Association of British Chambers of Commerce, and the Federation of British Industries, together with the Comptroller-General of the Department of Overseas Trade. Mr. F. H. Nixon, of the Export Credits Department, will act as Secretary.

Trade Announcements.—MESSRS. DORMOR & HINES, who have commenced business as wholesale electrical suppliers at 74, Old Christchurch Road, Bournemouth, wish to receive priced trade catalogues.

The notice in our issue of July 10th, p. 56, respecting a new "Exide" depôt at Glasgow was not quite correct in certain particulars. The purpose of the depôt is to give wireless and car-starter battery service and it will be under the control of Mr. A. T. Fraser, while Mr. Donald Sinclair will continue to act as the general representative for the whole of Scotland for all the CHLORIDE COMPANY'S manufactures.

The TWEEDALE MOTOR CO. LTD., Peebles, has opened an electrical and wireless department.

Catalogues and Lists.—MESSRS. DONOVAN & Co., 47, Cornwall Street, Birmingham.—An illustrated and priced folder dealing with the "Wandsworth" patent combination switch with automatic action.

MESSRS. SIEMENS BROS. & Co., LTD., Woolwich, S.E.18.—Catalogue 190, containing very full particulars of the company's ebonite manufactures with details of physical and electrical characteristics.

THE VACUUM OIL CO., LTD., Caxton House, Westminster, S.W.1.—A pamphlet dealing with steam cylinder and valve lubrication, specifying "Gargoyle" oils prepared for these purposes.

MR. J. R. MORRIS, Imperial House, 15-19, Kingsway, W.C.2.—Two illustrated pamphlets dealing with "Columbia" radio batteries.

SWITCHGEAR & COWANS, LTD., Old Trafford, Manchester.—Catalogue sections Nos. 4, 14-1, and 14-3, dealing respectively with spare parts for mining switchgear, "Andrews" reverse-power relays, and earth-leakage protection gear for systems with insulated neutral. Fully illustrated.

LAMLOK, LTD., 237, Acton Lane, Acton Green, Chiswick, W.4.—An illustrated pamphlet showing examples of the company's lamp-locking devices.

"MANDA" MOTORS, LTD., 53-54, Royal Mint Street, E.1.—A trade price list of "Manda" electric fans and small-power motors.

MESSRS. FERRANTI, LTD., Hollinwood, Lancashire.—A pamphlet illustrating a patent oil-filled cable box for transformers.

Bankruptcy Proceedings.—G. C. SPONG and J. H. TRUSSELL, trading as the C.C.S. TRADING CO., 30, Western Mail Chambers, Cardiff, electricians.—The public examination of these debtors was held on July 15th at the Law Courts, Cardiff. The debtor Spong stated that the concern was formed in January, 1923, and he acted as manager, his partner knowing most about the working of the business. The ranking liabilities were returned at £413, against assets of £25, leaving a deficiency of £388. The debtors attributed their failure to the loss of a contract. Debtor Trussell, in reply to questions, said that when they started trading he thought the business would keep them both, but the loss of the contract mentioned was disastrous. The examination was closed.

H. J. HEASMAN, Stamford Rivers, Ongar, Essex, company director.—The receiving order in this matter was made recently on a creditor's petition. The statement of affairs shows liabilities of £243 against assets of £1, leaving a deficiency of £242. Debtor attributes his failure to insufficient income. It appears that in August, 1914, he and his wife commenced business in partnership as general mechanical and electrical engineers, at Walthamstow, with £50 borrowed money, since repaid. On October 29th, 1919, the business was formed into a limited company with a capital of £5,000 in £1 shares, the debtor and his wife being allotted 2,200 shares, but he now holds only 10 shares. The following are creditors:—

	£		£
Greig, E. T. & M. R.	75	Income Tax Commissioners ...	20
Island Manufacturing Co., Ltd....	120	Shone, M. D.	25

F. J. NORTH, 13a, Midland Road Wellingborough, Northants, electrical engineer.—The public examination of this debtor was held recently at the County Hall, Northampton. The statement of affairs showed liabilities of £245, against assets of £28, leaving a deficiency of £217. Debtor attributed his failure to bad trade and lack of capital at the outset. The examination was adjourned.

V. G. BAINES, 2, West Street, Wellingborough, Northamptonshire, electrician and radio dealer.—The adjourned public examination of this debtor was held recently at the County Hall, Northampton. The statement of affairs showed liabilities of £185 against assets of £62, or a deficiency of £123. Debtor attributed his failure to lack of capital, working on credit, and competition. The examination was adjourned.

W. A. HUNTLEY, X-ray engineer, Farfield, Burnt Yates, near Harrogate, and 62, Albion Street, Leeds; late of Bradford.—The public examination of this debtor took place on July 17th, at the Harrogate Bankruptcy Court, when the statement of affairs showed gross liabilities of £1,233, of which £1,211 was expected to rank for dividend, and there were no assets. The examination was closed.

F. H. P. HOOLAHAN (Holloway Bros.), electrical engineer and instrument maker, 16, The Hale, Highams Park, and 209, Holloway Road, N.—Bankrupt discharged subject to consenting to judgment for 30s. being entered against him and payment of 30s. costs of judgment. (30s. paid to the Official Receiver in lieu of entering up judgment.)

W. K. M. WILSON, electrician and wireless apparatus dealer, 1, Mount Street, Heanor.—First meeting July 23rd, at the Official Receiver's offices, 4, Castle Place, Nottingham; public examination September 22nd, at the Court House, Derby.

H. FILDES, electrical engineer's superintendent, 108, Monton Road, Eccles.—First meeting July 22nd, at the Official Receiver's offices, Byrom Street Manchester. Public examination September 17th, at the Court House, Salford.

C. W. STOCKEN & C. FINK, Wyndham Radio Supplies, 74 and 80, Redcliff Street, Bristol.—Trustee, Mr. J. P. Emett, 18, Nicholas Street, Bristol, released June 18th.

G. W. TEMPEST (Northern Radio Co. & General Wireless Trading Co.) radio and telephone engineer, 40, Brazennose Street, and Arcade Chambers, Manchester, and Commercial Street, Leeds.—Receiving order made July 15th, on debtor's own petition.

A. O. JOYCE, electrician, 7, Park Parade, Leamington.—First meeting, July 28th at the Official Receiver's office, 9-11, High Street, Coventry. Public examination, August 19th, at the Shire Hall, Warwick.

J. S. YEOMANS, electrician, 11, Hill View Terrace, Chapel Allerton, Leeds.—First meeting, July 27th, at the Official Receiver's office, 24, Bond Street, Leeds. Public examination, August 5th, at the County Court House, Leeds.

R. A. BURNELL, electrical engineer, Harefield Park, Harefield, Uxbridge.—Receiving order made July 13th, on debtor's own petition.

J. S. TURNER (Stanley Motor Co.), electrical and motor engineer.—Trustee, Mr. E. D. Symond, Official Receiver, 11, Dale Street, Liverpool, released July 2nd.

P. L. SYMONS, electrician, 40, Victoria Road, Great Yarmouth.—Receiving order made July 9th on debtor's own petition. First meeting, July 27th, at the Official Receiver's office, 9, Queen Street Chambers, Norwich. Public examination July 28th, at the Town Hall, Great Yarmouth.

Company Liquidations.—DUBILIER CONDENSER CO.—Winding up voluntarily. Liquidator, Mr. F. W. Hollings, Ducon Works, Victoria Road North Acton, W. Meeting of creditors, July 27th, at Ducon Works. (This notice is purely formal for the purpose of complying with the provisions of the Companies Acts.)

ELBA, LTD., manufacturers of dry batteries, 1, Winchester Place, Acton.—The first meeting of the creditors of the above was held on July 17th, at the offices of the Official Receiver, Russell Square, W.C. Mr. Thomas Gourlay, the Official Receiver, occupied the chair, and reported that the statement of affairs had not yet been lodged. The company was formed on January 29th, 1924, for the purpose of taking over the business of manufacturing dry batteries for electrical purposes, and especially h.p. batteries for radio work. The issued capital was £1,353, of which only £103 was for cash, the balance being in respect of the vendor's shares. A debenture for £1,350 was issued, covering all the assets of the company. A receiver for the debenture-holder was appointed on April 28th last, but he had retired in favour of the Official Receiver, who at the moment was in possession of the assets and was realising them. The whole of the assets were subject to the debenture, and it did not appear that there would be anything for the unsecured creditors, whose claims were in the neighbourhood of £2,200. The assets were only estimated to realise £558. One of the directors stated that the position had been brought about by bad trade and keen competition particularly German competition, and the cancellation of important contracts. He added that when the debentures were issued for cash the assets had already been charged to the bank, and to others, for about £750. The money raised on the debentures was used to discharge those claims. A resolution was passed to the effect that no application should be made to the Court, and the Official Receiver therefore remains as the liquidator of the company.

M.E.L., LTD., 45-7, King's Road, Camden Town, N.W.—The first meetings of the creditors and shareholders of this company were held last week at Carey Street, W.C. The Official Receiver reported that the company was formed in July 1923, to carry on business as manufacturers of and dealers in electrical appliances and accessories. The issued capital was 5,650 ten per cent. cumulative preference shares subscribed for cash, and 2,400 ordinary shares issued as fully paid to the vendors of a business then acquired. The business carried on has been mainly that of manufacturers of and dealers in apparatus and accessories used in connection with radio-telephony; the company had also carried on a small trade in electric domestic appliances manufactured under the patents it had acquired. The failure was attributed to falling off of trade due primarily to the inability of the company to sell its goods profitably owing to foreign competition, and to the general fall in prices of apparatus used for radio-telephony which occurred during 1924. The accounts filed under the liquidation showed unsecured liabilities of £12,331, against assets valued at £2,575, consisting mainly of book debts. The liquidation was left in the hands of the Official Receiver.

LIVERPOOL ELECTRICAL ENGINEERING COMPANY (1923), LTD., 54, Oldhall Street, Liverpool.—A meeting of creditors was held recently at the offices of the Liquidator, Mr. C. Hodgson, accountant, Liverpool. A statement of affairs was submitted which disclosed liabilities of £4,222, of which £2,150 was due on debentures £775 was in respect of cash claims, and there were trade creditors for £1,297. The assets were estimated to realise £1,132, but from this had to be deducted £46 for preferential claims, leaving net assets of £1,086, or a deficiency of £3,136. It was reported that the company was incorporated on May 11th, 1923, to acquire the business previously carried on by Mr. John Clarke. The company took over the existing liabilities and allotted to the vendor or his nominees 1,996 fully paid £1 shares, and eight debentures of £100 each. The nominal capital of the company was £2,000. Subsequently the company purchased further plant and machinery for £525, that amount being advanced by Mr. J. Clarke. Further sums were also advanced to the company by Mr. Clarke, bringing the amount of his loan up to £1,350, for which a second charge was created in September, 1923. The trading of the company to March 31st, 1924, disclosed a loss of £2,297, which was attributed to the fact that the company was compelled to move into fresh premises, which caused it to dispose of certain plant and machinery and stock at a loss. Last September the company examined the position, and in view of the fact that the radio season was about to commence it was decided to continue trading, as there appeared to be some prospect of a profit being made. Those hopes were not fulfilled, and a further loss of £1,408 was sustained up to March last. A creditor for £300 then issued a writ, and the debenture holder appointed a receiver. It was stated that in addition to the amount of £2,150 in respect of which Mr. Clarke held debentures, he was also an unsecured creditor for £775, cash advanced. It was resolved to confirm the voluntary liquidation of the company, with Mr. Hodgson as liquidator.

ELECTROLITE, LTD., 138, Southbridge Road, Croydon.—The first meeting of the creditors of the above was held on July 15th. The Official Receiver said that a statement of the company's affairs had been lodged, showing unsecured debts of £2,166 and loans on debenture bonds of £10,372. The assets were estimated to realise £1,974, so that there was a deficiency, so far as the debenture holders were concerned, of £8,398. The liability to contributories was apparently £500. With regard to the debentures, there was one for £2,000, which appeared to be quite in order, but the Official Receiver said that there was a further debenture for £7,500 which might require consideration, although there did not seem to be anything very material in the point, as if the assets were correctly estimated, there would scarcely be sufficient to pay the debentures about which there seemed to be no question. A receiver and manager was in possession on behalf of the debenture holders. In the absence of a quorum the meeting was formally adjourned to enable the creditors to consider the question of appointing a liquidator.

FALLON CONDENSER MANUFACTURING CO., LTD.—A meeting of members is called for August 22nd, at 122-3, Moorgate Station Chambers, E.C., to hear an account of the winding up from the Liquidator, Mr. R. H. Dutchman.

P. S. WIRELESS MANUFACTURING CO., LTD.—Winding up voluntarily. Liquidator, Mr. E. Webb, 34, Grand Parade, Brighton. A meeting of creditors is called for July 27th at the liquidator's address.

Private Arrangements.—ASTRO ELECTRIC, LTD., 45, Carlton House, Lower Regent Street, S.W.1.—A meeting of the creditors of this company was held recently, when the Receiver, Mr. R. Rooke Jones, presented a statement of affairs which showed liabilities of £1,950, of which £653 was due to unsecured creditors; current expenses, &c., amounted to £46, salaries and commission totalled £169, and there were debentures and accrued interest amounting to £1,081. The assets were estimated to realise £1,504, leaving a deficiency of £446. The Receiver said he had endeavoured to dispose of the business, but so far without success. Since he had been carrying on the business the sales for April, May and June of this year had only amounted to £350, and if the business was continued it would not be in the interests either of the debenture holder or the creditors. He did not anticipate that any dividend would be paid to the creditors unless the business could be disposed of satisfactorily. The debenture holder was originally a director, but not at the time the debentures were taken up. The creditors resolved that the Receiver should approach four or five people in the electrical trade who might be interested in the purchase of the business and assets, and that a further meeting should be called as soon as *bonâ-fide* offers were forthcoming.

A. E. G. STONE, 61, Western Road, Hove, radio apparatus dealer and electrician.—A meeting of creditors was held on July 15th at the offices of Messrs. Bishop & Fenton-Jones, solicitors, Kingsland High Street, N.E. It was reported that the liabilities amounted to £2,813, of which £1,636 represented money advanced by the debtor's wife; there were trade creditors for £431, and there was a cash creditor for £683. There was also a claim for £209 in respect of advertising. The assets after deducting preferential creditors for £15 were estimated to realise £465. It was reported that the present position was due to very heavy bad debts and keen competition in the neighbourhood. The business was started by the debtor in September, 1921, with a capital of £75. For the year ended September, 1922, there was a loss of £15, while the debtor had drawn from the business only £27. From October, 1922, to March, 1924 there was a loss of £405 and the debtor drew £225. The creditors decided that the estate should be dealt with under a deed of assignment. The following are creditors:—

	£		£
Metropolitan - Vickers Electrical Co., Ltd.	35	Ullman (London), Ltd.	159
Bayleys, Ltd.	50	Pratt, Fred	33
		Mason & Co.	62

W. K. COXON, electrical and radio engineer, Nurshill, Lydney, Gloucestershire.—A circular has been issued to the creditors herein by Mr. C. Latham, stating that on June 19th a private conference of the larger creditors was held, at which a statement of affairs was submitted showing the assets to exceed the liabilities. The meeting was adjourned, and it was agreed that Mr. Latham, representing the largest creditor, whose account amounted to about half the total unsecured creditors' claims, should make an investigation and prepare another statement of affairs. At a further meeting on June 29th a statement of affairs was presented, and it was stated that negotiations were proceeding which, it was hoped, would result in the sale of the assets of the business for a sum more than sufficient to discharge the creditors' claims. On July 6th, at a further meeting, it was stated that negotiations were proceeding with a company for the sale of the plant, stock and machinery of Mr. Coxon for a sum of £1,000 in cash and the balance in shares in the company, leaving Mr. Coxon with the book debts. If this sale was effected there would be sufficient to discharge the liabilities of the trade creditors of the business in full. It was decided that, in view of the negotiations a deed of inspectorship to Mr. Latham should be

executed. The debtor has approved of this, and the creditors are asked to assent to the arrangement. An approximate statement of affairs shows ranking liabilities of £1,508, of which £1,082 is due to unsecured creditors and £426 to the bank. According to the books, the assets total £3,741, and at a forced realisation they are expected to produce £1,988, giving a surplus of assets over liabilities of £480. As a going concern the surplus is £2,233.

Dissolutions of Partnership.—MAGORIS, WIGHTMAN & Co., electrical engineers, Rusken Chambers Scale Lane, Hull.—Messrs. J. F. Magoris and O. N. Wightman have dissolved partnership. Mr. Magoris will attend to debts and continue the business.

HOWARD TERRY & Co., electrical engineers, Carlton House, High Street, Birmingham.—Messrs. F. H. Jeanes and M. Terry have dissolved partnership. Mr. Jeanes will attend to debts.

Deeds of Assignment.—R. H. W. GOUGH and H. SMITH (Electric & Radio Supply Co.), electrical engineers, 4, Waterloo Road, Epsom.—Particulars of claims by July 31st to Mr. W. A. J. Osborne, Trustee, Balfour House, Finsbury Pavement, E.C.

F. R. HICKSON, electrical engineer, 16, Dartmouth Park Hill, N.W.5.—Particulars of claims by July 31st to the Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Foreign Capital in Bulgaria.—A recent inquiry into foreign capital invested in Bulgarian industry shows that approximately 2½ millions sterling has been put into 79 companies. Sugar, electricity works, tobacco, and mines are the principal industries with which foreign capital is connected. One-third of the total foreign capital invested comes from Belgium and another 45 per cent. is divided between France and Czecho-Slovakia. British capital invested in Bulgaria is insignificant.—*British Industries.*

Annual Holidays.—The offices of the City Electrical Co. will be closed from August 3rd to 10th.

The Prescot works of British Insulated & Helsby Cables, Ltd., will be closed from Saturday, August 1st, to Saturday, August 8th, inclusive.

The works of Messrs. Alfred Graham & Co. will be entirely closed from the evening of Friday, July 24th, until the morning of August 10th.

The works of the Record Electrical Co., Ltd., at Broadheath, Cheshire, will be closed from to-night, Friday, July 24th, until the morning of Tuesday, August 4th, for the annual holidays.

Book Notices.—"*Journal* of the Institution of Electrical Engineers," Vol. LXIII, July, 1925. No. 343. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

The "Amplion Magazine," which is being produced by Messrs. Alfred Graham & Co., is of rather an unusual character. It is not strictly a "house" magazine, being directed to "all radio users," and although "Amplion" loud speakers receive special notice, it is not really advertisement. A number of interesting articles appear in the first issue, the writers including Capt. P. P. Eckersley, Mr. A. R. Burrows, and Mr. P. R. Coursey, B.Sc. The price is 1s.

"A Description of the Damages done by the Great Earthquake of September 1st, 1923, to the Electrical Installations in Japan"—prepared by the Japanese Electrotechnical Committee, Tokio, Japan.—The damages are treated generally in the order of the classified equipments. The considerations upon many of the peculiar effects are most interesting.

"The Induction Motor," by H. Vickers. Pp. ix. + 319; figs. 151. London: Sir Isaac Pitman & Sons. Price, 21s. net.

"The Post Office Electrical Engineers' Journal." Vol. XVIII, Part 2, July, 1925. London: The Electrical Review, Ltd. Price, 2s. net.

"Scientific Papers of the Institute of Physical and Chemical Research," Tokio.—No. 29, June, 1925.

"Transactions and Abstracts and Journal of Physics of the National Research Council of Japan." Vol. III, Nos. 7 to 10.

"The Technology Reports of the Tôhoku Imperial University," Sendai. Vol. V, No. 1.

Technologic Papers of the U.S.A. Bureau of Standards, No. 284.—A study of the Seasonal Variation of Radio-frequency Phase Difference of Laminated Phenolic Insulating Materials (5 cents). Washington: Government Printing Office.

Callender's Band.—The Band of Callender's Cable and Construction Co., Ltd., whose performance at 2LO gave such pleasure to listeners on two occasions early in the year, again broadcast from the same station on Monday evening last.

Domestic Appliances in Ontario.—According to Mr. G. J. Mickler, head of the Merchandising Department of the Hydro-Electric Power Commission of Ontario, the percentage of fully electrically-equipped homes in Ontario is actually decreasing, probably because electricity is not being installed in all new houses, showing that the field for the sale of equipment is as big as ever. According to a table prepared by the department, reproduced in the *Electrical News*, only 13.8 per cent. of wired houses use electric cookers. The highest percentage (89.2) is reached by electric irons, while only 0.2 per cent. of the consumers have electric refrigerators. Other appliances which show a small percentage of users are water-heaters (4.8) and hot-plates (5.5). No appliance, with the exception of irons, as mentioned above, has a place in more than 44 per cent. of the consumers' homes.

English Plant at a Newfoundland Development.—A great deal of English machinery figures in an important hydro-electric development which is nearing completion in the Humber Valley, Newfoundland. The undertaking is being carried out by Sir W. G. Armstrong, Whitworth & Co., Ltd., in connection with a large pulp and paper mills. The British Thomson-Houston Co., Ltd., is supplying the main generating plant, consisting of seven 10,250-kVA, 6,600-V, 3-phase alternators, designed to run at 375 r.p.m. The power is to be stepped up to 66,000 V for transmission to the main sub-station of the mills, Canadian General Electric transformers being employed. The B.T.H. Co. has also supplied seven 2,600-h.p., 2,200-V synchronous grinder motors, and two similar machines have been provided by Messrs. Crompton & Co., Ltd. Messrs. Ferguson Pailin, Ltd., have supplied some of the switchgear, the main gear having been ordered from the B.T.-H. Co. A feature of the mills is the use of two 25,000-kW electric steam generators for heating the rolls of the newsprint machines. The output of the mills will be about 120,000 tons of newsprint per annum.

Indian Electrical Trade in April.—Our Indian correspondent says that the Indian trade figures for the month of April, 1925, show that the imports of electrical machinery into India during the month declined, and those of electrical instruments and apparatus considerably increased, as compared with the corresponding month of the previous year. Machinery imports amounted in value to Rs. 14½ lacs as against Rs. 19½ lacs, while instruments and apparatus increased from 15 lacs to 23¾ lacs. The decline in the case of machinery has been mainly under the head "Meters," from 5 lacs to 2½ lacs, and "Miscellaneous," from 7 lacs to 3¾ lacs; control and switchgear showed an increase from 4 lacs to 5 lacs. The United Kingdom's share decreased from 17½ lacs to 13 lacs, but as imports from the United States have declined considerably, the percentage share of the United Kingdom shows a little improvement. Imports from Germany increased from Rs. 19,000 to Rs. 52,000, and those from Sweden from Rs. 3,000 to Rs. 16,000. Under "Electrical instruments and apparatus," the general increase of about 8 lacs has been mainly under the heads "Electric wires and cables," from 3 lacs to 8 lacs, and "Electric lamps" which increased from 1 lac to 2½ lacs. The United Kingdom considerably improved its position, the value of its imports rising from 9 lacs to 17½ lacs, the proportion being increased from 65 to 85 per cent. Germany and the United States both showed decreased trade.

New French Companies.—Among the new hydro-electric concerns lately formed in France are the Société des Forces Motrices de la Haute Creuse, with a capital of 3½ million francs, to acquire and work the Croix Blanche and Confolent stations at Moutier-Rozelle, in the Department of Creuze; and the Société des Forces Motrices de la Glane formed at Tulle with a capital of 5 million fr.

A new company has lately been formed in Paris (22 Rue Julie), with a capital of 100,000 fr. and the title La Société des Etablissements Kenotron to manufacture radio apparatus.

La Société de Distribution Rurale d'Energie Electrique is the name of a new company which has lately been formed at Ruffec, in the Department of Charente, with a capital of 1,200,000 fr.

Consumer-Ownership in Canada.—According to the *Financial Times*, the Shawinigan Water and Power Company has just completed a customer-ownership campaign, which has brought in 3,300 shareholders, making the total 7,700 shareholders, or an addition to the stockholders' list of 75 per cent. The total number of shares sold was approximately 12,000, representing a value of $1,600,000. A novel feature in connection with this campaign was that the company placed at the disposal of its customers common stock at $132 per share, instead of preferred stock, as is the practice in customer-ownership campaigns. The net yield on the investment at this price is 5.3 per cent. The terms were cash or deferred payments, and the average subscription was about 3⅔ shares. This company was the first utility company in Canada to offer stock to its customers, and is the pioneer in the customer-ownership field.

Local Exhibition.—TAMWORTH.—On p. 124 we give some particulars of the undertaking of the Pooley Hall Colliery Co., Ltd., which supplies electricity in Tamworth, Staffs. Mention is made of an exhibition which was recently held there and a view of the display is reproduced. The following companies were among the exhibitors:—The Credenda Conduits Co., Ltd. (cooking equipment and domestic appliances); the British Thomson-Houston Co., Ltd. ("Mazda" lamps and lighting fittings for home shop, and factory, "Tungar" rectifiers, fractional h.p. motors, and domestic apparatus); the General Electric Co., Ltd. ("Osram" lamps and lighting fittings, including the "Wembley" street-lighting lantern and colour-sprayed lamps, and electrical appliances for the home); the Western Electric Co., Ltd. (the "A.S." washing machine and an ironing machine, which were demonstrated, and various domestic apparatus); Metro-Vick Supplies, Ltd. (lighting fittings, fires, radio apparatus, &c.); the Siemens & English Electric Lamp Co., Ltd. (domestic appliances, the "Stannos" wiring system, and lighting fittings); the Tamworth Electrical Contracting Co. (various apparatus made by the leading electrical concerns); Hoover, Ltd. (vacuum cleaners); the Coventry Wireless Supplies, Ltd. (radio apparatus made by the principal British firms); and the Singer Sewing Machine Co., Ltd. (electrically-driven and lighted sewing machines).

Greek Power Contract.—Sealed tenders for the carrying out of power extension works in Athens, the Piræus, and the suburbs have just been opened by the Government, and have aroused great interest here. One was sent in by an Anglo-Greek group, consisting of the Power & Traction Finance Co., of London, allied with the principal Greek banks, headed by the National Bank, and with a guarantee for its proposals of £2,000,000 from the British Treasury, under the Trade Facilities Act. The only other competitor is the existing Greek Electrical Co.—*Reuter* (Athens).

The Rutenberg Concession.—The Bagdad correspondent of the *Financial Times* states that Baron Edmond de Rothschild has subscribed £100,000 to the Rutenberg electric power undertaking in Palestine, and that Mr. F. Worburg has promised to finance the scheme up to $500,000. The cost of the first stage of the scheme, which was the subject of a concession granted in 1921, was estimated at £750,000.

The Mulungushi Power Plant.—In the course of his speech at the recent annual meeting of the Bechuanaland Exploration Co., Ltd., the chairman (Mr. Edmund Davis) mentioned that the Mulungushi hydro-electric plant had been opened by the Prince of Wales. This plant has been erected by the Rhodesia Broken Hill Development Co. to provide power for its mine plant 39 miles away. The output capacity of the plant is 2,500 h.p. initially, but the site is capable of development up to 20,000 h.p. An artificial lake about 15 miles long and nearly four miles wide in places has been created for impounding the water against times of minimum flow.

A Canadian Telephone Contract.—The Manitoba Government Telephone Commission has recently awarded a contract for the installation of an automatic telephone exchange in the St. James's District of Winnipeg, to Messrs. Siemens Bros. (Canada), Ltd., a subsidiary company of Messrs. Siemens Bros. & Co., Ltd., of Woolwich. This firm installed the St. John's Exchange in Winnipeg in 1923. A considerable order for automatic dials and telephone instruments has been awarded to the same firm.—*Electrical News.*

Competition for Czecho-Slovakian Order. — The Witkowitz Iron Works Co. has placed the contract for a large steam turbine for its new electric power station with the Erster Brunner Maschinenfabrik of Brunn. Several English firms are reported to have competed for the order.

New Italian Companies.—A new company has lately been formed in Turin with a capital of 500,000 lire and the title La Società Fabbrica Accumulatori Elettrica.

The Società Collocamento e Lavorazione Telefoni Automatici "Scelta" has been formed in Milan, with a capital of 300,000 lire.

Among the new hydro-electric undertakings recently organised in Italy are the Società Idro-Elettrica di San Filippo, at Contigliana, capital 500,000 lire; the Società Idro-Elettrica dell' Isario, Rome, capital 100,000 lire; the Società Forze Idrauliche del Ceno, Barma, capital 90,000 lire; and the Società Forza Elettrichi Val Degagna, Milan, capital 200,000 lire.

A number of new concerns have lately been formed in connection with the radio industry in Italy.

Czecho-Slovakian Radio Exhibition.—Arrangements are in hand for the holding of a radio exhibition in Reichenberg from August 15th to 21st next.

Standardisation in Industry.—In the course of an address delivered at Leeds last week, Col. V. Willey, president of the Federation of British Industries, said that the growing adverse trade balance meant a decreasing amount available for foreign investment and as the latter always re-acted on exports, it was obvious that unemployment must increase. He said that industry in its present precarious state was not satisfied that the Government appreciated its critical condition. We as the premier manufacturing country were feeling most acutely the world trade shrinkage. Later, Col. Willey said (according to *The Times* report) that wastage in industry could be eliminated in an enormous number of ways. He would merely instance the possibilities of saving by standardisation. The present vast multiplicity of sizes, qualities, and specifications involved in their turn an immense cost in merchant stocks, in small unit transportation, and neglect of mass production possibilities. That was a tremendous field for possible economy. Let them imagine the saving in standardisation in hotel and institutional china, in plumbing supplies, paints and varnishes, in bolts and nuts, in bottles, wire fencing, timber. The idea that odd sizes gave the manufacturer competitive advantage was a fallacy. The only case where unlimited divergence seemed justified was in padlock keys. The Government could here well give a lead in standardising equipment for all Government Departments; but a determination of specification must be subsequent to the determination of standards in quality and dimension. By a Government lead in the simplification of business practices enormous saving to the taxpayer could be effected.

Swiss Firm to Finance an Austrian Company.—According to *Commerce Reports* the Salzburg Electric Company is constructing a 60,000-V transmission line in the Salzburg province. The company will be financed for this purpose by the Swiss firm, Aluminium A.G., of Neuhausen. The loan will not be made directly to the company but through the provincial Government. It is assumed that the Aluminium Company will supply the materials.

The Telephone Industry.—At a meeting of the Committee on Industry and Trade held last week at the Board of Trade, evidence was given on behalf of the Telephone Development Association by Mr. H. E. Powell-Jones, the secretary of the Association. After stating that the telephone manufacturing industry employed some 100,000 people, exclusive of 50,000 employed by the Post Office on telephone business, the witness pointed out that all the manufacturers could do was to create a demand and that they could not ensure that this demand was promptly satisfied. The principal cause, Mr. Powell-Jones stated, lay in the policy of annual revision of estimates, which made it difficult for the Post Office to lay down a programme in advance. The Association urged a policy whereby the probable requirements for a period of years should be ordered in advance. This policy would enable manufacturers to formulate a works programme and would result in employment being continuous instead of spasmodic. This should result in lower prices and more even quality, in addition to better deliveries. Further, it would assist manufacturers to tender more satisfactorily for contracts from abroad.

Golf Tournament.—A number of the principal members of the staff of the Automatic Telephone Manufacturing Co., Ltd., recently participated in a golf tournament. Messrs. H. W. Brooke and H. Adams reached the final, and the match was played off on the Bowring Park Municipal Golf Course, Liverpool, on July 10th. Mr. Adams received five strokes but was defeated after a very level game.

Swedish Wiring Practice.—An article on this subject recently appeared in *Commerce Reports*. It is stated that Swedish wiring practice conforms closely to the German methods. In the better-class buildings Bergmann or other forms of tubing are used; in many other buildings wiring on porcelain cleats is adopted. When lead-covered cables are used they are required to be armoured. Rotary and push-button switches are generally employed, although tumbler switches are used to some extent. The fuses are mainly of the Edison screw plug or the German "Diazed" types; cartridge-type, open-link and thumb-grip fuses are not employed. Edison screw sockets are general, the bayonet type being almost unknown.

For Sale.—Manchester Corporation Electricity Department invites offers for surplus electrical instruments, &c., including ammeters, voltmeters, relays, &c. Hastings Corporation Electricity and Public Lighting Committee has for disposal surplus generating plant consisting of steam turbines, alternators, boilers, cooling towers, &c. (See our advertisement pages to-day.)

Strike at Lochaber. — Work upon the Lochaber hydro-electric scheme was held up last week by a strike of carpenters and joiners, about 1,000 in all. The dispute originated with the dismissal by the contractors, Messrs. Balfour, Beatty and Co., of a joiners' shop steward. The strike lasted a day and the men decided to return to work pending negotiations.

German Activity in Italy.—In a review of a report upon the situation in Italy during the past year, the *Board of Trade Journal* says that Italian factory production itself is developing year by year and is becoming a formidable competitor with the goods of other countries. For the business available to foreigners Germany is a severe competitor. A feature of the year has been an intensive canvassing campaign on the part of German representatives on an even larger scale than before. These representatives speak Italian and know the country intimately, carry price lists in Italian, and are able to show complete collections of samples from which all traces of their origin have been removed. Prices are now quoted in lire. It is thought that no other country could contemplate competition with these representatives on anything like the same scale and it is doubtful whether the market would furnish sufficient orders to pay any other country to follow in the German's footsteps; yet it is a fact that they are reaping the fruits of their initiative.

Spanish Hydro-Electric Development.—The Seville Electric Co., of Seville, which controls the hydro-electric facilities throughout South-west Andalusia, has announced that it intends to issue a 6 per cent. loan to the amount of 10,000,000 pesetas for the carrying out of a large programme of hydro-electric extension involving the purchase of foreign equipment.

British Trade-mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 15th :—

Eos. No. 456,449. Class 4. Electric and galvanic carbons.—The firm trading as C. Conradty, 9, Spittlertorgraben, Nuremburg, Germany. (British representative: S. Sokal, 1, Great James Street, Bedford Row, W.C.1.)

Pixie Grippa. No. 459,076. All goods in class 8.—Perophone, Ltd., 76-78, City Road, E.C.1.

Eddystone (lettering and design). No. 456,158. Class 8. Instruments and apparatus, and parts thereof, for use in radio-telephony and telegraphy, but not including electric batteries and cells, nor goods of a like nature.—Janet, Rainsford & Laughton, Ltd., Alexandra Works, Kent Street, Birmingham.

Design only. No. 458,840. All goods in class 8.—Chinn's Patents, Ltd., 33, Brazennose Street, Manchester.

Icall. No. 448,364. Class 11. Electrolysis outfits, electric massage vibrators, air douches, radiant heat lamps, &c.—I. Calvete, Ltd., 11, Little St. Andrew Street, W.C.2.

Lumina. No. 459,539. Class 13. Sparking plugs for internal-combustion engines.—A. E. Macdonald, 5, St. John's Road, Golder's Green, N.W.4.

Memite. No. 459,287. Class 50. Electrical insulating materials.—The Midland Electrical Manufacturing Co., Ltd., Barford Street, Birmingham.

Amplifying Equipment at St. Peter's.—MESSRS. ALFRED GRAHAM & CO., LTD., have received a letter from Signor Federico Mannucci, the chief engineer of the Vatican, congratulating them upon the success of the amplifying equipment installed by them for the recent imposing ceremonies in St. Peter's Cathedral, Rome. It is stated in the letter that the apparatus enabled a huge assembly of 30,000 persons to hear every word of the ceremonies.

Proposed Municipal Showrooms.—The Loughborough Town Council proposes to open a showroom in connection with the Electricity Department, and shop premises are being inspected for the purpose.

Czecho-Slovakian Radio Regulations.—The importation of radio apparatus into Czecho-Slovakia is subject to a licence granted by the Ministry of Commerce, jointly with the Posts and Telegraphs Department. To obtain a licence manufacturers or their agents are required to submit drawings or a sample of the apparatus which it is desired to import. The use of reaction is prohibited by the Government.

Lead.—Messrs. James Forster & Co. report under date July 18th:—"Considering that demand from consumers this week was quiet and a general strike is threatened, the market shows a remarkably firm front. All lead arriving is quickly absorbed, and it is estimated in some quarters that there is an average consumption of lead in this country of 21,000 tons a month, an increase of from 3,000 to 4,000 tons a month over last year. In Germany, also, there has been a large increase, the average monthly imports this year of 14,000 tons being over 100 per cent. higher than during the same period of last year. This would mean a total increase in the United Kingdom and Germany of about 120,000 tons a year, apart from any increase in the United States, where consumption is running at a high level. If this rate is maintained, we can see nothing for it but still higher prices for lead, for, although production is increasing, it is not doing so to nearly the same extent. The Board of Trade returns show as follows:—May: Imports, 23,962 tons; exports, 3,678 tons; leaving 20,284 tons. June: Imports, 19,400 tons; exports, 2,278 tons; leaving 17,122 tons."

Social Event.—The staff and employés of Messrs. Macdonald, Syer & Co., Ltd., held their annual outing on July 11th. The *venue* was Southend and lunch was taken at the Palace Hotel, Mr. C. Stanley Syer presiding.

Chinese Notes.—The Yung Ming Electric Lamp Factory has recently commenced operations in Shanghai. The company has installed German machinery; its lamps bear the trade mark "Klasun."

The Mukden authorities are considering the installation of a long-distance telephone service between Tientsin and Shanghai. The line will be erected in four sections, *viz.*, Tientsin-Tsinan, Tsinan-Hsuchow, Hsuchow-Pukow, and Nanking-Shanghai. A cable will be laid in the Yangtze River to connect Pukow and Nanking. The total length of the line will be over 2,900 li (970 miles), and its cost is estimated at between 1½ and 2 million dollars.

The Yalukiang Electrical & Water Supply Co., a Sino-Japanese concern, is being organised with a capital of 6,000,000 yen to supply electricity and water in Antung.

An electric lighting company commenced operations at Yutse (Shansi) in May with a capital of $30,000.

The Shihkiachwang Telephone Service Co. has been registered in the Chihli province with a capital of $50,000. Another company to provide telephone service at Tsanghsien, in the same province, is being organised.

Proposed Large Canadian Aluminium Plant.—The *Electrical News* (Toronto) reports that the approval of the Provincial Government of Quebec has been given to the development of 600,000 h.p. near the Saguenay River. The power will be employed in a large aluminium producing plant which is to be erected by a group controlled by Mr. J. B. Duke, the American magnate, and Mr. E. H. Davies, who controls one of the largest aluminium companies in the world. The expenditure involved is estimated at between 75 and 90 million dollars.

Lighting and Power Notes.

Ashton-under-Lyne.—NEW CHARGES.—The Electricity Committee has recommended that the rateable value system of charging for domestic supplies be adopted, based on an annual fixed charge of 15 per cent. of the net rateable value of the house plus ½d. per kWh for all purposes; also that the scale of charges for three-phase energy to large consumers be varied by increasing the basic price of coal from 10s. per ton to 12s. delivered at the generating station, the increases over 12s. to be 0.02d. per kWh for each 1s., and proportionately for fractions of 1s.

Barnes.—BULK SUPPLIES.—The Urban District Council has now received quotations from neighbouring authorities for a bulk supply of electricity and is comparing them with the cost of extending the Barnes works.

Bedford.—EXTENSION OF OFFICES.—The Electricity Committee recommends the provision of new office accommodation by remodelling and extending the existing offices at a cost of £2,750.

APPLICATION FOR LOAN.—The Town Council has applied for a loan of £30,000 for electricity purposes.

Belgian Congo.—NEW SUPPLY COMPANY.—Under an agreement between the Société Union Minière and the Société Electricité et Traction, of Brussels, a new company is being formed with a capital of 75 million francs and the title La Société Générale des Forces Hydro-Electrique du Katanga to establish a plant to utilise the water power of the Lufia Falls in the Belgian Congo, for the supply of electricity to the mines of the Union Minière. Under the terms of the agreement the last-named concern will have the right to purchase the electrical undertaking at the end of 30 years on the basis of the profits during the preceding seven years.

Birmingham.—ALL-ELECTRIC HOUSES.—Two experimental houses now being erected at Bournville are to be equipped throughout for both heating and lighting by electricity. Only one fire grate is being put into each house, and it is estimated that this will make a saving of £20 on the equipment expenses.

Bradford.—MAINS EXTENSIONS.—The Electricity Committee has sanctioned an expenditure of £20,000 on mains extensions.

LOAN SANCTIONED.—The Committee has obtained sanction to borrow £1,724 in connection with the provision of an e.h.p feeder from the Valley Road works to Bolton Road sub-station

SUPPLY TO SHIPLEY.—The Committee has come to terms with the Yorkshire Electric Power Co. with respect to a bulk supply of electricity to the Shipley U.D.C.

NEW PLANT.—The new 20,000-kW turbo-generator is expected to be ready for work in two months' time.

Brecon.—OBJECTION TO ELECTRICITY ORDER.—The Brecon Gas Co. has lodged an objection to the Council's application for a Special Order for the supply of electricity.

Carlisle.—MAINS EXTENSIONS.—The Unemployment Grants Committee has agreed to the scheme of the Electricity Committee for laying electricity mains in various streets at a cost of £7,957.

LOAN SANCTIONED.—The Electricity Committee has received sanction to borrow £5,000 for electricity purposes.

Chard.—PROPOSED CONFERENCE.—The Town Council has received a communication from the Axminster Rural District Council to the effect that the promoters of the Axminster electricity scheme would be pleased to confer with the Chard Town Council to see whether any agreement could be arrived at for removing the objections to the scheme.

Chester.—OVERHEAD TO OUTLYING DISTRICTS.—Overhead transmission lines are being erected to form a belt at a distance of about four miles from the city of Chester. In this way an area of about 70 square miles will be supplied with energy.

Northern Ireland.—COLERAINE.—The Rural District Council is considering an application from the Coleraine Urban Council to obtain powers for the supply of electricity in the rural district.

Colwall.—ELECTRICITY SUPPLY.—The Hereford Corporation has assented to the Malvern Council's seeking powers to afford a supply of electricity to Colwall. The Malvern Council undertakes that the charges shall not exceed 20 per cent. of the rates in force at Malvern.

Continental.—SPAIN.—The Riegos Fuerza del Ebro (a Pearson enterprise) is considering a gigantic development of its plant. If this project is carried out the company will be able to provide all the electric power necessary for Catalonia, but the work would entail enormous expenditure and a long time would elapse before its completion.

According to an industrial map of the province lately issued by the Barcelona Chamber of Industry, water power to the extent of 326,175 h.p. is now being utilised in Catalonia. The major portion—268,813 h.p.—is used for hydro-electric purposes.

FRANCE.—The Société Biterroise de Force et de Lumière has lately completed the erection of a 30,000-V transmission line between Plaissan and Beziers. The company has also entered into an agreement with the Société Pyrenéenne d'Energie Electrique for the establishment of a second transmission line between the power station at Luzieres of the Société des Forces Motrices de l'Agout and Beziers.

East Morton.—ELECTRICITY SUPPLY.—An offer by the Bingley Council to supply electricity to East Morton at the price charged in Bingley, plus 7½ per cent., was accepted, and support will be given to Bingley's application for an order to supply electricity in the district.

Edinburgh.—PROPOSED EXTENSIONS.—Important proposals for the extension of the Portobello electricity station are being considered by the Corporation Electricity Committee. The estimated cost is £400,000. It is recommended that the work of the building extensions should be proceeded with at once, a decision to be reached later regarding the extent of the generating plant which would be required.

LIGHTING OF HOUSING AREAS.—The Corporation Lighting Sub-Committee recommend that provision be made in the estimates for additional lighting in housing areas and for increasing the wattage of electric lamps where this is unsatisfactory. The cost of the proposed extension is £2,067.

East Ham.—Cable Extensions.—The Electricity Committee has prepared a scheme for cable extensions at a cost of £4,751; it has also obtained sanction to borrow £1,199 for the extension of distributor mains.

Faversham.—Correction.—The new plant at the electricity works includes two Vickers-Petters heavy oil engines of 320 b.h.p. each, and not two Browett-Lindley engines, as stated in our issue of July 17th.

Great Yarmouth.—Year's Working.—The results of the year's working (1924-5) of the electricity undertaking (engineer: Mr. P. G. Campling) show an income of £48,953, as compared with £51,598 for the preceding year. The working expenses were £28,179, against £33,308, leaving a gross profit of £20,774 (£18,289). After deducting the capital charges, &c., a net surplus of £2,136 is shown, against £2,123 for 1923-4. During the 15 months ended March 31st, 1925, the sales amounted to 3,563,532 kWh.

Gloucestershire. — Opposition to Applications. — The County Council has decided to oppose the Gloucester application for extended powers for the supply of electricity, also the Cheltenham application and those of the Avon Valley Company and the West Gloucestershire Power Company.

Hamilton. — Acquisition of Undertaking. — The Town Council has adopted a recommendation by the Electric Lighting Committee to acquire the electric light undertaking from Messrs. Edmundsons from January 1st next. The committee is to meet the general manager to complete the negotiations.

Hathern.—Bulk Supply.—The village is to receive a supply of electricity from the Loughborough electricity works. It is proposed to erect overhead cables (2,800 yards) at an approximate cost of £1 3s. 3d. per yard in the main streets and 19s. 5½d. per yard in the side streets.

Ilkeston.—Supply Powers.—The Corporation has now received powers to supply electricity to various places in the district.

India.—Calcutta.—The new power house of the Calcutta Electric Supply Corporation, which is in course of construction, will be started with two 6,000-kW turbo-generators and three 50,000-lb. boilers. Ultimately it will be possible to increase the capacity of the generating station to 100,000 kW. It is understood that the station will be ready for running in September, 1926.

Japan.—Reserve Plant.—It is reported from Tokio that a law has been enacted requiring all hydro-electric power stations in Japan to be provided with a reserve steam plant capable of producing 10 per cent. of the normal output.

Keighley.—Distribution Conference.—A conference of local authorities is being called by the Town Council to discuss questions affecting the distribution of electricity in the north-western portion of the West Riding of Yorkshire.

Liverpool.—Street Lighting.—More than seven miles of thoroughfares in Liverpool have been converted from gas to electric lighting during the past twelve months and the Electric Power and Lighting Committee is carrying out a scheme to illuminate every city street with electricity.

Northampton.—Hospital Installation.—The Northamptonshire County Council has decided to install electric light and power at the Barry Wood Mental Hospital at a cost of £4,750.

Penang.—Year's Working.—We have received a report on the working for the year ended December, 1924, of the Electricity Supply Department (engineer and manager, Mr. W. J. Williams). The income was £91,555 and the working expenses amounted to £63,461, leaving a gross profit of £28,094. After deducting capital charges, &c., the net surplus amounts to £6,462. The capital expenditure during the year amounted to £118,905, making a total of £467,496.

Preston, Blackburn, and Blackpool.—Applications Recommended.—The Electricity Advisory Board for Mid-Lancashire has decided to recommend to the Commissioners that applications by the Preston, Blackburn, and Blackpool Corporations for permission to develop their electricity undertakings be granted.

Portsmouth.—Year's Working.—The statement of accounts of the electricity undertaking for the year ended March 31st last shows a total income for the year of £151,572, against £130,054 in the preceding year. The working expenses are recorded as £99,224, against £79,705, leaving a gross profit of £52,347 (£50,348). Deduction of the capital charges &c., leaves a net surplus of £14,574, compared with £17,904 for the year 1923-4. The capital expenditure for the year was £111,086, including £68,762 spent on mains, making a total of £748,087. The total kWh sold during the period amounted to 10,262,205, while the maximum demand was 7,000 kW. The bulk sales totalled 458,088 kWh.

Extension of Generating Station.—The Electricity Committee has received consent to extend the generating station.

Loan Sanctioned.—The Town Council has received sanction to a loan of £14,900 in connection with the scheme for supplying electricity to Hayling Island.

Application for Loan.—Application is to be immediately made for sanction to borrow £35,000 for mains to be laid in the areas first to be supplied under the Special Order for extensions which has been granted.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Ayrshire.—Private lighting: First 1,000 kWh per quarter to 6d. per kWh; beyond this figure 5½d. per kWh; 4½d. per kWh, with a minimum guarantee of 20,000 kWh per annum. Power (l.p.): First 5,000 kWh per annum, 2½d., the next 5,000 kWh, 2d., 1½d. for a further 5,000 kWh, 1½d. for the next 5,000 kWh, and 1d. for all beyond. Maximum demand: £6 per kW plus 0.5d. per kWh up to 150 kW, £5 10s. plus 0.5d. up to 200 kW £5 plus 0.5d. up to 250 kW, £5 plus 0.4d. up to 300 kW, and above this £5 plus 0.3d. Domestic heating: To 1½d. per kWh.

Weybridge.—10d. per kWh for the first 100 kWh per quarter and 9d. per kWh beyond.

Swansea.—Lighting: Flat rate from 6d. to 5½d. per unit; maximum demand system: The war increase reduced from 40 to 20 per cent. Power: The war increase reduced from 25 to 12½ per cent. Heating and cooking: Winter quarters from 2d. per kWh to 1½d. per kWh. Meter rent: By 50 per cent.

Bedford.—Cooker hire charges: From 10s. per quarter to 7s. 6d. in respect of large cookers, and from 8s. 6d. to 6s. 6d. in respect of smaller cookers.

Harrogate.—Lighting: By 1d. per kWh. Heating: By ½d. per kWh. Power: To 4d. for the first 116 kWh per h.p. per quarter.

Exeter.—Lighting: To 5½d. per kWh. Heating: To 2d. per kWh. Power: To 1½d. per kWh.

Barnes.—Rateable value system: To one penny per kWh throughout the year, meter rents to be reduced by 1s.

Grays.—Lighting: For first 1,000 kWh per quarter 7d., next 1,500 6d., beyond 5d.; prepayment meters, 8d. Power and heating: For first 500 kWh 3d., next 3,500 2½d., beyond 2d. Outside shop lighting, 5¼d. Cooking: If cooker is purchased, 1½d.; cooker hired, through separate quarterly meter, 1½d.; cooker hired, through separate prepayment meter, 2d., with a rebate of 1d. in each 1s. collected; cooker purchased, through separate prepayment meter, 2d., with a rebate of 2d. in each 1s. collected.

Fleetwood.—Reduction of over 10 per cent. on previous charges. Lighting: First 200 kWh per quarter, 6½d. per kWh; 201 to 400, 6d.; 401 to 600, 5½d.; 601 to 1,000, 5d.; 1,001 to 1,500, 4½d.; over 1,500, 4d.; prepayment meters, 8½d. per kWh and 2d. in 1s. discount. Power: Up to 2,000 kWh per quarter, first 500 kWh at 2½d., remainder 1½d.; over 2,000 and up to 5,000, a flat rate of 1½d.; over 5,000 a sliding scale from 1½d. to 1d. at 30,000, subject to coal clause for consumption of over 5,000 kWh per quarter. Heating and cooking purposes: A flat rate of 1½d. Discount to Railway Company to be increased from 5 per cent. to 7½ per cent.

Rawtenstall.—Application for Loan.—The Town Council is to apply for sanction to borrow £32,000 for the purchase of a 6,000-kilowatt turbo-alternator and the necessary equipment for extensions to the Corporation electricity works at Hareholme.

Ryde.—New Charges.—The Ministry of Transport has made an order authorising the Isle of Wight Electric Light and Power Co. to make the following charges for electricity as from July 1st:—Winter quarters: For any amount up to 15 kWh, 12s. 6d., and beyond, 10d. per kWh. Summer quarters: Any amount up to 10 kWh, 8s. 4d.; and 10d. per kWh beyond.

Saltburn-on-Sea.—Non-Purchase Decision.—The Urban Council has affirmed its previous decision not to purchase the electricity undertaking supplying the town.

Sheffield.—Year's Working.—The statement of accounts for the year ended March 31st, 1925, for the electricity supply undertaking (engineer, Mr. S. E. Fedden), shows a working expenditure of £368,994, against £297,729 for the previous year. The income amounted to £813,024, compared with £808,946, resulting in a gross profit of £444,030 (£511,217). After deducting the capital charges, &c., the net surplus stands at £147,510, against £201,411 for 1923-4. The capital expenditure for the year amounted to £149,406, making a total of £4,015,892; £131,792 was expended on sub-station buildings and mains. The average price per kWh during the year was 1.186d. The kWh sold increased by 2,568,316, or 1.7 per cent. The maximum demand for the year was 229,032 kW.

South Devon.—Supply Inquiry.—The Electricity Commissioners have appointed Col. Ekin, of the Ministry of Transport, to conduct an inquiry regarding proposals to supply electricity over a wide rural area in South Devon. This area extends from Prawle Point to Teignmouth on one side and Moretonhampstead on the other. The Teignmouth Electric Lighting Company has asked for powers respecting part of this area, including Kingsteighton, Bishopsteighton, Bovey Tracey, Teigngrace, Trusham, and Heathfield.

Southend.—NEW PLANT INQUIRY.—Col. T. C. Ekin, M.Inst.C.E., representing the Electricity Commissioners, opened an inquiry at the Clarence Hall, Southend, on July 14th, into the application of the Town Council to borrow over £75,000 for new plant and the conversion of the system of distribution. The principal witnesses were Mr. W. H. Patchell and Mr. R. Birkett, the borough electrical engineer. The latter gentleman spent some 6½ hours in the witness-box, and was mercilessly cross-examined for some time, says the *Southend Times*, on matters contained in the report of the late Mr. C. H. Wordingham. The figure referred to includes £40,000 in respect of new plant; £7,100 and £2,980 in respect of expenditure in excess of grants on previous sanction; and £25,000 for the purpose of laying a.c. mains, &c.

Southwick.—ELECTRICITY SUPPLY.—Considerable progress has been made with the laying of feeders to supply this area from the Brighton electricity undertaking, and it is hoped that the supply will be available in time for the next lighting season.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation, Special Orders made by them for the supply of electricity in the following districts:—The County Palatine of Lancaster, by the Urban District Council of Ashton-in-Makerfield; the rural district of Whitchurch in the county of Southampton, by the Whitchurch and District Gas Company, Ltd.; also a Special Order made by them authorising the London Electric Supply Corporation, Ltd., to supply the Southern Railway Co. with electricity to be used for purposes incidental to the working or lighting of certain railways.

Application is being made by the Darlington Corporation to supply electricity in the rural districts of Darlington and Croft.

The Urban Council of Dartford has decided to apply for a Special Order to supply electricity to the parish of Stone.

Stockton.—MAINS EXTENSIONS.—The Electricity Committee has agreed in principle to the laying of a new h.p. main from the works to the Dinham Road area, and the erection of an outdoor sub-station, at an estimated cost of £5,500. The electrical engineer is to report further on the matter later.

Strood (Kent).—ELECTRICITY IN BULK.—The Rural Council has decided not to accede to an application by the County of London Electric Supply Co., for an order to supply electricity in bulk by mains to be laid between Barking and Rochester.

Swansea.—MAINS EXTENSIONS.—The Electricity Committee has decided to lay electricity mains in various roads at a cost of £33,000, and to borrow £50,000 for prospective extensions to mains and house services.

Torquay.—APPLICATION FOR ORDER.—Subject to the disposal of an application by a private company for an Order to supply energy in an adjoining area, the Torquay Corporation proposes to apply for an Order for powers to supply outside its area, which would then enable negotiations to proceed with Edmundsons' Electricity Corporation, Ltd., for a supply in bulk to other districts. It is suggested that such a supply could be given to Dartmouth.

OVERHEAD LINES.—The Electricity Committee has obtained the consent of the Ministry of Transport to the erection of overhead lines to supply electricity at Kingskerswell.

Truro.—ELECTRICITY SUPPLY.—The Truro Corporation has accepted the offer of Messrs. Edmundsons' Electricity Corporation, Ltd., to supply electricity to the city, subject to provisions that the maximum price charged shall not exceed 10d. per unit for lighting and 5d. per unit for power, and that the company shall undertake to adopt as soon as possible the proposed Government standard periodicity.

Warwick.—NEW CABLE FEEDER.—The Leicestershire and Warwickshire Electric Power Co. is to lay a cable from the power station at Warwick to Coventry.

Watford.—PLANT EXTENSIONS.—The Electricity Committee has decided to ask for permission to install a 5,000-kW turbo-alternator and a 30,000-lb. water-tube boiler at the electricity works.

West Thurrock.—PUBLIC LIGHTING.—The Parish Council has accepted the offer of the County of London Electricity Supply Co. for public lighting at £3 7s. 6d. per 100-watt lamp. The total cost of lighting will be £351 18s. 6d., against £414 5s. 9d., the estimated cost of gas lighting.

Woking.—EXTENSION TO POWER STATION.—The Woking Electric Supply Co. are to enlarge their power station at the junction of Board School Road and North Road.

Wrexham.—OBJECTION TO BULK SUPPLY SCHEME.—The Wrexham Rural District Council has decided to make a formal objection to the application of the Wrexham Corporation for powers to distribute electrical energy within parts of the rural district.

Worcester.—APPLICATION FOR LOAN.—The City Council has applied to the Electricity Commissioners for a loan of £33,300 to carry out the first instalment of a scheme under the Electricity Extension Order.

Tramway and Railway Notes.

Argentina.—BUENOS AIRES.—Plans are under consideration for an underground electric railway in Buenos Aires to connect the Retiro railway station in the North with several important suburbs in the southern part of the city.

Bradford.—NEW TRAM TRACK.—The City Council has decided to re-lay the tramway track from the junction at Eccleshill to Five Lane Ends after considering the installation of a railless car system.

Continental.—AUSTRIA.—Austria will, within the next three years, electrify an additional 300 kilometres of its railways, and will purchase upward of 70 electric locomotives. A total of $18,000,000, part of the remaining proceeds of the International Loan for Austria, recently released for this purpose by the League of Nations finance committee, will be used to finance this electrification.—*Commerce Reports.*

ITALY.—Work has lately been completed on the electrification of the railway between Genoa and Sestri Levante.

A new electric railway has lately been completed and opened for traffic between Eribano and Agordo a distance of about 17¾ miles.

FRANCE.—The Midi Railway has prepared plans for a projected electric railway to the summit of the Pic du Midi de Bigorre, which has an altitude of 9,435 ft.

Work has been practically completed on the electrification of the Midi railway between Montrejean and Luchon, a distance of 22½ miles

SWITZERLAND.—Such good progress is being made with the electrification of the Olten-Berne section of the Swiss Federal railways that it is expected the work will be completed a month or two before the date specified in 1923, *i.e.*, by the end of 1925. This will enable work on the electrification of the Pratteln-Brigue line to be started somewhat earlier than was anticipated.

Dudley.—TRAMWAY ABANDONMENT.—The Ministry of Transport has sanctioned the abandonment of the tramway track from Dudley to Kingswood.

Java.—ELECTRIFIED STATE RAILWAYS.—The first electrified section of the Java State railway has recently been completed and opened for traffic. It is about 10 miles in length and runs from Batavia to Tandjong Priok. The power is transmitted at 7,000 volts from a hydro-electric station about 60 miles away, the current being converted to 1,650 V, d.c., at two sub-stations in Batavia.

Middlesbrough.—YEAR'S WORKING.—A progress table for the tramway and 'bus undertakings shows for the former a gross income for the year 1924-5 of £67,343, against £64,547 for the previous year. The working costs amounted to £48,493, against £45,245, leaving a gross profit of £18,850 (£19,302). The reduction of capital charges, &c., leaves a deficit of £4,316 against £3,848 for 1923-4. The car mileage for the year was 718,854, compared with 667,976 for the preceding year. There was a deficit of £3,414 on the 'bus services.

Penang.—YEAR'S WORKING.—The accounts for the year ended December 31st last of the Tramway Department (engineer and manager, Mr. W. J. Williams) record a total expenditure of £22,971 and an income of £27,923, leaving a gross profit of £4,952. The net result after deducting capital charges, &c., was £470 profit. The capital expenditure during the year was £4,579. The accounts for the 'buses and railless cars are both included in the above.

Southport.—YEAR'S WORKING.—We have received a copy of the annual report for the year ended March 31st last, on the working of the Tramway Department (general manager, Mr. T. J. Kendrew). The revenue is shown as £76,627, against £70,841 for the preceding year. The working costs amounted to £52,365, against £48,703, leaving a gross profit of £24,261 (£22,137). After deducting capital charges, &c., a net surplus of £4,401 is shown. The car miles run during the year reached a record figure of 1,015,969, an increase of 873,110.

Sunderland.—TRAMWAY REPLACED BY 'BUSES.—The Sunderland District Tramways Company has withdrawn the last of its tramway services and the track is being pulled up. The company has substituted motor-'buses for tramways, and has 58 'buses operating on eight separate routes in the Houghton-le-Spring-Durham-Sunderland area.

Swansea.—TRACK IMPROVEMENTS.—The Corporation has agreed to advance £25 000 to the Swansea Tramway Co. for doubling and improving the tramway track.

Walsall.—YEAR'S WORKING.—The accounts for the tramway way undertaking (engineer and general manager, Mr. C. Burgess) for the year ended March 31st, 1925, show a total income of £78,690 as compared with £76,315 for the previous year. The total working expenses were £55,285 against £57,378, leaving a gross surplus of £23,404 (£18,937). The capital charges for the year amounted to £13,109, which, after adding income from other sources, leaves a net profit of £10,877, as compared with £5,242 for 1923-24. The car miles run during the year increased from 901,580 to 933,143, and the number of passengers carried was 11,373,512, compared with 10,744,392 for the preceding year.

Telegraph and Telephone Notes.

Belgium.—ANGLO-GERMAN TELEGRAPHIC COMMUNICATION.—A meeting attended by three Ministers and officials connected with the Belgian Telegraph Administration was held on July 18th at Brussels for examining anew the installation of a cable from La Panne, on the Belgian coast, to Herbesthal, on the Belgo-German frontier. This cable is intended to assure direct telegraph communication between England and Germany, which is best served by way of Belgium. The present Belgian installations are unable to cope with the traffic, a large part of which is transmitted *via* Holland. The projected cable is estimated to cost one hundred million francs [about £950,000 at present rates]. It was suggested that the best solution would be for the work to be done by Germany under the head of reparations.—*The Times.*

India.—TELEPHONE TRAIN CONTROL.—The installation of telephone train control by the B.B. & C.I. Railway Co. has removed much of the cause of delays in running time which were so frequently experienced before its adoption, and again further relief was afforded when a system of track-circuiting was introduced extending over the section between Colaba and Bandra stations. These improvements have had the effect of enhancing the operating efficiency of the service in that 40 per cent. increase in the number of train movements per diem has been made possible.

Italy.—AUTOMATIC TELEPHONY.—An automatic telephone exchange on the Western Electric Co.'s system has recently been completed in Naples.

Mexico.—AUTOMATIC TELEPHONY.—According to *Commerce Reports* the Mexican Telephone & Telegraph Co., which was established 37 years ago and now has 32,000 miles of line in 10 Mexican States, has been granted a concession by the Congress of the State of Tamaulipas to install an automatic telephone system in Tampico. Several small lines in the State of Tamaulipas will be taken over, consolidated, and ultimately connected with existing lines. Work must be begun within eight months of the approval of the plans, and the company is obligated to have its lines into Matamoros within four years.

Postmaster-General's Statement. — In the House of Commons on July 20th the Postmaster-General (Sir W. Mitchell-Thomson) reviewed the working of the postal, telegraph, and telephone services during the past year. He said that the position with regard to telegraphs continued to be unsatisfactory; the service had incurred a deficit of £1,330,000. This was attributed to the competition of the telephone service. The latter service continued to make steady progress. In spite of the reductions in the fees, there had been a surplus of £865,000; it was expected that the further reductions which had been made would reduce the current year's surplus to £500,000. The Postmaster-General refrained from going into great detail regarding the telephones as he proposed shortly to introduce a Bill to make provision for capital expenditure upon the telephone service over a series of years. He made special mention of the increasing use of automatic telephony and to telephone communication with the Continent.

Referring to broadcasting, he said that the arrangements for the appointment of a Committee to study the whole matter were well in hand.

Dealing with Imperial radio communication, Sir W. Mitchell-Thomson said that the stations for communication with Canada and South Africa were due to be completed in October, and the sending and receiving stations for India and Australia were to be ready within nine months. It had been provisionally agreed that the Marconi Co. should be licensed to serve the following European countries, in addition to countries outside Europe:—Austria, Bulgaria, Denmark, Finland, France, Greece, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, and Jugo-Slavia.

Radio at Sea.—SHIP-SHORE SERVICE BANNED.—The G.P.O. has declined permission to the Cunard Co. to install a wireless telephone station at Liverpool as a medium of communication with its liners at sea. The White Star Line experimented twelve months ago with a wireless telephone service by which it hoped to establish regular connection between its ships at sea and Cherbough, but it was found that, principally owing to interference from other wireless services, the scheme was not a success. It is understood that a representative of the Marconi Company will visit Liverpool shortly to discuss details of new experiments.

Shetland Islands.—TELEPHONE SERVICE.—Telephone development has reached even the distant Shetlands. This month sees Lerwick equipped with a new telephone exchange with a manual switchboard, and a continuous service instead of just a daytime one as hitherto.

The Telephone Service.—RE-NAMING EXCHANGES.—By the time the next issue of the London telephone directory is in the hands of subscribers, there will be three further changes in exchange names, yet another step towards the introduction of automatic telephones: East Ham will be re-named Grangewood, Woodford will become Buckhurst, and Kingsbury will change to Colindale. Single digit telephone numbers will disappear, and big business houses will have four digit numbers instead of the familiar No. 1. The practice of calling for certain commercial exchanges by name only will cease and "Lloyd's" and "Baltic" will henceforth be known by numbers.

Radio Notes.

The B.B. Co..—PROGRAMME PLANS.—Lord Gainford, chairman of the B.B.C., at the second general meeting of the company, claimed that there is still great evasion in spite of 1,371,581 licences having been issued up to June, an increase of 567,000 during the year. "Not only is our present income not large enough," he said, "but even if and when the number of licensed listeners increases to 2,000,000 the income derived will not secure the standard of service which we desire to attain." Out of £666,000 received for licences during 2¼ years to March 31st, 1925, £612,000 has been spent in programmes, leaving a surplus of £54,000. It is essential to provide more alternative programmes than are at present possible to the great majority of listeners, and proposed improvements involve an expenditure of approximately £100,000. An income of £500,000 is expected from licenses next year, which will be spent on programmes. Lord Gainford emphasised that 85.37 per cent. of expenditure has thus been incurred on programmes, only 6.38 per cent. on administration (head office administrative salaries and wages, general expenses, directors' remuneration, &c.), and the balance of 8.25 per cent. on depreciation.

France.—RADIO LEAGUE.—An organisation open to all persons interested in radio communication in France has been formed at a meeting in Paris. This "National Federation of Wireless Clubs" represents the great majority of the 600,000 radio amateurs in France, and will deal with all questions of interest to listeners. M. Foveau de Courmelles was elected president, and vice-presidents were chosen for each district of France. Technical and juridical advisers were also appointed. —*Reuter* (Paris).

Germany.—SHORT-WAVES.—It is reported that the German Postal Ministry has decided to permit amateur broadcasting on short wave-lengths.

New Zealand.—NEW STATIONS.—The Christchurch correspondent of the *Daily Mail* reports that the Government and a new broadcasting company have agreed to the erection of modern 500-watt broadcasting stations at Auckland, Wellington, Christchurch, and Dunedin.

Rumania.—RADIO LAW.—The Department of Overseas Trade has sent us a translation of the "Law for the installation and use of Radioelectric Posts and Stations" in Rumania which has been received from the commercial secretary at Bucharest. The regulations were published on July 8th and they provide, *inter alia*, that the right of exploitation of broadcasting in Rumania belongs to the State, and may be carried out either through the General Post Office or through a limited company which will have the sole right of broadcasting. The State will contribute to the company 60 per cent. of the capital and will have the majority of votes at the general meeting and on the Council of Administration in proportion to its shareholding; private persons may participate to the extent of 40 per cent. The company will have the right to impose an annual tax for the use of receiving apparatus, fixed by agreement with the Ministries of Finance and Communications and with the approval of the Council of Ministers. Of this tax the General Post Office will take at least 30 per cent., of which it will give 10 per cent. to the town hall in the place where the apparatus is installed. The Ministries of Education, Worship and Arts, and of Communications will each have a delegate on the Board of Administration and 50 per cent. of the net profits accruing to the State from the company shall form a fund to be used specially for purposes of propaganda and national culture by wireless telephony. The broadcasting company can make agreements with enterprises in the country or abroad for the supply and erection of transmitting and receiving apparatus in models approved by the General Post Office. The General Post Office will register and control all apparatus in order to make sure that no system is used which might disturb other posts. All apparatus imported from abroad and that made in Rumania must, before being sold, bear the seal of control of the General Post Office. For certifying the apparatus the Post Office will charge a tax.

Transatlantic Broadcasting.—EXCHANGE OF PROGRAMMES.—In connection with the development of international broadcasting, the British Broadcasting Co. has sent a message to America through Mr. David Sarnoff, vice-president and general manager of the Radio Corporation, stating that, further to explore the possibility of an international exchange of programmes, the British organisation plans to establish a central station for receiving the world's most powerful broadcasting stations, and it hopes during the next winter season to be able to re-transmit to its 10,000,000 listeners Transatlantic programmes. The complete technical arrangements made on both sides of the Atlantic encouraged the B.B.C. definitely to allocate part of its programme time as an "American Programme Period, and it understands that similar arrangements will be made in the States. The scheme concerns other European countries besides England, and the *Evening News* explains that Continental programmes will be picked up by a new receiving station which is being built just outside London and thence conveyed by land line to Daventry, whence they will be re-radiated.

Telephotography in America.

Developments in the Transmission of Pictures over Telephone Lines.

THE broad principles of the electrical transmission of drawings, figures, photographs, &c., from one point to another have been known for years, but the systems heretofore devised have been insufficiently developed to meet the requirements of modern commercial service. Prominent amongst the newer developments which have facilitated picture transmission are the photoelectric cell, thermionic amplifier, electrical filters, and the use of carrier currents, the method described below having been designed for practical use over long distances on the Bell telephone network in the U.S.A.



Fig. 1.—Indian Lake, Adirondachs ; 220-mile Circuit.

The successful development that has taken place during recent months may be gauged from the accompanying illustrations, all of which have been reproduced from untouched prints made from the untouched negatives taken from the receiving apparatus in March and April, 1925. Each picture was transmitted in 7½ minutes, those shown in figs. 1 and 2 having been sent from Washington to New York City over a 220-mile telephone circuit, while those shown in figs. 3, 5 and 6 from New York to Chicago, or *vice versa*, over a circuit 931 miles long.

The negative picture to be transmitted is prepared in the form of a transparent positive celluloid film which is bent into the shape of a cylinder ; the latter is mounted on a carriage that is made to move along its axis at the same time that the film cylinder is rotated, and a spot of light thrown upon the film by an optical system is thus caused to traverse the entire film area in a long spiral. The light passing into the interior of the cylinder varies in intensity with the transmission (or tone) of the picture, and is transformed into a variable electric current by means of a photoelectric cell upon which it impinges. The vacuum cell has an alkali metal cathode (such as potassium), and its response to variations of illumination is practically instantaneous, the photoelectric current being directly proportional to the intensity of the light spot. Assuming the photoelectric current (which is d.c. of varying intensity) to be adequate and the transmission line to be suitable for carrying d.c., the photoelectric cell current may be imagined to traverse a communication line, at the far end of which is a "light valve" for reproducing the transmitted picture. This valve consists of a narrow ribbon-like conductor lying in a magnetic field in such a position as to entirely cover a small aperture; by passing the incoming current through the ribbon, the latter is deflected by the interaction of the current and the magnetic field, and so exposes the aperture beneath. Light passing through the aperture is thus varied in intensity, and if it is allowed to fall upon an unexposed photographic film (bent into cylindrical form and rotating in exact synchronism with the film at the sending end), the film will be exposed by amounts varying in proportion to the lights and shades of the original picture.



Fig. 3.—Interior View, Library ; 931-mile Circuit.

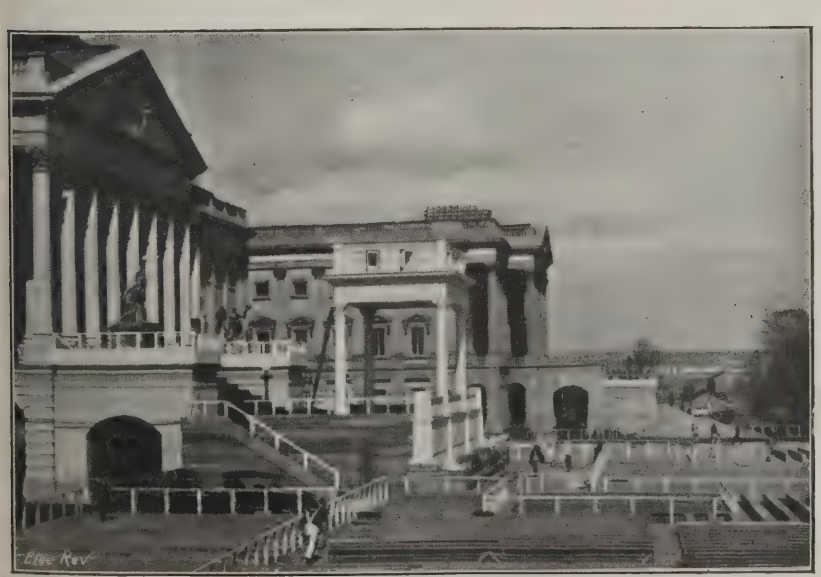


Fig. 2.—Capitol Buildings, Washington ; 220-mile Circuit.

Of the existing electrical means of communication, the wire telephone circuit has proved to be the most suitable for adaptation to the system postulated. Commercial long-distance telephone lines are, however, not ordinarily suitable for transmitting weak direct or low-frequency currents, and accordingly the photoelectric cell current is amplified by thermionic valves and then impressed upon a modulator jointly with a carrier current whose frequency is about 1,300 cycles per second. What the telephone line transmits, then, is the carrier wave modulated by the photoelectric wave so that the currents are similar in

frequency range and amplitude to the currents corresponding to ordinary speech. When the modulated carrier current traverses the ribbon of the light valve at the receiving end, the aperture is opened and closed with each pulse of alternating current; the envelope of the pulses follows the light and shade of the picture, but

controlled by electrically-operated tuning forks. Impulses controlled by the fork at the sending end are transmitted to the receiving station over the same circuit, the picture on a 1,300-cycle carrier and the synchronising pulses on a 400-cycle carrier, the two carrier frequencies being obtained from two thermionic

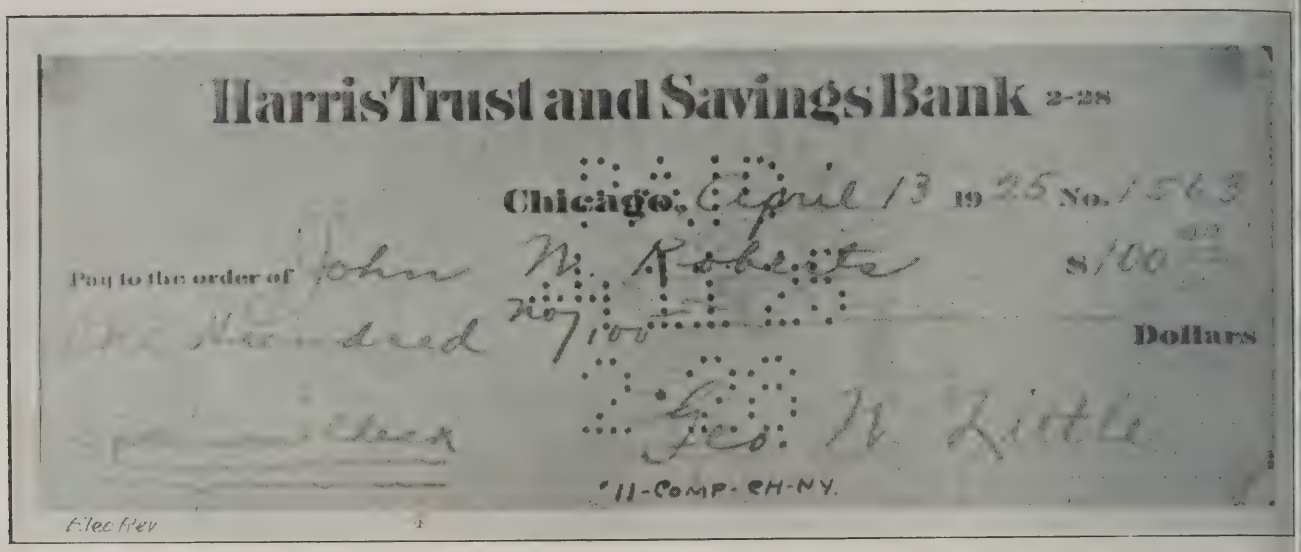


Fig. 4.—Specimen Cheque Telephotograph.

the actual course of the illumination with time shows a fine structure, of the periodicity of the carrier as indicated by the enlarged section of a picture (fig. 8), the black lines being traces of the image of the light valve aperture. Superposed on the larger variations of width, which are proportional to the light and shade of

valve oscillators, and the two currents are kept separate by electrical filters at the sending and receiving ends of the line. Space considerations do not permit reference to the interesting electrical circuits of the amplifier-modulator and filter systems; the functions of starting the two ends simultaneously and the transmission of

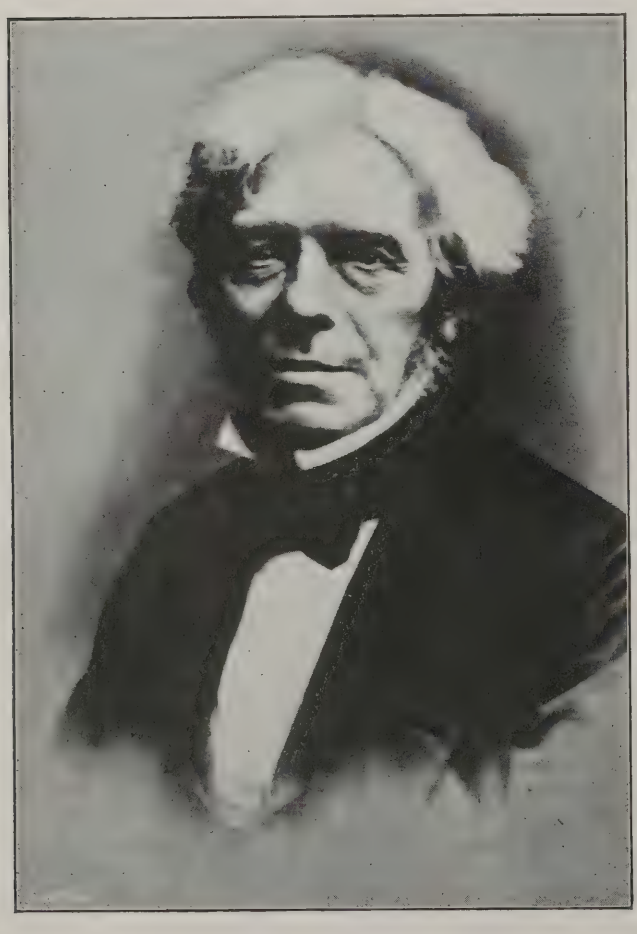


Fig. 5.—Michael Faraday; 931-mile Circuit.



Fig. 6.—X-ray Picture; 931-mile Circuit.

the picture, small steps may be noted (particularly where the line width varies rapidly), which are caused by the carrier pulses.

To secure accurate reproduction, the rotation of the transmitting and receiving cylinders is maintained at the same uniform rate with the aid of phonic wheels

signals are performed by the interruption of the picture current working through detectors and relays, while testing circuits are provided for adjusting the various elements without utilising the actual transmission line. No important changes in the transmission characteristics of the telephone line are called for; with regard to the

frequency range of the a.c. transmitted and also the permissible line attenuation, picture transmission is less exacting than speech, but variations in the transmission loss of the line, or noise appearing even for a brief instant, will be recorded as blemishes on the finished picture, while a high degree of balance between the lines and their balancing networks at repeater points is necessary. Picture transmission by radio is less stable and not so free from interference.

There are two methods of reception: (*a*) When an image of the light valve aperture is formed on the photographic surface, the picture is made up of lines of constant density and varying width. A merit of this type of picture (when received in the negative form) is that if the structure is of suitable size (from 60 to 65 lines to the inch) it may be printed directly on zinc for making a typographic printing plate, thus saving copying time, but a disadvantage is that such a picture does not readily lend itself to retouching or to change of size in reproduction. (*b*) If, however, the light from the light valve is allowed to fall on the film in a diffused manner through an aperture of fixed length so that lines of constant width (exactly juxtaposed), but of varying density, are produced, prints made from film negatives received in this way (if the structure is chosen fine enough, *i.e.*, 100 lines to the inch, or more) may be reproduced by the ordinary half-tone cross-line screen. Electrically-transmitted pictures are, in general, suitable for all purposes for which direct photographic prints are used, being faithful copies of the originals.



Fig. 7.—Specimen Finger Print.

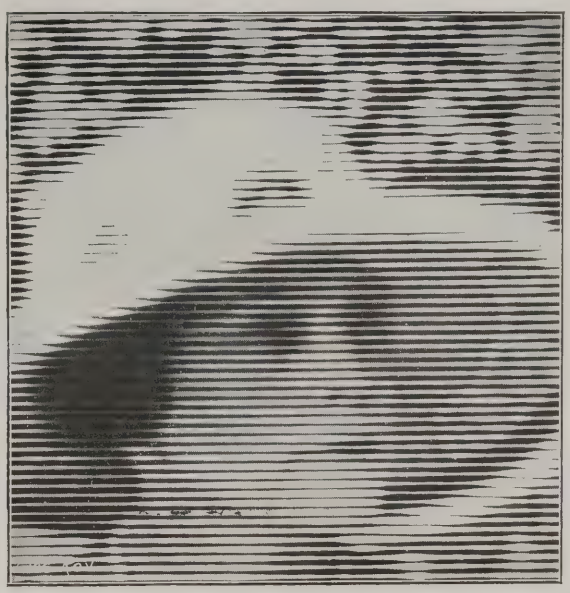


Fig. 8.—Portion of Variable-line Picture, Enlarged.

In conclusion, we have to express our indebtedness to Mr. F. Gill (International Western Electric Co.) for furnishing the pictures reproduced herewith, the accompanying details of the system employed having been abstracted from the *Bell System Technical Journal*.

A Record of Half-a-Century.

Messrs. Johnson & Phillips's Charlton Works.

To have remained on the same site, constantly growing in importance and magnitude, for half a century is a record which may be paralleled in mechanical engineering, but is probably unique in the electrical field. Messrs. Johnson & Phillips started the manufacture of cables and accessories in 1875, in the primitive workshop illustrated in fig. 1, which is still standing in the midst of the buildings which now occupy over 15 acres and employ approximately 2,500 workpeople. In those days Charlton was a village, and the electrical industry consisted wholly of telegraph engineering; commencing in that line, the firm contrived its own machinery not only for making submarine cables but also for laying them, and has continued the business with such success



Fig. 1.—Original J. & P. Workshop.



Fig. 2.—Main Cable Shop; 20,000 sq. yd. Area and 1,000 ft. Long.

that it claims to have equipped the majority of the world's cable steamers with paying-out, picking-up, and cable-handling machinery.

The introduction of electric lighting opened a new field for the company's activities. At that period electrical engineers hesitated at nothing; if they wanted

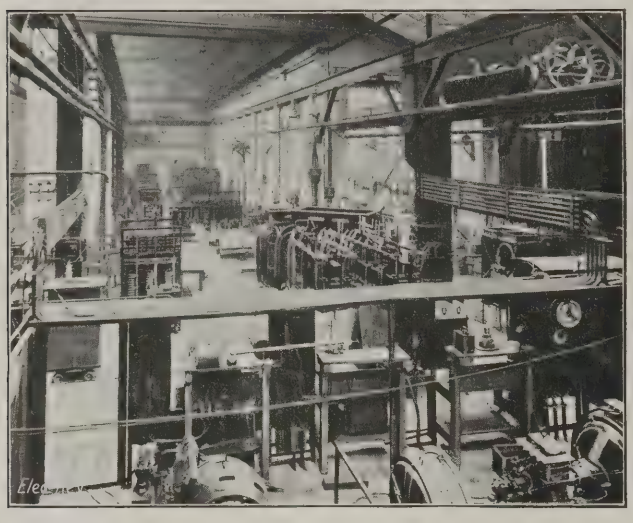


Fig. 3.—Transformer Shop Bay.

some piece of apparatus they made it, and thus a dynamo factory sprang up at Charlton—of which for a time the late Dr. Gisbert Kapp, who exercised so great an influence on dynamo design, was the director—and large numbers of machines were manufactured during the 'eighties and 'nineties. Arc lamps were also produced, the Brockie-Pell lamp which at one time was so widely known and highly esteemed being first manufactured by the company, which maintained its position in the front rank of arc lamp makers until the metal-filament lamp came into general use. The "Metroflam" magazine flame-arc lamp, designed by the late Mr. James Brockie, was one of its products. Rubber-insulated cables, of course, for lighting and power, were manufactured at the Charlton works, and from these it was a natural step to the production of lead-covered, paper-insulated cables for feeders and distributors. Such cables, for ever-increasing power and pressure, to-day form a most important part of the company's output, the cable shops, of which one is illustrated in fig. 2, occupying a large proportion of the floor space of the factory. Here, again, as in the case of submarine cables, Messrs. Johnson & Phillips designed their own machinery, and have supplied similar plant to almost

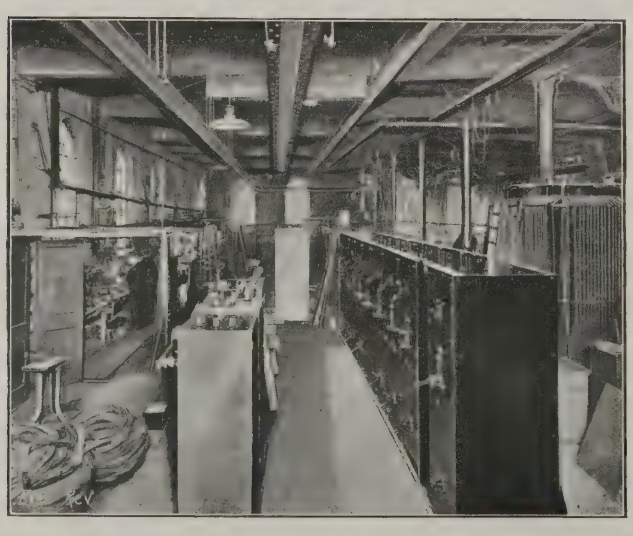


Fig. 4.—A Section of One Switchgear Shop.

every manufacturing country in the world. They make paper-insulated cables for pressures up to 33,000 volts, as well as the junction boxes, &c., for use with them; they also make cables insulated with vulcanised bitumen for mining work, claiming for their "Elastumen" type that it is free from the decentralising trouble, and like most other cable makers, they have their own "J. & P." twin metal-sheathed surface wiring system, for which all the virtues are claimed, as well as their cab-tire-sheathed wires and cables. Electric light flexibles and trunk telephone cables are likewise included in the company's operations.



Fig. 5.—A 33,000-V Line; Edinburgh Corporation.

Generators are not now built at Charlton; the company has devoted its attention rather to the transmission end of the electrical circuit, and this involves the addition of the manufacture of transformers and switch-

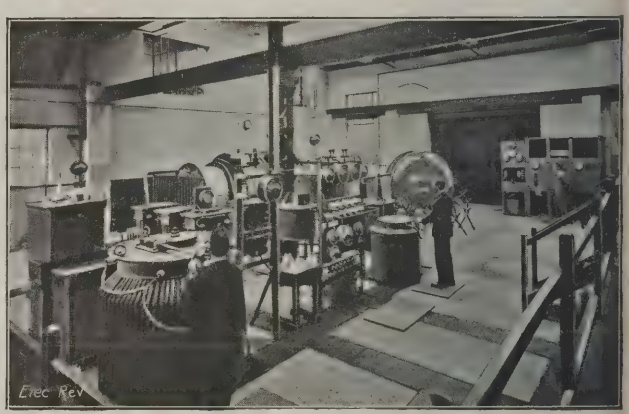


Fig. 6.—One of the Cable Testing Rooms.

gear to that of cables; at the time of a recent visit the transformer shop, of which we give a view in fig. 3, appeared to be working at its maximum capacity, a large proportion of the output being for export. Moreover, as our pages have witnessed, the company adopts an enlightened attitude with regard to the communication of technical infor-



Fig. 7.—Canteen.

mation on the design of transformers to the world in general. Fig. 4 shows a section of the switchgear shop, where are manufactured various types of switchboards for power stations and sub-stations. Ammeters, voltmeters, and frequency meters are included in the company's products.

Many large home and oversea contracts have been carried out by Messrs. Johnson & Phillips, involving the erection of overhead transmission lines, which naturally fall within the bounds of their chosen field of work. An example of a 33,000-V three-phase overhead line of their construction is shown in fig. 5, and on a later occasion some particulars will be given of the important share that they have borne in the cabling of the Southern Railway which, though not overhead, is generally overground. For use with their aerial lines they have developed pole-mounting transformers and suitable switchgear.

Special attention is given by the company to the development of export trade, particularly within the Empire, with marked success; from 25 to 30 per cent. of the turnover is for export; but the home trade is not neglected. Large contracts with the postal authorities at home and in the British Dominions are being fulfilled, and the contract for cables for the South-Eastern section of the Southern Railway is said to have been the largest of its kind yet placed in connection with railway electrification. Recent orders for transformers and switchgear have been received from a score of countries overseas, and overhead lines have been under construction in many parts of this country. Record figures were reached last year, and there are good prospects that the current year will beat them. It will be seen, therefore, that this concern though old in years is young and vigorous in spirit, and may look forward to the completion of another half-century with the confidence born of conscious integrity and strength.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—SYDNEY.—September 14th. New South Wales Public Works Department. Electrical equipment, machinery, &c., for bascule bridge over Cook's River at General Holmes' Drive.*

September 21st. Material and apparatus for complete communication system, Barrenjack hydro-electric scheme.

MELBOURNE.—Postmaster-General's Department. August 11th. (Sched. C. 26), plugs and sleeves (switchboard). (Sched. C. 25), switchboard cords.

September 15th. Lamps, lamp caps, and lamp sockets. Tender forms from High Commissioner, London.

September 14th. State Electricity Commission. 3,000 kVA transformers and spares.*

Barking.—July 28th. Electricity and Tramways Department. One 1,000-kW and one 500-kW rotary converters, with oil-cooled transformers and synchronising panels or, alternatively, one 1,000-kW and one 500-kW motor-converters (La Cour type), with starting and synchronising panels, e.h.p. switchboard, 3-wire d.c. switchboard and traction board. (July 10th.)

Bristol.—August 10th. Docks Committee. Four 3-ton movable electric jib wharf cranes for the Royal Edward Dock, Avonmouth. Spec. (£3) from Mr. T. A. Peace, chief engineer, Avonmouth Docks.

France.—July 31st. French Ministry of War (Service de Genie) in Paris. 1,500 metres of 26-pair conductor lead-covered cable and 1,000 metres, with 14 pairs of conductors. Particulars from Etablissement Central du Materiel de la Telegraphie Militaire, 51, bis Boulevard de la Tour Maubourg, Paris.

Grimsby.—August 1st. Electricity Department. Storage battery, booster, and switchgear. (July 10th.)

Steel lamp standards. (See this issue.)

India.—August 5th. India Store Department. Electric ceiling and table fans. (See this issue.)

August 11th. 313-kVA 3-phase alternators and exciters and accumulator cells. (See this issue.)

London.—ST. PANCRAS.—September 3rd. Electricity Department. One 10,000-kW steam turbine, alternator, condensing plant, pipes, &c. (July 17th.)

BETHNAL GREEN.—July 20th. Electricity Department. L.p. cables and switchgear. (July 10th.)

ST. MARYLEBONE.—August 31st. Highways Department. One 200-kW turbo-alternator set with surface condenser and auxiliaries; one second-hand 200-kW, 200/220-V d.c. generator set. (July 17th.)

H.M. OFFICE OF WORKS.—July 31st. Incandescent lamps. (July 17th.)

Manchester.—August 7th. Electricity Department. Three-phase, 6,600-V switchgear for Dickinson Street and 6,600-V switchgear for Bowker Vale. (July 17th.)

August 18th. One water-tube boiler, &c. (See this issue.)

Motherwell and Wishaw.—The Corporation is inviting tenders for electric lighting work at 128 houses. Particulars from Director of Housing, Motherwell.

New Zealand.—MARLBOROUGH.—September 22nd. Electric Power Board. Turbines, generators, and switchgear. (B.X. 1,904.)*

Newport (Mon.).—August 15th. Electricity Department. Ferro-concrete foundations for a 10,000-kW turbo-alternator and condensing plant, and one 49/50-ton engine-room crane, &c. (See this issue.)

Nottingham.—August 7th. Electricity Department. One 20,000-kW turbo-alternator, with exciter, condenser, air pumps, oil coolers, air coolers, and auxiliary plant. (July 17th.)

Oban.—August 4th. Town Council. Electric lighting work at six blocks of houses. Specifications from Burgh Surveyor.

Preesall.—August 17th. Urban District Council. E.h.p. 6,600-V cables, l.p. distribution and service cables, including excavation and reinstatement. (See this issue.)

South Africa.—JOHANNESBURG.—August 1st. Municipal Council. Twelve a.c. power relays.*

September 3rd. South African Railways and Harbours. Five 4-wheeled traversers and two tractors.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Bedford.—Electricity Committee. Accepted:—

Three rotary converters (£3,926).—Crompton & Co., Ltd.
Rotary feed pump (£249).—W. H. Allen, Sons & Co., Ltd.

Boston.—Town Council. Accepted:—

Installing electric light at the Assembly Rooms.—J. & S. Farr, Ltd.

Bradford.—Tramways Committee. Accepted:—

100 steel tramway tires (£230).—Hadfields, Ltd.
24 gear wheels and 30 pinions (£183 18s.).—A. Wiseman, Ltd.
500 lap-welded steel poles (£2,750).—Stewarts & Lloyds, Ltd.

Board of Guardians. Recommended:—

Radiological apparatus for St. Luke's Hospital, £977, Newton & Wright, Ltd.; £280, Watson & Sons, Ltd.; and £996, General Radiological Surgical Apparatus Co.

Bromley (Kent).—

Installing electric light at Christ Church, Bromley Park.—G. J. Wade and Son.

Carlisle.—Electricity Committee. Accepted:—

Battery-charging motor-generator set (£226).—English Electric Co., Ltd.
Exciter armature (£97).—British Thomson-Houston Co., Ltd.

Croydon.—Farm Committee. Accepted:—

Substitution of electricity for gas power at Beddington sewage farm (£2,075).—J. & T. Robinson.

Electricity Committee.

Alterations and additions at High Street offices and showrooms (£9,994).—E. H. Smith. (Accepted.)
Two 50,000-lb. Clayton-type boilers, with stokers, &c. (£36,424), buildings and foundations (£19,765).—Babcock & Wilcox (recommended).

Tramways Committee. Accepted:—

Points, crossings, &c. (£2,491).—Hadfields, Ltd.

Government Contracts.—The following Government contracts were placed during June, 1925:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Galvanometers.—Elliott Bros. (London), Ltd.
Motor alternators and spares.—E. N. Bray, Ltd.; Crompton & Co., Ltd.; G. Kent, Ltd.; W. Mackie & Co.; Small Electric Motors.
1,500-kW motor converter, &c.—British Thomson-Houston Co., Ltd.
Motor-generator sets.—Metropolitan-Vickers Electrical Co., Ltd.
Starting resistances.—Whipp & Bourne, Ltd.
Switches.—General Electric Co., Ltd.; Hawkers, Ltd.
Change-over switches.—General Electric Co., Ltd.; Whipp & Bourne, Ltd.
Electric tractors.—Electromobile, Ltd.
Wireless apparatus.—Dorman & Smith, Ltd.; Gambrell Bros., Ltd.; Park Royal Engineering Co., Ltd.; Radio Instruments, Ltd.; H. W. Sullivan, Ltd.; Veritys, Ltd.
X-ray apparatus.—A. E. Dean; Newton & Wright, Ltd.

WAR OFFICE.

Batteries.—Pritchett & Gold & E.P.S., Ltd.
Electric cable.—Fuller's United Electric Works, Ltd.
Electric cells.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Rotary converter.—English Electric Co., Ltd.
Economiser.—E. Green & Son, Ltd.
Electricity meters.—Ferranti, Ltd.; General Electric Co., Ltd.
Electric lamps.—British Thomson-Houston Co., Ltd.; Cryselco, Ltd.; General Electric Co., Ltd.; Stella Lamp Co., Ltd.
Turbo-alternator.—Metropolitan-Vickers Electrical Co., Ltd.
Electric lighting installation, Devonport Military Hospital.—C. H. Robinson & Son.

AIR MINISTRY.

Underground cables, Tangmere.—Watshams, Ltd.

POST OFFICE.

Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Bonnella Bros., Ltd.; British L. M. Ericsson Mfg. Co., Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.; Sterling Telephone and Electric Co., Ltd.; Western Electric Co., Ltd.
Testing and protective apparatus.—British L. M. Ericsson Mfg. Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Power Equipment Co., Ltd.
Cable (various).—Callender's Cable & Construction Co., Ltd.; Connolly's (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Macintosh Cable Co., Ltd.; Siemens Bros. & Co., Ltd.

Compound.—W. H. Keys, Ltd.
Telephone cords.—British Insulated & Helsby Cables, Ltd.; Phœnix Telephone & Electric Works, Ltd.; Western Electric Co., Ltd.
Generators.—Radio, Phonopore & Electricals, Ltd.; Siemens Bros. and Co., Ltd.
Insulator spindles.—Bullers, Ltd.; T. W. Lench, Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; Elliotts Metal Co., Ltd.; R. Johnson & Nephew, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., Ltd.
Copper wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; Elliotts Metal Co., Ltd.; Enfield Cable Works, Ltd.; R. Johnson & Nephew, Ltd.; Johnson, Clapham & Morris, Ltd.; Pirelli-General Cable Works, Ltd.; Shropshire Iron Co., Ltd.; F. Smith and Co., Ltd.; Wilkes, Son & Mapplebeck, Ltd.
Flameproof wire.—Macintosh Cable Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Kimberley-Langley Mill (Notts.) and Derby-Belper; W. T. Glover & Co., Ltd. Ipswich-Aldeburgh and Aberdeen-Inverness: Johnson & Phillips, Ltd. Oval-Brixton; Primrose Hill-Paddington; Holborn North and Walworth-Hop Junction: W. T. Henley's Telegraph Works Co., Ltd.
Electric lift, Mount Pleasant new sorting office.—Medway's Safety Lift Co., Ltd.
Private branch exchange equipment.—McNamara & Co. (1921), Ltd. (London, E.C.); Amalgamated Dental Co., Ltd. (London, W.); Scottish Oils, Ltd. (Glasgow); Kenrick & Jefferson, Ltd. (West Bromwich); Union Cold Storage Co., Ltd. (London, E.C.); Chad Valley Co., Ltd. (Harborne); Navy, Army, and Air Force Institute (Kennington).—Relay Automatic Telephone Co., Ltd.
Telephone exchange equipment.—Exeter: General Electric Co., Ltd. Sub-contractors: Tudor Accumulator Co., Ltd., for batteries; Newton Bros. (Derby), Ltd., for machines. Huddersfield and Dewsbury, Topsham and Beaconsfield: General Electric Co., Ltd. Clissold; Clerkenwell; Ealing; Royal, Mountview; North; Addiscombe; Willesden; Streatham; Hop; Brixton; Sydenham; Walthamstow; Langham; and Woolwich: Automatic Telephone Mfg. Co., Ltd. Trafford Park and Aberdeen: Western Electric Co., Ltd.
Telephone repeater equipment.—Dover; Manchester; Taplow; Marlborough: General Electric Co., Ltd.
4-wire repeater equipment and power plant.—Newcastle; Leeds; Derby; Fenny Stratford; Edinburgh: General Electric Co., Ltd. Sub-contractors: Newton Bros. (Derby), Ltd., for machines.

CROWN AGENTS FOR THE COLONIES.

Cables.—British Insulated & Helsby Cables, Ltd.
Carbons.—Kolok Mfg. Co., Ltd.
Electric derrick crane.—Anderson-Grice Co., Ltd.
Electric crane.—Ransome & Rapier, Ltd.; S. Butler & Co., Ltd.
Switchgear.—Metropolitan-Vickers Electrical Export Co., Ltd.
Ceiling fans and regulators.—Crompton & Co., Ltd.
Electric generating plant.—Lancashire Dynamo & Motor Co., Ltd.
Telegraph line materials.—Bullers, Ltd.
Telephone apparatus.—British L. M. Ericsson Mfg. Co., Ltd.
Telephone cable.—Callender's Cable & Construction Co., Ltd.; Siemens Bros. & Co., Ltd.
Bronze and copper wire.—Shropshire Iron Co., Ltd.
Copper wire.—Wilkes, Son & Mapplebeck, Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.
X-ray apparatus.—Watson & Sons, Ltd.

Hull.—

Electrical work at 40 new houses in connection with the James Reckitt housing scheme extension.—H. Hyde & Co.

Kettering.—Electricity Committee. Accepted:—
30,000-lb. boiler and stoker (£6,525).—Stirling Boiler Co., Ltd.

London.—L.C.C. EDUCATION COMMITTEE.

Electric lighting installation at Maida Vale High School, Paddington:—

Star Electrical Co. (Recommended.)	**£450**
H. J. Cash & Co., Ltd.	599
Troughton & Young	648
Electrical Installations, Ltd.	764
A. Hawkins & Sons	819
R. Brightwell	965

Electric lighting installation at Holcroft Road school, Hackney:—

Smethurst & Co. (London), Ltd. (Recommended.)	**£326**
Tredegars (1923), Ltd.	437
Commercial Telephone & Electrical Co., Ltd.	438
A. Meckhonik	448
British Electrical Installations Co.	486
Stegman & Co.	495
Heath-Pritchard, Ltd.	546
G. A. Weston	579
Power Contracts, Ltd.	626
Belgravia Electric Co., Ltd.	664
W. E. Heath & Co.	688

HOLBORN.—Board of Guardians.

Electrical installation at Holborn and Finsbury Hospital, Archway Road, Highgate:—

Knowsley Electrical Co., Ltd. (Accepted.)	**£2,530**
Etna Lighting & Heating Co., Ltd.	2,587
T. Clarke & Co., Ltd.	2,801
Belgravia Electrical Co.	2,805
Electrical Installations, Ltd.	2,927
G. N. Haden & Sons, Ltd.	2,985
Smethurst & Co. (London), Ltd.	3,024
Eastern Armature Winding Co.	3,082
Francis Polden & Co., Ltd.	3,195
F. G. Edey & Co., Ltd.	3,312
Domestic & General Electrical Co., Ltd.	3,500
A. F. Goodwin & Co.	3,555
British Electrical Installations Co.	3,618
Ellis & Ward, Ltd.	3,744
Thorn & Hoddle, Ltd.	3,980
Alex. Hawkins & Sons	3,998
Heath-Pritchard, Ltd.	4,106
C. Mickleburgh	4,236

SHOREDITCH.—Lighting Committee. Recommended:—

Coal weighing and conveying plant:—

H. J. King & Co.	£2,342
Fraser & Chalmers	£3,215
Goodall & Clayton	£3,910
Babcock & Wilcox	£4,598
(Alternative)	£4,568
ditto (Recommended)	**£4,275**
Structural Engineering Co.	£4,841

Coal weighing and conveying plant (£4,275).—Babcock & Wilcox.

HAMMERSMITH.—Electricity Committee. Accepted.
Extensions to condensing water plant (£17,144).—Geo. Wimpey & Co., Ltd.
Circulating pump and motor (£114).—Gwynnes Engineering Co., Ltd.

BATTERSEA.—Electricity Committee. Accepted:—
Three 25-kVA balancers, with kiosks (£120).—Hackbridge Electrical Construction Co.

Lamp Contracts.—The London, Midland and Scottish Railway Co. has placed contracts for six months' supplies of electric lamps with the General Electric Co., Ltd., and the Edison Swan Electric Co., Ltd.

The Aberdeen Line has renewed its contract for Siemens traction lamps with the Siemens & English Electric Lamp Co., Ltd.

Lyme Regis.—Corporation. Accepted:—
Two 75-kW generators for the electric power station (£2,930).—General Electric Co., Ltd.

Weymouth.—Housing Committee. Accepted:—
Electric lighting on the Westham estate (£312).—W. J. Warren & Sons

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

FAMOS vacuum cleaners.
Pigskin electric lamp shades.

Notes.

Gas v. Electricity.—At the invitation of the directors of the Gas Light & Coke Co. some 300 members of Chambers of Commerce inspected the Beckton works on July 16th. After luncheon, Mr. D. Milne Watson, M.A., LL.B., D.L. (President of the National Gas Council), said he had a shrewd idea that the electricity undertakings were after the gas companies' business; they were not satisfied with power and light, most of which was supplied by them; they wanted the cooking and heating load as well, and that was exactly where the gas companies were up against them. It might be thought they were animated by a spirit of hostility to electricity. That was not true, for they used electricity in their gas works for a number of purposes. The Government, however, seemed to think that it was its special duty at the present moment to boost electricity. This was not a mere whim, but a course that had been advocated by previous Governments. To him it did not seem wise to boost electricity at the expense of gas, or the best way of overcoming the unemployment difficulties of the country, particularly in view of the fact that gas was at present so largely used. If there was any artificial boosting of electricity at the cost of gas, the people's gas would cost them more, though their electricity might cost them less.

New Insulating Material.—A new company named Aktiebolaget Isoleringsmaterial at Noortaelje has started the production of an insulating material called "Sphagni" according to a method invented by the Swedish engineer, M. Bagge. The raw material used is common white moss, which is found in very large quantities on the Swedish peat moors. The moss is dried and then pressed into paper-covered cakes. The cost of production is said to be very low.—*Reuter's Trade Service* (Stockholm).

Fatalities.—An inquest into the death of Leslie R. Bastock an employé at the Staveley Works, near Chesterfield, was held last week. A witness said that he found the deceased lying with his right hand on the switch of an electric motor. He tried to pull him off, but the shock knocked him backwards, and he then ran to the power-house to have the current cut off. A doctor said that artificial respiration was carried on for two hours, but without success. Death was due to paralysis of the respiratory organs. Charles Dissington, electrical engineer, stated that he examined the motor less than an hour after the accident, and found it perfect, but there was a leakage in one of the rods inside the switch. The earth wire had been broken and had evidently been twisted together by an amateur, without being reported to him. The insulation defect in the switch was so small that it was difficult to see. The pressure on the switch was 440 V a.c., and the voltage to earth 240 to 245. A verdict of "Accidental death" was returned.

On July 17th, Andrew Jones, who was engaged in repairing an overhead transmission line at Pentre, South Wales, received a fatal electric shock, while his companion, H. Wallis, sustained a slight shock.

Static Electricity.—At the conference of the Institution of Fire Engineers, held in Edinburgh, a paper was read by Mr. A. M. Cameron, A.I.Fire E., Lasswade, on "Some Notes on the Fire Hazard due to the Development of Static Electricity during the Storage and Use of Inflammable Liquids," a subject that had been given much attention in America, but had been somewhat neglected in this country. A number of delegates having expressed their views on the subject, Mr. Cameron stated that the Institution might gather together all the authenticated cases and have them published.

Czecho-Slovakian Electrical Engineers.—The annual congress of the Union of Czecho-Slovakian Electrical Engineers was lately held at Banska-Bysterica, when among the papers read was one on "The Electrification of the Czecho-Slovakian State Railways," and one on "The Construction of Super Power Stations."

A North Met. Anniversary.—To celebrate the supply of electricity to the British Empire Exhibition (1925), and incidentally its 25th year of activity, the North Metropolitan Electric Power Supply Co. entertained representatives of local authorities, large consumers, purchasers in bulk, and others in its area, to luncheon at the Garden Club, Wembley, on July 15th. The chairman, Sir James Devonshire, K.B.E., occupied the chair, and following the loyal toast he proposed "Electricity and Development," referring to the history of his company and its steady growth since its inauguration in 1900. It had been entrusted by Parliament with an area of 326 square miles in Hertfordshire, Middlesex, and Essex, supplying over 19,000 consumers direct and over 47,000 directly and indirectly. In other words, its development has been from less than 2 million kWh in 1904 to nearly 100 millions in 1924, while Royal Assent had recently been given by an Act of Parliament which extended the company's area by 230 square miles.

All this had been done with a capital expenditure of £2,331,000, of which £973,000 (or 42 per cent.) had been spent on buildings and generator plant; £389,000 (or 17 per cent.) on main transmission lines; £895,000 (or 38 per cent.) on distribution, the remaining £74,000 (or 3 per cent.) representing miscellaneous expenditure.

The company possessed four power stations; the first was opened at Hertford in 1901; in 1904 a supply from Brimsdown was commenced, while in the same year a power station was purchased from the Willesden U.D.C. and the St. Albans station commenced to supply in 1908. The stations were mostly interconnected and their total capacity was 50,000 kW. The company's system was interconnected with those of Luton and Hackney, and a link was now being laid to the new Barking station of the County of London Company, while the above-mentioned Act of Parliament authorised the erection of a new station at Brimsdown.

The districts served by the company numbered 26, with the aid of 182 miles of e.h.p. trunk lines underground and 1,400 miles overhead, in addition to 412 miles of h.p. and l.p. distributing mains underground. Seven authorised distributors purchased the whole of their supplies from the company, and in addition bulk supplies were furnished to the Metropolitan Electric Tramways, Ltd. Wiring installations of all descriptions were undertaken by the company at each local undertaking, showrooms being in existence in nine districts, and two more were to be opened in the near future at Edgware and Harpenden.

The toast was responded to by County Alderman B. Todd, J.P., chairman of the Middlesex County Council, who referred to the benefits that many had received by purchasing energy in bulk from the company. He emphasised the responsibilities of those companies which undertook to supply in bulk, and hoped that they would be able to enjoy a reduction in price in the near future.

Miss C. M. Eve, J.P., Mayor of Stoke Newington, also responded, as also did Sir Herbert Nield, K.C., M.P., vice-chairman of the Lee Conservancy Board, who referred to the efforts which had been made to stampede the country into believing that the Government was to subsidise the electrical industry.

Norway Water Shortage.—The *Financial Times* says that reports from Bergen indicate that the water shortage in Norway has become so acute that numbers of hydro-electric undertakings are apprehensive of a complete stoppage. The majority of companies have already reduced the supply of electrical energy.

The Supply "Change-over" of the Dick-Kerr Works, Preston.—We have received some interesting particulars respecting the supply change-over of the above works of the English Electric Co., Ltd., from its own generating station to the new Ribble power station of the Preston Corporation.

The Dick, Kerr works power station consisted of a 750-kW and one 250-kW reciprocating engines, a 1,500-kW steam turbine-driven generator, and two Babcock & Wilcox and four Lancashire boilers. The conversion to the Corporation supply meant the scrapping of the whole of this plant, together with the existing switchboards, and the installation of a joint sub-station, which is now being effected.

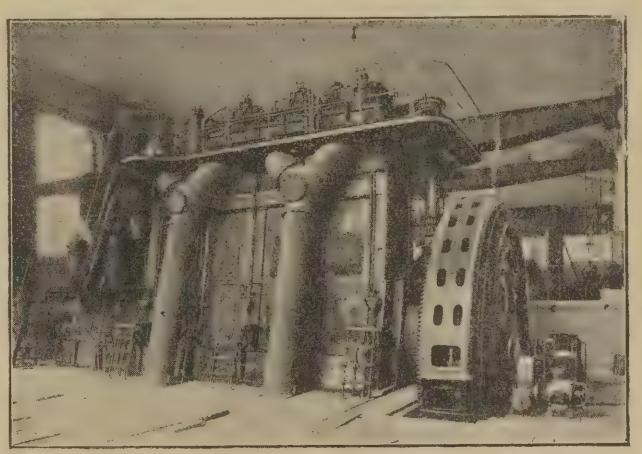
The works were driven throughout by d.c. motors, and it was decided to convert to a.c. all motors where a reasonably steady load was assured in the electrical works and the car works, to scrap the whole d.c. plant and change over completely to a.c. For machine drives, squirrel-cage a.c. motors (three-phase) have been installed, and for lighting, the d.c. wiring has been utilised and balanced between the phases.

Thirty motors, aggregating 600 h.p., in the electrical works, have been changed to a.c.; and in the car works 54 motors, amounting to 585 h.p., are gradually being changed.

The joint sub-station plant to supply the English Electric Co.'s works, as well as the Docks and Marsh Lane areas, consists of two 500-kW rotary converters, with transformers and switchgear on the Corporation side, and one 1,000-kW rotary converter, one 1,000-kW, 6,600 to 420-V transformer, and one 1,400-kW motor-generator for special heavy testing work. The switchboards have been so arranged that one 6,600-V feeder from the Ribble power station supplies the English Electric Co.'s machines, and another the Corporation machines; but the switching of motoring arrangements are such that the Corporation d.c. mains can be fed from the English Electric machines, or *vice-versa*.

The position to-day is that the whole of the power for the works is supplied by the Corporation. The conversion of the building from a generating station to a converting sub-station, and the changing of the motors has been effected without in any way affecting the continuous operation of the factory. Before an engine could be removed it was necessary to arrange for a temporary supply by using one of the machines in the testing department; and in view of the fact that the cellar contained the steam pipes it was necessary to lay the h.p. incoming cables along the floor until such a time as the steam pipes were removed. As soon as this was operating satisfactorily it was possible to remove the vertical engines. The whole of the work in connection with the conversion will be completed before the winter load comes on. In the changing of the shop drives it has in most cases been possible to erect the a.c. motor on a different site from the d.c. motor, so that the change in the drive is only a matter of fitting a belt on the new motor during the meal hour. In those cases where it has not been possible to arrange a new site for the motor it has been necessary to work on Saturday afternoons to carry out this work.

A Large Diesel Stand-by Plant. — To enable it to meet heavy peak loads on its hydro-electric undertaking as well as to act as a stand-by plant in case of emergency, the Berne Municipality has recently installed a 4,000-b.h.p. Diesel-electric plant at its Marzili power station. The undertaking was already provided with steam-turbine stand-by plant, but this will only now be used when the Diesel sets prove insufficient to meet the load. The installation is in two sets each of 2,000-b.h.p., consisting of a two-cycle, 136 r.p.m. Diesel engine, by Messrs. Sulzer Frères, coupled to a flywheel alternator generating three-phase, 50-cycle current. At the outset the sets are required to supply 40-cycle current and the engines are therefore run at 109 r.p.m., developing 1,600-h.p. Tests carried out with the engines running at this speed showed a consumption of 0.418 lb. of fuel per h.p.-hour at full load; 0.423 lb. at three-quarters load; 0.455 lb. at half load; and 0.575 lb. at



Diesel Stand-by Plant at Berne.

quarter load. The guarantees were respectively 0.429 lb., 0.440 lb., 0.484 lb., and 0.660 lb. per h.p.-hour. The foregoing figures all relate to fuel of a lower calorific value of 18,000 B.th.u. per lb.

The accompanying illustration shows the first set in position, and, in the foreground, the foundations for the second set. The first was put into commission in November, 1924, while the other commenced running in February last.

Submarine Diesels at Loughborough.—Two Diesel engines taken from German submarines and presented by the Admiralty to the electrical engineering department of Loughborough College, have been adapted for use in connection with the scheme of that college to provide its own electricity supply. One is of 1,850 h.p., and the other 500 h.p. The engines had been made unworkable by the Germans, and the task of re-assembling them has been a formidable one, but, nevertheless, it has been a valuable experience for the students. A very cheap and crude oil is being successfully used for running the engines. The switchgear has been collected from various submarines. When the new power house is completed it will supply the whole of the college buildings, the current being conveyed by overhead wires.

Illuminations on Southend Pier. — This year visitors to Southend will find the illumination of the pier, pierhead, bandstand and dancing pavilion, to be on an altogether more elaborate scale than in the past. It is at the pierhead where the most extensive additions and alterations have been made to last season's illuminations. Festoons of white light in the foreground are supported by posts which are surmounted by G.E.C. fittings and flambeau shades; each shade accommodates a green or flame coloured sprayed lamp. In the dancing pavilion the bandstand is outlined with clear lamps; streamers of clear lamps also radiate from a central four-tier corona of lamps over the dancing floor to the bandstand and the sides of the pavilion. The installation of a number of "Wembley" lanterns illuminating the whole of the dancing floor has proved to be extremely satisfactory.

Electricity on Board Ship.—An interesting event took place at Belfast on the 7th inst. that is, the launch from Messrs. Harland & Wolff's East Yard of the Royal Mail passenger motor liner *Asturias* (22,000 gross tons). The new vessel marks an epoch in the progress of naval architecture, for she is the largest and most powerful motor vessel in the world (with her two Harland-B. and W. 8-cylinder double-acting oil engines. Needless to say, elecfricity is used largely; there are 400-kW Diesel-driven generators and one 75-kW Diesel-driven emergency generator. There will be some 4,000 lights in all, together with the usual navigation lights with Morse lantern and the high-angle-power lamps and lanterns for working of cargo. A feature of the ship will be the ample ventilation which is so necessary in warm climates, there being over 50 large fans for delivering cold air to the accommodation, in addition to more than 500 cabin and ceiling fans distributed throughout the staterooms and public rooms. The heating throughout will also be electric, there being some 500 heaters in the public rooms and the accommodation. The cooking ranges for passengers and crew will be electric. There will also be two large electrically-heated bakers' ovens, in addition to salamanders, grills, toasters, griddle plates and fish friers. In the dining saloon electrically-heated *rechaud* stands are distributed at intervals in way of the tables.

In the hospitals and barbers' shops large sterilisers will be installed; the barbers' shops will contain electrically-heated hair driers and machines for the application of vibro-massage.

On the decks the electrical equipment includes a 135-h.p. warping winch, two 150-h.p. capstans, and 136-h.p. windlass, together with the motors for the electro-hydraulic steering gear. The watertight doors are electrically operated and controlled from the captain's bridge, where an indicator shows their position at any time.

There are no less than seven electrically-operated lifts and hoists and the following service machinery:—Two mincing machines, one cake whisk, one coffee mill, one bacon slicer, one ice-cream machine, four plate washers, three potato peelers, two dough mixers, one printing machine, one laundry motor, one gymnastic motor, and one photographic printing machine for the dark room.

A complete system of bells and telephones is installed throughout the vessel, and an up-to-date equipment for wireless telegraphy has been fitted both on the ship and the motor lifeboats.

Electricity Supply Rifle League.—The following are the results of the June matches:—*1st Division:* Central A 591, St. James' 573; Central A 589, County 589; City A 578, Central B 561; Shoreditch A 584, Central B 563; Shoreditch A 587, St. James' 557; County 586, City A 577. The Central A team heads the list with nine points. *2nd Division:* Central C 574, City B 573; Central C 569, Shoreditch B 562; City B 573, Epsom 474; Hackney 541, Epsom 444; St. James' A 529, Shoreditch B 515; St. James' A 536, Epsom 412. The Central C team heads the list with 10 points.

Electric Vehicles in the Vienna Postal Service.—At a recent meeting of the Austrian Motor Engineers' Association, Herr Ing. Josef Altmann gave particulars of the electric and petrol vehicles used in connection with the postal service in Vienna. At the present time 26 electric vehicles, built by the Austrian Daimler Motor Co., and 35 petrol vans and trucks constructed by the Austrian Fiat Co., are in service, the "electrics" having a carrying capacity of 1½ tons and the petrol vehicles two tons. The electromobiles are each fitted with compound four-pole motors rated at 6 h.p. at 1,250 r.p.m., driving the rear road wheels through gearing and chains. The controller is adapted to give three speeds, with a maximum of approximately 12 m.p.h. The battery consists of 80 cells, supplied by the Akkumulatorenfabrik Gesellschaft, of Vienna; they have a capacity of 200 amp.-hours and weigh, with their receptacle, about 24 cwt. Owing to the bad hilly roads in the Vienna district, the mileage per charge amounts to only from 25 to 35 miles. For charging the batteries, a special installation was put in for the postal authorities by the A.E.G. Union Electricitäts Gesellschaft. The available 5,000-volt a.c. is stepped down to 380 V by means of six transformers of a total capacity of 400 kW, and converted to the desired battery-charging voltage by 26 mercury-vapour rectifiers. The latter are said to work at 88 per cent. efficiency, their glass bodies having a useful life of from 2,500 to 4,000 hours. Special provision is made for the rapid substitution of charged for discharged batteries; in front of each charging board is a pair of rails on to which the little battery-carrying trolleys can be run in front of a charging board. Along the length of the battery-charging room, at right angles to the other rails, is a set of rails running to the electric vehicle garage on which runs a special trolley capable of carrying two of the battery trolleys. The main trolley, together with an auxiliary one, is run under the vehicle and, by means of special gear, a battery box is quickly released and dropped into position ready for transport to the charging room. At the same time another trolley brings a fully-charged battery.

The records which have been kept indicate that on macadam roads the energy consumption of the vehicle works out at 85 watt-hours, and on asphalt roads at 77 watt-hours per ton-kilometre. In the case of vehicles provided with ball instead of plain bearings, the figures are 77 and 61 watt-hours respectively. Experience has also shown that the positive plates of the batteries have a life of from 4,300 to 4,400 miles, and the negative plates from 8,500 to 8,800 miles. Owing to the greater tare weight and the high cost of electricity in Vienna at the present time, the running costs of the electromobiles are stated to be higher than those of the petrol vehicles. Efforts are, however, being made to reduce the costs not only of electricity, but in other sections of the electrical department, notably in connection with mercury-vapour rectifiers, as a result of which it is anticipatesd the electric vehicles will be able to show results contrasting more favourably with the petrol type.

Island Falls Plant, Canada.—According to the *Electrical News*, Toronto, the plant of the Island Falls, which has been purchased by the Abitibi Pulp & Paper Co. from Hollinger Gold Mines, Ltd., is to be completed to capacity. The order has already been placed for the installation of the two remaining generators. These will be supplied by the Canadian G.E.C. and will have a capacity of 12,000 kVA, operating at 128½ r.p.m. The two machines already installed are 25 cycle, but the two units outstanding will be 60-cycle machines. They are all of the vertical type with direct connected exciters. The wheel pit for No. 3 was completed in the original construction, and the excavation was completed for No. 4. The two final machines will be ready for installation early next year.

Boiler Explosion Report.—We have received a copy of the Board of Trade report of the preliminary inquiry into the explosion at a steam trap at the Great Western Railway power station, Park Royal. The explosion is attributed to the abnormal stresses to which the metal of the cover was subjected when its securing nuts were tightened. Examination of the fractured portions suggested that the cover had been working in an unsafe condition for a considerable period prior to the explosion, and that, when the cover was last rejointed, these fractures were either extended or the remaining metal was subjected to such an abnormal stress that it could not withstand the normal load. Both the existing and final fractures are attributed to the design of the joint. The owners and makers have substituted a design of cover in which the jointing material extends over the whole width of the flange.

Institution Notes.

Institution of Electrical Engineers.—NEW MEMBERS OF COUNCIL.—The following gentlemen have been duly elected members of the I.E.E. Council:—*President*: Mr. R. A. Chattock. *Vice-Presidents*: Lt.-Col. K. Edgcumbe, R.E. (T.A.), and Prof. W. M. Thornton, O.B.E., D.Sc. *Hon. Treasurer*: Mr. P. D. Tuckett. *Members of Council*: Prof. C. L. Fortescue, O.B.E., M.A., Messrs. R. W. Paul, C. Rodgers, S. J. Watson, R. Grierson, Major E. O. Henrici, R.E. (ret.), and Messrs. J. W. T. Walsh, M.A., M.Sc., and E. Leete.

Whitworth Society. — SUMMER MEETING. — The second summer meeting of the Society was held on July 17th. A number of members took tea together at the British Empire Exhibition, Wembley, and in the evening nearly fifty of them dined together at the Holborn Restaurant. The chair was taken by the retiring president, Mr. R. B. Buckley, C.S.I. (senior Whitworth scholar) who installed the new president, Mr. Wm. Sisson (Wh.Sc., 1874). There are now 465 members on the roll.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

The Salaries Committee of Keighley Town Council recommends that as from April 1st, 1925, the salary of the borough electrical engineer (Mr. H. WEBBER) be at a minimum (without bonus) of £800 per annum, plus (1) £20 for every complete 1,000,000 kWh sold above 10,000,000 in each financial year; and (2) as from April 1st, 1926, £30 for every reduction of .03d. in the works costs in each financial year below the figure for the year ending March 31st, 1926.

From Berne we learn that the Swiss Federal Technical High School has lately awarded the title of Doctor to Herr EMIL HUBER-STOCKAR, of Zurich, as a mark of recognition of his work in connection with the development of electric traction and the electrification of the Swiss Federal railways, and to Herr ARTHUR NIZZOLA, president of the Motor Columbus Gesellschaft, of Baden, for his services in connection with Swiss hydro-electric development.

Prof. GUISEPPE PESSION, a captain in the Italian Navy, has lately been appointed General Director of the Post and Telegraph section of the Italian Ministry of Communications.

The degree of Doctor of Science has been conferred by Leeds University upon Mr. H. S. HOULDSWORTH, chairman of the Heckmondwike Council's Electricity Committee.

Since the death of Mr. W. J. Hudson, in May last, Mr. R. W. WEEKES has been carrying on for his widow till his affairs could be settled. Mrs. Hudson has now re-assigned the business to Mr. Weekes as from January 1st last. Mr. Weekes will continue to practise under his own name, and the name "Weekes & Hudson" will not be used any more.

Mr. T. G. HUNTER, formerly representative in South Wales for the Siemens & English Electric Lamp Co., Ltd., has joined Messrs. Johnson & Phillips, Ltd., as their cable sales representative for the southern counties (Hampshire, Sussex and Kent coast). Mr. Hunter will work in conjunction with Messrs. Johnson & Phillips's Portsmouth branch, having his headquarters at Southampton.

Mr. G. RABBITTS, head linesman on Sunderland Corporation tramways for the last 25 years, is leaving to take up an appointment in New Zealand, and has been presented by the Sunderland tramway employés with a wallet of Treasury notes.

Mr. C. BURGESS, manager of the Walsall Tramways since 1920, has secured an important appointment at Shanghai.

At Tuesday's meeting of the L.C.C. the General Purposes Committee brought forward a recommendation that Mr. J. K. BRUCE, the traffic manager, be appointed general manager in succession to Mr. A. L. C. Fell, who retired in December last. The salary proposed is £2,000, the amount which Mr. Fell was receiving. Mr. Bruce's present salary is £1,500 a year, plus a special allowance of £150 per annum while acting as general manager, plus bonus, making £1,856.

It is reported that Mr. H. W. WATTS, of Cheltenham, has been appointed electrical engineer to the Epsom Council.

We are pleased to report that Mr. E. HOLCOMBE HEWLETT, borough electrical engineer, Mansfield, who was taken suddenly ill on the Friday of the I.M.E.A. Convention, has, after a dangerous period during which his life was several times despaired of, now turned the corner and is approaching convalescence.

Mr. GUY BURNEY, retiring managing director of Sterling Telephone & Electric Co., Ltd., paid his farewell visit to Dagenham Works on Thursday last week. In his speech he thanked the employés for their efforts on behalf of the company. One of his chief regrets in severing his connection with the company was the parting with the staff and employés who had worked so well and loyally under him for so many years. Outlining the position of the telephone industry, Mr. Burney said that the domestic trade in which they had specialised for such a number of years was gradually declining, largely due to competition from the G.P.O., who were now giving such splendid facilities to subscribers that privately-owned intercommunication telephones were no longer in large demand. Unhappily the telephone manufacturers had only one customer for public exchange work, the competition for which was keen, with prices very lean. Touching on the future of the radio industry, Mr. Burney expressed the opinion that its future prosperity largely depended upon the attitude of the Board of Trade in regard to the application shortly being made to safeguard the industry against unfair foreign competition. He stated there was ample evidence that radio apparatus was being dumped into this country at prices approximately 50 per cent. below those at which the British manufacturer could afford to market them. German and Austrian telephones were coming in at an alarming rate, prices delivered averaging 6s. per pair. He had an example at 4s., and this was by no means a shoddy production. Foreign loud speakers were now increasing in numbers ranging from 16s. to £3 10s. retail. Components, too, were looming up large, such articles as transformers at 4s., variable condensers from 4s. 6d., &c. When it was realised that the cost of labour in Germany and Austria was between 45 and 50 per cent. below the British rates, it would readily be appreciated that the home manufacturers could not possibly compete. America and France were also doing their share of dumping. Trade unions, Mr. Burney remarked, saw to it that British labour received the union rates of pay, yet they did not appear to concern themselves about the vast influx of foreign goods manufactured in neighbouring countries by labour costing about half of that which we had to pay to British workmen. Such a state of affairs was lamentable, and the sooner the Government realised it the better. British labour must be protected if disaster to industry was to be avoided. At the conclusion of Mr. Burney's speech, he was presented with a silver salver by the employés.

The Shoreditch Borough Council Special Standing Joint Committee recommends that Mr. W. WEEKES, the present chief assistant electrical engineer, be appointed borough electrical engineer on probation for a period of 12 months, as from the date of Mr. C. Newton Russell's retirement, at a salary of £850 per annum.

St. Marylebone Borough Council Electric Supply Committee recommends that special duty pay as follows be granted to the senior technical officers of the Electricity Department for the extra and valuable services rendered by them in connection with the two plant extension schemes adopted by the Council in 1919 and 1923, involving capital outlay of approximately £750,000:—Mr. C. H. SMYTH, chief electrical engineer, £750; Mr. F. B. LEONARD, chief assistant electrical engineer, £350; and Mr. F. SELLEY, mains and sales engineer, £200.

Obituary.—MR. H. BEVIS.—We regret to record the death of Mr. Henry Bevis, M.I.E.E., which occurred on July 16th at East Molesey. Mr. Bevis had been a sufferer for 2½ years He was managing director of Pirelli, Ltd., and of the Pirelli-General Cable Works, Ltd. The funeral took place on Monday afternoon at East Molesey Cemetery. Mr. Bevis was one of the well-known personalities of the electrical industry in its early days. He was born in 1865, and he joined Mr. (now Sir) Hugo Hirst in 1884 as assistant in the Electrical Apparatus Co., Ltd. When, two years later, Mr. Hirst joined Mr. G. Byng—a step which led to the formation of the General Electric Co., Ltd.—Mr. Bevis continued to manage the Electrical Apparatus Co. for a few years as an opposition concern, but in 1889 the company liquidated and Mr. Bevis then re-joined Mr. Hirst. For 17 years the closest collaboration existed, Mr. Bevis, under Mr. Hirst's leadership, taking a lion's share in the strenuous work attaching to the early development of the G.E.C. Whether it was selling, advertising, catalogue compiling, or manufacturing, Mr. Bevis was always ready to step into the breach, showing great ability and the utmost loyalty. He was one of those who realised the necessity for the Electrical Trades Benevolent Institution, took an active part in its inception and formation, and took the keenest interest in its welfare. He was also a firm believer in the value of electrical exhibitions. Mr. Bevis made a tour round the world in the early history of the G.E.C., and also visited the U.S.A. and the Continent very frequently. He was, in his time, one of the best-informed men on trade in the electrical industry both at home and abroad. About the year 1907, changes of policy of the G.E.C. decided Mr. Bevis to enter a new field of activity and he joined the Pirelli enterprise in this country, which was then closely allied with the G.E.C. For many years he acted as their managing director, playing a most prominent part in making its success. Unfortunately he broke down more than 2½ years ago.

Wills.—The late Mr. THOMAS DUNFORD of the Parsons Marine Steam Turbine Co., Ltd., left £5,611 net and £7,857 gross personalty.

Mr. H. J. COATES, works manager of the G.E.C. branch at Stoke, left £2,622 gross personalty.

New Companies Registered.

Vernita Scott, Ltd. (207,319).—Private company.—Registered July 16th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for, and dealers in lamp shades and stands, electrical apparatus and accessories, designers, decorators, architectural designers (interior and exterior), builders, contractors, &c. The directors are:—F. A. Basnett, 66, Mercers Road, Tufnell Park, N., building contractor; E. E. Vere de Lissa, 32, Gledstanes Road, Kensington, W.14, stockbroker. Secretary: F. A. Basnett. Solicitors: A. E. Samuels & Co., 36-38, New Broad Street, E.C.2. Registered office: 19, George Street, Manchester Square, W.1.

Curtis Manufacturing Co., Ltd. (207,288).—Private company. Registered July 15th. Capital, £6,000 in £1 shares. Objects: To adopt an agreement with F. C. Curtis and to carry on the business of electrical, mechanical, automobile and general engineers, machinists, sheet and metal workers, pattern makers, and manufacturers of electrical apparatus, &c. The directors are:—F. C. Curtis (permanent governing director), 94, Salusbury Road, Brondesbury, N.W.6; Gertrude Curtis, 94, Salusbury Road, Brondesbury, N.W.6; F. Rice, 47, Crediton Road, Kensal Rise, N.W.10. The governing director, whilst the registered holder of at least 50 per cent. of the share capital, shall be entitled by his will to nominate two directors as governing or ordinary directors so long as such proportion of the share capital forms part of his estate. Qualification, £20 shares. Remuneration as fixed by the company. Secretary: F. Rice. Registered office: 32, Spring Street, Paddington, W.2.

Tomlins, Ltd. (207,213).—Private company. Registered July 11th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical engineers and fitters, manufacturers of and dealers in motors, dynamos, and electric, wireless and other appliances, &c., formerly carried on by F. E. Tomlins at 124, High Street, Tunstall, Stoke-on-Trent, as "Tomlins Brothers." The directors are:—F. H. Tomlins, 124, High Street, Tunstall, Stoke-on-Trent, electrical engineer; F. Whitaker, 54, Prestbury Road, Macclesfield, Cheshire, incorporated accountant; H. Boulnois, Hill Crest, Tunstall Road, Biddulph, Staffs., potter's manager. Qualification, 100 ordinary shares. Remuneration as fixed by the company. Secretary: F. Whitaker. Solicitors: Ellis & Ellis, Burslem. Registered office: 124, High Street, Tunstall, Stoke-on-Trent.

G. F. Cooksley & Co., Ltd. (207,289).—Private company. Registered July 15th. Capital, £1,200 in £1 shares. Objects: To acquire the business of an electrical engineer and contractor carried on by G. F. Cooksley as "G. F. Cooksley & Co." at 66, Charles Street, Cardiff. The subscribers (each with one share) are:—G. F. Cooksley, 43, Grosvenor Street, Cardiff, electrical engineer; J. Bromley, 199, Arabella Street, Cardiff, electrical agent. G. F. Cooksley shall be permanent director and chairman subject to holding 100 shares. Qualification of ordinary directors, 100 shares. Remuneration, £300 each per annum (chairman, £350). Secretary: J. Bromley, 199, Arabella Street, Cardiff. Solicitor: H. G. W. Saul, 33, Windsor Place, Cardiff. Registered office: 66, Charles Street, Cardiff.

Radio (Hove), Ltd. (207,257).—Private company. Registered July 14th. Capital, £600 in £1 shares. Objects: To adopt an agreement with T. W. Cutts, and to carry on the business of manufacturers of, agents for, and dealers in wireless broadcasting sets, appliances and parts, motor, electrical and general engineers, &c. The directors are:—E. R. Lees, 30, Gordon Road, Portslade, Sussex; H. W. Lees, Ousedene, Bognor; A. Aisbitt-Gibson, 8, Aymer Road, Hove. Qualification, £50 shares. Remuneration, £10 each per annum. Secretary: H. W. Lees. Solicitor: T. W. Cutts, 50, High Street, Bognor. Registered office: 10, Westbourne Place, Hove.

N. E. C., Ltd. (207,256).—Private company. Registered July 14th. Capital, £1,000 in £1 shares (900 8 per cent. preference and 100 ordinary). Objects: To acquire the business of an electrical contractor as now carried on by J. R. Bessant at Front Street, Wingate, Durham, and to carry on the business of electrical engineers and contractors, omnibus proprietors, automobile and motor engineers, haulage contractors, &c. The permanent directors are:—J. R. Bessant (managing director), 15, Welney Place, Birley Carr, Wadsley Bridge, Sheffield; F. Craft, Lyon House, Front Street, Shotton Colliery, Co. Durham; R. Bessant, 15, Welney Place, Birley Carr, Wadsley Bridge, Sheffield. Qualification, 10 shares. Remuneration, £5 each per annum (managing director, £260). Secretary: Eileen M. Gillatt.

Singapore Traction Co., Ltd. (207,278).—Registered as a public company on July 15th with a nominal capital of £400,000 in £1 shares (200,000 preference, 199,999 ordinary, and 1 management). The preference shares confer the right to a fixed preferential dividend at 7 per cent. per annum (non-cumulative until September 30th, 1925, but afterwards cumulative) and ranking first for return of capital. The ordinary shares take all the remaining profits which it shall be determined to distribute as dividend, and in a winding up take half of any surplus assets after providing for the claims of the preference shareholders. The management share confers no right to any dividend, but in a winding up takes the remaining half of the surplus assets. Objects: To acquire all or part of the undertaking, assets and liabilities of the Singapore Electric Tramways, Ltd., and the undertaking authorised by the Singapore Traction Ordinance, 1925, of the Straits Settlements, to adopt an agreement between Sir William Plender, G.B.E., of the first part, the Singapore Electric Tramways, Ltd., and the said Sir William Plender, as liquidator thereof, of the second part; J. E. Prestwich

of the third part; the Shanghai Electric Construction Co., Ltd., of the fourth part; and this company of the fifth part, to construct, maintain and work by horse, electrical, steam or other power, tramways, railways and other means of communication in Singapore and other parts of the Straits Settlements or elsewhere, and to carry on the business of tramway, railway, omnibus and car proprietors, carriers of passengers and goods, generators, accumulators and distributors of electrical energy for light, heat, motive power or otherwise, &c. The subscribers (each with one share) are:—L. W. Hawkins Basildon House, E.C., chartered accountant; R. S. Portham, 195, Strand, W.C., engineer; A. Bide, Basildon House, Moorgate, E.C., chartered secretary; H. Burfoot, 13, Worbeck Road, Anerley, S.E., registrar; H. Donaldson, 15, Worsley Road, Hampstead, N.W.3, chartered accountant; and two clerks. Minimum cash subscription, 7 shares. The directors are to number not less than three nor more than seven. No qualification required. Remuneration, other than any directors appointed by the subscribers and the managing director, £400 each per annum (chairman, £600). Solicitors: Linklaters and Paines, 2, Bond Court, Walbrook, E.C. Registered office: Basildon House, Moorgate, E.C.2.

Gaskell & Baggaley, Ltd. (207,330).—Private company. Registered July 17th. Capital, £150 in £1 shares. Objects: To act as merchants, manufacturers, and agents in the sale, purchase and manufacture of synthetic crystals and other products of a similar nature, capable of being used in connection with wireless telegraphic installations or telephony, &c. The first directors are:—F. H. Baggaley, 681, Ashton New Road, Clayton, Manchester, chemist; H. R. Gaskell, "The Laurels," Barrington Road, Altrincham, Cheshire, crystal manufacturer. Qualification, 5 shares. Solicitor: W. T. Rylande, 2, Rook Street, Manchester. Registered office: 70, Barton Arcade, Manchester.

Haworth & Williams, Ltd. (207,224).—Private company. Registered July 13th. Capital, £1,000 in £1 shares. Objects: To carry on the business of dealers in wireless receiving and transmitting apparatus and component parts, &c. The directors are:—G. A. Haworth, 13, Yorkshire Street, Accrington; H. G. Williams, 25, Marlborough Street, Accrington. Qualification, 100 shares. Secretary: G. A. Haworth. Solicitor: F. Rowland, 15, St. James's Street, Accrington. Registered office: "Ewbank House," 13, St. James's Street, Accrington.

Official Returns of Electrical Companies.

N.S. Battery and Equipment Co., Ltd.—P. B. Nevill, of 96, Old Broad Street, E.C., was appointed receiver by Order of Court dated June 26th, 1925.

Dowsing Radiant Heat Co., Ltd.—Satisfaction in full (1) on June 1st, 1919, of mortgage or charge dated August 30th, 1912, securing all moneys due or to become due from the company to the London and Provincial Bank, Ltd.; (2) on June 23rd, 1925, of trust deed dated July 29th, 1902, securing £10,000; and (3) on same date of assignment dated July 29th, 1902, executed pursuant to the said trust deed.

X. L. O. Co., Ltd.—Debenture dated July 9th, 1925, to secure £200, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Col. O. C. Sherwood, 10, Chelsea Park Gardens, S.W.3.

Sea Houses and District Electric Supply Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated June 26th, 1925, to secure all moneys due or to become due from the company to the Bank of Liverpool and Martins, Ltd.

Insulated Cap and Rivet Co., Ltd.—F. W. Kellaway, of 112a, Junction Road, Upper Holloway, N.19, was appointed receiver and manager on July 7th, 1925, under powers contained in mortgage dated October 9th, 1923.

Baker & York, Ltd.—D. W. H. Phipps, of 15, Park Row, Nottingham, C.A., ceased to act as receiver for debenture holders on May 19th, 1925.

Berrite, Ltd.—Floating charge on the company's undertaking and property, present and future, including uncalled capital dated July 3rd, 1925, to secure all moneys not exceeding £6,000 for which the mortgagees may become liable by virtue of a guarantee given to the company's bankers. Holders: A. F. Berry, 50, Oxford Street, W., and G. Berry, The Lodge, Cowley, Middlesex.

Robins Wholesale Electrical and Wireless Co., Ltd. (formerly Robins Electrical and Wireless Depôt and Institute, Ltd.).—J. W. Williams, of 5, St. Andrew's Crescent, Cardiff, was appointed receiver and manager on July 10th, 1925, under powers contained in debenture dated April 17th, 1923.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Edmundsons' Electricity Corporation, Ltd.

The annual meeting was held on July 14th, Mr. P. D. Tuckett presiding. In moving the adoption of the report (*vide* our issue of July 10th, p. 68), the chairman said the profits had increased by £21,223, the net balance showing an increase of £16,424 after writing off last year's ordinary share issue expenses of £2,153 and providing for an additional income tax charge of £2,698. Both the gross trading profit and dividends and interest showed large increases, and it was their knowledge that they were likely to do so which encouraged them last year to restore to the ordinary shareholders the £2 per share previously written off, but although they hoped the profits would continue to expand, he would like them to realise that there was no prospect or possibility of their expanding to anything like the same extent as in the past year. Most of their older subsidiary companies were now paying substantial dividends which they could not expect to see increased much further, while the growing return from the more recent ones must necessarily be comparatively small owing to their investment in them being also comparatively small. They were able to maintain the 7 per cent dividend on the increased ordinary share capital. The schedule of investments showed a number of changes resulting in an increase of £13,608 in their share holdings and of £5,68 in their advances. Most of their older companies were now paying a reasonable return on their holdings, whilst they and the younger ones continued to make satisfactory progress. Last year, excluding the Lancashire Power Company, their connections increased by over 5,000 kW, of which a large proportion was for lighting, whilst they sold upwards of 1,100,00 kWh more for lighting and about 6½ million kWh more for power. Coal averaged 3s. a ton higher than in 1923, representing an additional cost of over £10,000, and there was a increase of about £4,000 in their wages bill. Their costs still averaged 100 per cent. or more over the pre-war level. They had, nevertheless, been able to make large reductions in their charges in a number of instances, and wherever the circumstances justified it they looked forward to making still further reductions. Taking the business as a whole he thought they had every reason to feel satisfied with the progress which had been made. He was anxious regarding the Government's avowed intention to assist the electricity supply industry. It had been their unhappy experience to suffer a great deal from legislative interference in the past and they inevitably viewed with misgiving the prospect of having their activities made the subject of the Government's experimental enterprise.

Fuller's United Electric Works, Ltd.

This company's report was briefly reviewed in our last issue (p. 108). The annual meeting was held on July 16th when Mr. F. R. Wade, O.B.E., who presided, said that continuous hard work and solidification had brought about a steady improvement in the company's affairs. It was satisfactory to note that business had been increased in the face of very adverse conditions. In the last four years the turnover had nearly doubled. It has been necessary to revise the methods of manufacture and during the past year £26,000 had been spent on new plant and the renewal of some of the old plant. This made the expenditure on this account £58,000 for the last two years. There were possibilities of considerable expansion in the future, but although the company was putting itself into a state of efficiency it had to be remembered that if the markets did not exist it could not hope for business. There was a very real danger of a collapse of British trade which no individuals could prevent. The company, however, had considerable fields before it and it must be prepared to finance the work when it was offered. Meetings of the holders of first debentures, income stock, and notes were being called to sanction powers of expansion. The National Bank of Scotland, the company's bankers, had agreed to advance the necessary funds on a prior lien and it was necessary to secure sanction to this. The appointment of Mr. R. P. Wilson, C.B.E., to the board was confirmed.

Notices have now been issued calling a meeting of the holders of the 7 per cent. income debenture stock for Monday next to consider a resolution for creating a prior lien debenture in favour of the company's bankers, the National Bank of Scotland, Ltd., for £75,000 to secure a working overdraft up to that amount on terms to include the complete redemption by March, 1931, at the rate of not less than £15,000 per annum; to increase the rate of interest on the first mortgage debenture stock from 6 per cent. to 6½ per cent. and on the income debenture stock from 7 per cent. to 7½ per cent.; and to arrange that no payments between April, 1925, and March, 1928, shall be made in respect of the redemption of the first mortgage debenture stock or of interest on the income debenture stock and notes, the available profits being retained in the business as working capital.

British Broadcasting Co., Ltd.

The annual meeting was held on July 16th, and Lord Gainford (the chairman), in presenting the report and accounts (*vide* our last issue, p. 109), said that the number of licences issued as at June 1st, 1925, was 1,371,581, an increase of 567,000 during the year. He considered that there were still many people evading the payment of the licence fee. The total receipts from the Postmaster General in the 2½ years to March 31st, 1925, were £666,00 Of this amount £612,000 had been expended in the provision of programmes. The surplus of £54,000 was sufficient to meet income tax and reserves and leave a small balance. They had a total capital commitment of £179,000. It was essential to provide more alternative programmes for the great majority of listeners; these proposals involved an expenditure of about £100,000. Out of every £100 spent by the company, the programmes and operating costs absorbed £85 7s. 6d.; administration £6 7s. 6d., and depreciation £8 5s. It was proposed to form a staff benefit fund.

Prospectus.—*North Somerset Electric Supply Co., Ltd.* The list of applications was opened last Saturday and is to close on or before to-morrow, in an issue of 55,000 ordinary shares of £1 each at par in this company. The profits set forth in the prospectus show continuous progress during the past five years. The number of consumers advanced from 872 to 1,1 during 1924, and during the first half of 1925 it has further increased to 1,360, while the revenue for the first half of 19 has increased by 25 per cent. as compared with the corresponding period of 1924. For the four years 1921-1924 the dividend on the ordinary shares was 6 per cent. per annum. The Electricity Commissioners have made an Order which awaits confirmati

by Parliament under which the company will have powers to supply electricity to rather more than a quarter of the county of Somerset. The purpose of the present issue is the extension of high-pressure mains in a southerly direction.

Anglo-American Telegraph Co., Ltd.—Interim dividends of 15s. per cent. on the ordinary stock and 30s. per cent. on the preferred stock have been declared for the quarter ended June 30th last.

Brazilian Traction, Light and Power Co.—The annual meeting of shareholders of the company was held in Toronto on June 15th. Mr. E. R. Wood, one of the vice-presidents, presided. The chairman said that the results of the year's operation should be regarded as satisfactory considering the unfavourable rates of exchange prevailing. In reply to questions asked by shareholders regarding the continuance of the drought, the chairman stated that there was little prospect of change until the next wet season about the end of the year, but that in the meantime the company was doing everything possible to alleviate the situation, and was proceeding rapidly with large new developments, which it was hoped to have completed within a year. The directors have declared a quarterly dividend of 1 per cent. on the ordinary stock.—*Financial Times.*

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

American Telephone and Telegraph Co.—$24,219,100 capital stock in shares of $100 each.

Shropshire, Worcestershire, and Staffordshire Electric Power Co.—17,375 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,110,001 to 1,127,375.

The undermentioned securities have been ordered to be officially quoted:—

Adelaide Electric Supply Co.—£350,000 5½ per cent. redeemable consolidated debenture stock.

Adelaide Electric Supply Co.—500,000 6½ per cent, "C" cumulative preference shares of £1 each, fully paid, Nos. 1 to 500,000.

Marconi International Marine Communication Co., Ltd.—The gross revenue for 1924, £976,359, was slightly higher than that of the preceding year, but the net profit, £83,576, was lower. The position is considered satisfactory having regard to the continued depression in the shipping world. It has been necessary to make provision for bad and doubtful debts. The dividend is reduced from 10 per cent. to 7½ per cent. and only £1,745 is carried forward, as against £7,623.

The meeting is to be held to-day (Friday).

Northampton Electric Light and Power Co., Ltd.—A special meeting of shareholders is being called to sanction the appointment to the board of Mr. H. G. Thornton, a director of the Wellingborough Electric Supply Co., and Mr. R. E. Lamb, a director of P. Phipps & Co.; and also to approve an increase in the directors' fees from £1,000 to £1,500 for the current year.

Marconi's Wireless Telegraph Co., Ltd.—A final dividend of 5 per cent. making 10 per cent. for the year 1924, has been declared on the ordinary shares.

County of London Electric Supply Co., Ltd.—The directors have declared interim dividends on the preference shares and one of 5 per cent. on the ordinary shares.

South London Electric Supply Corporation, Ltd.—An interim dividend of 5 per cent. has been declared on the ordinary shares.

General Electric Co. (U.S.A.).—The New York correspondent of the *Financial Times* reports that the company intends to retire $15,137,000 of outstanding 5 per cent. bonds, due September 1st, 1952, at 107½ per cent., with accrued interest.

Yorkshire (West Riding) Electric Tramways Co., Ltd.—An interim dividend of 2½ per cent., actual, has been declared on the ordinary shares.

Electrical Distribution of Yorkshire, Ltd.—A dividend at the rate of 7 per cent. free of tax, has been declared on the ordinary shares for the half-year.

Yorkshire Electric Power Co.—The directors have declared an interim dividend of 3 per cent. on the ordinary shares.

Calgary Power Co.—The surplus for the past year was $96,823 as against $30,791 in 1923.

Stocks and Shares.

Monday Evening.

The rubber share market again occupies the principal place in the Stock Exchange scene. There has been little diminution in the volume of business, and, although everyone is looking for a setback to occur, if only by reason of the furious pace at which the boom has proceeded, the public interest is maintained at a high rate. It is already beginning to affect other companies through the manner in which the price of raw rubber has risen. Various protests have been lodged against the manner in which, it is maintained, the price of raw rubber has exceeded legitimate bounds. In order to reduce the price, proposals have been put forward, by American buyers and certain British interests, that have for their object the removal of the restrictions at present limiting the output of raw rubber. The Government has declared that the rise in price is regarded by them as being temporary, and that they have no intention of legislating in regard to the restriction scheme. The India Rubber Manufacturers' Association has, however, issued a notice in which the removal of restriction is supported, and in the share market, a few small declines have occurred during the past few business days in the securities of those manufacturing companies which are large buyers of the raw material.

Henleys, for instance, are easier at 2 15/16. Electric Constructions are also 1/16 down at 31s. 3d. English Electrics went back to 18s. 3d. Siemens at 24s. 6d. are 6d. lower, and Metropolitan-Vickers ordinary gave way similarly to 20s. 9d. Shares in several other companies of similar character are slightly easier in tendency, although it is pointed out that the companies will probably pass on, at all events partially, to their customers the addition to costs which the rise in raw rubber entails upon them.

British Aluminiums are better at 30s. Brush strengthened to £1. Fuller's United Electric Works has issued a report in which the company's shareholders are asked to sanction an arrangement whereby the company's bank will advance, on a prior lien, the necessary money for expansion of the work in hand. The price of the ordinary for a long time past has been about 6d. per share, and the 8 per cent. non-cumulative preferences stand about 3s., while the 5 per cent. income-tax free short-term notes changed hands a few days ago at 21½. From which prices it will be observed that there is plenty of room for improvement, from the shareholders' point of view, in the value of their property. The report indicates that there is a reasonable promise of better things in the near future.

Electricity supply shares are quiet. Few changes have occurred in the London list, though Kensingtons at 12¾ have recovered the 7s. 6d. which they lost lately. London Electric preference eased off a little. Bournemouth & Poole are 1/16 higher. Edmundsons went back to 21s. 6d., a fall of 1s. 6d. The new County of London preference are what is called a good market. There is a close price between buying and selling, and the shares have been steadily bought since the market opened, the present price being 1s. premium over the issue price of 20s. 6d., at which the shares came out. No changes have occurred this week in the company's ordinary and senior preferences. Yorkshire Electrics gave way to 30s. There has been a little selling in this market of shares, the money from which was required to finance purchases of popular rubber issues. The third reading of the Summer Time Bill had no effect upon lighting shares generally, but prices have rallied from their recent worst.

The Home Railway market is dull. Dividend announcements are close at hand; the Metropolitan announcement comes on Thursday in this week. Underground Electric ordinary shares of £10 each gave way to 2⅜. Districts remain at 45, at which price the yield on the money is nearly 7¾ per cent. Southern Railway stocks are in a little demand, upon the extension of the electrification programme. Fresh weakness in London United Tramways preference has lowered the price to 4s. 6d. London General Omnibus income debenture, which was changing hands last week at 80, has strengthened to 83½. Yorkshire (West Riding) Trams at 17s. 6d. are 1/16 lower.

Marconi Marine has declared a dividend of 2½ per cent. as the final for the year, making 7½ per cent., against 10 per cent. in the previous twelve months, and 12½ per cent. in the year before that. The price of the shares has dropped to 18s. 9d. and Marconis, in sympathy, went down to 1⅜. The Marconi dividend should be out in a few days' time, and, in the light of the Marine Company's cut, it is feared that the parent concern may reduce its distribution to 7½ per cent. Canadian Marconis drooped to 4s. 1¼d. Cable stocks are quiescent. Anglo-American preferred and deferred have lost a little ground.

Brazilian Tractions continue to advance, and show another gain at 59. Anglo-Argentine 5 per cent. debenture shed 1½ points to 71½. Mexican issues are listless and inclined to be heavy. Engineering and allied shares keep moderately firm. Babcocks can be bought at 48s. 9d., the nominally middle price. The rubber market is very hard. City electric lighting Companies must regard with an air of benevolence the boom conditions that keep the lights burning, from sunset to daybreak, in a good many Stock Exchange offices this week.

Thanks are due, and hereby tendered, to a reader who courteously draws attention to a slip which occurred in our tables, in printing the last year's dividend on Siemens ordinary shares. The figure should have been 7½ per cent., instead of 5 per cent. as stated, and this gives a useful opening for a word explanatory of the method adopted here in presenting yields upon the officially-quoted prices. The Stock Exchange Official List sends out double prices, *e.g.*, Eastern Extension Telegraph shares, 16¾ to 17¼. The middle figure is 17, and upon this is calculated, in our tables, the return per cent. to an investor, taking the last year's dividend as the basis. Eastern Extension received 10 per cent. tax-free, upon its £10 shares, a rate which gives a buyer of the shares, at £17 per share, a yield of £5 17s. 8d. free of tax, upon each £100 of money spent on the purchase at this price. It may appear somewhat superfluous, or supererogatory, to enter thus closely into details that are perhaps obvious. In defence, the excuse may be ventured that the City mind is apt to take for granted a familiarity with mechanical matters which are not always clear to the man who stands a little outside the range of ordinary Stock Exchange affairs.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price July 20, 1925.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	13	14	2⅞	+ ⅛	5 0 10
Brompton Ordinary	1	10	10	1¾	—	*5 14 3
Charing Cross Ordinary	1	14½	15	46/9	—	6 8 2
do. do. do. 4½ Pref.	1	4½	14½	17/6	—	5 2 10
Chelsea	1	12	12	1⅞	—	6 8 0
City of London	1	15	15	45/9	—	5 11 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	31/-	—	5 3 3
County of London	1	15	15	53/-	—	5 13 3
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	21/6	—1/6	6 10 3
do. 7% Pref.	1	6	7	22/-	—	6 7 3
Elec. Supply Corporation	1	10	10	33/3	—	6 0 4
Kensington Ordinary	5	14	15	12¾	+ ⅜	5 17 8
Lancs. Light and Power	1	7½	7½	25/6	—	5 17 8
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref	5	6	6	5½	+ ⅛	5 9 1
Metropolitan	1	10	11	38/3	—	5 15 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	23/3	—	5 4 4
Newcastle-on-Tyne Ordinary	1	6	7	22/6	—	6 4 5
do. 5% Pref.	1	5	5	18/3	—	5 9 7
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	13⅜	—	6 8 5
South London	1	15	15	2⅞	—	6 3 1
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref.	1	6	6	20/-	—	6 0 0
Westminster Ordinary	1	15	15	45/6	—	6 6 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/6	—	7 13 10
Yorkshire Elec.	1	8	8	30/-	- 1/-	5 6 8
HOME RAILS.						
Central London Ord. Assented Stock	4	4		68	—	5 17 8
Metropolitan	,,	4	5	63½	—	7 6 0
do. District	,,	3½	3½	45⅝xd	—	7 13 10
Underground Electric Ordinary	10	Nil	Nil	2⅜	— ⅛	Nil
do. do. "A"	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds	6	6		98	—	*6 2 5
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	104	— ½	5 15 5
do. Def.	,,	1½	1½	24	— ¼	6 5 0
Automatic Telephone	1	3	6	2⅛	—	2 18 2
Chili Telephone	5	6	5	5⅞	—	*5 10 4
Cuba Sub. Ord.	10	5	5	6¾	—	7 8 2
Eastern Extension	10	10	10	17	—	*5 17 8
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 15 11
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 14 3
do. do. Pref.	10	6	6	10⅝	—	5 10 4
Great Northern Tel.	10	22	22	31	—	7 1 11
Indo-European	25	7	8½	41½	—	*4 4 4
Marconi	1	10	—	1⅜	— 1/16	7 5 6
Marconi Marine	1	10	7½	18 9	— 1/16	8 0 0
Oriental Telephone Ord.	1	12	12	2⅜	—	*5 12 11
United R. Plate Tel.	5	8	8	7⅜	—	*5 12 3
Western Telegraph	10	10	10	16¼	—	*6 3 1
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3¼	—	8 16 0
do. do. 2nd Pref.	5	6	6	2½	—	10 4 4
do. do. 5% Deb.	Stock	5	7	71½	— 1½	6 15 2
British Electric Traction Ord.	,,	6	6	112	—	5 7 2
do. do. 6% Pref.	,,	6	6	104	—	5 15 5
Brazil Traction	100	4	4	59	+ 1	6 15 7
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	89½	—	5 11 9
do. do. Preferred	,,	96/-	96/-	83½	—	*5 15 0
do. do. Deferred	,,	129/5	129/5	102½	— 1	*6 6 6
do. do. Deb.	,,	4½	4½	76½	+ 1	5 11 1
Lond. & Sub. Trac. 5% Pref.	1	2½	—	4 6	- 6d.	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	62½	—	8 0 0
Mexican Light Common	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	59	—	Nil
do. 1st Bonds	—	5	5	6⅝	— 1	7 15 0
Yorkshire (West Riding)	1	5	—	17 6	— 1/16	5 14 3
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	12	2⅞	—	*4 18 6
British Aluminium Ord.	1	5	10	1½	+ 1/16	6 13 4
British Elec. Transformer Pref.	1	Nil	7	17/6	—	...
British Insulated Ord.	1	15	15	3½	—	4 10 3
Brush Ord.	1	10	10	1	+6d.	10 0 0
Callenders	1	15	15	2⅝	—	5 4 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅝	—	...
Edison-Swan	4/-	10	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	1⅞	+ 1/16	6 8 0
Enfield Cable, Pref.	1	7½	7½	1⅛	—	6 0 0
English Electric	1	5	5	18/3	-6d.	5 9 7
do. do. Pref.	1	6	6	2⅝	-6d.	5 17 1
Gen. Elec. Pref.	1	6½	6½	2 /-	—	5 4 0
do. Ord.	1	5	7½	2 1/-	—	6 5 0
Henley	1	15	16	2⅛	- 1/16	5 8 11
do. 4½% Pref.	5	4½	4½	⅝	-	5 6 0
India-Rubber	1	5	5	1	—	*5 0 0
Johnson & Phillips	1	10	10	2⅛	—	4 17 0
Met-Vickers, Ord.	1	8	8	20 9	-6d.	7 14 3
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	24/6	-6d.	2 5
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemical and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only gener and they may vary according to quantities and other circumstanc

CHEMICALS, &c.	Price July 21.	Fortnight inc. or de
a Acid, Oxalic per lb.	5¾d.	...
a Ammoniac, Sal per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ,,	...	...
a Borax ,,	£25	...
a Copper Sulphate ,,	£25 10s.	...
a Potash, Chlorate per lb.	4d. to 4½d.	...
a ,, Perchlorate ,,	5½d.	...
a Shellac per cwt.	£15 15s.	...
a Sulphur, Commercial ,,	£7 15s.	...
a ,, Roll ,,	£7 15s.	...
a Soda, Chlorate per lb.	3¼d. to 3⅜d.	...
a ,, Crystals per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots per ton	£120 to £125	...
b ,, Wire per lb.	1/9 to 2/6*	...
b ,, Sheet ,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		...
Grade I per ton net	£231	...
Grade II ,, ,,	£165	...
Grade III ,, ,,	£92	...
c Brass (rolled metal 2" to 12" basis) per lb.	9⅜d.	...
c ,, Tubes (solid drawn) ,,	11⅜d. to 1/-	...
c ,, Wire, basis ,,	10½d.	½d. inc.
e Copper Tubes (solid drawn) ,,	1/1	...
c ,, Bars (best selected) per ton	£91	£1 inc.
c ,, Sheet ,,	£91	£1 inc.
c ,, Rod ,,	£91	£1 inc.
d ,, Electrolytic) Bars ,,	£67 5s.	4s. inc.
d ,, ,, Sheets ,,	£148 10s.	...
d ,, ,, Wire Rods ,,	£77 5s.	45s. inc
d ,, ,, H.C. Wire per lb.	9½d.	3d. inc
f Ebonite Rod ,,	2/- to 3/6	...
f ,, Sheet ,,	2/- to 3/6	...
a German Silver Wire ,,	2/3	...
h Gutta-percha, fine ,,	8/3	...
h India-rubber, Para fine ,,	4/1	1s. inc.
i Iron Pig (Cleveland Warrants) per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. gauge ,,	£23	...
g Lead, English Pig ,,	£16 5s.	2 s. inc.
g Mercury per bot.	£14 to £14 5s.	...
e Mica (in original cases) small per lb.	8d. to 8/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/8½	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/9½	...
p ,, ,, wire ,,	1/8½	...
o Platinum per oz.	£26	...
d Silicium Bronze Wire per lb.	1/0½	...
c Steel, Magnet, in bars ,,	7½d.	...
n Tin, Bloc (English) per ton.	£226 10s. to £231 15s.	£6 5s. to £6 10s. in
o ,, Wire, Nos. 1 to 16 per lb.	3/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
o The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd
n P. Ormiston & Sons.
o Johnson, Mathey & Co., Ltd,
o C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

The Convention of the Illuminating Engineering Socie U.S.A.—The nineteenth annual convention of the Il minating Engineering Society, U.S.A., will be held dur the week of September 14th-18th at Detroit, Michigan, w headquarters at the Hotel Statler. A programme of papers being arranged by Mr. Frank C. Taylor, chairman of the Co mittee on Papers. A complete session will be devoted motor-vehicle lighting, with papers by a number of w known authorities, covering such topics as State regulat of head-lights, depressible beam head-lighting and the lat developments in traffic control systems. Another session v be allotted to a symposium on natural lighting, which will held under the leadership of the Society's Committee Natural Lighting. There will also be a symposium on re dential street lighting. Among the other topics which v be discussed are shop-window lighting, high-intensity ind trial lighting, floodlighting, computations, recent devel ments in neon lamps, and photometry of asymmetric lighti units. An entertainment programme of unusual interest being prepared by Mr. C. C. Munroe, Secretary of the Gene Convention Committee.

Platinum Finds in Africa.—According to the *Financ News* it is reported that a platinum gold reef, six miles lo yielding 8.80 dwt., has been found along Ngwenia Ran Swaziland. Prospecting operations in the Olifants River s tion of the Lydenburg Consolidated Platinum Mines prop ties disclose satisfactory values, including a chrome ore bo carrying high platinum values and a new upper reef much promise.

The Problems of Trade and Industry.

A Report on Overseas Markets. Manufacturers View Subsidies with Disfavour. Economic Influences.

"A Survey of Overseas Markets."

IS sub-title is the description of a volume published t week by the Committee on Industry and Trade.* The ncipal feature of the survey is a series of statistical articles ıling separately with the Dominions, Colonies, and foreign ıntries, considered primarily as markets for British goods. the first place figures are given of population and external de for the period, 1904-1913, and the latest available post- r year. The share of the United Kingdom in this trade shown in volume and percentage. The public finance of ch country is briefly dealt with and economic development ıtural resources, transport, national industry, &c.), is ated at some length. Industrial and commercial policy, in- ding tariffs and the fostering of industries, are then touched on. The competitive situation as regards commodities and ıntries is discussed at the end of each section. Another tion of the work compares pre-war and post-war customs ties and an attempt is made to estimate the overall change these tariffs to show whether increases (if any) have sed the average *ad valorem* incidence when the increased ue of goods is taken into account. The next chapter con- ns memoranda on foreign commercial policy affecting itish trade and includes such matters as commercial aties, most-favoured-nation practice, import restrictions, treatment of British shipping (in the light of measures opted by foreign countries to aid their own shipping indus-), &c. The volume includes a number of interesting statis- al tables. Among other things these show the external de of the United Kingdom over a series of years on the sis of 1913 prices; the share of the United Kingdom and ıer countries in world trade in 1913 and 1923; and the dis- bution of our external trade.

n an introduction to the report the Committee makes it ar that the volume does not pretend to constitute a report mulating definite recommendations; it is rather an attempt assemble the facts and to summarise the main features of extent and prospects of British trade in overseas markets. is shown that though, in sterling values, our proportion of world's export trade appears to have risen from 13 per ıt. in 1913 to 14 per cent. in 1923, the great reduction which occurred in the total world trade means a substantial luction in the volume of our trade. It is of the greatest portance to make a study of each group of markets to esti- te the weight of the various factors which are responsible the decline in our trade. These factors are:—(1) The de- ne of the purchasing power of the local populations; (2) The wth of local manufacture; and (3) The displacement of itish imports by those of other countries. The Committee nsiders that the first factor still exerts a considerable, though creasing, effect. The growth of local manufacture is per- ps the most important permanent factor tending either to nit the volume or to modify the character of British export de, and this factor is discussed at considerable length. The tial effect is to drive international commerce to the finer alities of manufacture, the home industry dealing with the npler and coarser classes of goods, and from this point of ew we should be in a favourable position on account of our gh reputation. Moreover, the local development of manu- tures must inevitably create an increasing demand for ods, and this country should be able to secure its share in satisfying of this demand. The Committee points out at such re-adjustments as will be necessary are bound to ake great and increasing demands on the foresight, intelli- nce and adaptability of those concerned in the export trade. e Committee next discusses the various means by which local nufacture is assisted in various countries. As regards cus- ns tariffs, the Committee states that, while these are with- t doubt an important obstacle to the flow of international de, it appears that taking British trade as a whole, the creases in tariffs which have taken place since 1913 have not far been an important factor in retarding the recovery of r trade.

As regards import prohibitions and restrictions, the Com- ttee emphasises their harmful effect on trade through the certainty with which they operate and the delays and diffi- lties which they cause, and it welcomes the tendency which making itself felt for the removal of these restrictions. ference is also made to the obstruction to trade caused by multiplication of customs and other similar formalities. e Committee is of the opinion that the parties to the inter- tional convention for the reduction and simplification of stoms formalities should expedite the general ratification the convention. In connection with special privileges, con- sions or subsidies for industry, the Committee points out at the widespread impoverishment and financial weakness lowing the war have deterred most governments from em- rking on large schemes of direct subsidy, but certain arrangements for assisting industry have been initiated in some countries. Among other things the preferential treatment of national shipping is mentioned and is deprecated. Under the heading of "State control or monopoly," the Committee indicates that, except as regards Soviet Russia, British trade does not appear to have been materially affected by an abnormal increase in such monopolies in recent years.

The last section of the introduction deals with foreign competition and shows that while some of our competitors have been strengthened others have weakened. It is thought that the recovery of Central Europe will eventually benefit British trade, but the rehabilitation of German industry, which is a necessary pre-requisite to the payment of reparations is likely to strengthen Germany's competition for some years. After a brief mention of preferences granted by the Dominions to British goods, the introduction concludes with a statement that it is essential that all concerned should strive to accommodate their outlook, their methods, and their organisation to the changed and changing conditions of world trade.

* Stationery Office (700 pp.). 6s. net.

Subsidies for Industries not Desirable.

FOR a considerable time a Committee of the Federation of British Industries has been examining the various proposals which have been advanced for subsidising industry for the relief of unemployment. The Committee has now issued its report stating the conclusion that no subsidy of a general character applicable to a large number of industries is possible. It is inclined to be dubious as to the advantages of partial schemes especially adapted to particular trades, though the opinion is held that if suitable organisations could be devised for full and rapid consideration of the circumstances, the grant of occasional and temporary subsidies might prove of value in providing employment. Some of the difficulties and dangers involved in a policy of subsidies for general application may be stated here:—

Any general scheme of subsidies might result in many cases in subsidising the relatively inefficient firm to the detriment of the more efficient. It might also tend to deprive of subsidy those firms who had made particular efforts to reduce costs and keep their works running, and those firms which, rather than close down and throw more men out of employment, have been recently accepting orders at or below cost of production. These are the very firms which on general grounds it would be most desirable to help.

It is considered that further thought should be devoted to more limited schemes, each specially adapted to the circumstances of a particular trade, or even a section of a trade, and followed, where practicable, by actual experiments. Any schemes should be designed so as to be of a merely temporary character.

With reference to partial schemes specially adapted to particular trades, these can obviously only be worked out in a concrete and detailed form by each trade for itself. The Federation draws attention to two classes which it considers merit careful consideration. One of these includes trades mainly concerned with large specific contracts, such as shipbuilding and important sections of the steel and engineering industries, which under the present abnormal circumstances of international trade are exposed to exceptional competition from foreign firms. "There is substantial ground for the belief that the occasional quotation of exceptionally low prices, which are well below the general cost of production even in their own country, is being adopted as a deliberate policy by certain foreign firms and groups; and some ground for believing that this policy is being supported by direct or indirect assistance from their Governments or from local authorities. The object seems to be partly to obtain a favourable position for the particular industry and country concerned in respect of future orders, partly to embarrass and injure the more efficient of the British firms which may be competing in the hope that they may be seriously crippled when more normal trading conditions return. Apart from more immediate effects, the loss of contracts of this class is often particularly injurious to future trade, since the firm which secures the original contract is frequently placed in a position to secure a valuable series of repetition orders for repairs, replacements, and extensions."

The Federation therefore suggests careful investigation by the Government and the trades chiefly concerned, as to the possibility of arranging a system by which direct Treasury grants might be made available from time to time for the retention in this country of important orders of this class.

If suitable organisation could be devised for full and rapid consideration of all the circumstances, the grant of occasional subsidies in this manner might prove not only of substantial immediate value in providing employment, but of even greater value in preserving the efficiency and future competitive power of the trades concerned.

Report by the F.B.I. Economic Staff.

THE Grand Council of the Federation of British Industries, at its meeting on July 8th, considered an important report from the Economic Staff on some of the factors which have produced the present trade position. It was decided to appoint a strong committee to consider this report, and to consult with other interests with regard to the questions raised.

Pending this investigation and the publication of the full report, the Council has published the following summary in the hope of eliciting comment and criticism which may throw further light on the grave and complex problems involved:—

The present trade position in the country gives every appearance of becoming permanent. British trade, after improving for some years, has been checked, and during the past few months has been actually going back, and is doing so at a time when the general conditions of the world are favourable to improvement. If the conclusions to be drawn from analysis of pre- and post-war conditions are correct, it is obvious that just as the most favourable general conditions of trade will not make a nation prosperous if it is inferior to its competitors in efficiency and economy of production, so, without such favourable conditions, the highest conceivable efficiency cannot bring active trade and full employment.

Briefly summarised, the prosperity of British industry before the war primarily depended—(1) On a continuously expanding foreign trade rendered possible by the continuous investment on a large scale of British capital for the purpose of developing hitherto undeveloped countries. (2) On reasonably stable political conditions, at least in the principal trading countries. (3) On a plentiful supply of money involving a general tendency for prices to rise throughout the world.

In addition to this, however, the presence of these conditions throughout the decade preceding the war exercised a profound influence on the development and balance of British industry, as they constituted a steady stimulus to the development of export trade, as opposed to home trade. In 1914 capital and labour had moved continuously for many years into the great exporting industries, rather than into the industries which worked for the home market, and even in those industries which worked for both markets the tendency had been for a steady development in the relative importance of the export branch to the "home" branch. The war demand still further developed many of the industries, such as iron and steel, shipbuilding, and many branches of engineering, which already relied on a substantial proportion of export demand to obtain full employment, so that the end of the war found us with industries specially adapted for an active foreign trade and only capable of giving full employment when conditions were favourable for such trade. But in the whole post-war period from 1920 onwards, these conditions have not been present; in fact, precisely opposite economic forces have been at work. There have been many factors largely outside our control, such as unstable exchanges, lack of balance in the world's markets, a great increase in the restrictions and obstacles which impede the flow of international trade, and political instability in many countries. These factors may, however, be considered as temporary in the sense that they may be expected to pass away and, indeed, are already doing so with the return of stable conditions.

There have been other influences, however, operating on the whole trend of our trade, which to a considerable extent have been the result of conscious and deliberate control. The following are among the most important of these influences:—(1) The influence of heavy taxation, depleting the fund of savings available for industrial and foreign investment, and diverting such savings as are available to gilt-edged rather than industrial securities. (2) The influence of the greatly increased expenditure on social services housing, unemployment relief, education, pensions, &c., which has directly stimulated home trade, at the same time checking export trade by increasing costs through the increase in local taxation and direct contributions, and reducing the funds available for foreign and industrial investment. (3) The influence of post-war monetary policy, which by increasing the exchange value of the £ sterling has forced up the price of British goods relatively to world prices and thus stimulated home and import trade and checked export trade. (4) A great and progressive reduction in the amount of investment abroad. The steps necessary during the past nine months to prepare for and achieve the final return to a gold standard have greatly intensified the effects summarised under (3) and (4) above, and the necessary restrictions on the supply of money are, temporarily, at least, affecting home trade as well as foreign trade, with the natural consequence of a further rise in unemployment.

We have therefore the following position: Industry organised and developed for a large and active export trade and incapable of giving full employment unless it obtains it; but the economic forces which in pre-war days stimulated such a trade removed, and in their place forces which directly oppose it. The action of these forces serves to explain the reduction as compared with pre-war in our exports, both absolutely, and relatively to our imports; the increase as compared with pre-war in our home consumption of coal; the fact that despite the reduction of our export trade to 75 per cent. of the pre-war amount, there were in 1923 approximately as many persons in employment as before the war; the alteration in the relative position of sheltered and unsheltered industries; the relative prosperity, both of retail traders and of industries serving the home market only, as compared with industries mainly dependent on export; and the incidence of unemployment as between different trades and occupations. The p lem to be solved is whether it is possible to reverse t tendencies and to restore the conditions which as far as previous experience can guide us are the only condition which British industry, as at present organised, can pros or whether we must accept post-war conditions as perma and attempt to re-organise and re-adapt industry to meet new position. Will political and general considerations mit the Government to make a reduction, not of a few lions, but of 15 to 20 per cent. in national expenditure taxation? Can local authorities reduce the rates by the s percentage? Is it possible without imperilling the stab of our newly regained gold standard (*a*) to provide money for trade, (*b*) to allow foreign investment to be sumed? Is it possible, pending the resumption of for investment on a scale comparable with pre-war, which obviously be a question of time, to employ such funds as available for lending abroad primarily in the direction w will create the most immediate and effective demand British goods? If these questions cannot be answered in affirmative, it is obvious that the balance as between ex and import trade has been permanently altered, and, whil may reasonably hope for a substantial export trade, suffi probably to pay for essential imports, we cannot expect give us active trade and full employment as in the imme pre-war period. If this is the case, ought we to wait, a are doing at present, until the forces which post-war c tions and our own post-war policy have set in motion brought about a re-adjustment of industry through the s pressure of economic necessity, with all that this impli unemployment and suffering, or should steps be take stimulate home development? Can the export trades helped to divert a portion of their output to new h markets and to adapt some proportion of their produ capacity to new purposes? Can means be devised to a them to pass with the minimum of dislocation through difficult transition period?

These are some of the questions which must be answ and it is obvious that a purely industrial organisation, as the Federation, cannot solve them by itself.

The Commercial Outlook for Radio.*

THE world wants the radio and it will have it, just adopted the talking machine and the automobile. The ind is too new yet to be classed among the stable comm operations of the period, but it is estimated that not less 450 million dollars of total sales will be made in the U States this year, an increase of 100 million dollars or n contrasted with 1924. This of course refers to domestic ness. Exports of radio instruments and accessories are al looming large. In 1924 radio exports exceeded six m dollars in value, with a total of nearly three million d for the first four months of 1925. At this rate radio ex will double in 1925. Practically no limit can be set o expansion of radio exports. Regarded in the beginning mere toy, or a dispensable luxury or amusement, the ra destined to live and grow into a stable business. Its parative cheapness is in its favour. Over and above thi new world that it opens is a stronger argument.

As in the case of nearly all other new and like invent the speculative possibilities of the business have been s upon with unhappy results to many credulous people. panies without number have been formed and exploited, attendant losses to those who invested in them. Recen culations showed a decline in the value of listed or un American radio shares of not less than fifty million do Sooner or later the business will settle down to a commercial basis, with one or two large companies le the field. Organisations ill financed and poorly managed pass out of existence.

Perhaps it is too much to hope for a standardised radio put within the next few years. The time is coming, n theless, when this will happen. As to any estimate "saturation" limit, it is idle to make predictions. A pilation prepared recently by the Standard Statistics Se shows that while there are more than fifteen million pa ger automobiles and nine million talking machines in u the United States at present, there are only about 3,5 valve radio sets in operation. The Service mentione authority in the industry as predicting that there will b million sets in operation in 1930. This does not seem an unreasonable calculation. If the United States touches that record the export trade will grow in propo It must not be assumed, however, that the United State have any monopoly in furnishing the world with radio i ments or accessories. Foreign competition will be keen.

Whether America will produce a Henry Ford in the industry is doubtful. Whether Europe will develop o even more doubtful. Competition will be fought out o plain level of manufacturing costs without much in the of patent monopoly to give advantage to any single prod

* From the *Journal* (June) of the British Empire Cha of Commerce in the U.S.A.

Exports and Imports of Electrical Goods and Machinery in June, 1925.

THE Board of Trade returns for the past month show that our exports of electrical machinery and apparatus reached only 75 per cent. of the April value. The reason for this can again be traced to the item "Submarine telegraph and telephone cable," which is subject to extremely violent fluctuations. In April it made an upward jump of £280,000, and in May it went up a further £83,000; last month the figure experienced a sudden fall to about £16,000. Unfortunately this item is not wholly culpable for the fall of £423,000 in the total, as compared with that of the preceding month. Unenumerated electrical machinery exports also showed a considerable decline (£62,000), as did also the other items under the heading "Electrical machinery," amounting in all to £112,000. Another large decrease is shown under the heading "Telegraph and telephone wires and cables (not submarine)." The falls are partly offset by a number of increases, none of which, however, with the exception of "Insulated wires and cables," is of large proportions.

The position for the first half of the year is a substantial improvement over the first six months of 1924, as will be seen from the following summary of exports:—

Exports.	1924.	1925.
Electrical goods and apparatus ...	£4,759,956	£6,142,309
Electrical machinery	2,495 636	3,031,059
Totals for six months ...	£7,255,592	£9,173,368

The increase, as is shown in the table, is £1,917,776.

As regards imports, these remained approximately at the May level, the decrease being of the order of 1 per cent. A very large increase in the value of imported insulated wires and cables was counterbalanced by falls in respect of unenumerated electrical machinery, meters and instruments, telegraph and telephone instruments, and unenumerated electrical goods and apparatus. The June total was considerably higher than the figure for the equivalent month of last year, and the six-months' total shows a rise of £667,000, as appears from the following figures:—

Imports	1924.	1925.
Electrical goods and apparatus ...	£1,373,879	£2,032,105
Electrical machinery	532,695	541,437
Totals for six months ...	£1,906,574	£2,573,542

The value of goods re-exported during June was about half that of the previous month's re-exports, due mainly to the large decreases in the cases of unenumerated electrical goods and apparatus, and meters and instruments. The total for the six months is, however, greater than that for the first half of 1924.

Leaving the values of goods, it is of interest to note that during the first six months of this year the number of incandescent electric lamps exported was 3,109,620, as against 2,385,534 in the first half of 1924. The total weight of electrical machinery exports for the same period was 17,271 tons, as compared with 15,210 tons.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for June, 1925.	Inc. or dec. as compared with May, 1925.	Inc. or dec. as compared with June, 1924.	Electrical imports for June, 1925.	Inc. or dec. as compared with May, 1925.	Inc. or dec. as compared with June, 1924.	Electrical re-exports for June, 1925.	Inc. or dec. as compared with May, 1925.	Inc. or dec. as compared with June, 1924.
Electrical goods and apparatus (unenumerated)	£142,785	+ £8,738	+ £10,274	£79,347	— £9,000	+ £10,932	£4,073	—£12,346	—£1,850
Insulated wires and cables ...	247,306	+ 42,271	+ 49,723	65,821	+ 30,801	+ 31,401	2,969	— 397	+ 2,963
Flow lamps	25,452	— 7,094	+ 1,480	49 392	+ 7,176	+ 37,849	452	+ 188	+ 177
Arc lamps and parts	302	— 257	— 536	812	+ 54	— 767	28	—	— 553
Batteries and accumulators ...	107.840	+ 11,640	+ 57,392	22,688	+ 1,702	+ 6.890	1,583	+ 14	+ 1,140
Meters and instruments ...	29,626	+ 1,443	— 1,385	10,879	— 6,551	— 5,951	212	— 975	— 1,463
Carbons	1,941	+ 1,019	+ 126	6,527	— 2,351	— 739	184	+ 129	+ 110
Electrical Machinery—									
Electrical machinery (unenumerated)	264.888	— 61,840	+ 111,129	80,273	— 19.022	— 15,353	4,826	— 789	— 3,422
Railway and tramway motors	17.867	— 19,528	— 46,125	—	—	—	—	—	—
Other motors and generators ...	157.196	— 25,419	+ 8,670	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	6.977	— 5,451	+ 1,091	61	— 9	+ 49	—	— 95	— 111
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	55.916	— 13,690	— 22,397	15,910	+ 1,557	+ 9,370	467	+ 234	+ 100
Submarine telegraph and telephone cable	15,922	— 357,675	+ 15,922	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	221,065	+ 2,645	+ 74,270	39,297	— 7,842	— 5,377	4,700	— 732	+ 912
Totals	£1,285,173	— £423,198	+£259,634	£371,007	— £3,485	+ £68,304	£19,488	—£14,769	—£1,997

Increases for the six months ended June, 1925	Exports.	Imports.	Re-exports.
	+£1,917,786	+£666,968	+£35,489

French Electrical Trade.

Imports and Exports by Countries.

THE French Government has now published a detailed statement of the foreign trade of France, by countries, for 1923. From this the following figures relating to imports and exports of electrical and allied material have been extracted. Comparative figures for 1922 are given and a note is added of increases or decreases.

Exports.

	Metric quintals.		
	1922.	1923.	Inc. or dec.
Dynamo-electric machinery—			
Total	23,050	28,330	+ 5,280
To Belgium	4,910	7.240	+ 2,330
,, Switzerland	300	850	+ 550
,, Spain	3,460	4,270	+ 810
,, Argentina	2,380	1,340	— 1,040
,, Algeria	1,600	2,570	+ 970
,, Tunis	900	1,450	+ 550
,, Morocco	480	2,420	+ 1,940
,, Indo-China	1,100	1,250	+ 150

	Metric quintals.		
	1922.	1923.	Inc. or dec.
Electrical and electro-technical apparatus—			
Total	21,110	27,110	+ 6,000
To Great Britain	1,300	1,800	+ 500
,, Belgium	7,000	7,500	+ 500
,, Switzerland	255	1,160	+ 905
,, Spain	2,055	2,720	+ 665
,, Algeria	2,000	2,500	+ 500
,, Morocco	885	1.160	+ 275
,, Indo-China	660	860	+ 200
Dynamo and motor frames—			
Total	140	195	+ 55
To Great Britain ...	3	58	+ 55
,, Spain	—	96	+ 96
,, Belgium	95	32	— 63

	Metric quintals. 1922.	1923.	Inc. or dec.
Insulated wires and cables—			
Total	33,600	26,510	− 7,090
To Belgium	10,800	5,600	− 5,200
,, Egypt	740	1,240	+ 500
,, Algeria	4,300	5,400	+ 1,100
,, Tunis	360	940	+ 580
,, Sarre	10,040	8,500	− 1,540
Armatures and parts for electrical apparatus—			
Total	3,930	6,230	+ 2,300
To Belgium	370	760	+ 390
,, Italy	180	440	+ 260
,, Spain	280	580	+ 300
,, Algeria	430	900	+ 470
,, Morocco	450	1,300	+ 850
Incandescent electric lamps—			
Total	1,290	1,790	+ 500
To Great Britain	100	150	+ 50
,, Belgium	110	230	+ 120
,, Algeria	300	180	− 120
,, Indo-China	335	300	− 35
Imports.			
Steam engines, stationary—			
Total	13,900	10,365	− 3,535
From Great Britain	2,860	1,200	− 1,660
,, Belgium	3,460	2,630	− 830
,, Switzerland	4,730	5,660	+ 930
Dynamo-electric machinery, 1,000 kg. and over—			
Total	35,000	30,200	− 4,800
From Germany	14,000	1,000	−13,000
,, Switzerland	8,000	5,200	− 2,800
,, United States	9,000	16,000	+ 7,000
Dynamo-electric machinery, 50-1,000 kg.—			
Total	7,200	6,700	− 500
From Switzerland	2,000	2,500	+ 500
,, Belgium	700	800	+ 100
,, United States	640	650	+ 10

	Metric quintals. 1922.	1923.	Inc. or de
Dynamo-electric machinery, less than 50 kg.—			
Total	4,000	4,150	+ 150
From United States	2,500	2,250	− 250
,, Italy	530	760	+ 230
Electrical and electro-technical apparatus, with insulated windings—			
Total	7,000	10,000	+ 3,000
From Great Britain	1,200	1,400	+ 200
,, Germany	1,800	1,000	− 800
,, Switzerland	1,800	1,900	+ 100
,, United States	1,600	4,500	+ 2,900
Ditto, without insulated windings—			
Total	5,700	5,300	− 400
From Great Britain	1,000	1,300	+ 300
,, Switzerland	1,000	1,300	+ 300
,, United States	1,700	1,350	− 350
Dynamo and motor frames—			
Total	140	1,530	+ 1,390
From Great Britain	—	880	+ 880
,, Belgium	—	630	+ 630
Insulated wires and cables—			
Total	1,150	3,900	+ 2,750
From Great Britain	140	1,600	+ 1,460
,, Switzerland	120	1,250	+ 1,130
,, United States	—	500	+ 500
Armatures and parts for electrical apparatus—			
Total	4,250	8,080	+ 3,830
From Great Britain	600	2,650	+ 2,050
,, Switzerland	1,050	1,180	+ 130
,, United States	600	1,270	+ 670
Metal-filament lamps, mounted—			
Total	3,130	3,580	+ 450
From Holland	2,700	3,150	+ 450
Ditto, unmounted—			
Total	37	48	+ 1

The South-East Lancashire Electricity Board.

Annual Report of the Engineering Advisory and Finance Committees.

AT a special joint meeting of the above-named Committees (Alderman W. T. Dagnall in the chair), held recently, the report of the Board's proceedings during the year ended March 31st, 1925, was approved for submission to the Electricity Commissioners. The Board met first on April 1st, 1924. During the year it approved of the following bulk supply contracts: Manchester-Salford, Manchester-Middleton, and Lancashire E.P. Co.-Horwich, the last-named being the purchaser in each case; originally the Board decided that the supply to the Horwich U.D.C. should be furnished by the Bolton Corporation, but the largest consumer in the Horwich area (*i.e.*, the L.M. & S. Railway) elected to take its supply from the L.E.P. Co. (which has power to continue furnishing detail power supplies notwithstanding the granting of a special order to the Horwich U.D.C.), and the Board therefore approved of the change of the source of the bulk supply, the Bolton Corporation fully concurring.

The following plant and mains extensions received approval: Bury Corporation, one 1,000-kW rotary converter and switchgear; Buxton Corporation, one 400-b.h.p. heavy-oil engine and 255-kW dynamo; Lancashire E.P. Co. (Radcliffe station), two 6,000-kW turbines and four 30,000-lb. B. & W. boilers; Stockport Corporation, two 10,000-kW turbo-alternators (to be installed in two sections); and Manchester Corporation, six 33,000-V cables (two of them to be laid only if financial assistance is granted by the Government).

The Oldham Corporation submitted proposals for the erection of a new station at Chadderton, being a station scheduled to the technical scheme. The first instalment would consist of three 12,500-kW, 6,600-volt, three-phase, 50-period turbo-alternators, with electrically-driven auxiliaries. The Board recommended the Commissioners to sanction the erection of the station; it supported the applications of six constituent authorities for special orders and recommended the Commissioners to grant several in circumstances which clearly went beyond the true intention of the fringe order procedure as originally contemplated, *i.e.*, to deal with premises of specific owners. The fringe order procedure is usefully employed in developing areas which do not warrant the taking out of special orders and the Board considers that geographical area rather than ownership of premises ought to be the basis upon which fringe orders are granted so as to encourage cheap and expeditious development pending the time becoming ripe for the taking out of special orders.

There is no obligation upon a constituent authority to acquaint the Board with its intentions in relation to Parliamentary Bills. The Board, therefore, adopted a resolution requesting all constituent authorities to submit details of any Parliamentary proposals to it in the first instance, and at request of the Board the Commissioners have indicated th willingness to consult it on such matters.

Regarding interruptions of supply, upon the representat of a constituent authority the Board has given serious c sideration to troubles which have arisen through the ope tions of Post Office contractors. A scheme for giving not which would secure to a great extent that interruptions sho not take place in the future has been drafted and the Cc missioners have been asked to endeavour to bring the sche into being.

The Leigh Corporation has entered into a temporary agr ment to take a bulk supply from the L.E.P. Co. for six mon from January 1st, 1925, pending the final determination of permanent source of supply by the Board; the matter is *sub judice*.

The Commissioners referred to the Board a proposal by company to erect a private generating station at Chinl about 3¾ miles from Buxton generating station and 5¾ m from Hazel Grove and Bramhall (an electrically develo area). The character of the intervening areas is such t there is no possibility of the Board's indicating an alternat supply, and it therefore informed the Commissioners that had no observation to make thereon. The Board is un obligation to submit proposals before May 28th, 1925 (or su extended time as may be sanctioned by the Commissione for the supply of electricity in areas in which there is a reas able prospect of the supply being remunerative. Activities this connection have already resulted in applications for seve special orders, and several others are under consideration.

The coal consumption in the district has improved follows:—

Year 1919-20	3.112 lb.	per kWh generated.
Year 1923-24	2.190 lb.	,, ,,
A quarter in 1924 ...	2.05 lb.	,, ,,

The cost of administration for the year ended March 3 1925, amounted to £1,991, which when distributed over kWh sold during the year ended December 31st, 1923, *i* 551,251,843, yields a figure of 0.00086d. per kWh, as compa with 0.00119d.* for last year. The district contains a po lation of 2,833,782, the areas which are at present the subj of distribution orders include a population of 2,670,158, be 94.2 per cent. of the whole. The energy sold amounted d ing the past year to 632,369,490 kWh, being equal to 223 k per head of population, as compared with 100 kWh per head Great Britain.

* A 12 months' figure calculated from the ascertained 6 months' figure of 0.00099d.

Factories and Workshops.

H.M. Chief Inspector's Annual Report.

THE annual report of the (Home Office) Chief Inspector of Factories and Workshops for the year 1924* shows that the number of registered factories in Great Britain has again increased; the total now stands at 142,494, as against 139,920 for 1923, but the number of workshops continues to decline, and is now 33,729, as opposed to 140,850 last year. Factories thus for the first time exceed workshops in number and, as has been pointed out before, the decline is largely due to the introduction of electrical power, the use of which converts premises from a workshop into a factory. There is, too, the tendency for the small places to be absorbed by the larger ones.

Accidents.

During the year under review 169,723 accidents were reported, an increase of 44,172 over the previous year. The main reason for the increase is stated to be trade improvement in those industries which experience has shown are the chief accident producers. No fewer than 656 fatal accidents were reported last year, an increase of 89 on the total for 1923, the increase having again taken place in particular groups of industry in which fatal accidents are always most numerous, and deaths due to transmission machinery reach the formidable total of 58, an advance of 9 on the figures for 1923; an unusually large percentage of this particular type of accident is of the most serious character, and we know from experience that of all transmission machinery the unprotected rotating shaft claims the most victims. About 85 per cent. of the prime mover accidents were caused by back-fires in internal combustion engines, and the majority of accidents due to starting engines could have been prevented by the use of compressed-air or electrical starting devices. Cranes have been responsible for a total of 3,093 accidents, no fewer than 76 of them being fatalities. The crane as an accident producer is apt to be under-estimated, but as a matter of fact, after falls of persons from heights, and of articles on persons, the crane comes next as a source of fatal accidents and stands far in front of any single type of machine known at present to industry; however, cranes are in use in an immense variety of industries, and predominate where heavy material has to be handled.

Four explosions in dry-cleaning works were notified; one was doubtless, and the others probably, due to the ignition of benzine vapour by sparks caused by electrostatic charges. Under the heading of "Dangerous Trades," the special danger which arises in such operations as the covering of heels for shoes, or the making up of some kinds of advertising goods, by the use of celluloid that is softened in a tray of spirit before application, is pointed out. A fire occurred in one factory, probably owing to one of the workers attempting to remove an electric lamp bulb with a rag (soaked with acetone or other spirit) which caught fire; fortunately it was quickly put out, but the incident emphasises the need for double glass gas-tight electrical fittings where such processes are carried on.

Accumulator Trade.

New Regulations for the Manufacture of Electric Accumulators were issued on March 1st, 1925; the new code, like the old one, deals with the risk of lead poisoning. The old code was confined to manufacture, but, as a like risk is associated with certain processes in the repair of accumulators, the new regulations cover repair work. A recent development in manufacturing processes is the use of a new kind of paste material which avoids the employment of oxide of lead. It is said to be very satisfactory, and its use appears to be extending, but risk of lead poisoning is not eliminated by its introduction. Future experience alone will show to what extent the use of this material will prove less dangerous than oxide. As a result of the wider definition of "lead process," the new rules go beyond the corresponding regulations of the old code; moreover, they set up higher standards.

During the past year many improvements were introduced by manufacturers either to secure compliance with the old regulations or in anticipation of the requirements of the new code. A number of departments were remodelled, and new exhaust plant installed. The rush of orders in many cases has, however, militated against anything in the way of finality being achieved, especially in those cases where the capacity of the works is being fully tested by the present volume of production. It may well be that the present incidence of lead poisoning in the trade is largely the outcome of these circumstances. During 1924 cases of lead poisoning in the accumulator trade totalled 101 (no fatalities), as against 95 (2 fatalities) in 1923. This industry, owing to the increasing use of electric accumulators for motor-cars and wireless sets, is a notable exception to the prevalent trade depression, and has been characterised by a corresponding increase in the number of cases of lead poisoning; 60.4 per cent. of the cases were slight, with absence of symptoms of paralysis, but this is only to be expected with the short time of exposure of the workers to the baleful influence of lead dust. Undermining of the health must be slowly taking place and, as poisoning is due to dust, it is clearly amenable to exhaust ventilation meticulously applied as near as possible to the point where the dust is generated. Regulations based on this principle were drawn up by Dr. Bridge and Mr. Price, in conference with a subcommittee of employers and employed, and are now in force.

*H.M. Stationery Office; price 2s. 6d. net. Cmd. 2,437.

Lighting.

Lighting is exciting greater interest, but perhaps the most striking feature is the wide inequality in the standard of lighting, not only in different works, but in different parts of the same works. Such inequality is strong evidence of lack of scientific knowledge, and demonstrates the need for putting forward some standard for the guidance of employers and workers, and for obtaining information as to satisfactory practice which can be made known to the persons concerned.

With such objects in view, representatives of the Home Office have, during the past two years, met representatives of both employers and workers in a large number of industries, and have explained the general principles governing good lighting on the lines of the Departmental Committee's reports, and have discussed in detail the requirements of the particular industry. These meetings have proved very useful, and both employers and workers have shown great interest in the subject. In factories where attention has been given to supplying a good light for fine or very fine processes, tests showed the amount of illumination in every case to be over three foot candles, and in many cases above five foot candles. In one process where a good light is recognised as important, the factory had been newly equipped with an installation affording an illumination of from 13 to 23 foot candles for each worker, while in the same factory for the same process the light previous to the new installation was less than one foot candle. Both employers and workers were delighted with the improved lighting and found it entirely satisfactory.

Provided that the eyes are protected from glare, the workers appreciate a high degree of light, and, so far as the inspectors are aware, no injury is caused to the eyes by artificial illumination of from 20 to 30 foot candles if the light is properly shaded and diffused, but the inspectors who conducted the tests lay emphasis upon the need for much greater care in this respect than is commonly exercised. A big problem is that of glare, and in many instances where new lamps have been fitted in old shades the results have been very unsatisfactory. The least satisfactory tests have been those obtained in the spinning and weaving departments of textile factories (other than hosiery). The amount of light provided is, on the whole, low, and there is need for more attention to its equal distribution over the plane of work on the loom or the spinning frame and to the placing of the lights so as to avoid glare on the one hand, and troublesome shadows on the other. Generally, the low readings are not usually due to economy in the use of gas or electricity, but to neglect of upkeep of fittings—globes and shades being dirty or in need of renewal—or to bad placing of lights in relation to the position of the worker or of the machine.

Trade Conditions.

Taking industry as a whole, trade conditions have again been bad, and one of the tragedies of the situation is that so many young people have no opportunity of learning a trade, and there is real danger that in some of the staple industries, when the revival in trade at last arrives, there will be found a shortage of skilled labour. It has been suggested in some quarters that older workers, more especially in the case of women, were being replaced by young labour, but the inspectors have not in fact obtained any evidence of this.

Some branches of engineering have been very busy, more particularly those connected with electrical developments, wireless apparatus, motor transport, and railway plant. Perhaps the most noteworthy development is the continued and rapid increase in the generation and use of electricity, which is referred to by the senior electrical inspector.* Important developments, too, have been taking place in the chemical industry; a new plant, the only one of its kind in this country, has been erected in one area for the manufacture of sulphuric acid by the Schmiedal process, which is capable of turning out 1,000 tons of concentrated acid a month, and in the same area a plant has been completed for the manufacture of synthetic ammonia. What is said to be the largest alcohol factory in Europe has been started up in the Hull district, and in Grangemouth the large new oil refinery is now working to full capacity. An entirely new process, the manufacture of endurite, has been started in connection with a paper mill in the Edinburgh district, and this promises to develop greatly. This is to use up all the waste products from the esparto grass, the coarse fibre of which is unsuitable for paper making. At present many of the mills pay large sums annually for the removal of this waste, which will now be collected, ground, and pressed in steam and hydraulic presses. The resulting material can be stained to any colour, and may be used in the manufacture of combs, buttons, toothbrushes, &c., just like the casein products. Its principal use, however, will be in electrical work, as it possesses extremely high electrical resistance. There have also been developments in machinery, and a good deal is said in this year's divisional reports concerning labour-saving appliances.

The British Silk Research Association is collaborating with the British Electrical and Allied Industries Research Association in research on the electrical insulating properties of silk, and on the improvement of the method of preparing silk destined for electrical purposes.

*See ELEC. REV., July 10th, 1925.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

Combined Electric Fire and Electro-Vapour Radiator.

The accompanying illustration, fig. 1, is of a novel design of electric fire and electrically heated water radiator combination marketed by MESSRS. BENHAM & SONS, LTD., 64, Wigmore Street, W.1. The control of the fire is entirely separate from that of the immersion heater, under the radiator, for the heating of the water.

The combined convected and radiant heat has many advantages in the office and home. The large heating surface of

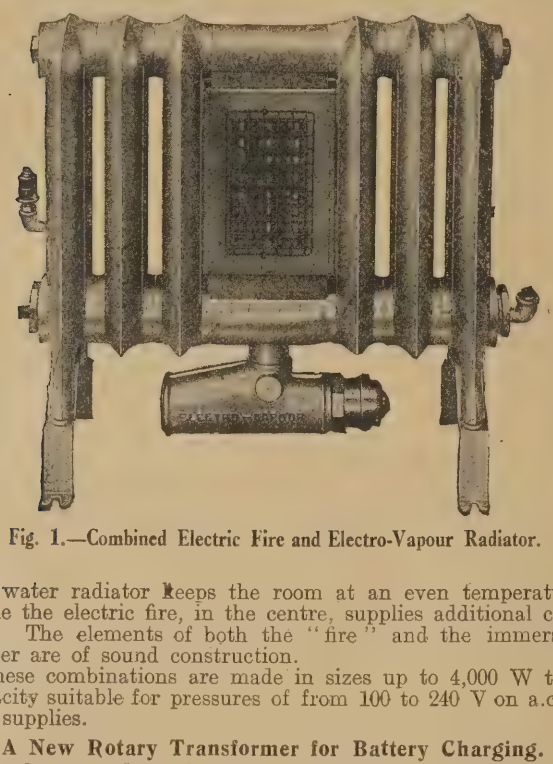


Fig. 1.—Combined Electric Fire and Electro-Vapour Radiator.

the water radiator keeps the room at an even temperature, while the electric fire, in the centre, supplies additional comfort. The elements of both the "fire" and the immersion heater are of sound construction.

These combinations are made in sizes up to 4,000 W total capacity suitable for pressures of from 100 to 240 V on a.c. or d.c. supplies.

A New Rotary Transformer for Battery Charging.

The latest product of MESSRS. NEWTONS, of Taunton, which is being marketed by MESSRS. ROTAX (MOTOR ACCESSORIES), LTD., Rotax Works, Willesden Junction, London, N.W.10, is a new rotary transformer for battery charging, illustrated herewith, fig. 2. This model consists essentially of two armatures mounted on a single shaft of ample dimensions to prevent flexure, a point of importance in the design of double armature machines having two bearings only. Separate field magnets are provided for the motor and the generator, permitting pressure regulation from full to zero. Special regulation coils are fitted to ensure constant pressure over long periods. These coils are in series with the motor armature and are wound so as to assist the shunt windings. The temperature

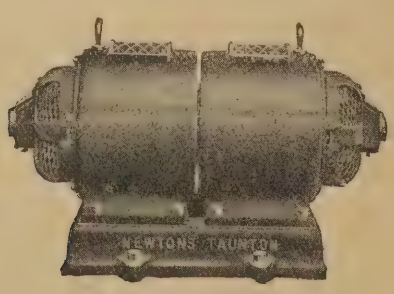


Fig. 2.—A Battery Charging Transformer.

rise is claimed to be very moderate. Messrs. Newtons also make a model, designed to meet the case where two different pressures are required simultaneously, which carries a second and smaller generator excited in a similar manner. Three bearings are fitted to this machine.

Powdered "Insalute" (Liquid Porcelain).

According to *The Electrical News, Toronto*, the TECHNICAL PRODUCTS Co. has developed a new adhesive fireproof and acid proof insulating cement which is being marketed under the name of "Powdered Insalute." It is also being used for assembling metal to wood, asbestos, mica, porcelain, glass, &c., because it is not necessary to melt it to make it stick. It does not become conductive until heated above 1,000 deg. F. (the best porcelain becomes conductive at about 1,500 deg F.). If insulation is required at higher temperatures, insalute may be mixed with other refractory materials. It is stated that insalute may be used as a binder for making furnace cements, cementing asbestos tubes, assembling materials of var natures, and for use as a paint where organic materials not withstand heat.

An Armour Plate Coal Crusher.

Power gives an illustrated description of a new coal cru recently put on the market by the PENNSYLVANIA CRUSHER Philadelphia. This crusher is built in sizes from 1 diameter roll and 24 in. wide to 30 in. diameter roll and 7 wide, giving capacities of from 30 to 500 tons per hour. the exception of the breaker plate and roll segments, crusher is made entirely of steel, 30-in. H girders being for the side frame construction. Cross members of he channel and angle plates are hot-riveted to the girder-b side frames. Steel bearing housings, shouldered into the frames to take the shear, and hot-riveted in position, are fi with interchangeable die-cast bearing bushings. Lubrica is effected by large grease cups in the frames over the beari The crushing roll is of special segmental construction, ha no bolts through the crushing surface. The segments are l in place by tapered steel dowels and one through bolt. breaker plate tip, which takes the major portion of the w in the crusher, is of manganese steel, and is renewable. plate is readily adjustable for varying the fineness of crush

A Switch and Transformer Combination.

This is the latest production of MESSRS. W. FRANCIS & LTD. Manor Road, Altrincham, Cheshire, which will appea engineers who are faced with the difficulties of installing plant in restricted spaces.

The transformer core and windings are housed in the sw pedestal which forms a substantial flame proof, oil-immer transformer tank. Fig. 3 is a general view of the device w the tank removed.

The switch is of the draw out type—oil-immersed—and interlocked that it is impossible to withdraw the switch w

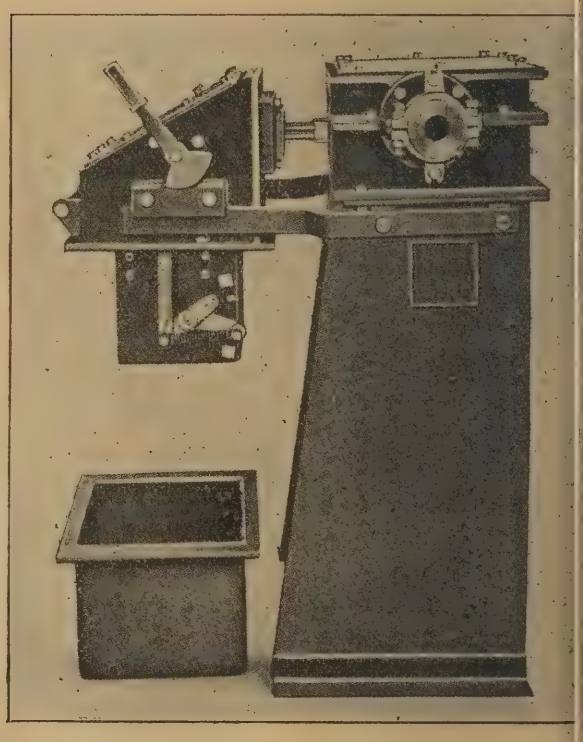


Fig. 3.—A Combination Switch and Transformer.

out first switching "off" and, though when withdrawn switch can be operated "dead" for adjustment and inspecti it cannot be plugged in again unless it is in the "off" positi thus ensuring that the circuit cannot be closed with the enga ment only of the plugs. The switch tank is also interloc in order that the tank cannot be removed until the switch been withdrawn, nor can the switch be re-plugged in until tank is replaced.

The plug and terminal chamber is arranged for tak the h.p. cables straight through, without cutting, thus ens ing the continuity of the main cable system. The plug soc and the split terminal for the cable connections are mou into an insulated base and plugs and sockets for disconnect the main cable and the h.p. side of the transformer provided.

The complete unit is rated for 3,300 volts; it is of str and compact construction both electrically and mechanica and, it is claimed, will render reliable service under the m trying conditions incidental to mining.

Electricity Supply in Ulster.

A Northern Ireland National Scheme.

COMPREHENSIVE scheme of electricity development for er was outlined by Mr. Johnstone Wright, M.I.E.E., Mech.E., city electrical engineer, Belfast, to the Com- ion on the Natural and Industrial Resources of Northern nd, which held its thirty-third session in the Municipal ge of Technology, Belfast, on July 9th, under the presi- y of Viscount Charlemont.

r. Wright is reported by the *Belfast News-letter* to have ted out, *inter alia*, that a comprehensive scheme was of the test importance, but the difficulties of attaining that de- le end were not so much technical as financial and ad- istrative. Uttering a warning against expecting too much, aid there were certain defined limits below which the price lectricity from a public supply network could not fall, but in a reasonable radius and under normal conditions supply ld be cheaper than from small isolated plant. Heavy tal charges were the bane of the electricity supply industry. r effect could be mitigated in no other way than by im- ing load factor, and thus a scheme for any district must ased on the load factor which the industry of that district ld give. The same remarks could be made to apply to a er power scheme, for it was quite possible to have a water er scheme (which was a true coal conservation scheme) such a heavy capital cost that it could not produce a per supply than a coal-fired station. Any country that ched a comprehensive national electricity supply scheme ht be doing a very good thing for the future, but unless Government of the country was prepared to finance the ertaking for a number of years the scheme would operate he advantage of future consumers at the expense of the ent ones. There was no doubt about the benefits of an ndant electricity supply in any country, but he believed a supply should be developed gradually on economic lines an eye to the future and with some form of Government stance for schemes on which there would not be an imme- e return due to providing for future development, but e likely to be economic, say, within ten years. The tion in Ulster was somewhat different from that he defined electricity districts in England and Scotland. re were only two public electricity authorities of any size resent—Belfast, with a normal rated plant capacity of, say, 00 kW, and Londonderry, with a plant capacity of 6,500 . For the year ended March 31st, 1925, Belfast generated 09,610 kWh and Londonderry 539,716 kWh. The distance veen the two stations was, roughly, 62 miles and no possible ntage in load factor or otherwise could accrue from linking hose two stations at the present time. In fact, it was im- ible from an economic point of view. Witness said that at outset, financial assistance would be required to develop rge scheme, though he thought that in the course of time e would be a possibility of repayment. Small stations in n areas were wasteful and expensive, and could not be rporated in a large network.

y means of a large scale map witness explained details of heme for Ulster. The first thing which struck one were facilities for electrification of the whole district by means ailway electrification. Unfortunately, he was afraid that not practical politics in the meantime; and, if possible, a me must be considered which, while not overlooking rail- electrification, was not based on it.

Sources of Supply.

he two existing sources of supply were Belfast and London- y, and two outstanding possible sources, Coalisland and River Bann (Carnroe), in future years might take part in mprehensive scheme when that stage of development was hed. The sites could not be better placed from a distri- ing point of view. The greater part of the power load was red around Coalisland and Belfast. Londonderry, although as well placed as Belfast from an efficient generation point iew, was at present far removed from the load centres, for that reason alone he thought it must be left out of any nary discussion. Prospects of generation at Coalisland ned to be the most promising, for there coal was within reach of an ample water supply for condensing purposes. would not recommend building the station at the colliery he use of cooling towers at the colliery would involve a loss efficiency far exceeding the cost of coal transport to the k of Lough Neagh. If the colliery developed, would it not better to extract the household grade of coal from the ton- e brought to the Lough bank and transport this part of output alone by rail, convert the remainder into electricity, distribute by this means throughout Northern Ireland? cheme of this kind had considerable possibilities, and with verised fuel equipment there was no difficulty in operating efficiently with all grades of coal, and the advantages of distributing electricity instead of transporting steam-raising coal were obvious. The promoters of the Northern Ireland Electricity Supply Bill might have done better, if they had considered a co-operative scheme.

Cost of Power Stations.

At the Belfast station, for instance, there was ample spare plant during the summer months to supply any Bann scheme network during drought periods, and the Belfast Corporation would be only too glad to assist in any scheme which would not involve increased capital, but make better use of the existing capital. It was more than possible that a working agreement between a Bann scheme and a coal-fired station might result in a lower capital cost on a Bann scheme and more efficient use of capital at the coal-fired station, resulting in lower charges to the consumers. In order to ascertain the economic possibility of supply at the various load centres he had designed a main transmission network capable of meeting the full requirements of the area, to be supplied from Coalisland, the Bann or Belfast, the ring main pole-line system being adopted as far as possible, transmission being at 33,000 volts. He estimated the cost of this complete transmission system, including pole lines (and cables where necessary) of 10,000 kW capacity, transformers and switchgear at load centres, but exclusive of buildings and distribution networks at load centres, would be £428,000. Assuming an average selling price of 1½d. per kWh, a reasonable price for bulk supply, the revenue from a demand of 6,500 kW on a 25 per cent. load factor, which would mean an output of 14,200,000 kilowatt-hours per annum, would be roughly £89,000 per annum. This would give a return on the capital cost of transmission network of approximately 21 per cent. If to the capital of the network was added the capital, say, at Coalisland, the result would be roughly as follows:—A steam-fired station consisting of two 10,000-kW turbo-alternators (one spare), complete with boilers to steam 10,000 kW (one boiler spare) at £20 per kilowatt of actual steaming capacity, plus £60,000 for spare plant, would cost £260,000. This gave a total capital of £688,000, on which the return with a revenue of £89,000 would be 13 per cent. Interest and sinking fund charges alone would absorb at least 8 per cent. A station utilising the Bann water, while having a greater capital cost, might give a better return due to lower operation costs, but this depended entirely on the capital cost of construction works. Again, the position of the Bann development in relation to the load centres made it very improbable that it could show any advantage, as the capital cost of transmission and the losses would be higher than those from, say, the Coalisland site. If the Bann development and transmission to Ballymoney and Limavady were cut out of the transmission scheme, there would be a saving in capital on transmission lines of about £54,000.

Considerable Financial Risk.

From those rough figures it was fairly obvious that any authority or company undertaking such a comprehensive scheme would be taking very considerable financial risk, unless a substantial subsidy were available for, say, 10 years. The financial results of a complete scheme were disappointing, but one must face economic facts although fully realising the benefit of public electricity supply to any community. If that represented the position in the industrial North of Ireland, as he believed it did, there was room for apprehension in connection with some larger projected schemes in non-industrial areas.

Under the existing prospective load conditions he could see no hope of financial success arising out of a station at Coalisland at the present time, and less prospect from the development of the Bann scheme, but he was far from suggesting that the idea should be given up altogether. The financing of the initial stages was the main stumbling block.

For an expenditure of about £1,000,000 a very complete system could be laid down, embracing the industrial area—a small expenditure when one considered the ultimate gain; but it was a political question as to how far a Government was justified in incurring that total expenditure for future results. The cost of scrapping old methods delayed ultimate development. The most promising field for first stage development was on the Lisburn, Lurgan, Portadown, Armagh, Dungannon line. Lisburn was within comparatively easy reach of Belfast, but even that supply could not be undertaken by the Corporation unless a demand of at least 1,500 kW was assured from the very commencement of supply, and there seemed little prospect of that. The Harbour power station at Belfast was quite capable of being developed at a minimum cost to give bulk supply to meet the whole needs of the area, and for first stage development at least it would be foolish to incur the capital cost of generation when a supply was available.

Concluding his formal evidence, witness said it would pay the country as a whole to bear the initial cost of the scheme in taxes, having in mind the ultimate results. If they electrified the railways, electrification of the whole of Northern Ireland would be simple.

Women in Science, Industry, and Commerce.

An International Conference of Women at Wembley.

ON Wednesday, July 15th, the first International Conference of Women in Science, Industry, and Commerce was opened at the British Empire Exhibition by the president, H.R.H. the Duchess of York, who addressed encouraging remarks to the large gathering of members of the Women's Engineering Society and kindred associations, including the Electrical Association for Women. Lady ASTOR, M.P., was in the chair, and said that the Conference afforded the opportunity to review the work that women had already done in these new fields, and would stimulate them to further efforts.

Lady RHONDDA expressed the view that business men should take their daughters into their businesses—until that was done they would never get many women into the higher ranks of commerce.

Miss ELLEN WILKINSON, M.P., maintained that women should not undercut the wages paid to men, and Miss MARGARET BONDFIELD said that women in industry were given inferior jobs on account of their lack of organisation. Several other ladies spoke, including delegates from overseas.

The Conference was convened by the Women's Engineering Association, in co-operation with the British Federation of University Women, the Industrial Welfare Society, the Institute of Industrial Welfare Workers, the National Union of Scientific Workers, the Standing Joint Committee of Industrial Women's Organisations, and the Electrical Association for Women. The members were entertained to luncheon at the Garden Club by the British Electrical Development Association; the Duke and Duchess of York were present, and Lady Astor presided.

After the loyal toast, Miss V. HOLMES, A.M.I.Mech.E., A.M.I.M.E., proposed "Women in Science, Industry, and Commerce," contrasting the conditions of 20 years ago, when practically no women took part in those pursuits, with those of to-day, when large numbers of women were thus engaged. The difficulties they met with in engineering were greater than in other branches of industry, yet hundreds of women were employed in that calling, and one engineering firm was "manned" entirely by women.

Responding, Miss MARGARET BONDFIELD, J.P., referred to the manual labour performed by women as chain and nail makers 40 years ago, and said that while they now enjoyed equal opportunity, they were underpaid as compared with men of equal skill. A revolution had taken place in processes of production; factories were equipped with machines in which the skill was incorporated, and were operated by "minders." There were still men's processes, but most jobs to-day were suitable for women to work at. Women would gain greater influence in industry; let it be a humanising influence, elevating industry to a higher plane. They asked for a clear road, free from the obstacles of prejudice and tradition, to make industry what it ought to be—the servant of life.

Mr. W. B. WOODHOUSE, president, I.E.E., proposing "Electricity in the Service of Women," said the Electrical Development Association was glad of the opportunity of welcoming that very important conference and assisting in a notable movement. Industrialism had been built up by engineers with the aid of the steam engine, which led to concentration in factories and towns; electricity would enable them to abolish smoke and redistribute the works in pleasanter surroundings, by its use in transport, for power; in the use of electricity in the home, he particularly welcomed the co-operation of woman, the real home designer. Electricity reduced domestic drudgery, but electrical apparatus required maintenance, and there was a big field for women engineers to specialise in the design and upkeep of appliances for home use.

Lady ASTOR responded, thanking the E.D.A. for the entertainment extended to the members, and expressing the hope that women in industry would not be bound by tradition; let them be helpful in the workshop as they were in their homes, and import spiritual qualities into public life.

After the luncheon a conducted tour of the Exhibition was made, a special display of women's work having been arranged for this day by exhibitors.

Vehicle Head Lamps.

On July 16th the morning session was concerned with engineering, chemistry, and research. A contribution on "Automotive Research," by Miss Ethel H. Bailey (of the Research Department of the Society of Automotive Engineers, in America), outlined some of the work being done by that organisation, which was established in 1921. Active work had been started anew on the subject of vehicle headlights, and a special committee had been appointed to investigate the visibility tests on which the present specifications were based, and to make recommendations as to the advisability of further tests. It was not the intention of the Committee to recommend specific devices, but to consider fundamental principles.

Electricity in Mines.

"Electricity Applied to Mining" was the subject of a paper by Miss H. M. DAVIS (of Messrs. Metropolitan-Vickers), which was read on Thursday morning. The author stated that the use of electricity in mines was rapidly increasing, and ceeded to describe in outline its various applications to mi operations, from the coal seam to the railway truck, gi special attention to winding plant. For the sake of thermal efficiency the supply of electricity from "st stations" was generally advocated, but she considered this system was not necessarily the solution of the pro of obtaining cheap power, and in the case of collieries n be distinctly inferior to a scheme involving the sub-div of the generating plant. High thermal efficiency did necessarily result in high commercial efficiency; the col load factor rarely exceeded 50 per cent., and the transpo electricity was much more costly than the transport of Unless energy could be supplied to the collieries at a 0.7d. per kWh, most collieries would be well advise generate power for themselves.

To meet the special conditions met with in colliery p stations, a scheme had recently been introduced know the "S.P." scheme,* the principle of which was the com separation of the winder load from the remainder of the p supply about the colliery. The energy for winding was plied by means of a high-pressure condensing turbine dri through reduction gearing the Ward-Leonard generators the winder, a flywheel being added to equalise the steam mand from the boiler plant. The remainder of the p was generated by high-pressure condensing turbo-gener units. This arrangement appeared to offer an economic tion for the power supply of the larger collieries. An exa on this principle had been installed at a large Yorkshire and was operating satisfactorily. This system claimed economies over either the central power station or the st winder mixed-pressure turbine arrangement of power su largely due to the elimination of transmission losses and p in the first case, and the more efficient utilisation of stea the second.

The elimination in this manner of the intermittent win peaks would have the effect of improving the load facto the central station, but the solution of the problem was only half complete. Taken over the period of one win shift, the load was reasonably constant, but taken ov longer period, such as a day or week, the load still fluctu to an enormous extent. The complete solution of the pro was very much more difficult of achievement, since it w appear to call for the complete re-arrangement of the wor periods. In the author's opinion, while this would b extremely difficult matter, the difficulty was not by any m insuperable, and it appeared that in the course of a few y with the sincere co-operation of all parties concerned, a rearrangement of working shifts could be carried out, re ing in an immense improvement in the load factor, and sequent reduction of the power costs.

Mrs. MATTHEWS (of the Consolidated Pneumatic Tool Ltd.) opened the discussion by saying that many exce examples of the flywheel storage method of meeting the loads of the winding seemed to meet the requiren of a large number of mines. It was a system, more which would probably prove more valuable when the "st power" stations came into use, because it would the necessary to take special precautions to prevent undue ru of current from the main power station during the p of accelerating the load on the winding gear. Progre operators were fast realising the ease and value of appl machines instead of muscles for shot-hole boring. Her pany's new machine was built for use in gaseous or mines, the electric motor being enclosed in a gas-tight case in order to reduce the weight, air cooling was ado through an extra casing surrounding the motor air was b by a fan, and it thus became a portable machine, e handled by the average miner. When introducing applia of this kind, one had to fight harder against the prejudic the man whose labour one was trying to reduce than ag the conservatism of the mineowner.

Miss DAVIS, replying to the discussion, said that the of a.c. and d.c. for winding gear depended upon the gramme at the pit. The Ward-Leonard equipment was, o average, about 1.7 times more expensive in initial cost a.c. equipment, but on a large equipment with a flyw the reduction in the energy consumed at the start of the and the equalisation of the peaks, would warrant the inst tion of the d.c. system. The saving in energy was so that the equipment would pay for itself in a few years.

The final paper of the morning session was by Miss I H. Hadfield, M.Sc., of the National Physical Laboratory, discussed some chemical problems in the cotton indust

Welfare and Factory Inspection.

The afternoon was devoted to questions relating to indus welfare and factory inspection. The first paper was by Constance Smith, who stressed the important part w

* The system was described in the ELECTRICAL REVIEW April 24th, 1925; pp. 674-6.

›men factory inspectors had played in industrial history. .e effect of welfare work on health and efficiency was dis-ssed in a paper by Miss C. U. Kerr (of the Industrial 'elfare Society), who gave many concrete examples of in-›ased efficiency and better health among workers as the ›ult of such work. The author's viewpoint was distinctly ›ctical rather than philanthropic. It was a striking tribute the value of welfare work that, in spite of an unprecedented lustrial depression, its practice and ideals had been every-›re maintained—sometimes cut down considerably—but still intained both in the letter and the spirit.

The possibilities of advancement for women in industry ›s dealt with in a paper by Miss E. E. Wilson (of the ›titute of Industrial Welfare Workers). Economically, the ›tion of women was serious, owing to the unemployment of ›n still remaining an unsolved problem. Tradition was one the most serious factors; the custom of assigning without estion a particular kind of work to a man, without con-›ering whether it could, with or without some modification, better done by a woman, was difficult to break down. Tem-›amentally, women were different; they took more interest the personal side, had greater intuition, but were not so ›ical as men, and were possibly more timid. Some of these ›iculties, however, under control, might probably prove to assets rather than hindrances.

)n July 17th the morning session was devoted to a discussion commerce and salesmanship, and papers were read by Miss Burlton, B.A., and Miss L. F. Nettlefold, LL.B., dealing ›pectively with salesmanship and the place of the wholesaler the scheme of distribution.

Electricity—Domestic Science.

In the afternoon there was a discussion on the production d distribution of electricity, and its uses in the home, ›ilst demonstrations of electrical apparatus were also given. ›erman Mrs. HAMMER, of Hackney, who is ever ready to each the gospel of electricity, especially in its domestic ›plications, presided over an interested audience of ladies, d in her opening remarks spoke convincingly about the inging of electricity into every home.

The first paper was by Miss M. Partridge, B.Sc. (of the ectrical Association for Women), on "Producing and Dis-›uting Electricity." She explained that the wide differences price of electricity in different districts were mainly due to difficult people." There was little room for improvement the efficiency and reliability of generating plant, but load ›tors varied widely according to local habits and customs. ›e cost of distribution for lighting was three times the cost production. In rural districts overhead lines were essential cheap supply, but their cost was greatly increased by the position of local authorities and land owners, and the re-›irements of the Postmaster-General. Unexpected additions the demand in a district might threaten overloading the ›ins, and necessitate restrictions on the supply pending the ›vision of increased carrying capacity. The cost of wiring ›o was a serious obstacle to development, tenants being willing to wire their houses for the benefit of the landlord. was unfortunate that electricity and gas undertakings were ›rly always in fierce competition—if it were not so, more ›ght be done in the way of standardising the practice of oviding light, heat, and power services in houses.

In order to satisfy inquirers about the reasons for different ›sts in different districts, the author made a list of various ›ms that made up the cost of electricity supply to private ›ellings and came to the conclusion that 90 per cent. of the ›st variations might be gathered under one main heading—difficult people." It was unfortunate that electricity and s undertakings were nearly always represented by different ›ancial interests. If it were not so, there was no doubt at more might be done in the way of either making the ›rvice installation a standard and necessary part of the house ›uipment, chargeable to the landlord and recoverable by an ›itable rent return, or else by giving the tenant who paid r the installation the possession of it, so that he would be at ›erty to sell it at a valuation to either landlord or incoming ›nant when he completed his tenancy. Gas companies often ›actically gave away everything except the gas. The author ›ew of one electricity company which gave a present of three ›e lighting points and one free heating point in each house. ›is pleased the tenant, who usually willingly paid for a few ›cessary extra lighting points. Hire-purchase terms also got ›er some of the difficulties, but plumbing was not carried on this patchy way; it was part of the building, as electric ›wer should be.

The final paper was "At Home with Electricity," by Miss J. Dillon, B.Sc. (of the Domestic Science Department of ›ing's College for Women, Lecturer in Physics at the College, ›d Demonstrator at the London School of Medicine for ›omen), who dealt in simple language with the first prin-›ples of electricity and pointed out that a knowledge of first ›inciples was necessary because, although electricity had ›en introduced into many homes, the users would not be ›ppy until they were more at home with it.

Mrs. HOSTER, in opening the debate, said that she had had ›ectricity installed in her own flat at her own expense, but no ›e else in the same building had it because it was too expen-›ve. If it were twice as dear as other means she would use it, ›t not while it was four times as dear.

Miss PARTRIDGE pointed out that there were several districts London where electricity was used in all the working-class houses; it was unfair to generalise and to say that it was expensive for cooking, because it was not.

Alderman Mrs. HAMMER said that it was a paying proposition up to 3d. per unit, and there was no question about its being more healthy.

Mr. L. L. ROBINSON (Borough Electrical Engineer, Hackney), on the question of cost, said that he had over 600 cookers on his mains. Electricity was supplied at 1d. per unit and the cost of gas was about 9d. per therm, and on that basis the general opinion of his consumers was that electricity cost from 75 to 100 per cent. of the cost of cooking by gas. Occasionally there were complaints that electricity cost twice as much as gas, but in every case investigated, the trouble had been found to be due to the faulty use of the cooker by the housewife. Nowhere in England should consumers be paying more than 2d. per unit for heating, and any undertaking charging more than that should be put out of existence. With regard to the difficulty of first cost of an installation, thousands of contractors could not afford to do anything except on cash terms, but if they helped the municipalities to obtain the powers to carry out installations, those municipalities would give contractors the orders to effect the installations and would themselves sell them on easy payment terms.

Mrs. WILSON, M.B.E., said that she had a private installation for the supply of electricity, but when supplied by the municipality in her district electricity was very dear.

Mrs. BALDWIN urged that housewives should be shown how to use electric cookers; some of those present had come for that very reason.

Miss C. GRIFF, A.M.I.A.E., said that electricity was economical when supplied on contract rates. At her home in Warwickshire the price was 30s. per quarter, and 1½d. per unit during the summer and 2½d. during the winter. Ordinarily the unit cost 7d. or 8d. If there were lighting and a power plug in every room, the cost would be less than at the ordinary rate, but supply companies would not tell the consumers that, and until they asked for the contract rate they did not get it. Her bill was about £2 10s. per quarter, and its use for lighting and heating was not stinted. It was not used for cooking, however.

Alderman Mrs. HAMMER compared electric with gas cooking from the point of view of health, and Miss PARTRIDGE, replying to the discussion, said it was not so easy to demonstrate electric cooking in a rural district as in Hackney, while Mr ROBINSON suggested the use of a travelling exhibition on a light Ford car.

Legal.

Miller v. Scintillating Sign Co., Ltd.

IN this debenture holder's action Counsel moved before Mr. Justice Eve in the Chancery Division, on July 17th, for the appointment of a receiver and manager of the defendant company. He said the principal money in plaintiff's debentures was not due nor was the interest in arrear, but five or six actions were pending against the company. The plaintiff held debentures to the amount of £2,030 out of a total of £3,460. The company was an electrical sign advertiser, and had a large number of contracts running. In reply to the Judge, Counsel said that he was told that Mr. Miller was a director of the company.

His LORDSHIP said that that had better be disclosed; it was not sufficient for Mr. Miller to describe himself as a "Government contractor."

Charles Harold & Co., Ltd., v. Andrews.

AT the Birmingham Assizes last week, before Mr. Justice Rowlatt, Messrs. Charles Harold & Co., Ltd., bullion dealers, Birmingham, brought an action against Charles Andrews, engineer and dealer in electrical and automobile accessories, Birmingham, for alleged breach of warranty and for a return of £200 advanced on the sale of "platinum" magneto points. It was stated that the defendant sold to the plaintiff company a number of magneto contact points which both parties thought were platinum points. Alternatively, it was suggested that the defendant had been guilty of fraudulent misrepresentation, because the points were found to be not platinum but tungsten. For the first delivery the defendant was paid with a cheque for £73 10s., which was stopped before payment. The plaintiff paid £200 on account of a second delivery. A first acid test led the plaintiffs' works chemist to believe that a pair of sample points were platinum. Analysis showed that those brought by the plaintiffs were tungsten, which reacted better to the acid test than platinum even.

The jury found that the purchases were not made on the faith of a warranty that the points were platinum; that the purchases were not induced by fraud; that the plaintiffs purchased 999 pairs expressly subject to analysis; that the plaintiffs were not guilty of negligence towards the defendant in testing the points; and that the defendant bought on the strength of plaintiffs' statement of the result of the test.

The judge found that the plaintiffs were entitled to judgment for £200 with costs, except that defendant was entitled to the costs of the issue as to warranty, as to fraud, and as

to mutual mistake. The plaintiff recovered on the ground that the delivery of the 999 pairs was subject to analysis, and that, the analysis proving unsatisfactory, the contract failed. As to the counter-claim, the defendant was entitled to £73 10s. with costs, but the plaintiffs were entitled to the costs of the issue as to the sale of 999 pairs and 2,400 pairs. Judgment was entered accordingly.

A Borough Electrical Engineer's Libel Action.

AT the Manchester Assizes on July 16th Mr. Ralph Lomax, the borough electrical engineer of Stockport, sued Messrs. Connell & Bailey, Ltd., the proprietors of the *Stockport County Borough Express*, for damages in respect of the publication of two letters in that journal, which, the plaintiff alleged, reflected upon him. The defence was that the published words had no defamatory meaning, and that they were fair comment upon matters of public interest. The case is fully reported in the *Stockport Advertiser* for July 17th. The jury awarded Mr. Lomax £10 damages in respect of each letter, and Mr. Justic Fraser certified for a special jury.

General Electric Co., Ltd., v. Dobson.

AT the Newcastle County Court recently the General Electric Co., Ltd., Newcastle, sued J. E. Dobson, a motor engineer, for £8, the balance of the price of an electric sign. The defendant complained that the plaintiff company, instead of supplying a sign with a front consisting of a single piece of opal glass, had inserted panelled glass. A witness for the plaintiff company explained that this was done to enable the front to withstand a greater wind pressure. The defendant agreed to pay the balance if his instructions were carried out, and on this understanding Judge Greenwell adjourned the case *sine die*, making no order as to costs.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The London and Home Counties Electricity Supply Scheme.—In our necessarily abbreviated report of the proceedings before the Select Committee of the House of Lords which is dealing with this Order (ELEC. REV., July 10th, p. 52), we stated that Mr. Sydney Morse, who appeared for the four-company group, supported an amendment proposed by Mr. Seager Berry, for the ten-company group, exempting those authorities which were not represented on the Joint Authority from the necessity of contributing to the funds of that body. Mr. Morse informs us that he did not support the amendment, of which he had not had notice. He merely agreed with Mr. Berry that the scheme had been sufficiently discussed in the course of the various departmental inquiries and the committee stages of the Nos. 1 and 2 Bills.

The London Tubes.—On July 14th, Dr. SALTER asked the Minister of Transport whether a public inquiry was to be held as to the advisability of constructing a tube railway in South-East London; if so, when such an inquiry was likely to take place and by whom it would be held; and whether the local authorities of the South London Boroughs would be permitted to give evidence.

Col. ASHLEY said that the answer to the first part of the question was, so far as he was aware, in the negative. He had referred to the London Traffic Advisory Committee, for its advice and report, questions relating to the alleged inadequacy of passenger travelling facilities in certain districts of London, including the South-Eastern district. The Committee informed him that it proposed to hold public inquiries in connection with these questions, and that it would afford every opportunity to the local authorities concerned to present their views on the questions involved.

Imperial Radio Communication. — On July 14th, Mr. AMMON asked whether, in connection with the development of the Empire wireless chain, the sites had yet been acquired for the erection of the stations for communicating between Great Britain and Australia and India.

Lord WOLMER, Assistant Postmaster-General, said that sites near Grimsby (for the transmitting station) and near Skegness (for the receiving station) had been selected for the beam stations for communication with Australia and India, and it was hoped that the purchase of the various properties concerned would be completed at an early date. The order for the erection of those stations had already been placed with the contractors.

Anglo-German Telephone Service.—On July 14th, Lord WOLMER informed Lt.-Commdr. KENWORTHY that it was hoped to open an Anglo-German telephone service in about 12 months' time. The circuits would pass through Holland. The submarine cable was on order by the Dutch Government, and the various land lines were being laid.

B.B.C. Profits.—On July 14th, Lord WOLMER informed Sir R. GOWER that the whole of the profits received by the British Broadcasting Co. after the payment of 7½ per cent. dividend, which absorbed only £5,172, had been invested in additions to plant. The Postmaster-General did not propose to reduce the licence fee pending the report of the Committee which the Government was about to appoint to examine the arrangements, financial and otherwise, for the maintenance of the broadcasting service.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the prin specification.
The numbers in parentheses are those under which the specifications will printed and abridged, and all subsequent proceedings will be taken.

1924.

6,987. "Circuit-breaker for ignition apparatus, more especially for as are used in high-speed internal-combustion motors." Allgemeine E tricitats Ges. March 19th, 1923. (213,260.)
7,019. "Electric conductors." F. H. Holmes. March 19th, 1924. (235,9
7,044. "Tone-regulating devices used in wireless telephony receptio C. H. Gardner. March 19th, 1924. (235,932.)
7,358. "Starting of electric motors." British Thomson-Houston Co., L and G. O. Watson. March 22nd, 1924. (235,936.)
7,455. "Magneto-electric machines." British Thomson-Houston Co., L A. P. Young, and E. G. Parrott. March 24th, 1924. (235,940.)
7,460. "Chain circuits particularly applicable to telephone systems." A matic Telephone Manufacturing Co., Ltd., and F. Tench. March 24th, 1 (235,941.)
7,524. "Production of permanent magnets." J. E. Gee and F. S. March 25th, 1924. (235,947.)
7,544. "Electrical connections for telephone headsets." C. Brandes, November 5th, 1923. (224,493.
7,559. "Thermionic valve-holder." R. F. Graham. March 25th, 1 (235,948.)
7,753. "Electrically-driven clocks." C. E. Prince. March 26th, 1 (235,959.)
7,824. "Electric cut-out switches." English Electric Co., Ltd., and Zweigbergk. March 27th, 1924. (235,960.)
7,978. "Glow cathode for discharge tubes." Telefunken Ges. für Draht Telegraphie. May 30th, 1923. (216,840.)
8,588. "Compensated induction motors for single or polyphase alternat current." Deutsche Werke Akt. Ges. April 6th, 1923. (213,928.)
8,635. "Electric thermal cut-outs." British Thomson-Houston Co., (General Electric Co.). April 5th, 1924. (235,982.)
9,999. "Telephone systems." T. H. Howell and R. G. Ferguson. A 18th, 1923. (214,665.)
10,174. "Electric muffle furnaces." L. W. Wild, E. P. Barfield, J. D. Coleman. April 24th, 1924. (235,993.)
10,574. "Methods of starting alternating-current motors." J. Lyons Co., Ltd., and A. G. Goddard. April 29th, 1924. (235,996.)
11,065. "Electric switches." A. C. Greene. May 5th, 1923. (236,005
11,092. "Electric safety lanterns." T. A. Edison. May 17th, 1 (216,116.)
11,872. "Contact for electric batteries." G. Pearson. May 14th, 1 (236,010.)
12,678. "Crystal detectors for wireless receiving purposes." E. M. Wil May 23rd, 1924. (236,018.)
13,002. "Automatic electric power stations." Metropolitan-Vickers trical Co., Ltd. May 28th, 1923. (216,876.)
13,492. "Electric condensers." L. Levy. June 1st, 1923. (216,901.)
14,129. "Insulating materials for submarine and other cables or ductors." Western Electric Co., Ltd. (Western Electric Co., Inc.). 11th, 1924. (236,026.)
14,166. "Electric ignition systems for internal-combustion engines." A. Mumford, Ltd., and A. W. Booth-Royd. June 11th, 1924. (236,027.)
14,377. "Electric headlamps for motor-cycles and the like." Bri Thomson-Houston Co., Ltd., A. P. Young, and A. G. Salisbury. 13th, 1924. (236,029.)
14,579. "Electric locomotives for use underground and on the surfa R. H. Patterson and R. H. P. White. June 17th, 1924. (236,032.)
15,328. "Radio-transmitting systems." Marconi's Wireless Telegraph Ltd. June 25th, 1923. (218,299.)
15,392. "Clip devices applicable for use in display stands or for porting electric light or gas globes or the like." T. J. Saveker. June 2 1924. (236,039.)
16,141. "Headlights for motor-cars and other vehicles." A. J.-B. Mar July 13th, 1923. (219,001.)
19,257. "Production of refractory bodies for electrical or other purpos B. Bell. August 13th, 1924. (Samples furnished.) (236,063.)
19,587. "Control of electric motors." English Electric Co., Ltd., and Zweigbergk. August 18th, 1924. (236,064.)
20,161. "Electric motor-control systems." English Electric Co., Ltd., F. D. H. Bremner. August 26th, 1924. (236,068.)
20,206. "Telephone systems." Siemens & Halske Akt. Ges. Noven 17th, 1923. (224,865.)
20,264. "Electro magnets." Western Electric Co., Ltd. (Western E tric Co., Inc.). August 27th, 1924. (236,070.)
20,436. "Apparatus for obtaining rotary motion from an electric vibrating arm." J. Jolley and J. E. Booth. August 29th, 1924. (236,071
20,897. "Frequency transformers." C. Lorenz Akt. Ges. September 1923. (221,507.)
21,026. "Electric water-heating apparatus and the like." K. F. He man and P. Kerkhoven. June 13th, 1924. (235,513.)
21,976. "Distribution of alternating-current energy." International Gen Electric Co., Inc. September 18th, 1923. (222,131.)
22,798. "Electric discharge devices." British Thomson-Houston Co., December 13th, 1923. (226,165.)
22,798. "Mechanism for effecting angular displacement of the bru in commutator dynamo-electric machines." British Thomsen-Houston Ltd. October 3rd, 1923. (222,877.)
23,841. "Insulators for the suspension of live cables for electric railw or the like." A. Linde. October 8th, 1924. (236,085.)
24,258. "Rotary condensers for wireless telephony." Telefon und Si Ges. February 25th, 1924. (230,010.)
25,567. "Electric condensers." Dubilier Condenser Co., Ltd. (form Dubilier Condenser Co. (1921), Ltd.) (H. R. van Deventer). October 2 1924. (236,091.)
26,165. "Electric hot-plates." P. E. Forget. November 13th, 1 (224,880.)
26,391. "Automatic or semi-automatic telephone systems." Coventry A matic Telephones, Ltd., and C. W. Wilman. November 5th, 1924. (235,77
27,365. "High-tension current transformers." Siemens & Halske A Ges. December 11th, 1923. (226,174.)
28,153. "Automatic distribution of current for electric traction loco tives." V. Goddaer. November 24th, 1924. (235,776.)
28,205. "Electric arc cutting." C. J. Bird, H. E. C. Wade, and Jackson. November 25th, 1924. (Addition to 237,278.) (236,098.)
28,639. "Diaphragm sounders." F. Krupp Germaniawerft Akt.- December 1st, 1923. (225,569.)
28,919. "Electric motors." B. Heger. May 14th, 1924. (234,048.)
30,772. "Protective arrangements for polyphase electrical circuits." Me politan-Vickers Electrical Co., Ltd. January 8th, 1924. (227,430.)
30,802. "Loud-speaking telephonic receivers." E. A. Graham. Decen 22nd, 1924. (235,783.)

1925.

1,651. "Spark-preventing device for electromagnetic or inductive circui G. Mombur. January 18th, 1924. (227,870.)
2,492. "Diaphragm for radio loud-speakers, gramophones, micropho and the like." R. Sornaes. February 8th, 1924. (228,880.)
6,362. "Telephone receivers for headsets." C. Brandes, Inc. Noven 5th, 1923. (Divided application on 224,493.) (230,491.)
6,794. "Apparatus for the electrical precipitation of suspended parti from gaseous fluids." Lodge-Cottrell, Ltd. March 12th, 1924. (Addition 216,789.) (230,841.)
7,584. "Electric connectors." British Thomson-Houston Co., Ltd. M 25th, 1924. (231,479.)

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Extra-High-Pressure Cables.

IT is an interesting comment on Mr. Everett S. Lee's paper before the American Institute of Electrical Engineers on "Testing High-Tension Impregnated Paper-insulated Lead-covered Cable," that the reports of the annual meetings of the shareholders in two very prominent British cable-making companies have announced in the one case the execution in this country of an important order for 75,000-volt cable, and in the other case the acquisition of an interest in an American cable-making company with a view to making e.h.p. cable behind the shelter of the Fordney Tariff.

It is, moreover, of interest that the discussion on Mr. Lee's paper and on that by Messrs. Del Mar and Hansen, recorded in recent issues of the *Journal* of the A.I.E.E., would seem to indicate that the experience of our American friends with 33,000-volt and 66,000-volt cable has been beset with a certain amount of trouble. We, too, have had a little, and apparently have found solutions. But habituated as we are to decrying our own performances, neither the C.M.A. nor its critics have found it necessary to confess to the occupation by Great Britain of a subordinate position in cable manufacture. Initially, perhaps, the difficulties may be said to have been due to the magnitude of the advance. The rules of design as to the proportioning of dielectric thickness for 6,600- and 11,000-volt cables —of which there are thousands of miles in existence— represent the advance due to years of experience, but when we consider the 33,000-volt cable, it is evident that pressures five times 6,600 volts introduce factors which are not in direct arithmetical proportion to the increased pressure. Still less is this the case when we have to consider the vital questions of uniformity of materials and uniformity in construction. At the lower pressures our factors of safety were such that the possibility of minor irregularities in impregnation did not greatly worry us. To-day, at pressures of 33,000 volts and over, the situation in this respect is greatly changed. To take a mechanical analogy, it is almost as though after for four or five generations using steel of 26 to 30 tons ultimate strength and working at one-third the elastic limit, we received for the first time a new alloy steel of 50 to 55 tons ultimate strength, and were compelled to work this up to 90 per cent. of its elastic

limit, with the added nightmare that the steel manufacturer could not guarantee uniformity of the metalloid constituents or uniformity of heat treatment.

We imagine that the magnitude of the change in pressure caused Mr. Lee to review the matter in the paper now under consideration, which was read in New York last February. Its summarised conclusions do not call for much critical examination: there is the dictum that "values of insulation resistance are of doubtful worth as a means of distinguishing between satisfactory and unsatisfactory cable"; "the test for dielectric strength is the most important and the best now available as a suitability test"; and "measurements of dielectric power loss and power factor are of value and should be continued." We doubt, however, the practicability of "periodic testing at voltages which will not injure sound cable, and which will only affect cables when the deterioration has been abnormal." Unfortunately the author does not define the percentage above normal pressure that would produce this result. Such periodic tests can, of course, be applied, when it is possible to isolate one of two e.h.p. feeders or to isolate one segment of a ring main. But an application of a test pressure to a cable *in service*, which will be sufficiently in excess of the normal voltage to be discriminatory, seems to us to be asking for trouble, in that it ensures the breakdown of a weak cable at an earlier date than would naturally be the case. That date may be merely days earlier, but if there should be any feeling that failure has been accelerated by weeks, most of us would prefer to wait and allow sleeping dogs to lie. The only good reason for making such a test appears to us to be that it could be applied at a slack time of year, when the removal of the cable from service would offer the least inconvenience. In other words, we should select the time for an inevitable breakdown to take place, rather than leave it to mature perhaps at a most inconvenient season. We note, however, that one speaker in the discussion expressed a firm belief in the proof testing of cables after installation—at six-monthly intervals and at one and a half times the working pressures, for fifteen minutes. The same speaker had no illusions as to what sample tests meant—he pointed out that on a 10-ft. piece for bending test the results do not reveal whether or not a 10-ft. sample cut from the other end of the cable will be as good as the first in meeting the bending test, and that there is nothing to indicate that a 10-ft. piece cut from the middle of the cable would yield as high a value.

Other speakers covered a wide range. One confessed that one-third of the failures in service revealed absolutely no discernible cause, and this speaker also put forward a figure-of-merit table based on inspections and tests on an order for 3-core, 13,000-volt cable distributed over seven factories. Points were awarded under 15 headings, six being for mechanical, five for electrical, and four for puncture tests. This table, which illustrates the differences in value in excess of specified limits, is certainly suggestive, but we are not sure that the scheduled scale of weights is correctly proportioned. The probability also remains that different scaling is necessary for 15,000-, 33,000-, and 66,000-volt cables. In any case the proof of the pudding lies in the eating. The seven cases cited vary in their figure of merit from 84.3 to 68.1 per cent. It will be of great interest—should the facts ever be disclosed—to learn five or six years hence whether there is any relation between the empirical total figure-of-merit value formulated and the working life, with special reference to the further question of the relation of the failure to the corresponding points making up the figure of merit. The possible fallacies in devising any figure of merit are indicated by the fact that it is most improbable that any two samples, 10 ft. in length, from the same drum would have identical values.

Passing to testing methods, the consensus of opinion was favourable to the e.h.p. direct-current method. When, however, the dielectric losses are low, recourse to recording instruments is necessary. Of even greater interest is the question of decomposition of the impregnating oil—a phenomenon akin in some of its asp to the sludging of transformer oil.

Finally, there is the question of what are to be test pressures and their duration on the finished cal Many will feel that our current practice of applyin test pressure of 75,000 volts for fifteen minutes at works to a finished 33,000-volt cable is unnecessa drastic—it is always conceivable that too high a pressure is a cause of incipient faults, which develop later. In this connection it would be inter ing—but expensive—to experiment with two drum one submitted to twice and one to three times the wo ing pressure for fifteen minutes. Afterwards a se of test samples could be taken from each drum broken down. Any marked difference between the of samples would be almost conclusive. We use qualification "almost," as we cannot at the works ceed in simulating the effects due to ageing.

Some day, when all the information now availa (and more with regard to performance when laid) been co-ordinated and when we all really underst what constitutes uniformity of impregnation and ensure uniformity of materials, the manufacture 66,000-volt cable will present no more anxieties than have to-day over cables for one-tenth of that pressu By that time we shall perhaps have a fresh set anxieties about 200,000-volt cables.

The New Showrooms at Liverpool.

ELSEWHERE is this issue we m reference to the opening of new sh rooms by the Liverpool Electricity partment, and reproduce some ph graphs of the premises. It is evid that the Corporation is making a great effort to bu up its domestic load, and a well-appointed and w managed showroom with a wide selection of appliar and intelligent demonstrations is an excellent means stimulating the interest of the domestic consumer.

Our illustrations scarcely do justice to the beautifu arranged apartments, but they serve to convey s impression of the care and thought that have b bestowed upon their decoration, furnishing, and "l out." We particularly like the idea of the lecture demonstration room. It will be remembered tha large demonstration room and lecture hall are feature the big showroom scheme which Hackney completes in early autumn. Practical demonstration is very ne sary, not only as a means of selling appliances, but to impart to customers a proper knowledge of th use. Many complaints of the expense of electric cook are solely due to ignorance of the special methods wh form one of its principal advantages.

Demonstration is not the only consideration, h ever; it is also necessary to have a reasonable rate domestic electricity. This has been thought of, t for the Corporation now has a two-part tariff, consist of 5 per cent. of the rateable value of the consume premises per quarter, plus a halfpenny for each k consumed. This should bring electric cooking and he ing within the reach of a very large section of population. Liverpool has set a very good example other large towns, and there is no doubt that expenditure which has been incurred will be repai hundredfold both from the financial point of view in the benefits which will accrue to the citizens from th adoption of electricity.

Spanish Industrial Progress.

IT will be seen from the report of British Commercial Secretary Madrid, which is reviewed in t issue, that there are a number of f ward movements in progress in Spa Hitherto the country has not been looked upon as industrial (or industrious) state, but it appears tha modification of this view is very necessary if we to form a true estimate of the position which Spain v occupy in a few years' time. Capt. Charles says that expansion of industry has shown a very considera

advance in the last few years. To-day there is very little which Spain does not produce, whereas before the war her manufactures were limited to a few lines. Some of her factories are so glutted with orders that they are unable to fulfil them. At the same time, Spain is still a large purchaser from abroad, and British manufacturers will find it profitable to study the market and make a bid for the business which is available. Activity has been very pronounced in the mining and metallurgical industries, as will be seen from the figures of production which we quote from the report. An outstanding feature of these industries is the rapidly-growing use of electric power. It is no doubt this and the railway electrification which is being undertaken in easy stages which have stimulated the development of the country's rich water-power resources. These amount in the aggregate to about 4½ million h.p., and about 1¼ million h.p. is already in use. We mentioned last week that a large scheme was being considered by a Pearson enterprise which was designed to provide all the electric power required throughout the province of Catalonia. It is noteworthy that an endeavour to enforce the use of Spanish plant and materials has been made by the Government in granting future concessions, but it is doubtful if Spanish industry can yet cope with this class of work. Capt. Charles reiterates the advice to would-be traders given in his last report, and sums up the requirements in two words, "efficiency" and "adaptability."

New Roads and Electric Mains.

We seem to have heard the last of the determined attempt which was made in the last session of Parliament and again in this one by certain county councils to place the cost of removing electric and other mains during the course of road reconstruction upon the public utility authority that owned them. The probable cost of this requirement is such a serious matter that the attempt has been equally strenuously fought, and with success, by the public utility authorities. Questions of this nature, of course, can only be raised when a public-utility concern is before Parliament with a Bill, and, as a matter of fact, the fight has been taking place in connection with some relatively small gas and water undertakings. The electricity and water supply authorities were involved, however, in what was a matter of important general principle, and concerted action was taken. The position can briefly be thus stated: In many road reconstruction schemes it frequently happens that a road may be doubled in width, and unless the mains which have been laid under the footpath are moved, they will be found under the surface of the new roadway, where not only will it be inconvenient to get at them for the purpose of repair, but they will also be subjected to a very much heavier traffic than the people who laid them originally ever contemplated. Thus they will be exposed to the risk of serious damage. Alternatively, they may be overlaid with a thick bed of concrete. Obviously, therefore, such mains must be moved to the sides of the widened roads, and with an ingenuity that did counsel credit, it was argued in one or two cases that this cost should fall upon the authority owning the mains, but not with much success. The point, however, was being pursued by the county councils in such a way that a conference of electricity, gas, and water authorities was held, and it was decided to bring the matter to a head in connection with the demands of the East Sussex County Council in relation to the Uckfield Gas and Electricity Bill and the Burgess Hill Water Bill this session. The County Council did not oppose when these Bills were before the House of Lords, but reserved the right to do so when they came before the House of Commons. The conference in question decided to fight the East Sussex County Council, and it was arranged that the expense should be borne between the three interests. Fortunately wiser counsel have prevailed, for when the Uckfield Bill came before the Unopposed Bills Committee of the House of Commons recently there was found in it a clause which laid it down that in the case of road widenings the cost of the removal of mains should be borne by the county council, whilst in the case of county bridges the cost should be borne by the authority owning the mains. The latter, of course, does not mean much, and was probably conceded in an endeavour to settle the matter. On the main question of principle, the public-utility undertakings have secured a valuable precedent, and it is hardly likely that other county councils will trouble further in the matter.

Electrical Progress in the United States.

The latest available figures of the growth of the electricity supply industry of the United States have refuted those who gave it as their opinion that the peak of progress was reached in 1923 and that thereafter the annual increment would gradually decrease. According to a survey recently completed by the *Electrical World*, 2,178,283 new customers of all classes were added to the service lines of the central stations during 1924, whereas during 1923, when progress was assumed to be at its highest possible level, the increase was 2,042,711.

It is shown that "domestic lighting customers" formed the most important class, their numbers rising from 11,613,348 to 13,395,887 out of a total of 16,555,714 at January 1st, 1925. We presume that this class covers domestic users generally, not merely those who use electricity for lighting alone. Commercial and industrial consumers also increased in number at a satisfactory rate, but there is no doubt that it is to the domestic load that American electricity suppliers are looking for the bulk of their revenue.

If the number of domestic consumers can show a growth of over 15 per cent. in a year in a country which is so well developed electrically as the United States, what are the possibilities in Great Britain?

There is little doubt that with the expenditure of a relatively small amount of money and effort, the mass of the people will be brought to a realisation of what electricity means.

British Engineering Standards Association.

In his review of the year's work of the B.E.S.A. at the annual meeting, which is referred to elsewhere in this issue, the chairman found himself able to strike a more hopeful note than was done this time last year, both as regards organisation as well as finance. The deficit carried forward from the previous year has been reduced, but it is sad to relate that there are no funds at present for carrying on the translation of British Standard Specifications into foreign languages, and accordingly their dissemination abroad has had to cease—a regrettable happening, and it is to be hoped that such valuable work will not have to be in abeyance for long.

It is announced, however, that a new scheme is to be put in operation next autumn whereby the Association's membership will be so reorganised as to allow the Main Committee to obtain the support of professional engineers, individual firms, and business men connected with all the great industries of the country. It is interesting to learn that individuals will now be given the privilege of becoming members of this important body. Membership will carry with it advantages too numerous to mention. The Prime Minister, who is personally familiar with B.E.S.A.'s work, has addressed a letter to the chairman expressing the hope that the Association will be successful in the effort now being made to widen the scope and influence of its work. Moreover, it is hoped that H.M. Government will eventually find itself in a position to give greater support than at present to the movement. It is confidently expected that all those connected with our great industries who are able to do so will lose no time in placing at the disposal of the B.E.S.A. Main Committee that additional measure of support which is so necessary in order to enable it to prosecute its national campaign successfully and, at the same time, make its work effective throughout the world.

D

New Showrooms at Liverpool.

The Corporation's Fine Display of Domestic Electrical Appliances.

THE Liverpool Corporation's new electrical showrooms, which occupy a commanding site in the centre of the town, were opened on July 20th by the Lord Mayor of Liverpool. The premises are situated in Whitechapel, within a stone's throw of Lord Street, which is one of the principal shopping thoroughfares of the city. The premises cost several thousands of pounds to adapt to the purpose for which they are now applied, and the result is one which does credit to the city of Liverpool. It is claimed that the showrooms, which contain about 2,000 electrical appliances, are the finest in the country. The premises were entirely re-modelled by Messrs. Ashby Tabb, Ltd., and the electrical furnishing and the arrangement of the displays were supervised by the city electrical engineer, Mr. H. Dickinson. Entering the premises on the ground floor, there is a fine reception hall (fig. 1) reminiscent of the Tudor period, replete with showcases fitted with glass shelves, which are wired and contain sockets so that plugs may be inserted for the display of lighting effects, &c. On the first floor there is a special showroom for the display of electric light fittings, pendants, shades and lamps of all descriptions. In this apartment alone there are on view close on 300 patterns of electric light fittings. The showcases, in old oak with glass shelves, are wired in the manner indicated above, and these display 96 varieties of shades and fittings. Adjoining is a demonstration room to seat about 70 persons (fig. 2). Here it is intended that specialists shall give demonstrations in cooking, washing, &c. On the second floor, fig. 3, which is reached by a lift, there is a whole host of appliances, from sewing machines to electrically-operated calculating machines. Adjoining there is a suite of four rooms approached through a little garden courtyard. A projecting window gives one a glimpse into a very cosily-furnished and electrically-lighted bedroom. On the right there is a passage illuminated by an antique flambeau. The bedroom opens into a bathroom. Then there are a dining room, a kitchen and a scullery. Space will not permit us to give a detailed review of the electrical exhibits which are so numerous and varied, but the showrooms certainly do justice to the progressive ideals of the City of Liverpool electricity department.



Fig. 1.—Part of the Reception Hall.

Speaking at the opening ceremony, Mr. H. Wilson, chairman of the Electricity Committee, said that there would be demonstrations at frequent intervals of all kinds of electrical appliances, and they could be depended upon that the showrooms would endeavour to keep the public informed of the latest developments in electrical devices for the home. Last year the Corporation decided to hire out electric cookers at a charge of 5s. per quarter, including fixing and maintenance. At the present time, continued Mr. Wilson, 800 cookers were installed, and a large demand was expected from the outside districts. If the department could develop the demand for electricity during the off-peak hours of the day, it would be possible to greatly reduce the cost of current.



Fig. 2.—The Demonstration Hall.



Fig. 3.—The Main Showroom.

A special domestic rate consisting of a fixed charge of 5 per cent. of the rateable value per quarter, plus a "running" charge of ½d. per kWh, has been instituted to encourage the use of electricity in the home.

Coal Mining in 1924.

Reports of the Secretary for Mines and H.M. Chief Inspector of Mines.

HE report of the Secretary for Mines contains much nformation regarding the coal output and wages for ie year 1924. Following a year of prosperity in 1923, ith an output second only to the record year of 1913, ith the exports exceeding even that year, it is much be regretted that the year 1924 was one of "gradu-ly deepening depression."

The boom of 1923 had been caused by the dislocation the Ruhr coalfield, and the resumption of normal pro-uction, as might have been expected, shattered it, and lated seasonable improvement then occurred, but the demand for house coal was lower than usual. In all 267 million tons of saleable coal was raised in 1924, as compared with 276 million tons in 1923 and nearly 287½ million tons in 1913.

The active developments in the newest coalfields is reflected in the higher level of output in Yorkshire, which was 7 per cent. greater than in 1913, and in Nottingham and Derbyshire, which was 2 per cent. greater. In all other districts except Kent, the output

TABLE A.—COAL-CUTTING MACHINES AND CONVEYORS IN USE AT THE COAL FACE.

Distr ct.	Machines in Use.				Driven by Electricity.	Driv n by Compressed Air.	To al number of Machines.	Tons of Coal Cut.				Total.	Percentage of Total Output.	Number of Conveyors at Coal Face.
	Disk.	Bar.	Chain.	Per-cus-sive.				Disk	Bar.	Chain.	Percussive.			
. Northumberland ...	62	23	159	350	203	391	594	674,113	153,445	1,661,663	1,383,123	3,872,344	28	28
. Durham	24	62	284	770	229	911	1,142	205,221	408,170	2,592,330	2,525,476	5,736,411	16	107
. Cumberland and Westmorland ...	—	10	19	6	22	13	35	—	31,679	94,246	29,241	155,166	7	1
. Lancashire and Cheshire	103	84	102	562	58	793	851	621,770	541,807	706,814	1,038,550	2,908,941	15	76
. Yorkshire, South ...	27	33	170	175	106	305	411	371,151	713,857	1,811 2 0	469,566	3,365,824	11	123
. Yorkshire, West ...	165	15	180	140	169	331	500	1,824,742	83,210	1,893,156	138,213	3,939,321	25	81
. Nottinghamshire ...	41	48	158	12	204	55	259	362,690	334,636	1,557,380	38,915	2,293,621	16	17
. Derbyshire (except South Derbyshire)	19	43	178	67	164	143	307	176,986	423,521	2,297,883	78,117	2,976,507	18	35
. Derbyshire, South														
. Staffordshire, North	1	16	163	129	59	250	309	333	138,181	1,279,843	196,447	1,614,804	25	31
. Cannock Chase ...	5	5	102	13	94	31	126	49,406	43,493	1,092,113	24,802	1,210,094	20	22
. Staffordshire, South and Worcestershire	17	5	65	9	70	26	96	207,013	35,240	920,837	9,850	1,172,940	12	4
. Leicestershire														
. Warwickshire														
. Shropshire	3	2	5	—	10	—	10	28,847	34,916	76,698	—	140,461	17	—
. Forest of Dean														
. Somerset ...	2	7	2	2	11	2	13	7,906	43,448	6,696	3,083	61,133	2	13
. Bristol ...														
. Kent														
. South Wales and Monmouth ...	2	76	250	81	83	326	409	17,622	564,849	1,979,166	58,311	2,619,948	5	671
. North Wales... ...	14	24	47	55	44	96	140	52,676	328,328	389,827	45,184	816,015	24	13
. Fife, Clackmannan, Kinross and Sutherland ...	147	89	93	14	311	32	343	2,035,656	884,926	1,088,359	39,153	4,048,094	48	63
. Lothians (Mid. and East)	29	40	44	2	99	16	115	390,779	603,474	517,355	3,062	1,514,670	35	38
. Lanarkshire, Linlithgow, Stirling, Renfrew & Dumbarton	515	291	226	17	994	55	1,049	5,293,969	2,536,019	2,387,014	79,413	10,296,415	54	47
. Ayrshire, Dumfries and Argyll ...	37	42	34	8	114	7	121	314,870	334,956	500,574	17,450	1,167,850	26	3
Totals ...	1,213	921	2,281	2,412	3,044	3,783	6,830	12,635,750	8,238,155	22,853,204	6,177,956	49,910,559	19	1,373
rresponding figures for 1923	1,240	882	1,841	2,192	2,745	3,414	6,159	14,216,031	8,156,053	19,363,065	5,784,805	47,526,439	17	1,157

en the year 1924 might have been worse had not the me demand at the beginning of the year improved—t this demand gradually fell off and prices declined. itput fell by 9 million tons, and exports by 19 llion tons. Values at the beginning of the year were od, but they subsequently declined, so that on balance ey showed little change from the previous year, for ile export prices were lower, inland prices were gher. The earnings of the workers were slightly gher than in 1923. Although 9 million tons lower an in 1923, the output in 1924 was higher than in y other year except 1907, 1911, and 1913. Up to e middle of May, a high rate was maintained and, cept for holiday periods, and a fortnight when trans-rt was disorganised by a strike of locomotive engine-en, it was not less than 5⅔ million tons in any week, d reached nearly 6 million tons in the second week April.

With the close of the house coal season, and the covery in the output of coal abroad, production de-ned, and fluctuated between 5 and 5¼ million tons week from June to the middle of November. A be-of coal was lower than in 1913. The difference amounted to 3 per cent. in the Staffordshire, Salop, Worcester, and Warwickshire district, 8 per cent. in Northumberland, 10 per cent. in South Wales and Monmouthshire, 12 per cent. in Durham, 17 per cent. in Lancashire, Cheshire, and North Wales, and nearly 15 per cent. in Scotland. It is interesting to observe that in the anthracite industry production has increased by one-eighth since the year 1922 and exceeded that of 1913 both in 1923 and in 1924.

The number of persons employed was 1,193,668 at the middle of May, the highest number recorded since the resumption of work at the mines after the national stoppage in 1921. By the middle of November the number had fallen to 1,135,380, but it increased subsequently to 1,137,173 at the end of the year, as compared with 1,184,786 at the end of 1923.

The export demand for British coal and coke, which reached "record" dimensions in 1923 owing to troubles in the Ruhr, was sharply checked in 1924. The production of coal at German mines increased from 6,302,000 metric tons in December, 1923, to 10,826,000 tons in

March, 1924, and 11,944,000 tons in October, when it was slightly greater than the average monthly output of coal in 1913 in German post-war territories. For this reason, coupled with the increased output from the mines in France, Belgium, and Holland, exports of British coal to these countries and to Italy declined in 1924 by no less than 20,000,000 tons, though even so they were only 1¼ million tons less than in 1913. Elsewhere British exports were 1½ million tons greater than in 1923, but were still nearly 13 million tons below the level of 1913. The total quantity of coal exported was 59,179,000 tons in 1924, 77,974,000 tons in 1923, and 73,400,000 tons in 1913.

With regard to home consumption, 180⅓ million tons was available for consumption in Great Britain in 1924, as compared with 168¾ million tons in 1923. The 1924 figure was approximately the same as that of 1920, the year of the post-war "boom" in trade, and was 3½ million tons less than in 1913. Deducting miners' and household coal, the quantity available for industrial purposes was about 140 million tons. Of this, 54½ million tons was used by the collieries, public utility undertakings, and railway companies (1¾ million tons more than in 1923), 14⅓ million tons in the manufacture of pig iron (rather less than in 1923), and for all other purposes 71 million tons (9⅔ million tons more than in 1923). These figures point to some temporary improvement in industry at home, except in the heavy iron and steel trades, which were affected directly or indirectly by the renewed activity of the Ruhr; but it is probable that to a large extent the increase represents replenishment of stock rather than actual consumption.

Over the year as a whole the average proceeds of coal disposed of commercially amounted to 19s. per ton, practically the same as in 1923. This the price at the pit-head, and the following are the ports annual average f.o.b. prices for exported coal 1913, 13s. 10d.; 1922, 22s. 7d.; 1923, 25s. 2d.; 19 23s. 5d.

As regards wages, the average earnings per man sh for all classes of labour were 10s. 3d. for the first f months of the year under the old 1921 agreement, 10s. 10¼d. under the present agreement, which exp at the end of this month, for the remaining eight mon of the year. The wages, of course, for the skilled were very much higher than this. The following gi

TABLE B.—ELECTRICAL EQUIPMENT AT MINES UNDER THE COAL MINES ACT IN 1924.

District.	Total Number of Mines at work.	Number of Mines at which Electrical Equipment is Installed.	Aggregate Horse Power of the Electric Motors in use. Below Ground. Haulage.	Pumping.	Portable Machinery.	Miscellaneous.	Total.	Above Ground. Winding.	Ventilation.	Haulage.	Coal Washing or Screening.	Miscellaneous.	Total.
1. Northumberland	125	73	16,441	17,410	6,444	1,113	41,408	8,151	6,589	2,100	3,821	13,187	33,848
2. Durham ...	293	176	55,381	53,708	7,796	4,036	120,921	16,185	21,790	14,453	17,064	49,867	119,359
3. Cumberland and Westmorland...	36	22	1,958	2,515	507	1,450	6,430	215	575	110	2,490	2,173	5,563
4. Lancashire and Cheshire ...	242	128	17,974	17,684	1,495	589	37,742	6,908	4,901	1,809	7,181	14,451	35,250
5. Yorkshire South	132	81	26,475	16,470	3,041	2,770	48,756	1,740	11,162	3,493	20,316	46,862	83,573
6. Yorkshire West.	181	99	12,376	8,890	4,697	1,152	27,115	3,313	2,814	1,254	7,720	11,912	27,013
7. Nottinghamshire	41	36	14,304	3,287	6,513	400	24,504	2,537	3,448	1,001	5,974	9,614	22,574
8. Derbyshire (except Derbyshire South	120	57	15,060	10,747	4,322	599	30,728	1,233	4,642	1,100	5,726	13,569	26,270
9. DerbyshireSouth	12	10	1,993	1,050	576	84	3,703	—	—	234	155	372	761
10. Staffordshire North	80	35	8,639	10,112	1,355	580	20,686	245	1,955	1,244	2,903	7,945	14,292
11. Cannock Chase .	32	27	8,110	1,308	3,045	293	12,756	1,350	765	934	2,479	2,810	8,338
12. Staffordshire South and Worcestershire	136	23	600	1,908	180	199	2,887	170	150	258	178	555	1,311
13. Leicestershire ...	26	17	2,139	819	895	80	3,883	—	100	283	361	846	1,590
14. Warwickshire ...	25	21	7,720	2,955	1,411	247	12,333	300	441	694	1,265	3,602	6,302
15. Shropshire ...	53	8	485	458	296	15	1,254	—	30	115	91	293	529
16. Forest of Dean	57	9	1,996	7,601	201	70	9,868	—	157	191	143	319	810
17. Somerset ...	18	12	1,312	808	46	124	2,290	—	55	60	97	366	578
18. Bristol	5	4	1,247	790	51	55	2,143	—	265	90	—	266	621
19. Kent	4	4	390	3,877	—	82	4,349	—	143	—	150	1,181	1,474
20. South Wales and Monmouth ...	656	383	79,900	83,835	2,496	2,574	168,805	53,809	31,831	27,886	18,168	75,843	207,537
21. North Wales ...	43	19	3,350	2,373	1,232	364	7,319	50	615	369	770	1,903	3,707
22. Fife, Clackmannan, Kinross and Sutherland	73	64	14,661	25,515	10,232	2,696	53,104	5,058	1,852	1,271	4,532	5,967	18,680
23. Lothians (Mid and East) ...	37	31	8,435	15,547	2,928	2,229	29,133	208	1,386	942	1,647	4,121	8,304
24. Lanarkshire, Linlithgow, Stirling, Renfrew and Dumbarton... ...	309	222	33,269	44,724	28,834	3,110	109,937	2,760	5,067	4,708	6,878	8,878	28,291
25. Ayrshire, Dumfries and Argyll	91	51	5,174	10,740	3,528	1,421	20,863	605	1,081	425	1,933	1,866	5,910
Totals...	2,855	1,630	343,586	348,803	92,121	26,386	810,896	107,139	102,911	68,230	112,660	280,096	671,036
Corresponding figures for 1923	2,902	1,598	312,225	333,140	82,257	25,516	753,138	91,810	96,456	63,079	99,126	261,136	611,607

particulars of the average income for the year from sale per ton of the coal and its disbursement:—

Gross proceeds	19s. 10¾d.
Costs other than wages ...	5s. 5¾d.
Net proceeds	14s. 5d.
Wages costs	13s. 3d.
Gross profit	1s. 2d.

Total output per man shift, 17.59 cwt.
Average earnings per man shift, 10s. 7¾d.
Average number of shifts worked, 260.
Average yearly earnings per man, £138 4s.

The highest earnings were in Scotland of £150 3d. for 277 shifts, the average profit being 10d. ton, and, strangely enough, in Kent, where the earn

-e given as £150 1s. 1d. for 241 shifts, while the vners made a loss of 2¼d. per ton. Bristol district as the lowest with £113 0s. 11d. for 267 shifts and a ss of 6½d. per ton. It must be remembered that in all stricts there is a minimum wage irrespective of pro-uction.

As showing the shocking state the industry is in, it ould be noted that whereas the first four months of e year showed an average profit for all districts of . 10d. per ton, the highest being 3s. 9¼d., and the west (Cumberland) 1½d., none showing a loss, while r the last eight months the 2s. 10d. had dropped to l.; only four showed a profit, and the remaining ne districts showed a loss varying from 2s. 4¾d. per n in Cumberland to ¼d. per ton in South Staffordshire id Salop.

£6,023,001 was paid on account of royalties and ayleaves, including the rental value of freehold inerals where worked by the proprietor, very much of hich went to the State in the form of taxes. If, how-er, this amount had been divided amongst the work-en it would have given them about 8½d. per shift orked. On the other hand, 24,907,890 shifts were lost iring the year which could have been worked, repre-nting a loss in wages of over £12,000,000 and a loss output of over 21,000,000 tons of coal. Table C ows the tonnage of coal disposable commercially, and e average costs of production, proceeds, and profits r each quarter of the year 1924 in more detail.

Electrical equipment is still increasing, as tables , B, and D show.

The number of flame safety lamps in use was 576,318, against 584,761 in 1923. The number of electric safety lamps in use was 356,817, as against 327,929 in 1923.

TABLE C.

	March.	June.	Sept.	Dec.
	s. d.	s. d.	s. d.	s. d.
Proceeds	20 8	20 2¼	19 1¾	19 0
Wages	12 7¼	13 8	13 8¼	13 1
Stores & Timber ...	2 1¾	2 2½	2 1¼	2 0½
Other Costs ...	2 8¼	2 10¾	2 11	2 10
Royalties	0 6¼	0 6¼	0 6¼	0 6¼
Total Costs of Production	17 10¼	19 2¼	19 1¼	18 4¼
Credit	2 9¾	1 0¼	0 0¼	0 7¾
Approximate tonnage of coal disposable commercially	65,200,000	60,200,000	58,600,000	60,300,000

TABLE D.—NUMBER OF COAL-CUTTING MACHINES AT WORK AND QUANTITY OF COAL CUT.

	1924.	1923.	Inc. or dec.
Number of Mines at which Coal-cutting Machines were in use	908	857	51 +
Total number of Machines in use	6,830	6,159	671 +
Driven by Electricity ...	3,044	2,745	299 +
Driven by Compressed Air	3,783	3,414	369 +
Percentage of Total Output cut by Machines ...	19	17	2 +
Total quantity of Coal cut	49,910,559	47,526,439	2,384,120 +

The number of horses and ponies employed in 1924 was 65,210, as against 65,579 in 1923.

The Manchester Mining Exhibition.

A Brief Review of the Electrical Apparatus Displayed.

: is unfortunate that the third Colliery and General ining Engineering Exhibition, which was held at Man-ester from July 7th to 18th (the last having been eld 12 years ago) should have been staged at a time hen the coal trade is under such a very heavy cloud depression. The display was a very comprehensive ne, and was spoken of on every hand as excellent, every ranch of mining engineering being represented, and a udy of the exhibits left the visitor with one feeling ppermost in the mind, *i.e.*, the crying need of the al industry—stability. The latest appliances were own, and were a credit to British manufacture, but ho can blame the owner for hesitating to embark on ceptional capital expenditure under the circumstances hich have pertained during the last few years? evertheless, it is necessary to show reasonable optimism, nd the exhibition certainly encourages that aim. The ectrical side of mining was given its fair share of rominence, and the following notes will give some idea the scope of this department. Electricity was not reated in any way as a separate section, but in its atural order, as an integral part of the whole.

On the stand occupied by the University of Edin-urgh and Heriot-Watt College the chief item of interest as the "Carboscope," the use of which was referred to a paper read before the recent Radiological Con-ress. It is an X-ray examination set, by Messrs. ent, McLaren & Thomson, of Edinburgh, by means which the mineral content of coal can be ascertained a glance, so that various grades of coal can be easily assified according to the fuel value, and the develop-ent of the device would seem to be of the greatest terest to all users of coal. It consists of a steel tank, led with a highly-insulating oil, immersed in which are high-pressure transformer and a Coolidge X-ray tube of the radiator type, these being connected together under oil. The transformer is of the step-up, closed-core type, and in the present instance gives 60,000 volts peak output. The X-ray tube employed is of the hot-cathode type, and two external terminals only are required, by means of which low-voltage alternating current is applied to the primary windings of the trans-

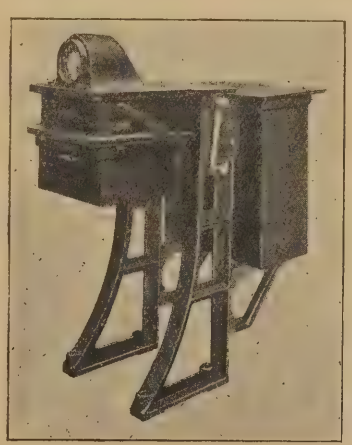


Fig. 1.—F.P. Circuit Breaker; 1,200 Amp.

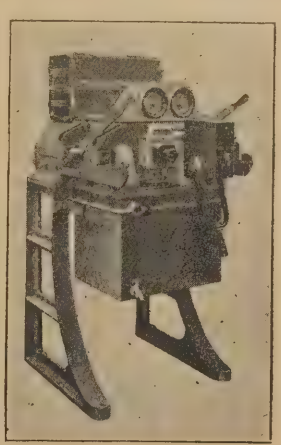


Fig. 2.—F.P. Flameproof Auto-transformer Starter.

former. The whole outfit is compact and devoid of adjustments, or unnecessary accessories; there are no moving or rotating parts, and the whole is noiseless in action. The lid of the tank has near its centre a comparatively small opening through which emerges in an upward direction a cone-shaped beam of X-rays. If, therefore, an object is placed in the path of the

beam and examined by means of a suitable fluorescent screen, the projected shadow will reveal the structural details of the object under examination, provided that its thickness or character are not such that they affect the total absorption of the radiation.

The "Clinophone," another instrument shown, is used in surveying boreholes for the freezing and cementation processes of shaft-sinking, where only extremely slight deviations are permissible. Orientation is by means of rods, and no magnet or gyroscopic compass is needed. The instrument is a continuous recorder, and is very rapid and accurate; deviation to within two minutes of arc is given. A hot-wire anemometer was also on view.

Messrs. Allen West & Co. had a large stand, on which could be seen complete control equipment for a 750-h.p. winder, comprising a liquid rotor controller, h.p. contactor, stator reverser, with lever operating gear assisted by a compressed-air engine. Amongst many electrical exhibits, mention should be made of the "S. R. I." oil-immersed stator and rotor starter for use with 3-phase a.c. slip-ring induction motors up to 650 volts. This starter is of the ironclad totally-enclosed, dust- and weather-proof type assembled in one case, thus minimising the space required. The stator circuit is controlled by a 3-pole contactor circuit breaker, while a face-plate starter is used to control the rotor circuit. The rotation of a handwheel first closes the stator circuit, and subsequent revolutions cut resistance out of the rotor circuit. A quick step-to-step movement is made between the rotor notches, and an

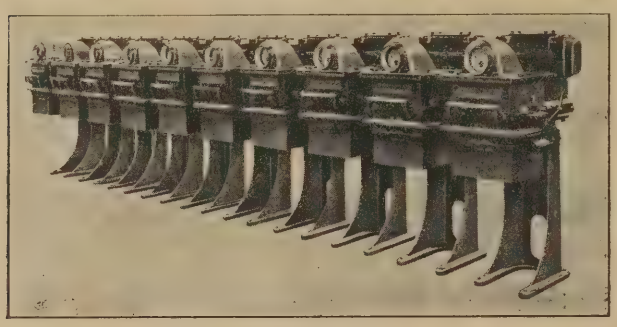


Fig. 3.—F.P. Flameproof Switches.

indicator shows which notch the starter is on. The operator does not have to make two distinct operations when starting a motor, and overload and no-volt protection is provided.

Messrs. Heyes & Co., Ltd., had a display of "Wigan" mining specialities, the newly-patented prismatic lamp-fitting being probably the outstanding feature of interest. It has been specially designed for use in low and narrow roadways, &c., and by means of the prisms the light is reflected over an area of 180 deg. from the plane of the fitting. It does not occupy any more space than the standard bulkhead fitting, and yet gives a normal front illumination with an increased side illumination up and down the roadways. The prismatic glass is of exceptional strength requiring no wire guard to protect it, with no consequent decrease of illumination. The fitting has explosion-proof joints, and the lampholder is already wired to connector blocks; it is fitted with one, two, or three armour glands, or screwed for tubing, and will not only be of use in mines, but also on board ship, in any place with low ceilings, subways, &c.

Messrs. Ferguson, Pailin, Ltd., exhibited representative types of switchgear generally used for mining purposes. Commencing with the larger sizes, such as could be used in the colliery power station or receiving sub-station, a metal-clad, compound-filled "ED" unit suitable for a duplicate busbar system was shown; selection of bus-bars is accomplished by an oil-immersed switch mechanically operated from the front and interlocked with the main oil circuit breaker, the current and potential transformers being accommodated in the draw-out portion of the unit and are oil immersed. Overhead transmission lines are now co mon in connection with colliery work, and an outd switch of the rocking type suitable for pole mount and remote mechanical operation was on view. Wh intended primarily for isolating only, it is fitted w arcing horns to enable the magnetising currents small transformers to be broken; an outdoor oil f suitable for the protection of such transformers sub-circuits was also shown. To deal with the he l.p. currents sometimes met with in mining work totally-enclosed type "C" unit has been desig (fig. 1). It is of the horizontal draw-out type, an bus-bar adapting chamber can be fitted to enable unit to line up with the standard "B" (fig. 3) a

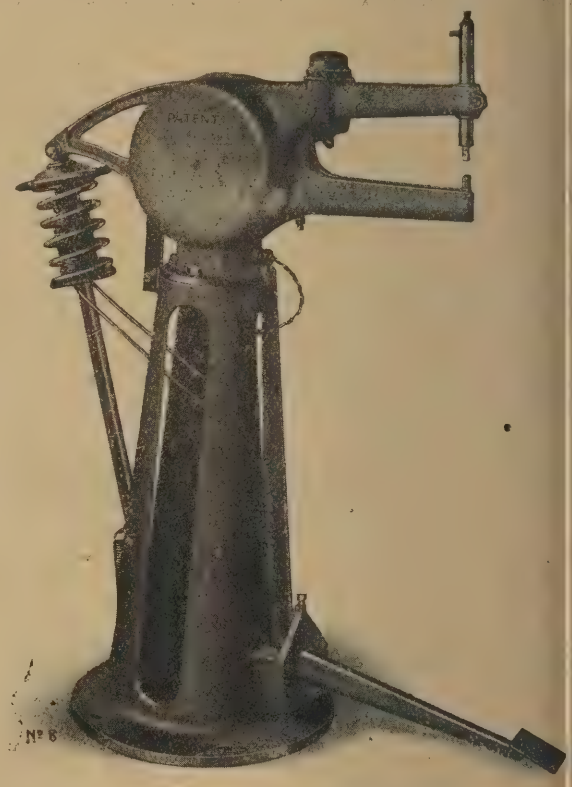


Fig. 4.—A New Process Co. Spot Welder.

"C" units, which are suitable for use in sub-stati both on the surface and underground. The control sub-circuits and squirrel-cage induction motors catered for by the "A" unit, which can be obtai in the following types:—Main switch, change-o switch, series-parallel switch, star-delta starter, auto-transformer starter (fig. 2). These units may made flameproof.

The New Process Co.'s recently-brought-out wel was to be seen on the stand of Messrs. Ogilvy & The chief point is the attempt that has been made eliminate the human element by the incorporation an "Ermack" automatic current controller, wh cuts off the current immediately the weld is complet Variation in material thickness or surface oxidat does not influence the efficiency of the machine. Fig illustrates a spot welder, but the firm also makes se and butt welders.

The Diamond Coal-Cutter Co., Ltd., had a fine play of cutters, jigging conveyors, and switchgear. latest electric chain coal-cutter is driven by a 30-h totally-enclosed motor, and the machine itself ha 15-in. cutting floor level, is 8 ft. 9½ in. in length a 2 ft. 3 in. wide, and two 2 tons 16 cwt. in weight. electric jigging conveyor driving gear is a comp exhibit; varying lengths of stroke are arranged f and the gear can be coupled to the troughing for dir end or under drives, or rope drive through a bell cra

The Wolf Safety Lamp Co. and Federation Lamp had a joint stand, with a comprehensive display of th products, including the Maurice-Wolf nickel-cadmi 2-c.p. mine lamps with removable battery covers.

(To be concluded.)

Belt and Rope Driving.

The Attendant Pull on the Shaft.

By W. R. NEEDHAM.

THE writer has known of cases of shafts breaking down almost immediately outside the journal at the driving end of an overhung belt pulley machine. When the stresses came to be calculated more carefully after the mishap, it was found that the bending stress alone was at least 10,000 lb. per sq. in—probably upwards of 11,000 lb. per sq. in. This is much too high a figure for the ordinary shaft material used, especially having regard to the alternating nature of the bending stresses (two reversals for each revolution), and to the fact that shear stresses due to driving torque co-exist.

The object of the present short notes is to express the pull on the shaft due to belt and to rope driving respectively in convenient form. It is one of those simple calculations, which are yet tricky; and mistakes have been made which a little thought and some application of first principles would have obviated.

It is well known that the effective force F transmitted by a belt $= T - t$ lb., where T is the force in lb., on the tight or driving side, and t is the force, in lb., on the slack side. Consequently, the horse power transmitted $= (T - t)v/33{,}000$, where v is the belt velocity in feet per minute.

Thus $T - t = F = 33{,}000 \times$ horse power$/v$ lb. .....(1)

Also $T/t = e^{\mu\phi}$ or $\log T/t = 0.4343\ \mu\phi$.....(2)

where μ is the coefficient of friction for belt and pulley; ϕ is the belt included angle (in radians); and e is the base of natural or Napierian logarithms ($= 2.718$).

The value of μ for leather on cast iron is approximately .3 for ordinary velocities, though it is doubtful whether a really close figure can up to the present be given. The angle ϕ is usually round about 180 deg. (π radians) for most cases one is up against. It may reasonably enough be taken at that figure, especially for open drives.

Thus, from (2), $\log T/t = 0.4343 \times .3 \times \pi = .4095$; whence $T/t = 2.567$; $t = T/2.567$; and $T - t = (2.567 - 1)T/2.567 = 0.611T$, where $\mu = .3$, and $\phi = 180$ deg.

In this case, therefore, (1) becomes $F = 0.611T = 33{,}000 \times$ h.p.$/v$ lb.; $\therefore T = 54{,}000 \times$ h.p.$/v$ lb. .....(3)

and $t = 0.389T = 21{,}000 \times$ horse power$/v$ lb.....(4)

Now (3) and (4) can be expressed in possibly a more convenient form. If N be the speed in revs. per min., and R the mean radius of the belt (in inches), then $v = 2\pi RN/12$ .....(5)

Substituting, we obtain

$T = 103{,}100 \times$ horse power$/R \times N$ lb.....(6)

$t = 40{,}100 \times$ horse power$/R \times N$ lb.....(7)

Similarly, $F = 63{,}000 \times$ horse power$/R \times N$ lb.....(8)

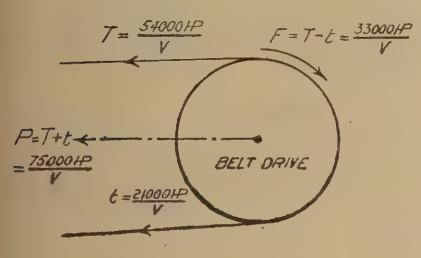


Fig. 1.

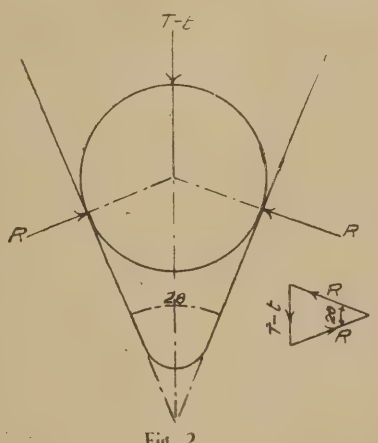


Fig. 2.

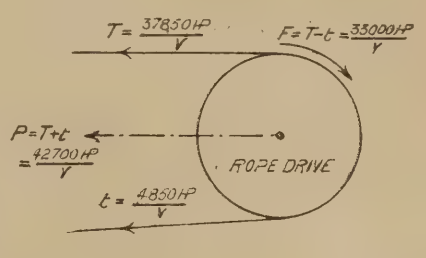


Fig. 3.

Now, the pull P on the shaft, with which we are principally concerned $= T + t$ lb. $= (3) + (4) = (6) + (7)$.

Thus $P = (54{,}000 + 21{,}000)$ horse power$/v = 75{,}000 \times$ horse power$/v$ lb.....(9)

$= (103{,}100 + 40{,}100)$ horse power$/R \times N = 143{,}200 \times$ horse power$/R \times N$ lb.....(10)

Reference to fig. 1 should assist any reader who may find the explanation lacking in clarity.

The effective rope pull in a rope drive is of the same general order of things as the belt pull we have just considered.

Here again $F = T - t = 33{,}000 \times$ horse power$/v$ lb....(1)

F in this connection can apply either to the force *per rope*, or the force for the complete pulley installation.

In order, however, to avoid any confusion we will take F as the effective force *per rope*. Thus in what follows horse power means horse power per rope.

Here, as in the case of belts, we can put $\log T/t = 0.4343\mu\phi$ (2), if we regard μ as an equivalent coefficient of friction. The value of this equivalent μ depends directly upon $2R$, and $2R = (T - t)/\sin\theta$, where θ is half the groove angle (in degrees). Reference to fig. 2 should help to elucidate matters.

Thus, when the groove angle $2\theta = 40$ deg., $2R = 2.926\ (2 - \phi)$; and when $2\theta = 45$ deg., $2R = 2.616\ (T - t)$.

Accordingly, if the real coefficient of friction for rope on iron be, say, 0.25, then the equivalent μ for a groove angle of 40 deg. will be $2.926 \times 0.25 = 0.731$, and for 45 deg. it will be $2.616 \times 0.25 = 0.654$.

By taking ϕ for general purposes as π radians, and 2θ as 45 deg., we ought to be sufficiently near the mark for ordinary calculations. All we need to remember is that where greater accuracy is required we must correct our values of ϕ, θ, and μ to suit. On these assumptions then we put

$\log T/t = 0.4343 \times .654 \times \pi = 0.892$;

whence $T/t = 7.798$; say, 7.80.

Consequently $t = T/7.80$; and $T - t = (7.80 - 1)T/7.80 = 0.872T$.

In this case, therefore, (1) becomes

$F = 0.872T = 33{,}000 \times$ horse power$/v$ lb. per rope;

$\therefore T = 37{,}850 \times$ horse power$/v$ lb. per rope. (11)

and $t = 0.128T = 4{,}850 \times$ horse power$/v$ lb. per rope. (12)

Then P, the pull on the shaft, $= T + t$ lb. $= (11) + (12)$,

$= (37{,}850 + 4{,}850)$ horse power$/v = 42{,}700 \times$ horse power$/v$ lb. per rope..... (13)

If there are n ropes, then P = total $42{,}700\ n \times$ horse power$/v$ lb.....(14)

Expressing T, t, and P in terms of $R \times N$, where R is the mean radius of rope in inches, and N is the speed in revs. per minute, we obtain

$T = 72,300 \times \text{horse power}/R \times N$ lb. per rope.....(15)

$t = 9,270 \times \text{horse power}/R \times N$ lb. per rope.....(16)

$P = 81,570 \times \text{horse power}/R \times N$ lb. per rope.....(17)

and P total $= 81,570\ n \times \text{horse power}/R \times n$ lb.....(18)

Fig. 3 illustrates diagrammatically the pull P, as compounded of its component rope forces T and t.

Mr. R. Livingstone, in his valuable book on "Mechanical Design and Construction of Generators" (now unfortunately out of print), gives P for belt and rope driving respectively. In the former case he assumes t to be half T, and in the latter t to be one quarter T. Consequently, corresponding to (9), P for belt drive is $99,000 \times$ horse power/v lb.; and corresponding to (13), P for rope drive is $55,250 \times$ horse power/v lb.

The values given in this contribution are a compromise between Livingstone's and those which Goodman's "Mechanics Applied to Engineering" would seem to favour. The late Prof. Perry, in his "Applied Mechanics," suggests for belts that $\mu = .3$, and for ropes an equivalent .6. Thus, values deduced therefrom would agree fairly closely with those tentatively offered in this article.

The actual calculation of horse power transmitted by any specific belt section or rope is really outside the scope of the present short contribution. The effect of centrifugal force on the material has to be considered. For ordinary purposes, however, the tabled data to be found in any reliable handbook can be worked to with reasonable confidence.

A "Relay" Automatic Telephone Exchange.

A "Cut Over" in an Admiralty Establishment.

On June 23rd there was "cut over" at one of H.M. naval establishments a "Relay" automatic branch exchange (p.a.b.x.), which is at present equipped for 550 lines. This exchange, which, we understand, is the largest automatic telephone installation in any British naval establishment, is interconnected with a 50-line "Relay" automatic exchange (p.a.x.) which was

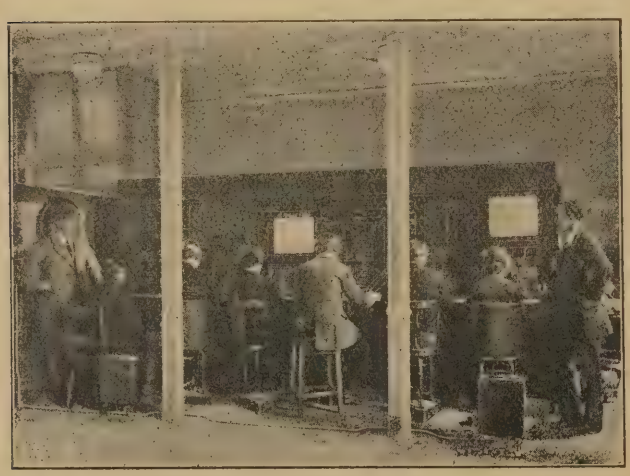


Fig. 1.—Old 6-position Manual Board.

brought into service at a subsidiary establishment some weeks previously. The large p.a.b.x. has been installed in a newly-erected telephone building, and has replaced a six-position manual board (fig. 1), which was originally a two-position board installed in 1907, four positions having been added subsequently. Eleven operators in three shifts and one supervisor were employed on this equipment.

The "Relay" p.a.b.x. (fig. 2) is fitted with a two-position manual board, the subscribers' jacks being arranged in three panels; the operator, therefore, has ready access to any subscriber's jack. The manual board is used only for calls to the public exchange, and as such calls amount to only one per cent. of the total traffic (the other 99 per cent. being dealt with entirely automatically by the "Relay" plant), it has been possible to give a much more efficient outside service and, at the same time, to dispense with nine of the operators necessary under the previous system.

The commander-in-chief and all establishments, such as the engineers, central offices, workshops, main offices, barracks, cashiers, and police, are linked up by an entirely automatic service which effects its connections day or night in three seconds, while two very important distant stations are connected by the switchboard, which also serves all vessels in the harbour. Some of these lines are three miles from the automatic exchange, and the 50-line subsidiary automatic exchange employs no operator whatsoever. Facilities are provided through the large exchange for any 16 officials to hold a con-

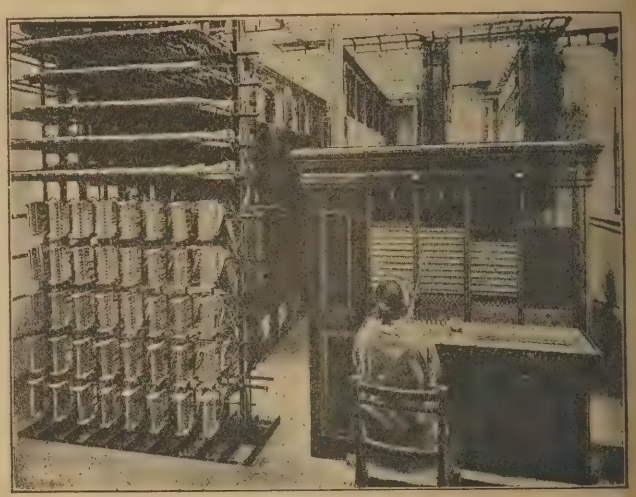


Fig. 2.—"Relay" Automatic Branch Exchange.

ference, and three officials have priority of service, while on the subsidiary exchange three high officials have the same privilege.

The exchange is similar to the "Relay" equipment supplied to the British Post Office, with standard dialling, ringing, and "busy-back" tones. Provision is made on the large exchange for 10 two-party lines with selective ringing; alarms to indicate exchange faults are provided and, according to the nature of the fault, either a delayed or instantaneous signal is given, depending on the importance of the fault.

The 550-line exchange is equipped with two sets of Chloride batteries of 340 ampere-hour capacity, both exchanges, by the way, being of the latest 32-volt model. Two ringing machines are fitted in the 550-line exchange, one of which runs off the 220-volt mains and the other off the exchange battery; the 50-line subsidiary exchange is also equipped with duplicate ringers.

Gas Firing at Dalmarnock.—Ex-Bailie W. B. Smith, Convener of Glasgow Corporation Health Committee, read a paper on "The Smoke Problem Solved" at the Royal Sanitary Institute Congress at Edinburgh last week. Having explained the initiation of the plant at the Dalmarnock gas works, now nearing completion, for the production of smokeless fuel and industrial gas by the Maclaurin process, Mr. Smith said that after the plant at the gas works had been working long enough to give them the experience necessary, they would at once consider putting down plant at the electricity generating station to carbonise about 500,000 tons of coal per year, to supply gas to fire all the boilers there, and produce 275,000 tons of smokeless fuel for the use of the citizens; 7,800,000 gallons of oil would be obtained from their own coal, instead of having to be purchased from abroad. They would also consider putting down plant to supply gas to works and factories in the area, and plant in the gas works at Provan to supply Maclaurin gas in the great industrial area adjoining it. There were those, Mr. Smith added, who did not see much necessity for Government help, except in special cases; most local authorities owning gas works or electricity stations could install the system themselves on a paying basis as a sound commercial proposition.

Legal.

Gas and Electric Securities, Ltd.

MR. JUSTICE EVE, in the Companies' Winding-up Court, on July 21st, heard the petition of the Northern Exploration Co., Ltd., for the compulsory winding up of Gas & Electric Securities, Ltd. Counsel said it was the petition of an unpaid judgment creditor for £17,000; no notice of opposition had been given.

His LORDSHIP said that he saw that the company had a paid-up capital of £2, but Counsel could take the required order.

The usual winding-up order was accordingly made.

Strand Electrical and Engineering Co., Ltd., v. Gee.

MR. JUSTICE ROCHE heard in the King's Bench Division, on July 22nd, an action by the Strand Electrical & Engineering Company, Ltd., Floral Street, Covent Garden, against Mr. Hugh Gee, South Kensington. Plaintiffs claimed £310 7s. 11d. balance of an account of £409 17s. 11d.

Mr. VAN DEN BERG, for plaintiffs, said the issue was whether credit was given to Mr. Gee or, as he alleged, to the Gee Construction Co., Ltd., which was now insolvent. The work claimed for was done in April last in connection with what was known as the Wembley airship, which was invented by Mr. Gee. The plaintiffs had never heard of the Gee Construction Company until long after the work was done. A sum of £49 10s. was paid on account by the company's cheque, but the plaintiffs did not pay any particular attention to the circumstance that the cheque was the company's. A second payment of £50 in cash was made by Mr. Gee.

Mr. PHILLIP SHERIDAN, general manager of the plaintiff company, giving evidence in support of the claim, said that Mr. Gee was a decorative artist and designer and the plaintiff company had done work for him personally before this particular work was undertaken. Mr. Gee had never mentioned the company.

Mr. GEE said that previous to this plaintiffs had done work through him for Barker's and other people but not work for him personally. He had not sufficient money himself to have this invention used at Wembley and formed a company with a capital of £2,000. Most of that sum was subscribed. He told Mr. Sheridan of the formation of the company, and the latter admitted the debt.

His LORDSHIP said the defence had been established to his satisfaction. Judgment was therefore entered for defendant with costs.

Coley v. Plum.

AT the Torquay County Court on July 22nd, before his Honour Judge Higgins, Mr. S. C. Coley, an electrical engineer, sued Mr. A. J. Plum, proprietor of the Hotel Regina, Torquay, for £16 6s. in respect of radio apparatus supplied. The defendant counterclaimed £32, the amount paid for a radio installation which, he alleged, had wholly failed.

Counsel for the plaintiff stated that his client originally installed a "Burndept" set in the defendant's premises, but at defendant's request he replaced it with a four-valve set of local make. This set was demonstrated to him and he agreed to purchase it for £32. That was in November last year and no complaint had been received until the end of April this year; in fact, defendant had written and expressed his appreciation of the set. If the set was properly operated it worked entirely satisfactorily.

WALTER HUME, employed by the plaintiff, said that he had tested the set and found it satisfactory. The witness agreed with the defendant's counsel that the set should be capable of receiving from all the British broadcasting stations. The plaintiff said that he had received no complaints about this kind of set apart from that of Mr. Plum.

His HONOUR gave judgment for the plaintiff for the amount claimed and costs, and for the defendant on the counterclaim for £16 and costs.

P. D. Mitchell, Ltd., v. British Insulated & Helsby Cables, Ltd.

THIS action came before Lord Morison in the Scottish Courts recently. The plaintiffs, metallic cask makers and oil refiners, claimed the sum of £2,800 as damages for breach of contract in respect of the supply of electric welding machines, while the defendants counterclaimed for the cost of goods supplied. The plaintiffs stated that they received from the Helsby Company a spot welder, a seam welder, two circumferential welders and some jigs. They complained that these machines did not operate satisfactorily, but the suppliers replied that the plant was quite suitable for the work if it was properly handled. His Lordship held in favour of the plaintiffs, but considered the amount of their claim extravagant. He awarded them £550 as damages for breach of contract and "assoilzied" them from the conclusions of the summons in the counterclaim. In giving judgment, his LORDSHIP said that the contract between the parties implied a warranty that the machines would efficiently weld the seams of the drums made by the plaintiffs and permit of an output of 2,000 per week. The thickness of the material employed was, however, beyond the capabilities of the machines and their efficiency was impaired by overheating. He considered that Messrs. Mitchell were entitled to reject the machines as they did not fulfil the conditions of the contract.

Gas Engines and Electricity Supply.

Some Views on the Power Supply Question.

ONE of the papers read at the annual meeting of the Institution of Gas Engineers in London on Thursday, June 11th, was by Sir Dugald Clerk, F.R.S., and it dealt with gas for motive power. One of the purposes of the paper was to show that it was possible for the gas industry to capture a large quantity of business from the electricity supply industry by inducing manufacturers to install gas engines upon their premises to generate electricity, in preference to taking supply from the public mains, the contention being that it was cheaper in many cases to do so when the average price paid for lighting and power was taken into account. Sir Dugald Clerk, who is well known, of course, as a director of the National Gas Engine Co., stated that electric light and power companies were pressing hard to supply motive power, and a certain field would doubtless always be theirs. For powers up to 5 or 6 h.p., occasionally used, no doubt they would find a considerable field; but if equal pressure were applied by gas companies, in conjunction with gas-engine manufacturers, he was convinced that the electricity companies would be prevented from seriously invading the field of larger powers. Even the very small gas power trade might be held against the electricity companies if gas companies would combine to let out gas engines on hire in the same way as they so commonly dealt with gas stoves. The electricity supply companies adopted similar methods; and there seemed to be no good reasons why the gas companies should not fix gas engines in the same way as the Tyneside Electric Supply Company, in Newcastle, fixed motors—either on simple hire or else on the five years' purchase system.

In the discussion, Mr. P. D. WALMSLEY (Great Yarmouth), after agreeing that in many industries, such as weaving and textile industries, electricity was essential owing to the advantages which followed from the use of motors on individual machines, urged the necessity for concentrating upon a consideration of the cost of generating electricity in such factories by means of gas engines. Whereas the average cost of generating electricity throughout the country was about 1.9d. per unit, there were many instances in which energy was being sold for 1½d. per unit for power purposes. In such cases he recommended gas engineers to inquire from these power users the average price they were paying for lighting and power, because it would more often than not be found that, in view of the high price charged for electricity for lighting purposes, it would pay these manufacturers to put down their own gas-engine-driven electricity generating plant.

Mr. S. SHADBOLT (South Bank, Yorks.), said the paper emphasised the absurdity of the methods adopted by the electricity supply industry in charging for electricity. On the North-East coast there were super-power stations interlinked with distribution systems which, he ventured to think, were a great deal more to be feared by the gas industry than anything the Government was likely to promote. Electricity supply undertakings were fleecing the lighting consumers in order to undercut the price to get the power load. At the same time it must be remembered that it was not always a question of cost which determined the use of gas or electricity; he was constantly finding that the convenience and adaptability of the electric motor played an important part.

Dr. E. W. SMITH (Woodall-Duckham Co.), urged gas engineers not to assume that the electricity supply industry was not moral because it adopted the methods of charging which it did. It was time that the gas industry started an inquiry to consider the best commercial methods of selling gas. Personally, he was quite sure that a very good case could be made out for selling gas for power purposes at cheaper rates than it was supplied at for lighting purposes.

The PRESIDENT pointed out that under their Acts of Parliament gas companies were prevented from making a reduction of more than 25 per cent. in the price charged the industrial consumer as compared with domestic consumers.

SIR DUGALD CLERK, replying to this part of the discussion, agreed that separate electric motors were frequently an enormous convenience, so much so that the National Gas Engine Co. used them, although it generated the electricity itself by means of gas engines. He agreed with Mr. Shadbolt that it was a pity that lighting consumers should be penalised by the electricity supply industry for the sake of the power consumers, and that it would be better if that could be avoided. At the same time as had been indicated by Dr. Smith, if some inquiry could be instituted into the division of the costs of manufacture in the gas industry, it would be possible to charge much lower prices for gas for power purposes than for domestic purposes.

"Wireless" Transmission of Energy.—According to one of our Italian contemporaries some interesting experiments have lately been carried out in Milan by Signor Narciso Midali in connection with the "wireless" transmission of electrical energy, when a receiving station succeeded in picking up 50 per cent. of the power transmitted. Signor Midali is continuing his experimental work.

Reviews.

The Law Relating to Public Service Undertakings. By F. N. Keen, Ll.B., Barrister-at-Law. Pp. xii + 320. London: P. S. King & Son, Ltd. 1925. Price, 15s. net.

This book is one of the monographs published in connection with the London School of Economics, and is based on a course of lectures delivered there by the author.

The "public service undertakings" specially considered include: Water, gas and electricity supply, land drainage and irrigation, markets and fairs, and hydraulic power. Transport services are excluded, the author thinking that their special features are best dealt with separately.

The characteristic of "public service undertakings" which interests the author is: "that the undertaking has such a degree of importance or involves such difficulties in execution as to justify the placing of those who undertake it in a position of special privilege within the community or the conferring of special powers upon them."

As these special privileges and powers mean generally that the "undertakers" are permitted to do things otherwise illegal, to interfere with the general rights of property within certain limits of locality and time, they are given some kind of monopoly rights in return for the assumption of some duties and obligations towards the community within their field of action; for the benefit of that community the undertakings have to be established and conducted under special laws, in respect of which there has developed a code of procedure, general principles, and precedents, partly statutory, partly administrative, partly judicial, and partly regulated, *e.g.*, by the Standing Orders of the two Houses of Parliament, differing in some respects for each class of undertaking, of which it is necessary for those who wish to engage in such undertakings, and those who have to administer them, to have a general knowledge. The imparting of this general knowledge with the addition of the more important detail conditions, is the author's object. It is an object which he can be congratulated upon having achieved to a satisfactory and useful degree.

The first eight chapters cover subjects of general application, the general code of procedure and principles obtaining in this country, under the headings, "A Preliminary View" (including the methods of obtaining the legal powers for the establishment, and the general scope of the regulations accompanying the powers, of the undertakings); "The Scope of Purposes and Powers," "Land Works, and Compensation," "Duties and Obligations," "Capital and Revenue," "Rating and Income Tax" and "Sale, Lease, Winding-up and other matters."

The third of these chapters deals very clearly with the provisions under which public service undertakings are permitted to take land by compulsory process, and in various other ways to invade the general rights of property. It gives a concise account of the procedure, from the first stage of notices, &c., up to the various methods of determining the compensation to be made to the parties whose properties and/or amenities and interests are taken or affected; and the legal principles upon which compensation is assessed. The chapter is mainly an exposition of the provisions of the Lands Clauses Acts, 1845 to 1895; the variations of these provisions as incorporated in, or applied to, special Acts of various kinds; and the constructions of the Acts established by decisions of the Courts. This is a very useful and informative exposition of an intricate matter of the first importance.

The eight general chapters give a good bird's-eye view of the position of public service undertakings before the law; the manner in which Parliament has ordained that they may be established; the general principles governing their privileges, powers, duties, obligations and rights; with illustrations of the way in which the Courts have applied these principles and construed particular provisions.

The remaining six chapters are devoted each to one of the particular classes of undertakings above mentioned. The relevant general Acts and Clauses Acts are summarised; the procedure for obtaining powers indicated and a general view given of the scope and character of the particular powers granted and the corresponding duties and obligations.

It is significant that by far the longest of the six chapters is that referring to electricity supply. Although the youngest of the industries dealt with, it operates in a tangle of legislation more involved than that regulating any of the others. As this is the subject of chief interest to the readers of the Electrical Review, it has been read with particular care. There is very little to criticise. It is a clear and full statement of the general legislation, with a sufficient reference to the nature and scope of variations in special cases for which there are precedents. The general effects of the more recent Acts, of 1919 and 1922, are set out as fully as can be expected, considering that the concrete results of those Acts are still very much in embryo, which is a good reason for cautious treatment by a lawyer. The two London Acts of 1908 and 1910 are not mentioned, but the author probably thought these of purely local interest.

Quite logically the author mentions in his descriptions of specific provisions of the various Acts, the alterations by repeal, amendment, and substitution, made by later Acts; but in describing the later Acts usually passes over the amending and repealing provisions in silence. This is a little inconvenience to the use of the book for reference. One definite omission of reference to an amendment is that of the date to which annual accounts are to be made up in Section 9 of the E.L. Act, 1882.

The summary of the Clauses Act of 1899 is particularly useful. That Act has always seemed to the reviewer an extraordinary difficult one to memorise and to find one's way in. The author's summary is quite helpful, and it is an important Act to everyone responsible for the conduct of electricity supply.

The Section defining the supply powers of a power company (pp. 253-254), if correctly quoted from any Act, is unusual in permitting a power company's consumer within the area of supply of an authorised distributor, to use as much energy for lighting as for power. Generally the lighting proportion is limited to 20 per cent. of the total supply.

The general style is clear and easy to read, but would have been improved by eliminating the occasional personal form of address ("you will remember," "you will see," &c.), derived from its original lecture form.

The book is a very useful one, remarkably free from divagations into legal and procedure technicalities, and consequently of the greater value to the layman who wants guidance in the general matters of promotion and conduct of undertakings which are necessarily outside the general law in certain respects.

Circuit Troubles and Testing. By Terrell Croft. Pp. x + 224; figs. 237. London: McGraw-Hill Publishing Co., Ltd. Price, 12s. 6d. net.

Probably we should all welcome the wireman or fitter, &c., who could produce a fault-proof installation, but our ideal must be one who after getting as near to the fault-proof installation as possible, will be able to locate with accuracy and speed and repair effectively the fault when it does arise. The book should prove of great value to all employed on the installation of any class of electrical equipment and will no doubt be welcomed by many electrical workers of all grades. The book commences with descriptions of many of the simpler testing devices leading up to the more advanced instruments and their application in many methods of testing and fault localising on distribution systems, including both overhead and underground cables, and installations of all descriptions.

The author forcibly draws attention to the necessary application of different tests to different classes of cables and installations. The Wheatstone-Bridge and Slide-Wire tests, and modifications of both, are extensively dealt with, while the simpler galvanometer and various fall of potential tests are dealt with in their respective cases. The author deals very briefly with the question of faults on motors; this is rather a pity, because the practical man's need for advice in connection with fault locating is probably more acute in the case of faults on motor windings, or machines of that family, than in the case of ordinary installation wiring faults, in virtue of the apparently complex character of such faults and their inaccessibility.

Some miscellaneous factory tests such as the testing of porcelain insulators, &c., add to the general interest of the book.

Theoretical and Applied Electrochemistry. By Maurice de Kay Thompson, Associate Professor of Electrochemistry in the Massachusetts Institute of Technology. Revised Edition. Pp. xviii + 551; figs. 218. New York and London: The Macmillan Co., 1925. Price, 20s. net.

The object of this volume is to give an account of the most important electrochemical industries, together with the principal applications of electrochemistry. The book is an important manual on the subject, the technique described being of a very high order. The great strides within recent years which have been made in this domain of chemistry, make the appearance of this volume timely and opportune. The present edition of this valuable work has been completely revised; a section on the theoretical aspects of the subject is added, Le Blanc's "Lehrbuch der Elektrochemie (1922)," and Foerster's "Elektrochemie wässeriger Lösungen (1922)," having been largely drawn upon.

The subject matter is divided into three parts; the first is "Theoretical," dealing with Faraday's laws, electrolytical dissociation, ionic theories, electro-osmosis and polarisation. The second part contains an account of the "Applied Electrochemistry of Aqueous Solutions," dealing with the construction of electrolytic cells, electroplating, the electrolytic extraction and refining of metals, electrolytic oxidation and reduction, and the construction and uses of storage cells. The third part deals with "Electric Furnaces and their Products," comprising sections on the products of resistance and arc furnaces, electrothermic reduction processes, fixation of atmospheric nitrogen and the production of ozone.

The electrochemical industries are of great and widespread importance, not only by reason of the capital involved, and the numbers to which they give employment, directly and indirectly, but also for the important part they have played in the development of various countries. They have of necessity called forth an abundant technical literature provided by experts of acknowledged eminence, all urging the desirability of extending the applications of electrochemistry. The contribution of the author in this volume, is a discussion of the subject from the theoretical and technical point of view separately, and the general industrial applications of electrochemistry. Throughout the whole work the industrial applications are kept in the foreground, and the chain of theory serves to link the indus-

trial processes into one coherent whole, giving a well informed survey of the subject. The treatment of the generalised theory is excellent; a great deal of scattered work is here brought together, and welded into a logical development. The volume shows a wide practical knowledge, and persistent endeavour to bring together the knowledge of the scientist and the skill of the industrialist, to give practical application to theoretical principles and new discoveries. In a science of such recent and rapid growth as electrochemistry, the methods of presentation are not so stereotyped as in the older sciences, and vary considerably with different authors; but this volume will serve as a model for future writers on the subject.

The volume under review is never tedious; the author's statements are always strictly relevant; they keep each subject well in view, and thus retain the reader's interest. The general excellence of the book is worthy of great praise, being a genuine attempt to elucidate the broad principles of the subject in the light of our present knowledge, and invaluable from the point of view of suggestive matter. The volume can be warmly recommended, particularly to those who, from the fact that the first edition has been out of print for some time, may be unacquainted with the merits of what may be still regarded as one of the standard treatises on the subject.

The book is far from being a mere compilation, for it is evident that the author has a first hand knowledge of the subject and also has devoted considerable energy and zeal to the undertaking. The description of processes are clear and concise, and are well illustrated with diagrams and sketches of the different types of plant employed.

The Elements of Railway Economics. By Sir WILLIAM M. ACWORTH, K.C.S.I., M.A. New edition revised and enlarged by the author and W. T. STEPHENSON, B.A. Pp. 216. London: Oxford University Press. Price 3s. 6d. net.

It is an uncommon and rather sad experience to have to review a book coincidently with the announcement of the death of the author. Sir William Acworth had attained a professional reputation maintained by untiring useful activities up to a ripe age, placing him among the worthily fortunate of his time.

The book is a new edition of a work already well known and esteemed, revised with the assistance of Mr. W. T. Stephenson, and brought up to date with respect to the changes in British railway organisation since the war, and the Railway Act of 1921. It is in these respects a new book, one which is indispensable to the student of the important subject matter, and to traders and others who need some knowledge of the underlying principles of railway charges and cognate matters. Its moderate price is a rare virtue nowadays.

Taking a broad view, the book is an explanation of the way in which railway charges are determined, with a short historical sketch from the early days of canals. It takes the standpoint that a "cost of service" basis is inapplicable, with the consequence that "what the traffic will bear" or "value of service rendered" principles have to be applied, with, however, numerous modifications due to, *e.g.*, the existence of competing transport agencies, special circumstances of individual trades and traders.

The author prefers "what the railways can bear" to "what the traffic can bear"; *i.e.*, the minimum rates which the railway can accept as reasonably remunerative, rather than the maximum which can be tolerated by the parties served. The substitution has a better face value. The older phrase has a somewhat predatory tone, which the author endeavours to prove unjust, with some success.

The principal argument against a "cost of service" basis is that it is impossible to separate from the costs and charges of a railway, the true cost of any particular class of traffic. This argument is supported by a number of sample railway revenue accounts, British and American. These differ in the amount of detail, the American forms being the fuller. They justify the author's contention that from the accounts of a single accounting period it is not practicable to allocate costs and charges to specific classes of traffic completely.

This argument seems to be open to two criticisms; first, that the forms and details of the accounts might be altered to give more information; secondly, that even with the accounts as they are, some information can be gleaned by the comparison of costs over different periods with different proportions of various classes of traffic.

The author's phrase "what the railway can bear" implies some evaluation of costs, for clearly the railway cannot "bear" rates of charge which do not cover costs and provide some return upon capital. Again, it is shown by numerous instances that different classes of goods carried entail specific costs which are allocatable. A railway cannot in reason make identical charges for carrying ten tons of coal, and ten tons of chilled beef, or ten tons of straw hats or furniture, the same distance. The ton-mile basis of charge is not commercially practicable as between different classes of goods; as between goods and passengers it is hardly more absurd.

The real difficulty of the "cost of service" basis seems to be the very large proportion of total costs and charges of a railway which have to be met independently of the amount of traffic, or the proportions of different classes of traffic handled; and—in a lesser degree—the difficulty of finding a common denominator for the services rendered. The reviewer is not convinced, however, that the costs and charges not definitely allocated might not be reduced to more manageable proportions by the application of "cost accountancy" methods. The obvious process is to allocate the specific costs of each class of traffic. When this is done to the fullest practicable extent it may appear that the non-allocatable portion is not so great as is now assumed.

The Railway Rates Tribunal set up by the Railway Act has to see that rates and fares as a whole are so adjusted that the railways can, with economical and efficient management, earn a sum equal to the net revenue earned in 1913, plus an allowance for interest on additional capital expenditure, and 20 per cent. of any economies effected—80 per cent. of the economies going to traders by way of reduction of rates. It also has to consider individual "exceptional rates and fares", and individual complaints as to rates. It may at some time have to distribute increases or decreases of costs among the various classes.

It is difficult to see how these functions can be carried out equitably without inquiry into costs and their allocation; so the legislature has laid upon the Tribunal a task which can only be accomplished by a process which the author thought hardly possible. The necessity may evolve the methods.

The book is written in an admirably lucid style, and cannot fail to interest and inform the careful reader. Whether agreeing or not with all its conclusions, the reader will thank the author for a clear exposition of an intricate subject, and regret that his great store of knowledge and capacity for applying .. is no longer at the service of the community.

In Mr. Stephenson, one ventures to hope, he has a capable successor.

The History of the Telephone in the United Kingdom. By F. G. C. BALDWIN, M.I.E.E. Foreword by F. GILL, O.B.E., M.Inst.C.E., M.I.E.E. Pp. xxvi + 728. Figs. 186. London: Chapman & Hall, Ltd. Price, 42s. net.

It is a long cry from "Mr. Graham Bell" of 1876 to the "Dr. Graham Bell, LL.D., Ph.D., D.Sc., M.D.," of 1922, the year of his death: yet the long interval between those dates represents the birth and growth of telephony in this country; and the distinctions added to the name indicate the importance of the practical application of electricity in the transmission of speech made by this great pioneer in what has become an indispensable necessity in our social and industrial life. Looking back over this long interval of years the writer can remember the intense excitement of listening to speech, badly cut up by inductive disturbances in those early days, and in comparing it mentally with a recent experience when he listened on a line equivalent in length to the distance between New York and San Francisco to flawless conversation carried on without any more noticeable diminution of intensity than if it had been received from a speaker a few miles distant!

In this exhaustive work of Mr. Baldwin's we have the records of those brilliant achievements, both in individual effort and organised industry, that have contributed to the attainment of the wonderful efficiency of our telephonic system of to-day.

A good deal of space is given in the earlier part of the book to the litigation between the Post Office and the telephone companies in connection with infringements of the rights of the P.M.G., and to the early disputes in connection with the infringements of patents held by the United Telephone Company.

The first three chapters may be taken as presenting the advances in telephony in a sequent order; but from this point onwards the author departs from the method in order to give prominence to the commercial and technical aspects of the subject as these develop. One chapter is wholly devoted to the legislation which, as the author truly says, has exercised such an important influence on the development of telephony in this country.

It is not possible in a review, such as this, to make more than a general reference to those chapters dealing with the methods of switching, and to the associated appliances which have been evolved to meet the progressive requirements; it will be sufficient to say that nothing essential has been omitted in tracing the growth of the organism up to the highly complex form in which, as represented by automatic telephony, we find it to-day.

In addition to its great utility as a work of reference for those interested in the historical development of telephony, the book has a readableness which one would not expect to find in a volume of this description, and the author is to be congratulated on this embodiment of what must have been a long and laborious task.

The work appears to be free from any typographical or other errors, but on page 649 it is stated that a transmitter of the condenser type "consists of two discs arranged in the *same* plane, one rigid the other of steel which serves as a diaphragm, and is free to vibrate in *front* of the other"—a statement which is not quite in accordance with Euclidean geometry!

Electrical Terms in the French Language.—In November last the Academie Française declined to admit to the standard dictionary as French words, the terms "Electrification" (noun) and "Electrifier" (verb). As a result, however, of the protests of the French electrical press against the decision, the Academie has, we learn, agreed to consider the matter.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The Yorkshire Agricultural Show.—A notable feature of the Yorkshire Agricultural Show, held at Bradford from July 22nd to 24th, was the considerable number of exhibits of farm, garden and domestic machinery and appliances driven by electric power. Displays of household electrical fittings were made by Messrs. Taylor & Parsons, Ltd., Bradford; Messrs. C. W. Lillie, Leeds; Messrs. Smith & Hardcastle, Bradford; and Messrs. Henry Wilson, Ltd., Bradford and Birmingham. Radio equipment was exhibited and demonstrated by Messrs. Taylor & Parsons and Messrs. E. Farnell & Sons, Birkenshaw, Bradford.

A Westinghouse-Siemens-Schuckert Agreement.—It is reported from Berlin that an agreement to run for ten years has been lately effected between the Siemens-Schuckert Werke Gesellschaft and the Westinghouse Electric and Manufacturing Co., Pittsburgh, U.S.A., for an interchange of technical and production methods and for the use by either company of any patents belonging to either of the concerns. The agreement applies purely to technical matters and in no way affects either concern from a commercial point of view.

Electric Transport at Wembley.—In addition to having one of their vans working in the Exhibition grounds, Messrs. Walker Vehicles, Ltd., are now opening a stand in the Palace of Housing and Transport at Wembley and exhibiting the "Walker-Electric" balance drive axle. They are further showing photographs illustrating some of their vans operating in this country.

Safeguarding of Industry.—At a largely attended meeting of Birmingham and Midland manufacturers at the Queen's Hotel, Birmingham, at which many trade organisations were represented, a resolution, proposed by Mr P. J. Hannon, M.P., and seconded by Sir Herbert Austin (Austin Motor Co.), was carried, calling upon the Government to take immediate steps to bring into operation its promises to afford relief to depressed British industries. This resolution was not, it was explained, an attack upon the Government; it was to give expression to the general feeling of disappointment in the minds of the manufacturing and business community that the present Government had not undertaken its obligations, as made in election promises, as rapidly and effectively as everybody expected. The points that were voiced by Mr. George Terrell (President of the National Union of Manufacturers), who presided, and in the discussion, were that the present unsatisfactory state of industry was due to unfair competition from abroad, and the high cost of production at home. It was stated by Mr. Hannon that before long there would be a great national movement, inaugurated on behalf of manufacturers and traders generally, with the object of proclaiming that the only remedy for depressed British industries was a careful system of protection. Resolutions were passed insisting that any industry which came under the Trade Boards Act should be deemed to come within the definition of a substantial industry under the Safeguarding of Industries Act; and that, in the event of an industry being granted protection under the Safeguarding of Industries Act, any duty imposed should be effective from the date of application.

Trade Announcements.—Messrs. Vickers, Ltd., have now acquired the whole interest in the Vickers-Spearing Boiler Co. Mr. A. H. Spearing has resigned his position as managing director, and is no longer connected with the company. The company will be carried on under the name of Vickers-Spearing Boiler Co., Ltd., as before. This change also gives Messrs. Vickers, Ltd., the control of Messrs. Tinkers, Ltd., Daisyfield Boiler Works, Hyde, near Manchester.

The name of the business of "S. E. Hunt," 272, Brighton Road, South Croydon, has been changed to Kingsdown Electrical Company. The proprietor, Mr. F. Pritchard, A.M.I.E.E., was, until January last, when he took over the business, proprietor of the Rugby Electrical Engineering Co.

Mr. E. S. Mackrill, late of the firm of E. T. Mackrill and Sons, electrical and general engineers, of 16, Kingsbury Square, Aylesbury, has purchased the stock-in-trade, together with the whole of the machinery and plant of the firm, and will continue to trade as an electrical engineer and contractor.

Messrs. Philips Lamps, Ltd., have opened a branch at 4, Park Place, Leeds, with Mr. E. H. Armitage as manager. Telephone: "Leeds 28,339."

Catalogues and Lists.—The Relay Automatic Telephone Co., Ltd., Marconi House, Strand, W.C.2.—An illustrated brochure outlining the "Relay" system of automatic telephony, and giving examples of large buildings in which private exchanges have been installed.

British Central Electrical Co., Ltd., 6 and 8, Rosebery Avenue, E.C.1.—Illustrated and price pamphlets dealing with "Koh-i-Noor" adhesive tape, various patterns of ventilating fans, a shock-proof hand-lamp, a three-pin handshield plug, and a violet-ray outfit.

Siemens & English Electric Lamp Co., Ltd., 38 and 39, Upper Thames Street, E.C.4.—Catalogue Z103, containing details and prices of house service switch- and fuse-gear, watertight switches and fuses, and knife switches.

British Insulated & Helsby Cables, Ltd., Prescot, Lancs.—Catalogue P191, illustrating and describing "Prescot" lead joint boxes.

Messrs. J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.—A pamphlet, illustrated in colour, advertising "Crabtree" quick-make-and-break tumbler switches.

The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.—A fully detailed and priced pamphlet dealing with a number of "B.T.-H." radio valves.

Messrs. Negretti & Zambra, 38, Holborn Viaduct, E.C.1.—An illustrated and priced catalogue of thermometers, tachometers, pressure gauges, hygrometers, and other instruments for industrial use.

The London Electric Wire Co. & Smiths, Ltd., 7, Playhouse Yard, Golden Lane, E.C.1.—A net trade price list of wires for radio work—aerials, telephone cords, enamelled, &c.

Mr. Alan Wright, Sentinel House, Southampton Row, W.C.1.—Two illustrated and priced folders, dealing respectively with the "Inventum" electric hot-water tap and the "Inventum" electric cistern.

Shell-Mex, Ltd., Shell Corner, Kingsway, W.C.2.—A handbook dealing with fuel and lubricating oils for heavy-oil engines.

The Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough.—Publication No. 1,005, containing details of a trial of a 5,000-kW Brush-Ljungström turbo-generator installed at Wallasey.

Messrs. Cecil Hodges & Co., Ltd., Empire Works, Dalston, E.8.—An illustrated and priced catalogue of windmills for generating electricity, &c. (Vereecke patents).

The Electrical Equipment & Carbon Co., Ltd., Bank Buildings, 109-111, New Oxford Street, W.C.1.—An illustrated pamphlet advertising the "Sonora" loud speaker for which the company holds the sole agency for this country.

Bankruptcy Proceedings.—F. W. Caseley, 5, Hepworth Arcade, Hull (trading as the Radiograph Company), radio engineer.—The public examination of this debtor was held recently at the Guildhall, Hull. Debtor attributed his failure to the illness of his wife, loss on the sale of bad quality radio goods supplied by a creditor, and bad trade. He stated that instead of returning the bad quality goods that were supplied to him, he kept them in stock. The examination was closed.

H. A. Sanders, Black Cat Restaurant, Chawston, Beds., electrical contractor, &c.—The public examination of this debtor was held on July 21st at the Shire Hall, Bedford. According to the statement of affairs, there were liabilities amounting to £2,326, and assets of £361, leaving a deficiency of £1,965. Debtor attributed his failure to the failure of certain businesses and limited companies in which he had been interested. He stated that he joined another person at Burnham-on-Sea to carry on business as electrical engineers. He first put £360 into the concern. After two years the business was formed into a limited company with a nominal capital of £5,000. The debtor was allotted 500 £1 shares and was appointed managing director at £5 per week. On the formation of this company and for its business purposes he obtained an overdraft from his bankers up to about £1,000, which was guaranteed by the present petitioning creditor. About 18 months ago the company was wound up. The debtor was a creditor of the company, and it was expected that about £10 would come to his estate. When he went to Chawston he had about £40 in cash. The object of acquiring the land was to start a petro-filling station, an electrical business, and a restaurant. The examination was adjourned. Mr. H. Ball, Duke Street, Bedford, was appointed trustee on July 17th.

J. Humphries, the yard behind the Plough Inn, Oldham Road, Rochdale, plumber and electrical engineer.—The public examination of this debtor was held on July 24th at the County Police Court, Rochdale. According to the statement of affairs, there were liabilities of £597 and assets of £276, leaving a deficiency of £321. Debtor attributed his failure to lack of capital, trade depression, and lack of commercial knowledge. He stated that he started on his own account as a plumber and electrical engineer in 1922 with £20 capital, which represented the proceeds of the sale of his furniture to his wife. At the end of 1922 he was joined by a partner with £30 capital, but in 1924 this partnership was dissolved, and debtor took over all the liabilities and assets, although he was aware of the financial position of the business. In February of this year he paid a deposit of £55 on the purchase of a house and shop for £550, but was unable to complete the purchase, and had to forfeit the deposit. The examination was closed.

G. W. Tempest (Northern Radio Co. and General Wireless Trading Co.), radio and telephone engineer, 40, Brazennose Street, and Arcade Chambers, Manchester, and Commercial Street, Leeds.—First meeting, August 5th, at the Official Receiver's office, Byrom Street, Manchester; public examination, September 18th, at the Court House, Manchester.

A. T. K. MOIR, trading as Moir & Watts, Weardale Road, Lee, Kent, electrical and mechanical engineer.—The public examination of this debtor was held on July 21st at the Court House, Greenwich. Debtor attributed his failure to recent inability, through illness, to exercise proper supervision over the business, lack of capital, depreciation of stock, and keen competition. He stated that his stock depreciated in 1924, and his trading loss was about £1,200. The examination was adjourned.

W. K. M. WILSON, 1, Mount Street, Heanor, Derbyshire, electrician and radio apparatus dealer.—The first meeting of creditors was held on July 23rd at the Official Receiver's offices, Nottingham. The statement of affairs showed ranking liabilities of £373 and there was a deficiency of £355. Debtor attributed his failure to the slump in trade, keen competition, and inferior goods supplied by a creditor, which had damaged his reputation. The matter was left with the Official Receiver as trustee of the estate.

M. D. ROSENBLOOM, trading as D. Rose & Co., dealer in electric lamps, 25, Osborn Street, E.—This debtor again attended on July 21st before Mr. Registrar Mellor, at the London Bankruptcy Court, for public examination on accounts showing liabilities of £2,293, against assets valued at £757. The examination had stood adjourned for the debtor to furnish cash and goods accounts. He was questioned in detail upon the accounts and the examination was ordered to be concluded.

H. M. MURAD (W. H. Murad & Co.), wireless manufacturer, 126, Princess Street, Manchester.—Last day for proofs for dividend, August 8th. Trustee, Mr. J. G. Grant, Official Receiver, Byrom Street, Manchester.

F. S. BOWEN (Manchester Electrical Maintenance Co. and F. Bowen & Co.), electrical engineer, 7, Brazennose Street, and 43, Thomas Street, Manchester.—Second and final dividend of 1s. 1 9/10d. in the £, payable August 10th, at 21, Spring Gardens, Manchester.

W. A. A. C. ROBINSON, electrical engineer, 10, Carnaby Street, Golden Square, W.—Receiving order made July 16th, on creditor's petition. First meeting, August 5th; public examination, September 1st, both at Carey Street, W.C.

R. A. BURNELL, electrical engineer, Harefield Park, Harefield, Uxbridge.—First meeting held on July 29th, at 29, Russell Square, W.C.1. Public examination, July 31st, at the Town Hall, Windsor.

J. E. LOCKING, dealer in cycles and wireless goods, 14, Fish Street, Kingston-upon-Hull.—Last day for proofs for dividend, August 5th. Trustee, Mr. J. E. D. Stickney, Official Receiver, 37, Scale Lane, Hull.

Company Liquidations.—CUTTING & MUIR, LTD., electrical engineers, St. Matthews Street, Ipswich.—A meeting of the creditors of the above was held recently at Ipswich. A statement of affairs was submitted, showing the position as at June 29th, prepared by the liquidator, Mr. Chas. G. Hines, accountant, of 4, Museum Street, Ipswich. This disclosed liabilities of £1,335, all of which was due to the trade. The assets totalled £875, but from this had to be deducted £42 for preferential claims, leaving net assets of £833, or a deficiency as regarded the creditors of £502. It was reported that the business was originally commenced as a partnership concern on June 1st, 1919. It was, however, subsequently sold to the limited company, which was registered in 1920, with a nominal capital of £5,000. There had been issued 3,500 shares, all of which, it was understood, were paid for in cash, with the exception of those issued in respect of the purchase consideration. Trading figures were submitted which showed that the total trading losses had been £3,372, which practically accounted for the whole of the capital of the company. It was decided to confirm the voluntary liquidation of the company, subject to Mr. Osborne being joined as co-liquidator with Mr. Hines, the shareholders' nominee. It was also resolved that the liquidators should enter into negotiations forthwith for the disposal of the business as a going concern. A committee was appointed consisting of representatives of the General Electric Co., Ltd., Callender's Cable & Construction Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd.

The following are the principal creditors :—

	£		£
A. R. Motor Accessories	21	Callender's Cable & Construction Co., Ltd.	228
Bennett & Snare, Ltd.	36	Falk, Stadelmann & Co., Ltd.	24
British Thomson-Houston Co., Ltd.	87	General Electric Co., Ltd. ...	359
Canham, F. W., & Sons	14	Metropolitan-Vickers Electrical Co., Ltd.	262
Chloride Electrical Storage Co., Ltd.	27	Ruston & Hornsby, Ltd.	50

HENRY JOSEPH & CO., LTD., 96, Victoria Street, London, S.W., electrical engineers.—At a recent meeting of the creditors the chair was occupied by Mr. Norman Bell, C.A., the liquidator in the voluntary liquidation. It was stated that the shareholders had previously passed the usual resolution for voluntary liquidation, and had appointed Mr. Bell, of 26-27, Bush Lane, E.C., to act as liquidator. A statement of affairs was submitted, disclosing liabilities of £4,091, and total assets of £4,196, from which had to be deducted £87 for preferential claims and £2,947 in respect of debentures and interest, leaving net assets of £1,162, or a deficiency as regarded the creditors of £2,929. Mr. Bell reported that at the date of his appointment a receiver was in possession for the debenture-holders. The Receiver, Mr. R. G. Sidford, of 36, Southampton Street, Strand, W.C., was appointed under the debenture deed as from June 18th last. He (Mr. Bell) understood that the receiver had previously been the auditor of the company, and it had been the intention of the shareholders to appoint that gentleman as liquidator. The principal creditors were Messrs. W. & T. Loch, of Bath, and they were consulted. They expressed the opinion that an independent liquidator should be appointed to represent the trade, and his (the chairman's) name was put forward. He added that the company was registered on July 27th, 1923, to take over as a going concern a business which had previously been carried on under the style of Henry Joseph & Co. No resolutions were passed by the creditors, and consequently the voluntary liquidation will be continued with Mr. Bell as liquidator. The principal creditors are :—

	£		£
Loch, W. & T.	1,090	Bankers	615
Meyer, L.	709	Vesshoff, H.	312

WIRELESS VALVES, LTD., 86, Rosebery Avenue, London, E.C.1.—A meeting of creditors was called for July 27th at the offices of the company. Resolutions for voluntary liquidation had previously been passed, and Mr. G. F. Marreco, the managing director of the company, was appointed as the liquidator. No creditors attended the meeting, and it is stated that all the liabilities have been discharged. The voluntary liquidation of the company will therefore be continued with Mr. Marreco as the liquidator.

BRITISH PORTABLE RADIO, LTD.—Winding up voluntarily. Liquidator, Mr. W. E. Bundy, 31, Bedford Row, E.C. Meeting of creditors at 31, Bedford Row, August 1st.

RADIOPHONES, LTD.—Winding up voluntarily. Liquidator, Mr. H. Lever, Chiswell House, Finsbury Pavement, E.C. A meeting of creditors was called for July 24th, at the offices of the liquidator. Particulars of claims to be sent to the liquidator by July 31st.

LEAD HYDRATE & BATTERY CO., LTD.—Winding up voluntarily. Liquidator, Mr. P. B. Nevill, 94, Old Broad Street, E.C. Meeting of creditors, August 4th, at the liquidator's offices; particulars of claims to the liquidator by August 14th.

W. R. THORNTON & SON, LTD.—A meeting of creditors was called for July 27th at the Duke of Edinburgh Hotel, Abbey Road, Barrow-in-Furness. Liquidator, Mr. W. H. Hole, 105, Duke Street, Barrow-in-Furness.

RODERICK ELECTRIC SUPPLIES CO., LTD.—Winding up voluntarily. Liquidator, Mr. W. H. Cork, 19, Eastcheap, E.C.

INTERNATIONAL RADIO MANUFACTURERS, LTD.—Winding up voluntarily. Liquidator, Mr. P. B. Nevill, 94, Old Broad Street, E.C. Meeting of creditors, August 4th at the liquidator's offices.

INGLEBY & CO., LTD.—Winding up voluntarily. Liquidator, Mr. R. E. Starkie, 6, South Parade, Leeds. Meeting of creditors at the Hotel Metropole, Leeds, July 30th.

LELIOS LAMP CO., LTD.—A meeting of creditors was called for to-day at 58, Southwark Street, S.E. Liquidator, Mr. E. L. Butler. (This notice is purely formal; all creditors have been or will be paid in full.)

GAS AND ELECTRIC SECURITIES, LTD.—Winding up order made by the High Court on July 21st.

Composition Annulled.—At Bolton County Court, on July 23rd, the Official Receiver applied for the annulment of an order approving a composition submitted by W. T. Smith, electrical and mechanical engineer, Bolton, and acceded to by his creditors. The receiving order was made in January, 1918, and in November, 1919, debtor's proposal to pay a composition of 5s. in the £ was accepted. Debtor paid the first instalment but no more. The arrangement was that amounts of 1s. 8d. should be paid five months later and again ten months later. Debtor had paid £336; he was four years behind time. The debtor explained that the moneys he had received had been taken up in perfecting an invention. The judge said that creditors must come first, and annulled the composition and adjudicated debtor bankrupt; the order would not operate if in three months debtor paid an instalment.

Private Arrangements.—H. W. SUTTON, trading as C. A. Sutton & Co., wholesale electrical supplies dealer, 110, Dale Street, Liverpool.—The creditors interested herein were called together recently, at the offices of Messrs. Latimer & Kelsall, accountants, Liverpool. A statement of affairs was submitted which disclosed liabilities of £4,233, of which £3,530 was due to unsecured creditors, and there were partly secured creditors for £703. The total amount of their claim was £933, but they held security valued at £230. There were, in addition, fully secured creditors for £3,830, holding securities of the estimated value of £4,300, leaving a surplus of £470. The assets were estimated to realise £1,721, from which had to be deducted £55 for preferential claims, leaving net assets of £1,666, or a deficiency of £2,566. The fully secured creditors were the mortgagees of the debtor's house and business premises. The partly secured creditor was the bank. The debtor commenced business in 1907 and carried it on until 1916. He then joined the Forces and his father carried on during his absence. No books were kept until 1920, when a statement prepared showed the capital at £2,849. It was stated that items of loan, &c., amounting to £1,181, which had gone into a private account, were not taken into the balance sheet at March 31st last. It was decided that the estate should be dealt with in bankruptcy. The following are creditors :—

	£		£
Brown Bros., Ltd.	664	Richardsons	280
Wightman, J. H.	620	General Electric Co., Ltd.	100
Wolff, S. & B.	283	Gilbert, J., & Co.	95
Bold, W., & Co., Ltd. ...	157		

Dissolutions of Partnership.—STEPHENS BROS., electrical and wireless engineers, 83, Stretford Road, Hulme, Manchester.—Mr. P. C. Stephens and Mr. W. Stephens have dissolved partnership. Debts will be attended to by Mr. P. C. Stephens, who will continue the business.

K. & W. RADIO SERVICE, retail wireless salesmen, 69, High Street, Thornton Heath.—Mr. R. S. Keeler and Mr. J. E. Wood have dissolved partnership. Mr. Wood will attend to debts and continue the business under the same style.

E. T. MACKRILL & SONS, electrical and general engineers, 16, Kingsbury Square, Aylesbury.—Mr. E. S. Mackrill and Mr. W. H. Mackrill have dissolved partnership.

Fire.—A fire occurred at the premises of the Kingsbury Wireless Engineering Co., Kingsbury, Hendon, on July 21st, causing considerable damage to a stock of accumulators and radio apparatus.

Deed of Assignment.—A. WALKER and C. WALKER (Walker Wireless Supply Co. and Newcastle Wireless Supplies), radio engineers and vendors of wireless goods, 31, Westgate Road, Newcastle-on-Tyne, 104, Leith Street, Edinburgh, 34, Broad Street, Aberdeen, and 58, Wellgate, Dundee.—Particulars of claims by August 4th to Mr. H. J. Armstrong, Trustee, Emerson Chambers, Blackett Street, Newcastle-on-Tyne.

Receiver Appointed.—WRIGHT MOTORS, LTD. Century Works, Halifax.—Mr. S. Laycock has been appointed receiver by the debenture-holders.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed trade marks may be lodged within one month from July 22nd :—

Abel (lettering and design). No. 457,223. Class 8. Instruments and apparatus for use in radio-telegraphy and telephony.—Austin Brothers Electrical Co., Ltd., Manbey Road, Stratford, E.15.

Rheco. No. 458,922. Class 8. Electrical, radio, telephonic, and telegraphic apparatus.—Robinson & Hands Electrical Co., Ltd., 54, Barwick Street, Birmingham.

Adico high-tension battery, noiseless, accurate (lettering and design). No. 459,057. Class 8. High-pressure batteries.—Adie & Co., Ltd., 2, Aldermanbury, E.C.2.

Adaptolite. No. 459,734. Class 8. Radio-telegraphic and telephonic apparatus.—Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, 12, Place des Etats Unis, Montrouge, Seine, France. (British representatives : Mewburn, Ellis & Co., 70-72, Chancery Lane, W.C.2.)

Zenal. No. 452,182. Class 13. Electric fuses and cut-outs of ordinary metal.—Parmiter, Hope & Sugden, Ltd.

Glasgonex. No. 459,531. Class 13. Electric switches (ordinary), electric fuses and cut-outs.—The Midland Electric Manufacturing Co., Ltd.

Electric Power Supply in Brazil.—The July *Monthly Review* of the Bank of London and South America, Ltd., states that the governor of the state of the Rio de Janeiro has recently signed a contract with the Rio de Janeiro Tramway, Light and Power Company, by which the company undertakes to supply electricity to the towns of Campos, Macahé, and Sao Joao da Barra. The terms stipulate that the company shall pay to the State the sum of 15,000 contos over a period of ten years. It is believed that the supply of electric power to those towns, which are exclusively agricultural and produce mostly sugar, will be an important factor in transforming them into large industrial centres.

A Brazilian Telephone Concession.—It is reported that the municipal authority of Sao Paulo has approved a new contract with the Brazilian Telephone Co. The ratification of the agreement is in doubt as there is considerable opposition to the granting of a 40-year concession and to the rates which the agreement sanctions.

Electrical Construction in Brazil.—The President of the State of Sao Paulo has issued a decree calling for further and more widely-diffused electrical services in that State. New works, to supplement those already in existence and to provide power for a number of new industrial purposes, will hereafter be placed under the direction of the State Ministry of Agriculture, Commerce and Public Works.—*Reuter's Trade Service* (Sao Paulo).

Unemployment.—A PROPOSAL.—We have received a copy of a pamphlet written by Mr. E. A. Radford, F.C.A., M.P., setting forth details of the suggested remedy for unemployment which he outlined in the debate which took place in the House of Commons on June 29th. He holds that the reason for our unemployment is that British goods are costing more than those of other industrial nations, and therefore are unable to compete with them either abroad or in the home market. By all classes of the population uniting in a common sacrifice, costs must be brought down. The Government is looked to by the author as being able to ascertain the percentage of reduction necessary in the trades that suffer most from competition. If it be found to be 10 per cent., he would have an Act passed, "The National Emergency Ten Per Centum Deduction Act," which would be used to reduce by 10 per cent. during the period of national emergency until trade was re-established, all rents, royalties, ground rents, professional charges, bank interest and charges, interest on investments, salaries, insurances, postages, &c., and make an effective saving of a similar percentage in all wages. It is a big order and a remarkable conception—nearly everybody would sacrifice a considerable part of his or her income in order to be able to buy and sell more goods. A 10 per cent. reduction would be made from the wages of the "higher-paid" workers, but in the case of the "lower-paid" workers they would suffer no drop, but would give 10 per cent. more work for the same money. The Government would pay 10 per cent. less than at present in interest, there would follow a big fall in taxation, and so forth and so on. And then when everybody had agreed to make his 10 per cent. common sacrifice, the cost of living would fall and that of British goods would go down by approximately 10 per cent. Competitive sales would revive (if something did not happen to reduce foreign costs further), and the burden of unemployment pay would be lessened as trade became re-established. Unfortunately, many difficulties are anticipated in the working out of the scheme, and these we are not sure that it is worth while discussing at the present moment, for the greatest need of all preliminary to anything and everything else is that there should be real evidence of the willingness of all classes to bear their rightful share in the common sacrifice as worked out in percentages either of possession or of leisure. What endless controversy and bloodshed would gather about the settlement of what was that rightful share!

The registers of the Unemployment Exchanges showed a total of 1,248,500 wholly-unemployed persons on July 13th. This was a decrease of 51,850 on the week, but the figure was still 222,500 in excess of that of a year ago.

Engineering Employés' Wages.—A further conference took place on July 23rd between representatives of the Engineering and Allied Employers' Federation and the engineering trade unions. It was agreed to approach the Government with a view to steps being taken to secure an arrangement whereby the working hours of competitor nations on the Continent should be put on a similar basis to working hours in Great Britain.

Book Notices.—"Science Abstracts" A and B. Vol. XXVIII. Part 7. July 25th, 1925. London: E. & F. N. Spon, Ltd. Price 3s. each.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIV, No. 7. July, 1925. New York: The Institute. Price $1.

The *Transactions* of the South African Institute of Electrical Engineers. Vol. XVI. Part 4. May, 1925. Price 2s.

"Dynamo Electric Machinery," by E. Hausmann. Pp. viii+645; figs. 447. London: Crosby, Lockwood & Son. Price 21s. net.

"The Dynamo," by C. C. Hawkins. Vol. III, "Alternators." Pp. xviii+572; 710 figs. London: Sir Isaac Pitman and Sons. Price 30s. net.

Annual Holidays.—The works of Messrs. Vickers-Petters, Ltd., Ipswich, will be closed from to-night (Friday), until the morning of Monday, August 10th.

The works of the Jackson Electric Stove Co., Ltd., will be closed from August 1st to 9th for the annual holiday.

The works of the Electro-Generator Co. at Hammersmith will be closed from August 1st until August 10th for the holidays.

Messrs. E. Brook, Ltd., of Huddersfield, announce that their works and offices will be closed from Friday, September 4th, until Monday, September 14th, for the annual holidays.

The works of the London Electric Firm will be closed from to-night (Friday) and will re-open on Monday, August 10th. A small staff will be in attendance to deal with urgent business.

Income Tax.—The *Financial Times* has issued the 1925 edition of its "Income Tax Guide" (one shilling net). It has been revised by G. H. Bridge, A.S.A.A., A.C.I.S. It is based on official data and shows the amount payable, how to obtain relief, giving tables and examples, as well as chapters on Corporation Profits Tax and the new Pensions Bill.

Certificate for a Storage Geyser.—The "Bastian" electric storage geyser has been tested and approved by the Good Housekeeping Institute, and Messrs. Bastian & Allen have received a certificate for it. The firm state that theirs is the only electric geyser that has been approved by the Institute.

The German Radio Exhibition.—From Berlin we learn that over 150 firms have already secured space at the second annual radio exhibition which is to be held in that city from September 4th to 13th next.

For Sale.—Offers are invited for the whole of the plant at H.M. power station, Beachley, near Chepstow, which includes coal-handling plant, four Babcock & Wilcox boilers, economisers, one 1,000-kW set, and two 3,000-kW sets, together with switchgear and auxiliaries. Southern Railway Stores Department has for disposal surplus electrical machinery and boiler-house plant at Southampton Docks. Darlington Corporation Tramways Department invites offers for 16 single-deck, six open-top double-deck, and two covered-top double-deck tramcars. Manchester Electricity Department has for disposal three A.E.G. 150-kW motor-generators. (See our advertisement pages to-day.)

Encouraging Electric Water Heating.—We are informed by the borough electrical engineer of Woolwich (Mr. G. W. Keats) that his department has instituted a special rate for electricity for continuous electric water heating. For a 20- or 30-gal. hot-water cylinder having an immersion heater permanently in circuit a charge of ½d. per kWh is made.

Opportune Advertising.—The new high-power station of the British Broadcasting Company was opened on Monday last and advantage was taken of the occasion by the British Thomson-Houston Co., Ltd., to distribute large coloured posters of a topical nature. One of these bore a map indicating the range of the Daventry station, and the appropriate "B.T.-H." receiving sets for varying distances and requirements. The other poster advertised the best valves to use for the reception of the Daventry transmissions.

An Australian Siemens Company.—The *Financial Times*, after referring to the registration in the Commonwealth of Siemens (Australia) Proprietary, with a capital of £100, in shares of £1 each, to conduct the business of manufacturers of electric wires and cables and other electrical goods, &c., states that Mr. H. P. Slipper, general manager in Australia for Siemens Bros. & Co., and electrical trade counsellor on the executive council of the Australian Association of British Manufacturers and their Representatives, is visiting this country. Mr. Slipper, while in Great Britain, will represent the executive council in matters requiring attention in London.

Lead. — Reporting on July 25th, Messrs. James Forster and Co. stated:—"The general position is unchanged. Consumption continues on a large scale, but arrivals have been up to the average this month, though 'spot' lead is not too plentiful. . . . The present price seems high enough for the moment, particularly in view of the threatening industrial situation, but, given a satisfactory settlement, consumption will go ahead and it will then remain to be seen whether supplies will be sufficient to meet the demand."

New German Companies. — Among the new companies recently formed in Germany in connection with the electrical industry are the Schuckert Betriebe Gesellschaft, Munich, capital £150,000; the Obere-Saale Gesellschaft, Weimar, capital £50,000, to establish hydro-electric plants in Thuringia; and the Nordharzei Kraftwerke Gesellschaft, Goslar, capital £20,000.

Chinese Notes.—A local capitalist of Shihpeichen, a market town about 100 li (33 miles) from Anking (Anhwei province) is negotiating for the purchase of one of the Anking Electric Light Company's plants from which he intends to distribute electricity in the Shihpeichen district.

The trackwork of the Mukden city tramway system has been completed, and a commencement has been made with the overhead equipment.

The Radio Corporation of America.—The *Financial Times* says that in curious contrast to the experience of the British Marconi Company, not to mention the British Broadcasting enterprise, the Radio Corporation of America appears to be encountering rather difficult times. For the past quarter it reports the first deficit in its history, a net loss of nearly $400,000 for that period comparing with a net profit of almost $2,000,000, for the previous three months. Its gross income, it seems, showed a very serious shrinkage, being only about $4,500,000 for the June quarter, in contrast with $15,000,000 for the three months to the end of March. While seasonal conditions are regarded as partly responsible for the unfavourable results now disclosed, it is admitted that the chief cause of the decline in earnings is the price-cutting of rival undertakings. The corporation for the present has refused to lower its prices, but another experience such as that of the past quarter may force it to alter its decision. For the last year a net profit of over $9,500,000 was reported. All but $1,384,000 of that sum was required for the payment of the preferred dividend and $3,356,000 credited to surplus account was absorbed by taxation, depreciation and the writing down of various items.

Rumanian Orders for Cables.—*Reuter's Trade Service* (Berlin) says that, according to the *Taegliche Rundschau*, several British and German firms tendered for the supply of cables and telephone apparatus of the value of 30,000,000 lei to the Postal, Telegraph, and Telephone Department at Bukarest. One British and three German firms were successful. The *Financial Times* states that the successful British firm is W. T. Henley's Telegraph Works Co., Ltd.

Copper, Lead, and Rubber Prices.—Messrs. F. Smith and Co. report, July 28th: Copper (electrolytic) bars, £67, 5s. dec.; ditto, ditto sheets, no change; ditto, ditto wire rods, £77, 5s. dec.; ditto, ditto h.c. wire, 9⅛d., 1/16d. dec.

Messrs. James & Shakespeare report, July 28th: No change in the price of copper bars (best selected), sheet and rod; English pig lead, £36 15s., 10s. inc.

Messrs. E. Till & Co. report, July 28th: India rubber, Para, fine, 4s. 5d., 4d. inc.

Lighting and Power Notes.

Bath.—YEAR'S WORKING.—The statement of accounts of the electricity undertaking (engineer: Mr. F. Teague) for the year ended March 31st last, shows an income of £55,430, against £53,181 for the previous year. The working expenses are recorded as £31,165, against £25,779, leaving a gross profit of £24,265 (£27,402). A net surplus of £6,319 is shown after deducting the capital charges, &c., compared with £12,188 for the year 1923-4. The capital expenditure for the year amounted to £60,180, bringing the total up to £359,462. The principal items of capital expenditure were £16,756 for mains, £14,872 for machinery and plant, and £11,479 for turbo-generators. The total sales of energy for the year amounted to 4,390,951 kWh, an increase of 840,295 kWh above the preceding year. The maximum demand for the year was 3,380 kW.

Bexhill.—MAINS EXTENSIONS.—The Electricity Committee has decided to extend mains to Whydown Place, at a cost of £412, and to Limsford Cross at a cost of £1,326, when there is sufficient revenue to justify the expense.

Birmingham.—RATE RELIEF.—The Finance Committee has recommended that the Electricity, Gas and Tramway Departments should each contribute 1 per cent. of the capital value of the undertaking to the relief of the rates. This would be equivalent to £102,000 per annum.

Blackpool.—YEAR'S WORKING.—The financial statement of the electricity undertaking (engineer, Mr. C. Furness) for the year ended March 31st, 1925, shows an income of £155,327 and a working expenditure of £94,610, leaving a gross profit of £60,717. The corresponding figures for the previous year were £141,586, £88,459, and £53,127. A net surplus of £29,884 is left after deducting the capital charges, &c., against £26,567 for the year 1923-24. The capital expenses during the year amounted to £8,507, making a total of £596,070. The average price per kWh during the year was 3.08d.

AUTHORITY TO INSTALL NEW PLANT.—The Mid-Lancashire Electricity Board has given the Corporation authority to install a 2,000-kW set at a cost of £12,000.

Bournemouth.—HOSPITAL INSTALLATION.—The Corporation has decided to install electricity at the Sanitary Hospital at a cost of £2,300.

Bradford.—APPLICATION FOR LOAN.—The Electricity Committee is applying for sanction to borrow £10,310 in connection with the renewal of e.h.p. feeders to Apperley Bridge.

Calne.—APPLICATION FOR LOAN.—The Town Council has decided to apply for a loan of £6,347, the estimated cost of obtaining and distributing electricity within its compulsory area.

Canada.—ONTARIO HYDRO-ELECTRIC REPORT.—The seventeenth annual report of the Ontario Hydro-Electric Power Commission shows that after reducing rates in many rural districts and paying all operating expenses, the year's working yields a net profit of 725,000 dollars. In spite of some industrial depression, the Commission experienced an increased demand for power on almost all its systems, some of which are reaching the capacity of their existing generating stations. The receipts for power sold during the year totalled $16,897,000.

Cheadle and Gatley.—NEW CHARGES.—The Council is to abolish the present system of charging and establish a flat rate of 6d. per kWh.

Chester.—ELECTRICITY SUPPLY.—The Electricity Committee has decided to approve the terms for a supply of electricity to Hawarden Rural District Council be affirmed, and the town clerk is to be instructed to apply to the Electricity Commission to revoke the Fringe Orders authorising a supply of electricity to Mancott Royal Estate.

Chesterfield.—YEAR'S WORKING.—We have received from Mr. D. H. Davies, borough electrical engineer, a statement of accounts for the electricity undertaking for the year ended March 31st last. The total revenue amounted to £46,443, against £41,574 for the preceding year. The working costs are shown as £22,386, against £20,124, leaving a gross profit of £23,721 (£21,053). The deduction of capital charges leaves a net profit of £5,471, compared with £4,984 for the previous year; £14,994 was spent upon the capital account during the year, making a total capital expenditure of £218,667. The sales of energy increased from 5,601,315 kWh to 6,445,550 kWh, and the average price per kWh was reduced from 1.69d. to 1.64d. during the year. The maximum demand for the year was 3,567 kW.

Chichester.—PURCHASE OF SUB-STATION.—The Corporation has arranged for the purchase of a sub-station in connection with the supply of electricity to Selsey.

Continental.—SWITZERLAND.—Work is now actively in hand on the construction of the new Ober Hasli power station in the Grimsel district. To supply the necessary electrical energy for the construction work a special cable is being laid between the Central Swiss Power Co.'s station at Eiswil and Innertkirchen *via* Lungern, the Bruning Pass and Meiringen. A light railway for the transport of material is also being built between Meiringen and Innertkirchen, a distance of about three miles.

A proposal is under consideration by the Swiss Government to raise the level of Lake Taillieres in the Locle district of the Canton of Neuenburg with the object of securing increased power for electrical purposes.

ITALY.—La Società Lombarda per Distribuzione d'Energie Elettrica, has recently been authorised to erect a 135,000 V transmission line between Piattamala, near Tirano and Valsassina, across the province of Sondrio and Como.

NORWAY.—*Transformers for Bergen and Nore.*—The Norwegian A.S. Per Kures Fabrikker, of Vestre Aker, is reported to be delivering two transformers, each of 15,000 kW, for the Dale installation at Bergen, and transformers of 30,000 kW, 143,000 V, for the State works at the Nore.

Croydon.—NEW CHARGES.—The Electricity Committee has recommended the following charges:—Up to and including 1 h.p.: First 200 kWh per annum, 5d. per kWh. Over 1 h.p. and up to and including 2 h.p.: First 400 kWh per annum, 5d. per kWh. Over 2 h.p.: First 600 kWh per annum, 5d. per kWh; beyond, 1d. per kWh. Power consumers whose consumption is under 2,400 kWh per annum, if they guarantee this minimum consumption, will have the option of being charged under the time-switch system.

MAINS EXTENSIONS.—The Electricity Committee has decided on mains extensions at a cost of £2,450.

Dewsbury.—STORM DAMAGE.—During a violent thunderstorm on July 22nd, some of the overhead equipment of the Yorkshire Electric Power Co. was put out of action.

Dodworth.—BULK SUPPLY.—The Urban District Council has decided to support an application by the Electrical Distribution of Yorkshire, Ltd., to supply electricity in bulk to the district.

Durham.—SUPPLY OFFER.—The Rural District Council has decided to make further inquiries in connection with an offer from the Weardale Steel, Coal & Coke Co. to supply electricity to the Ludworth houses at 6½d. per kWh, provided the Council undertakes to collect money due from the tenants.

Faversham.—PRICE REDUCTION.—The Town Council has reduced the charge for electricity for lighting from 10d. to 9½d. per kWh.

Grimsby.—YEAR'S WORKING.—The twenty-fourth annual report and statement of accounts for the year 1924-5 of the electricity undertaking (engineer, Lt.-Col. W. A. Vignoles) records an income of £78,150, against £78,410 for the preceding year. The working costs are shown as £46,493, against £46,432, leaving a gross surplus of £31,072, after deducting bad debts. A net profit of £5,558 is shown after deducting the capital charges, &c., against £8,035 for the year 1923-4. The sales of energy increased by over a million kWh, the average price per kWh being 1.83d., and the maximum demand on the station was 4,396 kW. The capital expenditure during the year amounted to £54,326, including £32,091 on machinery and £12,428 on mains, bringing the total capital expenditure up to £415,460.

Hartshorne and Seale.—ELECTRICITY CHARGES.—The Rural Council has received from the Burton-on-Trent Town Council an undertaking that the charges for electricity in the district shall not exceed 1d. for lighting and 15 per cent. for power above the charges in operation in the borough.

Huddersfield.—APPLICATION FOR GRANT.—The Electricity Committee has decided to apply to the Unemployment Grants Committee for a grant towards the cost of the proposed extension of mains to Crosland Hall during the coming winter.

Irish Free State.—LIMERICK.—The Lighting Committee has decided to adjourn the consideration of extensions to the electricity works, pending an interview with the Minister of Industry and Commerce, relative to the probable bearing of the Shannon Power Scheme on the city's electricity supply.

Kingussie.—TEMPORARY SUPPLY.—The Town Council is asking Messrs. Balfour, Beatty & Co. if they would object to the installation of a temporary power scheme on the understanding that the supply would be taken from the company as soon as it is in a position to give it.

Liverpool.—NEW STATION.—Rapid progress is being made with the extension of the Lister Drive power station, which is to house initially two, and eventually five, 25,000-kW turbo-alternators.

London.—ST. MARYLEBONE.—The Electricity Committee has recommended special flat rates of 1d. per kWh for inside shop-window lighting after closing hours, and ½d. per kWh for water heating in blocks of flats, &c. The Council has approved of the expenditure of £20,000 for mains extensions, &c., for the two years ending March 31st, 1927.

BERMONDSEY.—The Electricity Committee is to seek sanction for a loan of £8,000 for mains, services, and meters. It is also to lay a main in Beatrice Road at a cost of £1,051.

BATTERSEA.—The Electricity Committee has decided to replace the distributors at Lavender Hill and lay conduits for future cables at a cost of £4,483. The Council proposes to adopt a scheme to improve the lighting at the town hall buildings at a cost of £1,100. The borough engineer has prepared plans for offices and showrooms for the Electricity Department at Lavender Hill.

SHOREDITCH.—The Electricity Committee has prepared a scheme for extensions to the plant at the electricity works at a cost of £70,000, including the provision of a 10,000-kW turbo-generator.

POPLAR.—The mills of Messrs. McDougall, of the Wheatsheaf Mills, Millwall Docks, are to be converted from steam and gas to electric drive. The supply, estimated at one million kWh per annum, will be taken from the Corporation undertaking.

The Electricity Committee has obtained sanction to borrow £1,413 for a low-pressure feeder from High Street sub-station to Robinhead Lane.

Middlesbrough.—APPLICATION FOR LOAN.—The Corporation is applying for sanction to borrow £3,058 for the purpose of an electricity sub-station.

Northampton. — MAINS EXTENSIONS. — The Northampton Light & Power Co., Ltd., is to extend its mains from Mill Lane to Kingswell Road.

Peterborough.—CATHEDRAL INSTALLATION.—Electric lighting is being installed in the Cathedral at a cost of £2,000.

WORKS EXTENSIONS.—The Corporation proposes extensions to its generating station, including a new 6,000-kW turbo-alternator.

Plymouth.—LOAN FOR EXTENSIONS.—The Electricity Committee is to borrow £1,000 for the provision of two transformer chambers at North Prospect.

CABLE EXTENSIONS.—The Electricity Committee has authorised various cable extensions at a cost of £2,500.

REPORT ON RIVER AVON.—The Corporation has decided to invite a firm of hydraulic engineers to report as to the sufficiency of the flow of the River Avon for the purposes of a turbine, and also as to the cost of installing the necessary plant.

Preston.—NEW PLANT.—The Finance Committee has authorised the Electricity Committee to proceed with the installation of a third turbo-generator set at Ribble power station, at an estimated cost of £90,000.

Rawtenstall.—APPLICATION FOR LOAN.—The Town Council has decided to apply for sanction to borrow £32,000 for the purpose of extending the plant at the electricity works, Hareholme.

Saffron Walden.—LOAN SANCTIONED.—The Town Council has received sanction to borrow £880 in respect of new battery plant.

Shoeburyness.—SUGGESTED SUPPLY FROM WAR DEPARTMENT.—The Urban Council has decided to ascertain if the War Department can supply electricity for lighting and power, and if so upon what terms and at what cost.

Southend-on-Sea.—NEW DIESEL.—Following the advice of Col. Ekin at the recent inquiry of the urgent necessity of making an earlier application for sanction to install a spare Diesel engine, the Town Council has empowered the Electricity Committee to accept the lowest or most suitable tender of those of six firms for re-conditioning an engine and fitting it with a dynamo at a cost of not more than £10,000.

Sowerby Bridge.—APPLICATION APPROVED.—The Urban District Council has given its consent to the application of the Electrical Distribution of Yorkshire, Ltd., to the Electricity Commissioners for a Special Order to supply electricity for public and private purposes within the urban district.

Stoke.—EXTENSION OF STATION.—As the result of a recommendation made at a conference of authorised undertakers of the North-West Midlands District that each turbine station in that area should be extended to its ultimate economical capacity in order to meet the views of the Electricity Commissioners, the Council has decided to request Mr. Arthur Ellis, consulting engineer, to report upon the ultimate economical capacity of the power house site.

TEMPORARY SUPPLY.—The Electricity Committee, at the request of Mr. W. M. Selvey, consulting engineer of the Stone U.D.C., has agreed to supply under a fringe order until the Stone U.D.C. is able to obtain a special order.

DISTRIBUTION.—The Electricity Committee has decided to erect a sub-station off Shirley Road, and to lay mains at a cost of £1,000 to supply the district below Hanley Park.

HOUSING SUPPLY.—The Housing Committee recommends a supply of electricity to all the Council houses, at a cost of £5,000.

Special Orders. — The Electricity Commissioners have submitted to the Minister of Transport for confirmation, Special Orders made by them for the supply of electricity in the following districts. Parts of the parishes of Llechwedd, Llangelignin and Llangwstenin, in the Rural District of Conway, Carnarvon, by the Borough of Conway; part of the County Borough of Barnsley, by the County Borough of Barnsley; in the Urban District and Rural District of Woodbridge, and the Parish of Melton, by the Woodbridge and District Electric Light Co., Ltd.

The Urban District Council of Dartford is applying for a Special Order to extend its area of supply.

The Wallingford & District Electric Supply Co., Ltd., is applying for a Special Order to supply electricity in the Borough of Wallingford, and the outlying districts.

Trowbridge.—LIGHTING COMPLAINTS.—The Urban District Council is to communicate with the Trowbridge Electric Supply Co. concerning complaints received as to the lighting of the Ashton and Harford Streets.

Warrington.—EXTENSION OF SUPPLY.—The Corporation has decided to lay the necessary cables, and to build a sub-station for a supply of electricity to the Thelwall area.

Electricity Supply in Preston.

Inauguration of the Ribble Capital Station.

It was in 1891 that the National Electric Supply Co. obtained a Provisional Order authorising it to supply electricity within the county borough of Preston, the company commencing on a small scale with a temporary power station pending the completion of the permanent station in August, 1892. For some years operations were confined to a portion of the central area, until an extension order was obtained in 1898. The Crown Street station not being adequate to meet the post-war demand, the company acquired a site in Penwortham, on the south bank of the Ribble. In view, however, of the fact that the undertaking was purchasable by the Corporation in 1932, negotiations which had taken place some years earlier with the Corporation were re-opened, with the result that the Corporation obtained a special order in 1922 authorising the purchase of the company's powers.



Fig. 1.—The Ribble Capital Station.

Mr. J. A. Robertson, M.I.E.E., M.I.Mech.E., who had been advising the company, was retained as consulting engineer, and the Electricity Commissioners' sanction for the new station was obtained in May, 1922, the contracts for the main plant and buildings being placed by the following September. Since construction was commenced, the Mid-Lancashire Electricity Advisory Board has been constituted so that the new station will undoubtedly play an important part in the development of the Mid-Lancashire Electricity District, which extends from Fleetwood on the north-west, to Colne and Nelson on the east, and Chorley on the south.

The Corporation has entered into an agreement with the Lancashire Electric Power Co. to furnish a bulk supply for distribution by the company in the Leyland and Walton-le-Dale districts; the mains are partly laid and a supply is expected to be available in October next, while a further development is the inter-connection of the Blackburn (Whitebirk) and Ribble stations. This line forms an important link in the technical scheme for Mid-Lancashire, and the contracts for a 33,000-volt main capable of passing 10,000 kW, with the necessary transformers and switchgear, have been placed in order that the line may be in operation before the end of the year. Negotiations have also been taking place between Preston Corporation and the coast towns, comprising Blackpool, Lytham, St. Annes, and Fleetwood for a supply of 5,000 kW (rising to 10,000 kW), and the increased demand which will be made during the forthcoming year will involve an extension of the new plant described below, which was inaugurated by Sir John Snell, chairman of the Electricity Commission, on July 22nd.

The new station, fig. 1, is situated approximately 1½ miles from the centre of the town. The site extends to about 33 acres, and the river is tidal, with a maximum variation of 22 ft., having a minimum flow during dry weather of approximately five million gallons per hour. This amount of water is considered sufficient for the first section of the station, but it is proposed to impound tidal water for the second section by constructing a weir across the river, when it is estimated that the water available will be sufficient for condensing pur-

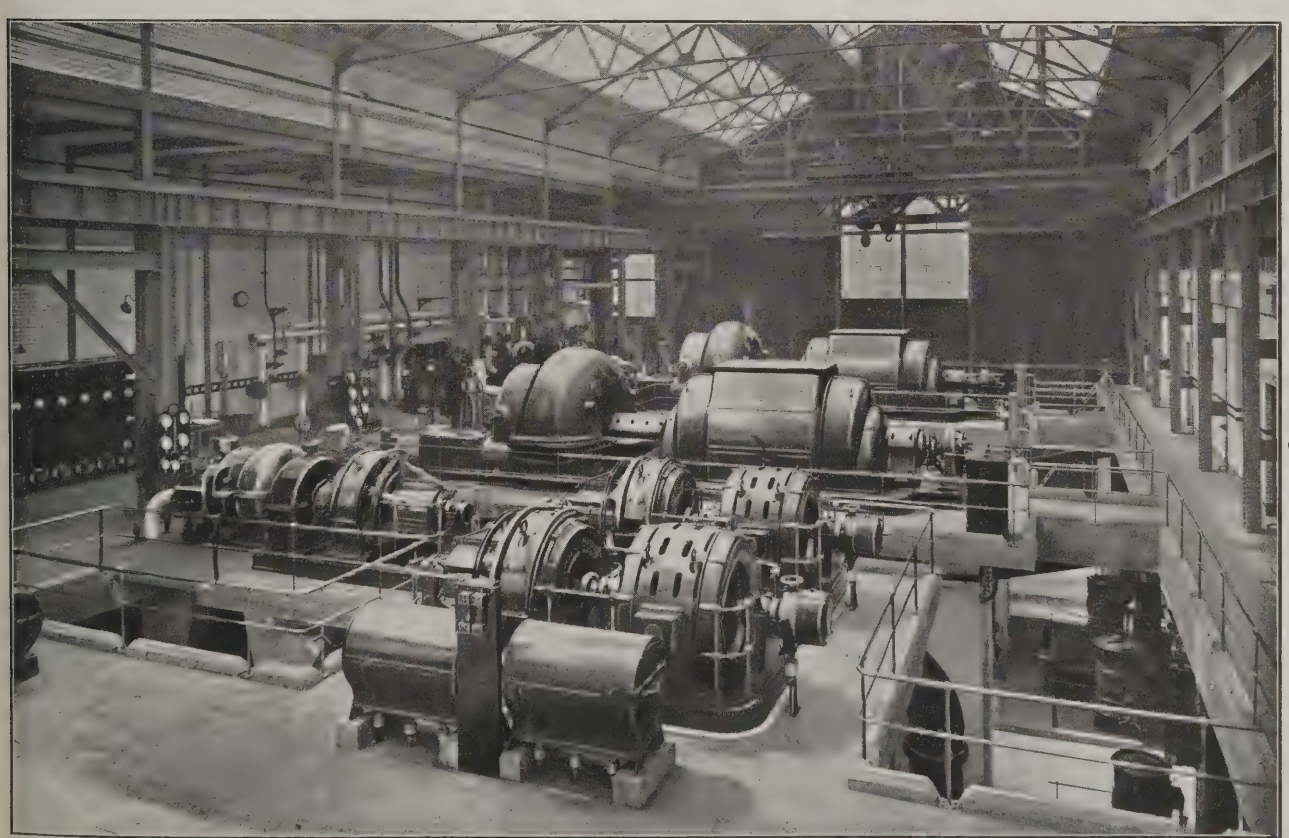


Fig. 2.—The Ribble Turbine Room; House Set and Motor Converters in Foreground.

poses for plant of 150,000 kW capacity. Coal is received by rail at the dockside on the north side of the river, and thence conveyed by an aerial transporter to a receiving tower at the power station, whence it is delivered by duplicate belt conveyors to the bunkers or to the stacking ground west of the station. A jib crane reclaims coal from the stack and delivers it to trucks, which are hauled on a light railway and tipped into a receiving hopper that is also available for road-borne coal, which is elevated by balanced skip hoists to the receiving hopper which serves the belt conveyors over the boiler-house bunkers; the belt conveyors are in duplicate, each being capable of delivering 40 tons per hour.

The ash-removal plant consists of two scraper conveyors working in water-filled cast-iron troughs. A battery locomotive transports the ashes over a narrow gauge railway to low lying dumping ground. The whole of the coal and ash plant has been supplied by the Mitchell Conveyor and Transporter Co., Ltd.

The turbine house, fig. 2, will accommodate three main generating sets, of which two are already installed, and provision has been made for extending the buildings to accommodate a fourth unit. The buildings are of steel, with brick filling, the outside walls being faced with Accrington bricks, and the turbine house is faced with white glazed bricks. The main generating and condensing plant, auxiliaries and house plant has been supplied by the English Electric Co., a considerable portion having been manufactured at the Preston works of the company. Each of the main sets has a continuous normal rating of 12,500 kW at 0.9 power factor, delivering 3-phase current at 50 cycles and 6,600 volts. The sets run at 3,000 r.p.m., and the guaranteed steam consumption at 10,000 kW output is 9.6 lb. per kWh. The turbines have seven stages, each disk carrying a single row of impulse blades, and the governor gear is of the Escher Wyss type. An oil pump lubricates the bearings and the governor relays, while an auxiliary steam-driven oil pump is provided for starting up.

Each turbine is provided with a heater, so arranged that steam may be taken from the low-pressure stages for heating the boiler feed water, and a closed system has been adopted, the water being heated partly by "bled" steam and partly by the exhaust from the feed pumps.

The alternators are totally-enclosed and ventilated on the closed air circuit system by a Heenan and Froude air cooler situated directly underneath in the main foundations.

Each of the main condensers, fig. 3, has 17,000 sq. ft. cooling surface, and is provided with two Drysdale electrically-driven circulating water pumps, situated in a chamber below the turbine house basement, fig. 4. Each pump is driven by a variable-speed motor and is capable of dealing with 85 per cent. of the rated full load. Three Hick, Hargreaves-Breguet air ejectors are provided for each condenser, each being capable of dealing with 50 per cent. of the rated full load. The plant is designed for a vacuum of 29 in., with a barometric pressure of 30 in. when supplied with 13,000 gallons of water per minute at a temperature of 53 deg. F. Duplicate condensate pumps have been installed for each main unit, arranged to deliver to a main header from which two pipes connect to surge tanks above.

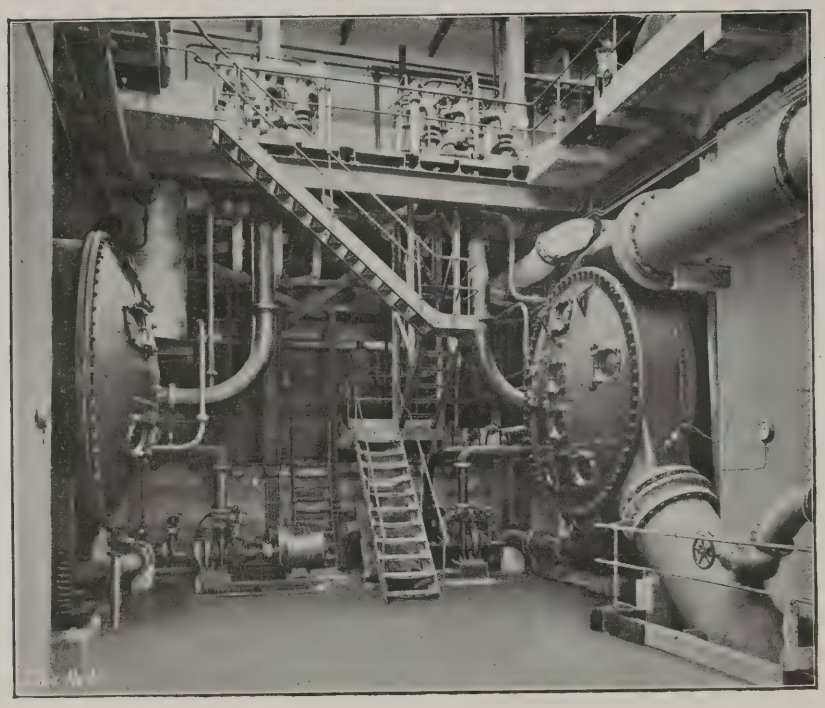


Fig. 3.—Main Condensers in Basement.

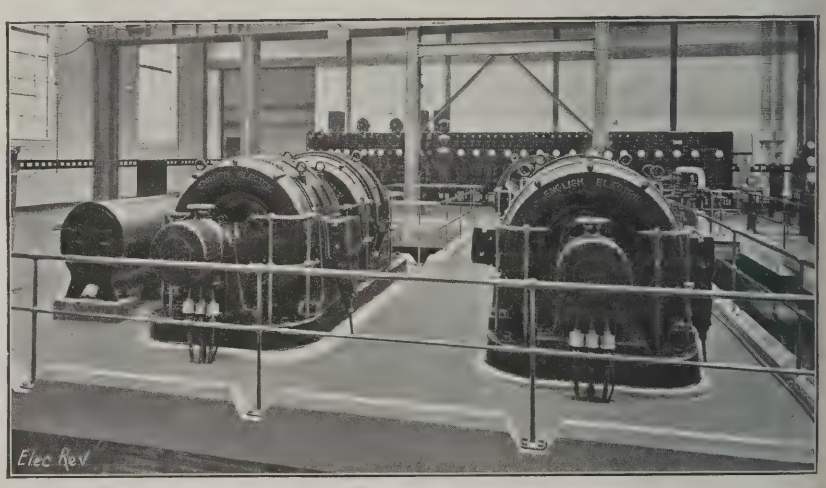


Fig. 5.—Motor Converters and Auxiliary Switchboard.

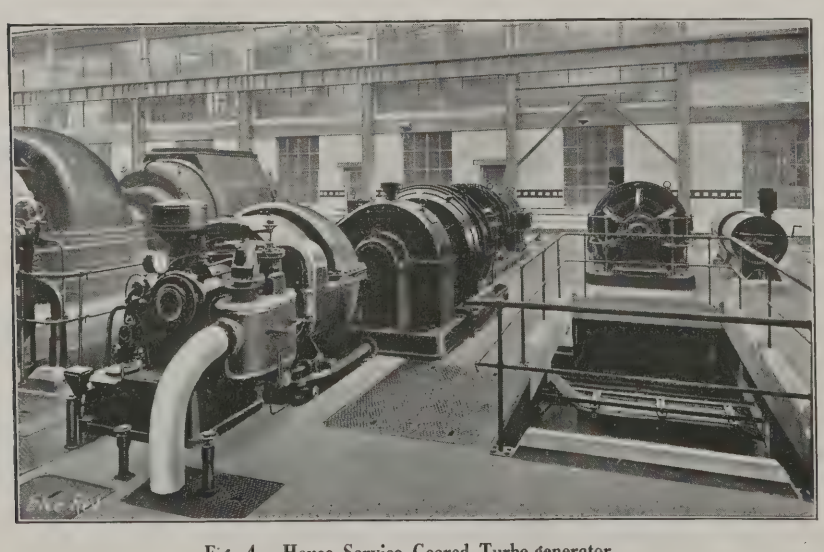


Fig. 4.—House Service Geared Turbo-generator.

Circulating water is taken from the river through a screening chamber equipped with three circular screens, by Messrs. F. W. Brackett & Co., each of 27 ft. diameter. Considerable excavation was necessary to ensure a sufficiency of water between tides, and the inlet chamber has a depth of 6 ft. below the river bed. The inlet and outlet culverts are each 7 ft. 6 in. high by 6 ft. wide, the outlet culvert being above the inlet culvert, and to meet the requirements of the Fisheries Board it discharges over a spillway 100 ft. in length on the river bank.

The whole of the auxiliary plant, except the steam feed pumps, is driven by electric motors supplied with direct current at 220 volts. The auxiliary generating plant comprises one geared steam turbine house set, fig. 4, with condensing plant of 600 kW capacity, two 600-kW motor converters, fig. 5, and a battery, fig. 11, supplied by the Chloride Electrical Storage Co., Ltd., having a three-hour discharge rate of 573 amperes and an emergency discharge rate of 2,000 amperes for fifteen minutes. The d.c. supply is used for lighting the station, and the battery is also employed for operating the h.p. switchgear. It consists of 106 cells, type TJW 12, with Planté design positive and box type negative plates. Each cell contains 12 positive and 13 negative plates, the containers being of lead-lined wood; connections between adjacent cells are burned solid to lead channel bars. Each cell is erected on oil-filled glass insulators supported by a wood stillage, which, in turn, is carried by porcelain oil insulators. The plates are separated by treated wood separators and dowels. The battery is used in parallel with the station auxiliary supply, control on both charge and discharge being normally effected by a hand-controlled booster. Provision is made for automatically cutting out the booster and throwing the battery straight on the busbars in emergency. Charging current is supplied by an induction motor-generator connected to the h.p. a.c. supply. In the boiler house, fig. 6, five Babcock & Wilcox marine crossdrum type boilers have been installed, each having an actual normal evaporation of 65,000 lb. of steam per hour at 325 lb. per sq. in., and 720 deg. F. from water at 100 deg. F. when fired with coal having a calorific value of 10,500 B.th.u. per pound; each is capable of evaporating 75,000 lb. on overload, and space is available for a sixth. When complete the boiler house will contain eight boilers of similar capacity, each complete with economiser, superheater, forced and induced draught plant, steel chimney, and "Diamond" soot blower. Three chain-grate stokers are provided for each boiler, driven from shafts extending along the length of the boiler house under the firing floor, and sectionalised by claw clutches. Four feed pumps are installed, two of the Weir type being driven by steam turbines, and two supplied by Mather & Platt, by electric motors. Each pump is capable of delivering 20,000 gallons per hour against a total head of 900 ft.



Fig. 7.—Switch Room; E.H.P. Cubicles.



Fig. 6.—General View of the Boiler House.

The h.p. switch room is in the office block, and contains at present ten 6,600-volt cubicles, fig. 7, for controlling the generators and feeders. The gear is completely enclosed in a structure of moulded stone, supported by an angle iron framework. The oil-immersed circuit breakers are three-pole electrically-operated units, each phase being actuated by cams and rollers from a common operating shaft. Normally, the breakers are operated electrically from the control desk, fig. 12, but provision is also made for direct hand

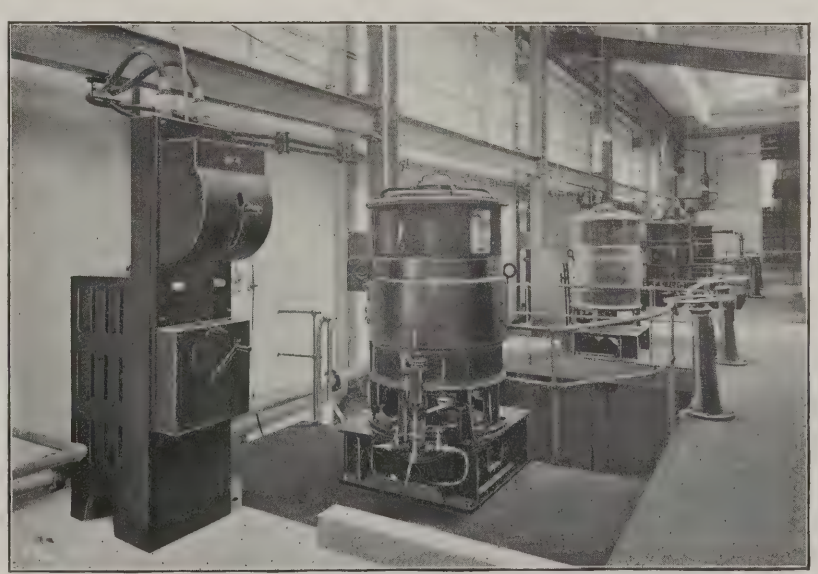


Fig. 8.—Circulating Water Pump Motors in Basement.

operation in an emergency; duplicate bus-bars have been provided throughout. The whole of the h.p. and l.p. switchgear has been supplied by the Metropolitan-Vickers Electrical Co., Ltd. Telegraph communication is available between the control room and the turbine and boiler houses. At present four 6,600-volt feeders have been connected to their respective cubicles; two additional ones will shortly be laid for supplying the borough, and two for feeding the Leyland area at 11,000 volts are being laid.

The control room is situated on the first floor of the office block overlooking the turbine room. Duplicate synchronising gear is provided, and a voltage regulator, the alternators being fitted with Merz-Price protective gear and the feeder circuits with overload time limit and leakage trip relays.

The d.c. switchboard consists of twenty-four panels, and controls the supply from the steam-driven house set, motor generators, and storage battery with duplicate bus-bars. The chief sub-station is in Crown Street, where a portion of the old steam generating plant has been removed to make room for two rotary converters of 500-kW and two of 1,500-kW capacity; a third set of 1,500 kW is on order. Rotary converting plant has also been installed at the old tramway generating station at Deepdale, and sub-stations have been equipped on the premises of large consumers, including th English Electric Co.' works* and Greenbank Mill A new static sub-station ha recently been equipped t supply the Ribbleton dis trict, where the forme three-wire d.c. network ha been changed over to three phase.

The step-up transformer of 8,900 kVA capacity, re quired for the 33,000-vo transmission line to inter connect the Ribble an Blackburn stations, will b placed in an outdoor sub station to the east of th power station. For this lin an induction regulator t give a 10 per cent. plus c minus boost will be em ployed for interchange c current, and an earthin transformer is to be installed to enable the 6,600-vo

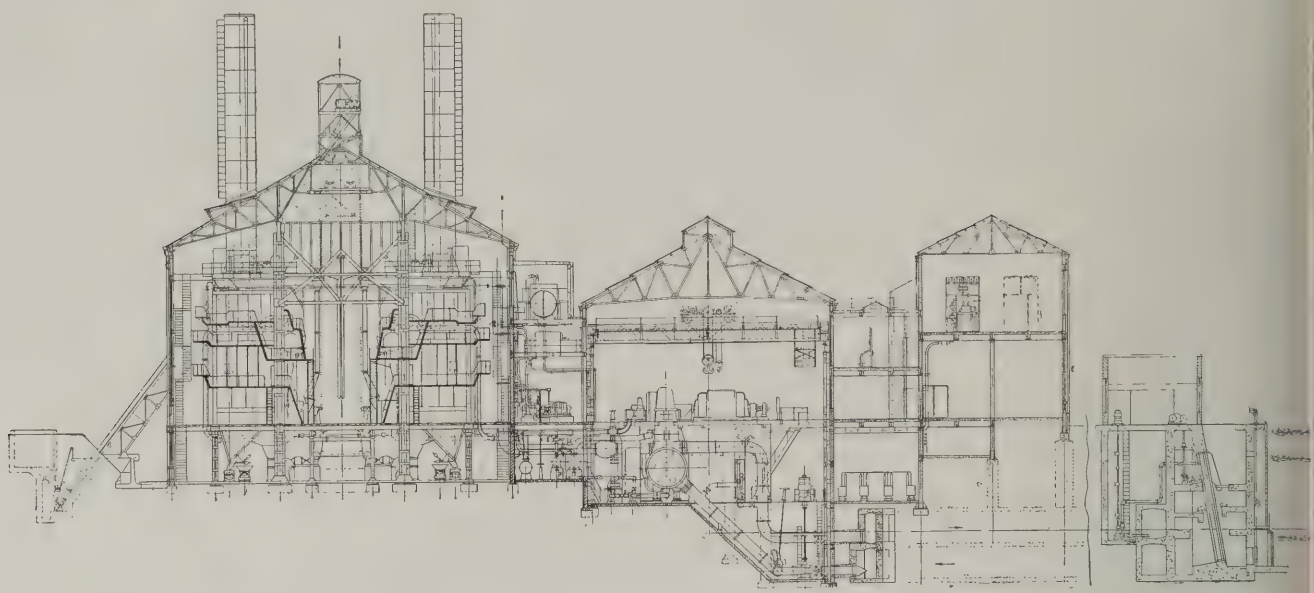


Fig. 9.—Sectional Elevation; New Ribble Power Station.

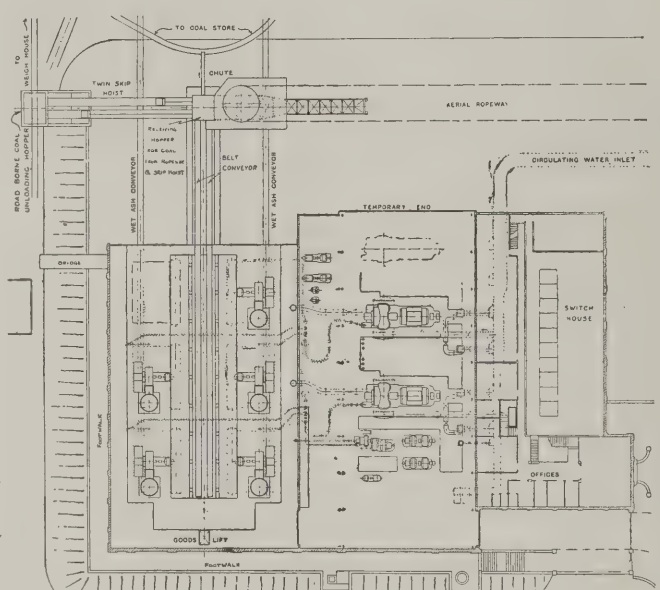


Fig. 10.—Plan; Ribble Station.

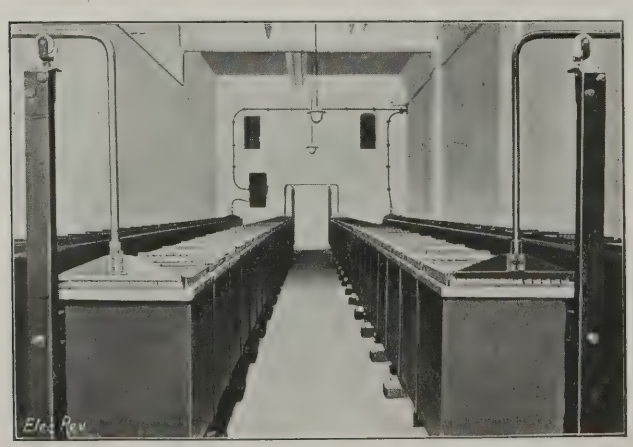


Fig. 11.—A 106-Cell Chloride Battery.

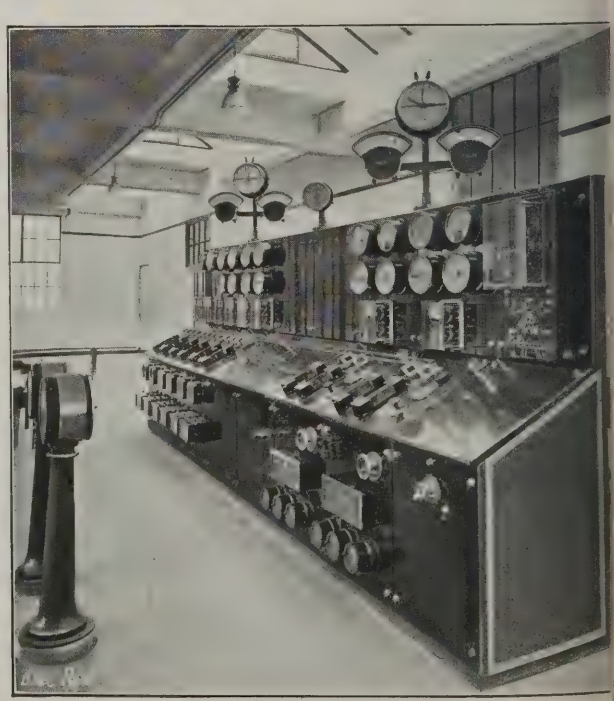


Fig. 12.—Switch Control Desk.

* See Elec. Rev., July 24th, 1925, p. 145.

stem neutral to be earthed when either station is shut own and receiving its full supply from the other.

n the later stages the consulting engineer received luable assistance from Mr. J. F. Simpson, borough ctrical engineer, and his staff. Mr. James Barron, bble engineer, supervised the preliminary excavation the site and the river bed, and the formation of the proach roadways.

The Opening Ceremony.

Sir John Snell, G.B.E., Chairman of the Electricity Commissioners, was Preston's distinguished visitor on July 22nd, hen he officially opened the new station. Accompanied by dy Snell, he privately inspected the station during the morning with Councillor E. A. Heaney, Chairman of the Preston ectricity Committee, and local officials. Later, there was other inspection by Mid-Lancashire civic officials, representatives of chambers of commerce, and industrialists numbering out 200, who assembled in the turbine room to witness the remony. The Mayors of Salford, Blackburn, and Lytham-St Annes attended along with Preston's Mayor and Mayoress, e Town Clerk, Councillor Heaney, Alderman T. Parkinson airman and vice-chairman of the Electricity Committee), d Messrs. J. F. Simpson (borough engineer), J. A. Robertson nsulting engineer), A. R. Dickinson (assistant engineer), and Shipton Wood (resident engineer).

Severing a silk ribbon, Lady Snell freed the stop valve of the bine and was presented with a bouquet by the Mayoress. John Snell then started the station. The Mayor presented dy Snell with a silver rose bowl.

The distinguished company at the luncheon included Mr. L. Pearce (of the Electricity Commission), Mr. W. L. chens (deputy chairman of the English Electric Co.), Mr. B. Woodhouse (president of the Institution of Electrical gineers), and Lieut.-Col. F. A. Cortez-Leigh (L.M. & S. ilway).

Sir John Snell trusted the new scheme would bring increased sperity to the locality; the new station would so affect cost t many industries not hitherto able to afford supplies from blic sources would be glad to take it. The Preston station s a model of what a new station should be. Some critics ght think it expensive, but they had had to deal with a ft. rise and fall of the river, a transporter arrangement for conveyance of coal across the river, &c., and though the tion would cost £19 per kW, another generating set (for ich the building was prepared) would reduce the average t to £15. He was told that when the next stage was carried , the cost would be reduced to about £13 per kW.

Sir John added that the day of small isolated stations was ing to a close. The English Electric Co., directly the Corration put the large station into action, arranged to take whole of its supply from the new Ribble station, a move ich pointed the direction in which things were trending. t of nearly 500 public generating stations, fewer than 100 tained 2,500,000 kW of plant and the other 300 or so had ongst them 600,000 kW. They would thus get an idea of relative importance of the few to the many. Last r municipalities produced two-thirds of the total elecal output of the country, and it was to them and other undertakings that the Commissioners looked for istance. Last year 68 per cent. of the electrical plant in s country was represented as spare, equivalent to a sum of million pounds sterling. That was the result of their policy the past of keeping stations independent of each other; it s waste of capital for which the consumer had to pay. If re had been less money expended on spare plant, and more n transmission, it would have had an all-round benefit.

On behalf of the electrical contractors, Sir John asked Councillor Heaney (Chairman of the Preston Electricity Committee) accept a memento of the opening in the form of a silver ver.

Councillor Heaney, in accepting the gift, said it had required breadth of vision to take the steps preliminary to the tion of the station. Having decided to erect it the Corration began to hunt for a load and made overtures to some the large cotton mills and power users generally, and then uced prices, but the results had more than justified their rts. They had paid approximately £300,000 for the undertak-; spent upwards of £450,000 on the Ribble station; and a ther £100,000 on mains, services, and equipment. They lt and equipped sub-stations, changed over districts from to a.c., and managed each year not only to meet the rapidly reasing costs, but to pilot the ship home to harbour with a fit in hand. They had increased the £68,000 gross income he undertaking in 1922 (when they took it over) to £105,000. year, and he believed this year it would reach £130,000. es at the time of purchase were just over 3,000,000 kWh: year they were over 8,000,000 kWh. They had 1,950 new sumers, and as a result of an exhibition last year 500 cookers been installed, or were on order. Some 33 miles of disution mains had been laid; the demand had increased from 0 to 4,500 kW, and they had entered into contracts ensura demand of over 10,000 kW during the winter. Further tracts would raise their maximum demand for 1926 to 00 kW, so that simultaneously with the official opening of station they had called a meeting of the Council the following day to consider installing a further 12,500-kW set.*

*At a cost, we understand, of £90,000.—Eds. Elec. Rev.

Alderman Astley Bell (cotton-manufacturer) proposed "The Contractors," and Mr. W. L. Hichens (deputy chairman, English Electric Co.), in responding, said the electrical industry was one of the few which had extended its export trade since the war—a great achievement, and it was in the interests of the country that such export should be maintained.

The staff and employés of the Preston Corporation electricity department marked the opening of the station by presenting Mr. J. F. Simpson, borough electrical engineer, with a silver cigarette box and Mrs. Simpson with a silver-plated coffee service and electric percolator. The gifts were handed over on July 23rd as a token of the esteem of the workers for their chief. Mr. D. S. Wood (resident engineer) presided and the presentations were made by Mr. Sydney V. Askew, the youngest and most recent addition to the power staff. Mr. Simpson suitably responded.

Tramway and Railway Notes.

Bradford.—Passenger Siding.—The Tramways Committee has approved a scheme for the construction of a tramway passenger siding close to the causeway in Town Hall Street, at an estimated cost of £1,826.

Continental.—France.—A project for the construction of a suspended electric railway between Paris and the suburb of St. Denis, a distance of about 3¼ miles, has been approved by the Seine Department Authorities. The cars would, it is stated, be constructed of aluminium and would be suspended from a rail at an average height of 56 ft. from the ground.

During June the French Southern Railway Co. converted the Lannemezan-Dax transmission line from 60,000 V to 150,000 V. It is claimed that this is the first line that has been put into operation in Europe at such a high pressure. The line forms part of the company's network which is to supply the railway lines of the company and private industries situated in the district of Bordeaux.

Negotiations are in progress between the Société Electrique Lille-Roubaix-Tourcoing and the municipal authorities of Mouscron regarding the electrification of the light railway between the Belgian frontier and Mont-a-Leux and the railway station at Mouscron and so form a new Belgian connection with the French railway system.

Russia.—*Tramway Electrification.*—The Soviet Government has recently placed a contract with the Elin Gesellschaft, of Vienna, through the Austro-Russian Industry Co., for the electrification of the steam tramway between Baku and Surahani.

Italy.—It is reported from Naples that, owing to the demand for electricity being greater than the supply, the municipal authorities have recently shut down a number of the electric tramway services in the town.

Greenock.—Non-Purchase Decision.—The Corporation is recommended to intimate to the Tramway Co. that it does not intend to exercise its option to purchase the undertaking when the lease expires in 1928; and that it is willing to negotiate as to the terms and conditions upon which a renewal of the lease might be granted.

Huddersfield.—Tramway Licences.—The Watch Committee has granted licences to the Yorkshire (Woollen District) Electric Tramways, Ltd., in connection with a service between Huddersfield and Dewsbury, *via* Bradley, Mirfield, and Ravensthorpe.

India.—Bombay.—*Local Electrification.*—The B.B. and C.I. Railway Company has set aside nearly Rs. 7½ crores exclusively to be devoted to works in connection with the Bombay Local Service, and of this amount the equipment, including rolling stock, necessary for the introduction of an electric service, will require Rs. 2 crores approximately. The distance to be electrified in the first instance, that is the line from Church Gate to Borivli, is 21¼ miles. It is hoped to finish the work by January 1st, 1927.

London.—Underground Scheme.—A scheme, involving an expenditure of £25,000,000, to provide a network of goods railways below the level of the present district system and linking up all the big termini and market centres in the Metropolis, is proposed by a party of American and English financiers who have just completed the preliminary plans.

Underground Interruption.—A defect on the supply system caused an interruption on the northbound service of the Bakerloo Railway between the Elephant and Castle and Piccadilly on July 22nd shortly after 10 o'clock. Trains running north from the terminus at Elephant and Castle were delayed while the defect was remedied. After a delay of about 30 minutes the service was restored.

Middlesbrough.—Loan Sanctioned.—Application has been made to the Ministry of Transport for permission to borrow £933, which is one-third of the total amount of £2,800 required in respect of the extension of the Tees-side Railless Traction Board's undertaking. Sanction has been granted to borrow £588 as the Corporation's proportion of the cost of a new petrol-electric trolley vehicle for use on the railless traction system.

Sunderland.—Conversion to 'Buses.—The Sunderland District Tramways have made a complete change-over from trams to motor-'buses, and the track and overhead tramway equip-

ment are being dismantled. Bolton Corporation has bought eight of the discarded tramcars and Grimsby Corporation has bought 16. The company has now a fleet of 58 motor-'buses covering a much wider area than the trams served.

United States.—RAILWAY ELECTRIFICATION.—The New York Central R.R. has been ordered by the Public Service Commission of the State of New York, says the *Railway Review*, to submit plans and specifications on or before September 1st, 1925, covering the electrification of its line from Spuyten Duyvil Creek to and including the 60th Street yard in New York City. Under the Order the New York Central is also required to submit on or before September 1st a statement of the detailed plans showing the method by which it will electrify its lines in New York City south of the 60th Street yard. The Commission granted an extension of time until September 1st in which plans for the electrification of the Putman Division and the Saw Mill River branch are to be filed.

West Hartlepool.—EXTENSION OF SPECIAL ORDER PERIOD.—The Minister of Transport has directed that the periods stipulated for the commencement of the works and for the completion and opening for public traffic of the tramway authorised by the West Hartlepool Corporation Tramway Order, 1912, shall be prolonged so as to expire on August 7th, 1926, and August 7th, 1927, respectively.

Telegraph and Telephone Notes.

Radio Navigational Aids.—COMMITTEE OF INQUIRY.—The Board of Trade Committee which is to inquire into the use of wireless in navigation will, says *The Times*, be as follows:—Sir R. Burton Chadwick, M.P. (chairman), Wing-Commander G. P. Grenfell, R.A.F., Mr. S. J. Lister, Commander F. Loring, R.N., Vice-Admiral G. R. Mansell, the Hon. Alexander Shaw, Captain J. R. Somerville, R.N., and Mr. J. R. Willis (secretary). The terms of reference are "... to advise the Board of Trade regarding the development in the United Kingdom of the service of wireless direction-finding stations, wireless beacons, and similar aids to navigation, and the location and types of such stations to be maintained."

Storm Damage.—Nearly 10,000 telephones were put out of action by the thunderstorm which broke over Paris during the evening of July 24th. The Ségur exchange subscribers were entirely cut off owing to the bursting of a sewer, and the Fleurus and Vaugirard exchanges were seriously affected. The lines of the Bourse and most of the Government offices have been restored, says *The Times*, but repairs to the Ségur exchange will take some days.

Storms also interfered with the service in this country last week. In the London area 1,200 lines were out of action, Ilford with 250 having the largest total. Of the Continental lines, most damage occurred to the Paris service, eight of the 16 lines developing faults, and one of the three lines to Antwerp was damaged. In the inland trunk service, 188 lines out of 830 were out of action.

The Telegraph Service.—DEFICIT.—When the Post Office estimates came under review in the House of Commons recently, the Postmaster-General stated that the telegraph, from the financial point of view, was the least satisfactory of the Department's services. Last year's deficit amounted to £1,300,000, which, he said, was due to the competition of the telephone service. The number of telegrams sent last year by Government Departments was only half the previous year's total.

The Telephone Service.—LARGE PRIVATE AUTOMATIC SYSTEM.—On July 27th, a large private automatic telephone exchange system was opened at the head office of the Port of London Authority. In addition to its size, a feature is the complete provision of inter-communication facilities over the very wide area covered by the dock system of the Port of London, which extends from London to Tilbury on the north side of the river and to Gravesend on the south. Each of the five dock groups has direct communication with the Post Office exchange system, and a telephone directory has been prepared by the P.L.A. giving particulars of the lines joined up by this automatic system.

TELEGRAPH MONEY BILL.—The Telegraph Money Bill, 1925, which came before the House of Commons last week, will authorise the issue of £30,000,000, which, when added to the unexpended balance available from the Act passed in 1924, will meet the capital requirements of the telephone service for about three years. *The Times* reports Sir W. Mitchell-Thomson, Postmaster-General, as having said that he had deliberately adopted the policy of laying down a programme over a period of years in the interests of the efficiency of the Post Office and of the industry concerned. He had in hand £9,400,000, which would make up a total of £39,400,000. It was intended to spend in three years £35,000,000, which would leave a balance in hand on April 1st, 1928, of £4,400,000, or, at the rate of £1,000,000 a month, about 4½ months' supply. He proposed to spend £2,500,000 during next year on the extension of the underground system. At present, in proportion to the length of the telephone service, they had got as much wire underground as the United States, if not more.

PUBLIC KIOSKS.—It is proposed to erect telephone kiosks for public use at several points in Golders Green and Hendon.

Radio Notes.

Daventry Station Opened.—On July 27th, Sir W. Mitchell-Thomson, Postmaster-General, inaugurated the new high-power broadcasting station in Northamptonshire. Situated practically in the geographical centre of England and on the summit of Borough Hill (1½ miles from Daventry) which is 600 ft. above sea level, the two lattice steel masts are 500 ft. high, so that the aerial is about 1,100 ft. above sea level. The call sign remains 5XX and the wave-length 1,600 in., while the mean input to the plates of the magnifying valves will be 25 kW, which power can be augmented when necessary.

Russia.—RADIO DEVELOPMENT.—Russia, through a broadcasting company operating on similar lines to the B.B.C. in this country, is making a bid to become one of the leading European countries using wireless for entertainment purposes. The Russian broadcasting company has nothing to do with the Soviet Government beyond working under a concession which has been granted to it, and at present it has six stations in operation—four in Moscow and one each in Leningrad and Kiev, South Russia. According to the *Evening News*, representatives of the company have recently been in England buying apparatus. The principal station in Moscow, where there are 300,000 licensed listeners, was formerly the old Russian Post Office station, and transmits on a wave length of 1,... metres at a power of 12 kW. Work is already in hand to construct this station and increase its power to 50 kW in the aerial. This work will be finished by September, and during the next few weeks four other stations, now nearing completion, are to be opened. Two will transmit at 4 kW and two at 2 kW. Then before next March no less than 30 other broadcast stations are to be erected.

Time Signals.—NEW CODE.—One of the principal objects of the International Service of Wireless Time Signals is to ensure that no ship, in whatever remote seas she may be sailing, shall ever be out of reach of them. The co-ordination of such signals can only be attempted by an international authority, and the International Astronomical Union's *Commission de l'Heure* met on July 17th for a critical discussion of the relative merits of the various codes and the times at which they should be transmitted, particularly in Western Europe. The decisions have not yet been officially announced, but *The Times* understands that it has recommended the abolition of the old Paris code as still transmitted from FL at 10.45 a.m. and p.m. ... the adoption of the International Code with the difference that in place of the last three dashes, each of the three minutes shall end with the six dot seconds as transmitted by 2... This scheme was brought forward by the British Horological Institution, whose chairman, Mr. Frank Hope-Jones, is responsible for the original suggestion and arrangements for broadcasting the Greenwich dot seconds.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—September 14th. State Electricity Commission. 3,000-kVA transformers and spares.*

State Electricity Commission. September 21st. 250-kVA 22,000-V transformers and spares.

September 15th. Postmaster-General's Department. (Sch. C. 36). Telegraph equipment. Tender forms from High Commissioner, London.

NEW SOUTH WALES.—New South Wales Railways. Oct. 7th. One 20,000-kW turbo-alternator for White Bay power house.

NEWCASTLE.—September 22nd. Caledonian Collieries, Ward-Leonard electric winding engine for Aberdare cer... colliery complete with balancer, exciter, and the neces... switchgear.

Bristol.—August 10th. Docks Committee. Four 3... movable electric jib wharf cranes for the Royal Edward D... Avonmouth. Spec. (£3) from Mr. T. A. Peace, chief engi... Avonmouth Docks.

India.—August 5th. India Store Department. Ele... ceiling and table fans. (July 24th.)

August 11th. 313-kVA 3-phase alternators and exciters ... accumulator cells. (July 24th.)

Kettering.—August 28th. Electricity Works. One ... ing tower and tank circulating water pipes. (See this is...

London.—ST. PANCRAS.—September 3rd. Electricity Dep... ment. One 10,000-kW steam turbine, alternator, conden... plant, pipes, &c. (July 17th.)

ST. MARYLEBONE.—August 31st. Highways Departm... One 200-kW turbo-alternator set with surface condenser ... auxiliaries; one second-hand 200-kW, 200/220-V d.c. ge... tor set. (July 17th.)

August 26th. METROPOLITAN ASYLUMS BOARD.—Install... of additional electric lighting at North-Eastern Fever Hosp... Tottenham. (See this issue.)

Manchester. — August 7th. Electricity Department. Three-phase, 6,600-V switchgear for Dickinson Street and 3,600-V switchgear for Bowker Vale. (July 17th.)
August 18th. One water-tube boiler, &c. (July 24th.)
August 11th. Tramways Committee. Supply and delivery of steel girder tramway rails, steel fishplates, steel clip plates and coach screws. Specifications and forms of tender from Mr. H. Mattinson, general manager, 55, Piccadilly, Manchester.

Newbury.—August 10th. Board of Guardians. Electrical generating plant at the Poor Law Institution. (See this issue.)

Newport (Mon.).—August 15th. Electricity Department. Ferro-concrete foundations for a 10,000-kW turbo-alternator and condensing plant, and one 49/50-ton engine-room crane, &c. (July 24th.)

New Zealand.—WELLINGTON.—September 22nd. Post and Telegraph Department. Bituminous tape.*

Nottingham.—August 7th. Electricity Department. One 10,000-kW turbo-alternator, with exciter, condenser, air pumps, oil coolers, air coolers, and auxiliary plant. (July 17th.)

Oban.—August 4th. Town Council. Electric lighting work at six blocks of houses. Specifications from Burgh Surveyor.

Preesal.—August 17th. Urban District Council. 6,600-V cables, l.p. distribution and service cables, including excavation and reinstatement. (July 24th.)

Shipley.—August 5th. Education Committee. Installation of electric light at four Council schools and the Salt High Schools. (See this issue.)

South Africa. — JOHANNESBURG. — September 3rd. South African Railways and Harbours. Five 4-wheeled traversers and two tractors.*
October 13th. Electricity Supply Commission of South Africa. Equipment and buildings for an electric power station at Durban:—Complete boiler-house equipment, also other plant and piping; boiler-house installation, including pulverised fuel equipment with buildings, piping and other plant; steel frame buildings; overhead electric travelling crane; coal and ash-handling plant; two 12,000-kW turbo-alternators; condensing plant and auxiliary apparatus; transformers for power station; and switchgear and auxiliary plant. (See this issue.)

BULAWAYO.—September 29th. Municipal Council. Plant for the extension of the electricity works.*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room) 35, Old Queen Street, S.W.1.

Closed.

Australia. — SYDNEY. — Electricity Committee. Recommended:—
30,000 electricity meter coils (£599).—Weldon Electric Supply Co., Ltd.

Bexhill.—Electricity Committee. Recommended:—
Cable: Enfield Cable Works (£305); British Insulated & Helsby Cables, Ltd. (£385 12s. 2d.).
Meters, about 700.—Electrical Apparatus Co., Ltd.

Birkenhead.—Electricity Committee. Accepted:—
Six miles 7/16 single-core cable (£179 5s. per mile).—Liverpool Electric Cable Co., Ltd.
Two 200-kVA transformers (£199 10s. each) and two 150-kVA transformers (£172 each).—English Electric Co., Ltd.
Switchgear at New Ferry and Bebington sub-stations (£1,054).—Metropolitan-Vickers Electrical Co., Ltd.

Birmingham.—Education Committee. Accepted:—
Electric lighting of elementary schools.—Alston Road, Bordesley Green (£580), Messrs. Lewis & Hall; Witton Lodge, Erdington (£734), Messrs. Lea, Son & Co., Ltd.

Bradford.—Electricity Committee. Accepted:—
Extension of Odsal sub-station building.—Thos. Obank & Son, Ltd.
25-ton lifting gear for transformers at Valley Road works and Thornbury sub-station.—Herbert Morris, Ltd.
1-ton cable trailer.—R. A. Dyson & Co., Ltd.

Bolton.—Corporation. Accepted:—
Meters.—The Edison Swan Electric Co., Ltd.

Cheltenham.—Electricity Committee. Accepted:—
Cables.—British Insulated & Helsby Cables, Ltd.
Meters.—Metropolitan-Vickers Electrical Co.

Chester.—City Council. Accepted:—
Meters.—The Edison Swan Electric Co., Ltd.

Chesterfield.—Electricity Committee. Accepted:—
5,500 yd. distributor cable.—British Insulated & Helsby Cables, Ltd.

Colchester.—Education Committee. Accepted:—
Installation of electric light at St. John's Green School (£106).—E. Bailey.

Dunstable.—Town Council. Accepted:—
Wiring houses for electric light at £6 per house.—Mr. S. F. Goodwin.

Hawarden.—The Hackbridge Electric Construction Co., Ltd., informs us that the R.D.C. order for sub-station transformers has been placed with it, and not as already reported.

Irish Free State.—DUBLIN.—Contracts placed by the Controller of Stores, Department of Posts and Telegraphs during June, 1925:—
Bronze wire.—F. Smith & Co.
Copper wire.—R. Johnson & Nephew.
Electric motor.—Metropolitan-Vickers Electrical Co., Ltd.
Insulators.—W. F. Dennis & Co.; Taylor, Tunnicliffe & Co., Ltd.; Wm. J. Kellie.
Telegraph accessories.—Murray Printing Telegraph Systems, Ltd.; J. Carpentier.
Telephone accessories.—India Rubber, Gutta Percha and Telegraph Works Co., Ltd.; J. McMillan & Co.; J. Thompson.
—*Irish Electrician.*

Post Office. Accepted:—
Dry cells.—The Edison Swan Electric Co., Ltd.

Leeds.—Electricity Committee. Accepted:—
Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£7,664); Enfield Cable Works, Ltd. (£2,771); Macintosh Cable Co., Ltd. (£1,974).
Sub-station at Armley (£480).—Messrs. J. Ferguson & Son, Ltd.
Sub-station at Quarry Mount (£465).—Mr. S. J. Flockton.

Lewes.—Education Committee. Accepted:—
Wiring schools for electric light (£137).—Mr. H. J. Galliers.

London.—POPLAR.—
The Electricity Committee recommends placing with International Combustion, Ltd., as prime contractors, the following orders for the extension at the electricity works:—
Main buildings (£23,505); foundations (£3,410).—Mitchell Conveyor Co.
L.p. main switchboard (£2,360).—George Ellison.
Wiring of motors (£1,675).—W. T. Glover & Co., Ltd.
Maconite cable, &c. (£910).—International Combustion, Ltd.
Distribution boards (£820).—Parmiter, Hope & Sugden, Ltd.
Station lighting (£625).—International Combustion, Ltd.
Motors, &c. (£122).—Veritys, Ltd.
Starters and gear (£177).—Brookhirst Switchgear, Ltd.
Modification of one boiler (£350).—Vickers Spearing Boiler Co., Ltd.
Treatment of circulating water (£340).—Paterson Engineering Co., Ltd.
Ash sluicing equipment (£1,490).—Underfeed Stoker Co., Ltd.
Surge and storage tanks (£1,056).—International Combustion, Ltd.
Additional batteries (£722); switchgear (£25).—Hart Accumulator Co., Ltd.

GREENWICH.—Board of Guardians. Accepted:—
Installation of electric light in the West Block of the Institution (£319).—Electrical Installations, Ltd.

Perth.—Electricity Committee. Recommended:—
New economiser for the electricity works.—E. Green & Son, Ltd.

Stoke.—Electricity Committee. Accepted:—
Electrical interlocks for conversion sets at Longton and Stoke sub-works (£53 each station).—Metropolitan-Vickers Electrical Co., Ltd.
New battery for electric vehicle (£172).—Chloride Electric Storage Co., Ltd.
L.p. switchgear (£803).—Berry's Electric, Ltd.
Wiring at central power house extension (£1,142).—Barnett & Soans.
Grab crane (£3,091).—Alex. Jack & Co., Ltd.
Two 25-kVA transformers (£116).—Metropolitan-Vickers Electrical Co., Ltd.

Warwick.—Board of Guardians. Accepted:—
Installation of electric light at the Infirmary (£497).—Ellis & Ward, Ltd.

Forthcoming Event.

Institution of Electrical Engineers (London Students' Section).—Summer Meeting in London. July 25th to August 1st.

Notes.

Wireless Societies.—At the invitation of the Committee of the Wireless Section of the Institution of Electrical Engineers, Mr. James Nelson was present at a meeting of the Committee held on July 25th, when the question of a suggested new wireless society was discussed with him. A statement on the subject will shortly be published, but it is stated that the definite conclusion has been arrived at that there is no need for a new body.

New Belgian Electro-Technical Association.—The Comité Electrotechnique Belge has been formed by representatives of various electrical associations in Belgium to represent Belgian interests on the International Electrotechnical Commission and to deal with electrical standardisation questions in Belgium.

British Engineering Standards Association. — The B.E.S.A. held its 7th annual general meeting on July 9th, when the chairman, Sir Archibald Denny, Bart., took a more hopeful view of affairs than was possible 12 months ago. The balance sheet showed that the deficit carried forward from the previous year had been reduced from over £1,900 to £677; he regretted, however, that owing to there being at the present time no further funds for the purpose, the valuable work of translating the British standard specifications into foreign languages and disseminating them abroad had had to cease.
For some time past the Association has had under consideration suggestions for widening the scope and influence of its work, and we are now informed by the secretary, Mr. C. Le Maistre, that the Main Committee has decided to enlarge the membership, so as to enlist the active support of professional engineers, industrial firms, and business men connected with all the great industries of the country, who are invited to become members at a minimum annual subscription of two guineas. Technical and trade organisations connected with the work of the B.E.S.A., as well as public utility undertakings, are also eligible, while the members of the Technical

Committees, who give their time and experience to this national work without fee or recompense and who now number some 2,300, are in future to be known as honorary members. All members will be entitled to privileges, including direct representation on the Main Committee through a duly elected Advisory Council, as well as being able to apply to the organisation for advice on any matters of simplification or standardisation as carried on in this country and in the other large producing countries. Present contributors are being invited to become members without additional fee and are being asked to maintain their present contributions.

As an E.C.A. representative of the B.E.S.A., Mr. W. R. Rawlings, in an appeal for new members, points out that the annual report contained some interesting figures; for instance, the number of committees was 474; members of committees numbered 2,294; the number of new and revised specifications issued during the year was 54; the sale of specifications increased during the year by over 10,000; and the total sale of specifications per year amounted to 54,405.

The carrying out of the above, including the working of the whole organisation, cost only £16,729, which Mr. Rawlings thinks all must agree, shows that the B.E.S.A. is one of the most economical associations in existence.

Appointments Vacant.—Shift charge engineer, for Lancaster Corporation electricity department; assistant shift charge engineer, for St. Marylebone Council electricity department; Diesel engine fitters, for the Gold Coast Government Railway (£380-£12-£480 per annum); boiler house assistant engineer and two junior generation assistants, for the Hull Corporation electricity department; clerk for the Sevenoaks and District Electricity Co., Ltd. The Walsall Corporation is advertising for a tramway manager to succeed Mr. C. Burgess, who is leaving for an appointment in the East The salary offered is £800 per annum, rising by £50 per annum to £900. (See our advertisement pages to-day.)

American Electric Vehicle Progress.—Endorsing the sales promotion campaign conducted last year by the Society for Electrical Development, representatives of all the leading electric truck and battery manufacturers in America at a recent meeting in New York subscribed a tentative budget of £5,000 for a similar campaign for 1925. A well-defined programme of sales promotion, embracing the preparation and distribution of special articles for trade journals and newspapers, will be put into effect. There will also be special studies dealing with the logical relation of central stations to the electric truck industry. During the past four years the number of electric trucks in use in the United States is said to have shown an increase of 64 per cent.

It is announced from Detroit, U.S.A., that Mr. Ernest M. Howe, who is described as a British transportation expert, has been elected president of the Gray Motor Corporation, and that the concern has obtained exclusive manufacturing rights in America for Tilling-Stevens petrol-electric 'buses, all parts of which, except the electrical equipment, are to be made in the United States.

Second World Power Conference.—In continuation of the work initiated by the First World Power Conference at Wembley last year the *Financial World* announces that the International Executive Committee held its first meeting, under the chairmanship of Mr. D. N. Dunlop, director of the British Electrical and Allied Manufacturers' Association, in London on July 27th. Twenty countries sent representatives, among them being the United States, India, Canada, Australia, New Zealand, France, Germany, Italy, Holland, Switzerland, Sweden, Russia, Norway, Denmark and China. Mr. O. C. Merrill, secretary of the Federal Power Commission, was the delegate for the United States; M. Tribot-Laspiere, director of the Union des Syndicats de l'Electricite, for France; Mr. Conrad Matchoss, director of the German Engineering Association, for Germany; Mr. J. W. Meares, electrical adviser to the Government of India, for India; Dr. E. Tissot, President of the Swiss Association of Electricians, for Switzerland; Mr. J. G. Bellaar Spruijt, President of the Association of Electrical Companies, for Holland; and Mr. S. Klouman, of the Aluminium Company, for Norway.

South Devon Inquiry.—The Torquay Corporation, the Salcombe, Ashburton and Kingsbridge Urban Councils, and the Newton Abbot and Kingsbridge Rural Councils, were represented at an inquiry opened by Col. T. C. Ekin, chief engineering inspector of the Electricity Commission, at Newton Abbot on July 21st and 22nd, into the applications made by Mr. Raymond Hartree, of Salcombe, for an order empowering him to supply electricity in central South Devon, and by the Teignmouth Electric Lighting Co., Ltd., for a similar order relating to parts of the same rural district. In the case of Mr. Hartree it was said that he was prepared, if his application was granted, to give a bulk supply to Teignmouth; he did not wish to hamper the Teignmouth undertaking, but when he had done the work and spent the money it was not fair for a company to come in at the eleventh hour and be granted the cream of the area. It was cheaper to run the gas and electricity undertakings together rather than separately, and he had already spent £4,500 in connection with the order. He also had an option to purchase the Dartmoor Electricity Supply Co. Mr. Uttley, of Sir Charles Bright and Partners, Ltd., gave details of the work necessary to be carried out by Mr. Hartree under the proposed order, the total cost involved being £96,700.

For the Teignmouth Electric Lighting Co. it was said tha Mr. Hartree's application was two years old, and the Teign mouth Co. had been held up very considerably by the fac that a competing application was in existence. The Teign mouth Co. was anxious in the autumn of last year to lay cable between Torquay and Teignmouth, and but for Mr Hartree's application being in existence might have laid main last year. As a result of not being able to do this som temporary plant had to be put down. It was urgent tha the company should get permission to lay a cable now be tween Torquay and Teignmouth. If it could not do this would have to put down more temporary plant. The Teign mouth Co. considered that as it was taking energy from To quay it would be a natural sequence and in the interests the area it desired to serve that it should have this order. Th company was anxious to supply Shaldon, which had no ga supply, and was going to take a main over there this year it could. At Teignmouth the company had four 60-h.p engines or four 40-kilowatt sets, and one 10-kilowatt set, total of 170 kilowatts. The demand last winter was 142.2 kil watts, and the company was estimating for 190 kW by Chris mas next and 400 kW in four years. It was proposed to charg 10d. per kWh for lighting in the extended area, provided n abnormal circumstances arose, and 5d. for power, with di counts for large users.

It was suggested that £6,000 would be a very generous off for the Dartmoor Electricity Supply Co.'s concern, and reply, for Mr. Hartree, it was pointed out that the Teignmout Co. was hardly larger than the Dartmoor Co.

Subsequent to the ending of the inquiry, Col. Ekin made tour of the districts concerned.

Institution Notes.

Institute of Metals.—The programme of the annu autumn meeting has just been issued. The meeting ope in Glasgow on September 1st with a lecture by Sir Jo Dewrance, K.B.E., on "Education, Research, and Standard sation." The mornings of September 2nd and 3rd will devoted to the reading and discussion of sixteen papers deali with many differing aspects of metallurgical work. In t afternoons visits will be paid to works in the Glasgow distri and in the evening of September 2nd a reception is to be giv by the Lord Provost and Corporation of Glasgow. The co cluding day of the meeting, September 4th, is set apart for visit to the Trossachs and Loch Lomond.

Institution of Electrical Engineers.—Society of Rad graphers.—The Council of the Institution of Electrical En neers, which took an important part in founding the Society Radiographers in 1920, and under that Society's constituti has hitherto nominated six out of the eighteen members of t Society's Council, has withdrawn its nominees and terminat the Institution's connection with the Society. This action h been taken because the majority of the Council of the Soci of Radiographers has resolved upon certain alterations of t Society's articles, with which the Council of the Institution in entire disagreement, as in the I.E.E. Council's opinion th alterations will materially lower the professional status of n medically qualified radiographers.

Institution of the Rubber Industry.—The final for t Wallwork Challenge Cup, under the auspices of the Golf S tion of the Institution, was played off at Sunningdale on J 17th, the winner being Mr. E. A. Utley (Birmingham). H. Standring, in presenting the cup, regretted the absence Col. Wallwork and Mr. J. H. C. Brooking, a vice-president the Institution.

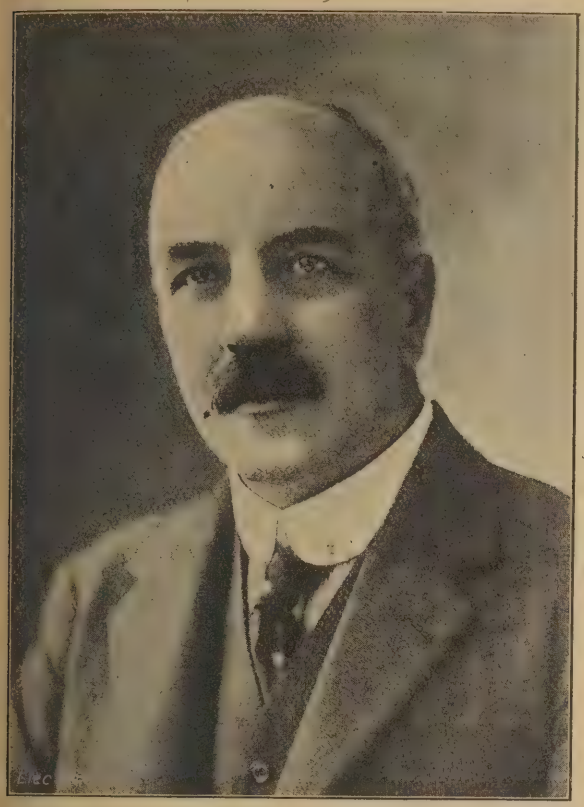
Royal Society.—Summer Conversazione.—The Society h its second soirée of the year at Burlington House on July 22 and was honoured with an afternoon visit from the King a Queen, who examined the exhibits and were present at lantern lecture by Mr. F. E. Smith on "Navigational Device A source of interest to their Majesties was the display "Telephotographs" (see Elec. Rev., July 24th, 1925).

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

Mr. Joshua Kidd Bruce, whose appointment as gen manager of the London County Council Tramways Departm in succession to Mr. A. L. C. Fell, was confirmed at the Cou meeting last week, is 53 years of age. Mr. Bruce, for greater part of a year during the war, while Mr. Fell absent owing to illness, was in charge of the tramway syst The General Purposes Committee, in reporting that it wa the best interests of the service that he should be appoin general manager said:—"He has had intimate experience the working of the Council's system as traffic manager 15 years, and as deputy chief officer of tramways for 6½ ye He is a member of the Council of the Institute of Transp and from November, 1919, to January, 1925, was a mem of the Sub-Committee of the Advisory Committee on Lon

Traffic which dealt with traffic regulations. We are informed that for the last six months Mr. Bruce has been very successful in operating the Council's tramways, and has initiated several improvements of a striking character which have effected considerable saving. We have no hesitation in recommending Mr. Bruce for the appointment."



[London. & A. Photos]

Mr. J. K. Bruce,
General Manager of the L.C.C. Tramways.

The address of Mr. O. C. WAYGOOD, hon. secretary of the Mersey and North Wales (Liverpool) Centre of the I.E.E., is now Astbury, Forest Road, Meols, Hoylake, Cheshire.

Mr. W. WEEKES, chief assistant electrical engineer under the Shoreditch Borough Council, has been appointed borough electrical engineer, on probation for a period of twelve months, at a salary of £850 per annum, in succession to Mr. C. Newton Russell, who is retiring at the end of the year. Mr. Weekes has been in the service of the Council, or the Vestry which preceded it, since 1897.

Captain A. D. NEWBURY has resigned from the staff of Messrs. Sparks & Partners, consulting engineers, on appointment as chief assistant engineer to the Notting Hill Electric Lighting Co., Ltd.

The Hon. A. G. V. PEEL has joined the board of the Globe Telegraph and Trust Co.

Mr. HERBERT W. WATTS, who, as stated last week, has been appointed electrical engineer to the Epsom Urban Council, is power station superintendent in the Cheltenham Corporation Electricity Department. There were 92 applications for the post at Epsom.

MR. CECIL GRIFFITHS, who has for the past three years held an appointment in Persia with the Anglo-Persian Oil Co., has been appointed commercial electrical engineer at Calcutta for the firm of Alex. Laurie & Co., London, and he left for India on July 11th.

The German Society of Engineers awarded the Grashof medal—its highest order of merit—to Dr. ING. OSKAR VON MILLER on the occasion of his 70th birthday. Dr. Miller is regarded as the pioneer of hydro-electric work in Germany.

The Halifax Tramways and Electricity Committee has increased the salary of Mr. ROGERSON, the borough electrical engineer, by £120 per annum in order to bring it into conformity with the recognised scale.

On Monday last, Mr. S. L. PEARCE, who has become a member of the Electricity Commission, was honoured at a farewell luncheon at the Town Hall, Manchester. Alderman Nagnall, chairman of the Electricity Committee, presented Mr. Pearce with an illuminated address.

On July 20th, Mr. GUY BURNEY was the principal guest at a dinner held at the New Hotel Metropole, when 26 of his associates representative of the whole telephone industry, met under the chairmanship of Sir Hugo Hirst, Bart., to express their esteem and to bid him farewell on his resignation of the managing directorship of the Sterling Telephone and Electric Co., Ltd. Sir Hugo proposed the toast of the guest of the evening, which was received with musical honours. He then presented Mr. Burney with a six-branch cut-glass candelabra on behalf of the assembly. He remarked that he and most of the guests had known Mr. Burney for a very lengthy period, many of their friendships going back over a period of a quarter of a century, and although their business interests had often been opposed, they had always remained friends. Mr. Burney, in a reply which was reminiscent of his long career, hinted that after enjoying a well-earned holiday he might return to the industry in some capacity or other. Other speeches followed.

Obituary.—MR. G. F. C. PRATT.—The death took place on July 22nd, at Gloucester, of Mr. George Frederick Charles Pratt, who at the age of twenty went to America to develop his experience, and was eventually appointed superintendent of the Bell Telephone Co. at Philadelphia. He returned to England in 1900, and joined the engineering staff of the National Telephone Co. When the undertaking was transferred to the Government he was appointed assistant engineer in the Post Office Telephone Department, at Gloucester, and he retired under the age limit in April, 1924. He was 62 years of age.

New Companies Registered.

Gil-Ray Trading Corporation, Ltd. (207,400).—Private company. Registered July 21st. Capital, £2,000 in 2,000 ordinary shares of 5s. and 1,500 preference shares of £1. Objects: To acquire the undertaking and all or any of the assets and liabilities of Allan C. Gilmour, trading as Gil-Ray Radio Co. and Gil-Ray Trading Corporation, together with the trade mark "Gil-Ray," No. 452,575, and to carry on the business of wireless manufacturers and factors, metal and general merchants, store keepers and universal providers. The life directors are:—A. C. Gilmour, 42, Bacon Lane, Roe Green, Kingsbury, N.W.9, secretary; I. J. Lithauer, 7, First Avenue, Hove, manager (managing director). Qualification (except first directors), £250. Remuneration, £250 each per annum. Registered office: 35, Sicilian House, Southampton Row, W.C.1.

Gilfillan Brothers, Ltd. (207,424).—Private company. Registered July 22nd. Capital, £2,000 in £1 shares. Objects: To acquire the business of Gilfillan Brothers carried on by H. W. Cook at 63, High Holborn, W.C.2, and to carry on the business of manufacturers of and wholesale and retail dealers in wireless apparatus and the components parts thereof, &c. The directors are:—H. W. Cock, 64, Elm Grove Road, Barnes, Surrey; S. M. Forwood, 22, The Drive, Loughton, Essex; C. L. Weller, Bendrose House, Amersham Common, Bucks. Qualification, 200 shares. Remuneration, £260 each per annum. Secretary: S. M. Forwood. Solicitors: Marchant, Newington & Dommett, 27, College Street, E.C.4. Registered office: 63, High Holborn, W.C.1.

Burwood (Concessionaires), Ltd. (207,398).—Private company. Registered July 21st. Capital, £1,000 in £1 shares (500 7½ per cent. cumulative preference and 500 ordinary). Objects: To carry on the business of importers, exporters and manufacturers of and dealers in electrical machinery, wireless receiving and transmitting apparatus, accessories and parts, automobile lamps, kinematograph goods, &c. The permanent directors are:—J. H. Wood, 20, Lesbia Road, Clapton, secretary; L. R. Wood, 20, Lesbia Road, Clapton, electrical engineer; G. Davis, 16, Lamb Lane, Hackney, telegraph engineer. Remuneration of first directors, £50 each per annum. Solicitors: Foster, Grove & Jay, 35, Finsbury, Square, E.C.2.

Continental Radio Import Co., Ltd. (207,450).—Private company. Registered July 23rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in electrical and other instruments, appliances, supplies and components in connection with wireless telegraphy and telephony, and wireless communications, scientific instruments, &c. The first directors are:—S. Kremner, 377, Cheetham Hill Road, Manchester, merchant; I. Kremner, 3, Oakfield Street, Cheetham Hill, Manchester, merchant. Qualification, £10. Solicitors: Neville Isitt & Co., 26, Brazennose Street, Manchester. Registered office: 26, Brazennose Street, Manchester.

Alfred Roberts & Sons (1925), Ltd. (207,449).—Private company. Registered July 23rd. Capital, £25,000 in £1 shares. Objects: To acquire the business of Alfred Roberts & Sons, Ltd., incorporated in 1921, now in liquidation, and to carry on the business of manufacturers, producers and sellers of rubber and rubber goods of all kinds, and all goods, compounds and materials in the manufacture or preparation of which rubber, caoutchouc gum, gutta-percha, xylonite, vulcanite, stabilite, celluloid, asbestos, fibre, paper, leather or textile materials or other like substances may be used, &c. The subscribers (each with one share) are:—R. S. T. Shelly, Aston Brook Street, Birmingham, engineer; T. W. Horton, 4, Bennetts Hill, Birmingham, solicitor. The first directors are:—R. S. T. Shelley (chairman), W. Mansell and E. Lawrence, addresses not stated. Qualification: 500 shares. Solicitors: Wragge & Co. 4, Bennetts Hill, Birmingham.

Sunlight and Electric-Therapeutic Nature Treatment, Ltd. (207,352).—Private company. Registered July 18th as a company limited by guarantee and not having a capital divided into shares, with 20 members each liable for 1s. in the event of winding up. Objects: To act as an institute for electrical operations and practices, comprising and utilising any type of sunlight radiation for medical-therapeutic purposes, whether carbon arc lamps, mercury-vapour, green, blue, and ultra-violet or other rays, &c. The first directors are:—G. A. O. Hanlon, 18, Adam Street, Adelphi, W.C., director of Securities Finance Corporation, Ltd.; Hilda M. Simmons, 72, Woodlands Avenue, Wanstead, technical therapeutist. Secretary: Hilda M. Simmons.

Shirebrook Electric Supply Co., Ltd. (207,358).—Private company. Registered July 18th. Capital, £5,000 in £1 shares. Objects: To carry on at Shirebrook and elsewhere the business of an electric lighting and supply company. The directors are:—M. Robinson, 158, Station Road, Shirebrook; A. Riley, 18, Main Street, Shirebrook; G. Barker, 166, Station Road, Shirebrook; G. M. Webster, Market Hotel, Shirebrook; G. H. Oade, 6, Market Square, Shirebrook. Qualification, 100 shares. Secretary: E. Edson. Solicitor: J. J. B. Young, 25, Bank Street, Sheffield. Registered office: Church Drive, Shirebrook.

J. F. Rispin, Ltd. (207,349).—Private company. Registered July 18th. Capital, £500 in £1 shares. Objects: To acquire the business of a motor and electrical engineer carried on by J. F. Riskin at Well Lane, Batley, as "J. F. Rispin & Co." The subscribers (each with one share) are:—J. F. Rispin, 7, Grove Place, Leeds, electrical and motor engineer; Mrs. L. A. Rispin, 7, Grove Place, Leeds. J. F. Rispin is the first director. Qualification, 100 shares. Solicitors: Watts & Son, Dewsbury. Registered office: Well Lane, Batley.

Cecil Cooper & Co. (London), Ltd. (207,343).—Private company. Registered July 18th. Capital, £12,000 in £1 shares. Objects: To adopt an agreement with Cecil Cooper & Co., Ltd., for the acquisition of the London branch of their business and to carry on the business of electricians, mechanical engineers, manufacturers, and workers of and dealers in electricity, motive power and light, &c. The subscribers (each with one share) are:—W. H. Tyrrell, 147, Oakwood Court, Kensington, W., chartered accountant; J. P. Southwell, 38, The Ridgeway, Golder's Green, N.W., chartered accountant. C. J. Cooper is one of the first directors, and may retain office for life. Solicitor: W. B. Wattson, 31, Budge Row, E.C.4. Registered office: 14, Gloucester Road, Kensington, S.W.7.

Official Returns of Electrical Companies.

Thermal Electric Works (Hackbridge), Ltd.—Debenture dated July 10th, 1925, to secure £500 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. Keene, 5, Barmouth Road, Wandsworth Common, S.W.

Berrite, Ltd.—Satisfaction in full on March 12th, 1925, of mortgage dated July 21st, 1924, securing £2,700 and further advances. (Notice filed July 17th.)

Orlings Telegraph Instrument Syndicate, Ltd.—Issue on July 13th, 1925, of £25 debentures, part of a series already registered.

Atkinson, Lloyd & Co., Ltd.—N. Wood, of 26, Corporation Street, Manchester, ceased to act as receiver or manager on June 2nd, 1925.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Greenwood and Batley, Ltd.

The annual meeting of this company was held on July 22nd, Col. O. C. Armstrong, D.S.O. (chairman), presiding. Col. Armstrong, in moving the adoption of the report and accounts (see ELEC. REV., July 17th, p. 109) referred to the depressed state of industry generally and the general engineering industry particularly. He considered that while the unsettled state of Europe and the inflated currency of Continental countries was responsible for a great deal of this there were other factors. Although there had been an improvement in conditions on the Continent, the expected reaction upon our export trade had not materialised. In fact, things had become worse and our unemployment figures were higher. One of the most serious causes of the trouble was the attitude adopted by certain sections of labour. They did not seem to gauge the gravity of the situation. They did not realise that no industry or occupation stood by itself; the cost of coal, railway rates, public utility services, freights, dock charges, &c., all acted and reacted upon the cost of production. The short-sighted view prevailed that each section was a law unto itself. If the men would neither accept a lower wage nor work harder for longer hours, there could only be one outcome—the gradual attrition of many of our industries and the handing over of a large proportion of our foreign trade to our competitors. The chairman also referred to the burden of taxation, and said that he would place little confidence in the committee which was being set up to consider the matter unless its terms of reference included the condition of a fixed minimum of reduction, leaving only the excess to their determination. Turning to the accounts, the chairman said that in spite of the bad times the company was in a strong financial position. The reserves and the surplus of the profit and loss account totalled over £200,000, representing 57 per cent. of the paid-up ordinary share capital. The valuation of the works was £398,918—a low figure. The shareholders could congratulate themselves upon the company's satisfactory position. It was difficult to forecast the results of the current year. Although the orders for the first quarter were less than in the first quarter of last year, a number of good inquiries had been received. The works had been maintained in a high state of efficiency and were prepared to cope with any orders which might be received.

Marconi International Marine Communication Co., Ltd.

Senatore G. Marconi (chairman) presided at the annual meeting of the company on July 24th, and in dealing with the report and accounts (*vide* our last issue, p. 149), he said that the total revenue was slightly in excess of that of the preceding year. The net profit included £26,000 from investments, so that the profit from the company's business operations was about £57,000. This compared unfavourably with the profits of previous years, but in view of the unprecedented depression in the shipping industry the result was not unsatisfactory; the company could only prosper when shipping was prosperous. The company was in a very strong financial position, holding more than £550,000 of gilt-edged securities in addition to substantial bank deposits. For each of the company's £1 shares 10s. was invested in securities earning not less than 5 per cent. The chairman mentioned that the company had recently completed 25 years of service and he reviewed some of the work which had been done. He said that although allowance had been made for depreciation in the ordinary sense, the rapid development of radio-telegraphy demanded something more than that if an efficient service was to be maintained. Since 1920 the company had spent £100,000 in keeping up to date stations on hire to shipowners. Maintenance charges had increased considerably, too, and it might be necessary for some years to come to spend £20,000 annually on modernisation. The company had adopted the policy of allowing a reduction of rental to shipowners when their vessels were laid up; since 1921 £27,277 had been granted in this way. Referring to the experiments in radio-telephony between ships and between ships and the shore, Senatore Marconi said that the results demonstrated that there was no technical difficulty in the way of instituting a satisfactory service of duplex radio telephony, especially between ships on the high seas, away from the areas of congested radio-telegraphic traffic. The company was quite ready to exploit the possibilities of this system as soon as a demand arose for it, but it would merely act as an adjunct to and would not supersede radio-telegraphy. The demand for the company's direction finder had rapidly increased. The company did not think it desirable for the Government to enforce the new regulation compelling the installation of an automatic calling device on vessels carrying a crew of fewer than 50. The chairman said that in efficiency and organisation the company was unrivalled. He would no prophesy as to the future; they could only hope that the depression in industry would soon pass away. In conclusion, he referred to the death of Mr. Godfrey Isaacs and Mr. W. W. Bradfield, and he mentioned the appointment to the board of Mr. Henry Morgan and Sir Bertram Hayes, and that of Mr. F. S. Hayburn as general manager. The report and accounts were adopted after a brief address by Mr. F. G. Kellaway, the deputy chairman and managing director.

Chili Telephone Co., Ltd.

In presenting the report and accounts (*vide* ELEC. REV., July 10th, p. 68) at the recent annual meeting, the chairman (Mr. Eric B. Butler-Henderson) said that the company's business had steadily advanced in spite of the political changes which had taken place in Chile, and had tended to arrest general commercial progress. The basis tariffs under the new concession had proved unsatisfactory. Under this concession the company had to provide automatic plant at Santiago and carry out extensive improvements at Antofagasta, Concepcion, Iquique, Vina del Mar, and other districts, in addition to new trunk-line communication between Santiago and Valparaiso and at various other places. A large amount of this work had been carried out; the new plant at Santiago was in course of manufacture by Messrs. Siemens Bros. & Co., Ltd., a capacious concrete building was being erected, and it was hoped to have the plant installed in January or February next. The technical staff was engaged in constructing the new trunk lines from Santiago to Valparaiso. At Concepcion underground work was being pushed forward, and a modern c.b. switchboard plant for this centre was being made by Messrs. Ericsson at Stockholm. At Antofagasta similar work was being done and a c.b. switchboard plant also made by Messrs. Ericsson, had already arrived there. An extension to the Valparaiso automatic plant, made by Messrs. Siemens Bros., had been installed, and a special composite cable had been laid from Valparaiso to Vina del Mar. The work had necessitated new capital and that was the reason for the issue of £156,000 of shares during the year. Negotiations were proceeding with the authorities for permission to institute a more remunerative tariff and he (the chairman) had every confidence that satisfactory arrangements would be made. In briefly reviewing the accounts, the chairman pointed out that the revenue had been very slightly affected, although the net profit was lower by about £8,000. In view of the developments the directors considered it necessary to transfer £10,500 to the reserve for plant renewal, which involved a reduction in the final dividend.

Victoria Falls and Transvaal Power Co., Ltd.

The annual meeting was held on July 23rd, the Marquess of Winchester in the chair. In moving the adoption of the report (ELEC. REV., July 17th, p. 108), the chairman said that the profit and loss account for the year after providing for the service of the debentures, depreciation, and taxation, showed a net profit of £349,852. The maximum dividend of 10 per cent. had again been paid on the preference shares and 12½ per cent. on the ordinary shares, compared with 10 per cent. for 1923. £50,000 had again been added to reserve, which now stood at £350,000. He was pleased to report that the company's business and prospects continued to be quite satisfactory. The plant capacity had been fully loaded as in the previous year, and further demands for power had been notified. The present supply was being well maintained, though the further demands for power by the mining industry had caused some anxiety as regarded the margin of spare plant. That position would be entirely relieved when the Witbank station which was being built by the company for the Electricity Supply Commission, came fully into commercial service. At the time also the final adjustment of prices arranged in the new power contracts of the further discount of 2½ per cent. would come into force. The erection of the first section was due to be finished by the end of the current year. Meanwhile they had also sent out an additional 12,500-kW turbo-alternator for erection at Rosherville. That machine would be available for service within the next few months, and would not only secure the stability of their supply at the moment but also be a most valuable and useful permanent addition to their plant. The arrangements under the new agreements with the Electricity Supply Commission and with the mining groups were working quite satisfactorily and harmoniously, and he looked forward to a period of steady business free from the difficulties which were previously always with them through the uncertainty of the interpretation of contracts. At previous meetings he had referred to their lease of the power at the Victoria Falls which asset up to the present they had never been able to turn to account. The cause of that was that there was no market for power in that part of Africa. Nevertheless, they had the matter always before them and would welcome the time when the population of Rhodesia and its industries would require sufficient power to justify the development of the Falls

Marconi's Wireless Telegraph Co.

The report for the past year states that although large sums were devoted in the last accounts to the writing-down of assets, it has become necessary to allocate still further sums to this process. The sum £75,140 has been credited to the general reserve, being the ipany's share of the amount of £127,609 received from the t Office in respect of war services; the balance has been l to the subsidiary company operating the Carnarvon sta-n. First convertible debenture stock has been purchased he market to the extent of £70,595 and the cost in excess ar value has been deducted from the general reserve. On other hand, this reserve had been credited with the pre-um obtained from the issue of 500,000 new ordinary shares. net profit for the year, after providing for debenture in-st, was £225,600—an increase of £53,056. The addition he balance brought forward makes available £628,159. It roposed to pay a final dividend of 5 per cent. on the ordi-y shares (making 10 per cent. for the year) and to carry ard a balance of £310,652. The beam stations for com-nication with the Dominions and India are being built for ration by the Government. The company is to receive a lty of 6¼ per cent. on the gross radio receipts of these ices. The "beam" system is developing satisfactorily. ent experiments showed that communication with Canada Australia could be maintained throughout the whole day, the results with India and South Africa have removed all bts as to the company's ability to fulfil its guarantees. The rt-wave system is considered to be the future method of ing with commercial messages. An arbitrator has been inted in connection with the company's claim against Government for the use of its patents by the Services dur-the war, and every effort is being made to expedite the iminary work. The meeting is to be held to-day (Friday).

Petters, Ltd.

Speaking at the company's annual meeting on July 23rd, the chairman (Sir E. W. Petter) said that the accounts for the past year showed a distinct improvement, but were still suffering from periods of slackness which ate the profits earned during the busy times. The directors osed to fund the arrears of dividend on the preference es amounting to £45,000 and it was hoped to pay off the ars in a shorter time than that provided for under the me. He attributed the unrest in the engineering industry ne effect of the high rates paid to those employed in shel-l industries. It was impossible to increase the wages of ed men, although, relatively, an increase was justifiable. scheme for funding the arrears of preference dividend approved at a subsequent extraordinary meeting.

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ench Company.—The *Société Française Radio Electrique*, h made a net profit last year of 2,108,722 fr., reports that only were the works fully occupied on radio-telegraphic rial for the Government and private undertakings, but "Radiola" department had had a busy year in meet-he demand for broadcast receiving sets and components. further extensions are being carried out at the works at llois-Perret.

lgian Companies.—The report for last year of the *Société ctricité du Bassin de Charleroi* shows a net profit of ,608 fr., as compared with 2,220,831 fr. in 1923. *Société d'Electricité du Nord de la Belgique* reports a t of 4,738,400 fr. as against 3,739,485 fr. in the preceding

echo-Slovakian Company.—The *North Bohemian Elec-y Works Co.*, Podmokly (Bodenbach), has paid a dividend per cent. for last year, as in 1923.

ock Exchange Notices.—Dealings in the following have specially allowed by the Committee under Rule 159, and ommittee has ordered them to be officially quoted:—
utta Electric Supply Corporation, Ltd.—191,116 new ordinary shares each, fully paid, Nos. 1,025,462 to 1,216,577.

ttenham District Light, Heat, and Power Co.—The ividends on the 5 and 5½ per cent. preference shares have paid in respect of the half year to June 30th last. The stock receives a dividend at the rate of 7⅛ per cent. per m (as against 8 per cent. in 1924), and the "B" stock t the rate of 5⅞ per cent. per annum (as against 6½ per

gentine Light and Power Co., Ltd.—The directors state owing to the delay in completing the audit of the accounts e subsidiary companies for their incorporation in the com-s accounts, the annual meeting will not be held until rly autumn. It is stated that the accounts show a steady rovement in the revenue position.

ndon Electric Supply Corporation, Ltd.—An interim nd of 3s. per share, being at the rate of 6 per cent. per n, for the six months ended June 30th, has been declared e preference shares, and a dividend of 9.6d. per ordinary being at the rate of 8 per cent. per annum, has been ed for the same period.

Kalgoorlie Electric Tramways, Ltd.—The report for 1924 shows gross receipts of £26,079 and a net profit of £5,148—a reduction of £2,297, which is attributed to the depressed state of business and motor-omnibus competition. The number of passengers carried decreased from 1,927,398 to 1,729,414. The meeting was to be held yesterday (Thursday).

Puebla Tramway, Light and Power Co.—The net profits of this company in Mexico for 1924 amounted to $1,272,584 (Mex.), equivalent to £129,909. After paying all expenses, including mortgage interest, note service interest, and sinking fund contributions, a balance of £1,682 is carried forward.

Vickers, Ltd.—Dividends of 2½ per cent., less tax, have been declared for the half-year ended June 30th, on the 5 per cent. preferred stock and the 5 per cent. preference shares. The cumulative preference shares receive 2½ per cent., free of tax.

Northern Mexico Power and Development Co.—The report for 1924 shows a net income of $364,842 as compared with $293,193. The proceeds of a bond issue during the year ($300,000) were applied to extensions. The dividends accrued during 1920 and 1921 on the preference shares have been paid.

Western Union Telegraph Co. (Inc.).—The earnings report for the six months ended June 30th last shows a gross revenue of $55,448,011 and a net income of $6,043,234, as compared with $59,938,214 and $6,965,937 respectively in the first half of 1924.

Kensington and Knightsbridge Electric Lighting Co., Ltd.—The directors have declared an interim dividend on account of the year ending December 31st next of 5s. per share, less tax, on the ordinary shares, payable on August 8th.

Charing Cross Electricity Supply Co., Ltd.—The directors have declared an interim dividend on the ordinary shares of the West End Undertakings for the half-year ended June 30th, at the rate of 1s. 6d. per share.

Consolidated Gas, Electric Light and Power of Baltimore.—A dividend of $0.5 per share has been declared on the common shares of no par value, for the quarter ending September 30th.

Canadian Marconi Co.—By a special Act of the Canadian Legislature the name of the Marconi Wireless Telegraph Co., of Canada, has been changed to "Canadian Marconi Company."

Northampton Electric Light and Power Co., Ltd.—The following interim dividends have been declared:—2½ per cent. on the 5 per cent. preference "B" shares, and 4 per cent. on the ordinary "B" shares.

Herbert Morris, Ltd.—A dividend at the rate of 7½ per cent. per annum has been declared on the ordinary shares for the half year to January 31st last.

Llanelly and District Electric Supply Co., Ltd.—A dividend at the rate of 6 per cent. per annum has been declared on the ordinary shares.

Metropolitan Railway Co.—An interim dividend of 2 per cent. actual, has been declared on the ordinary stock. The Surplus Lands stock is to receive 1½ per cent., actual.

Rushden and District Electric Supply Co., Ltd.—The directors have declared an interim dividend of 3½ per cent.

Mather & Platt, Ltd.—An interim dividend of 5 per cent. actual, free of tax, has been declared, as in 1924.

Metropolitan Electric Supply Co., Ltd.—An interim dividend at the rate of 6 per cent., as in 1924, is announced.

Stocks and Shares.

MONDAY EVENING.

THIS seems to be the time of year for which strikes, lock-outs and other labour disturbances show peculiar partiality. This week is one of fresh crises in the particular areas affected by mining and railway problems. The shadow of a possibly extensive strike casts depression over Stock Exchange markets. There is some little talk about the likelihood of a reduction in the Bank Rate, but this, as a Stock Exchange factor, is practically ignored, and it is improbable that any change will be made until the monetary requirements of the autumn are provided.

Business in the Stock Exchange is quiet. The rubber boom, as such, has tamed considerably, though there is still a very large volume of trade being done, in consequence of the continued strength of the price of raw rubber. The protest of the India Rubber Manufacturers' Association against retention of restriction upon rubber output remains the subject of a good deal of discussion. The standard of exportable rubber becomes raised this week to 75 per cent. of the allowance

granted to companies that conform to the Stevenson Restriction scheme, and this in itself should relieve the situation to the extent of providing, within the next few weeks, a material increase in the supplies.

Home Railway stocks are dull, owing to the fears of a lock-out in the mining districts. Metropolitan ordinary at 69½ is tolerably steady. The company has declared an interim dividend of 2 per cent., being the same rate as that of last year. Districts went back to 45, and the Undergrounds have not varied.

Interim dividends are in course of declaration by the various electricity supply companies. The Charing Cross announcement is at the rate of 1s. 6d. per share, *i.e.*, 7½ per cent., an increase of 3d. per share over the 1924 payment. No alterations are made by the London Electric Supply Corporation at 4 per cent., County of London at 5 per cent., Metropolitan and Llanelly both at 6 per cent. The Charing Cross increase comes as a pleasant surprise, for it had not been expected that any of the London companies would pay more, in their interim distributions, than they did a year ago. The price of the shares remains at 46s. 9d. London Electrics and County ordinary are both 6d. down. Westminsters drooped similarly to 45s., and Yorkshire Electrics to 29s. 6d. Edmundsons at 20s. 6d. are ex dividend. The new County preference are firm at 9d. to 1s. premium. Chiswick Electric 4½ per cent. debenture rose 2 to 86½.

Attention has been drawn for some time past to the great desirability of providing cheaper power for the encouragement of home industries. The companies that supply wide fields in the country are doing their best to reduce rates and to increase their area of supply. They operate upon lines distinct altogether from those of the West-end companies in London, and to compare, as some people are doing, the charges made by the latter companies with those of the big provincial power undertakers is to misunderstand the positions occupied by the two different classes of company.

The Marconi Wireless Telegraph Company announces a dividend making 10 per cent. for the year, whereas anticipation had prepared itself for a reduction in the rate, following upon the cut recently made in its dividend by the Marconi Marine. The parent company's net profit for the year came to £225,600, and conservative critics are inclined to think that the directors are scraping the pot a little too clean by distributing 10 per cent., having regard to the increased capital which now ranks for dividend. The report refers to heavy depreciation of foreign currencies, which, together with the possibilities of certain subsidiary companies, has rendered it necessary to make greater provision than was expected when the directors six months ago issued a circular expressing the opinion that necessary provision would not reduce the general reserve account below 1½ million pounds sterling. This reserve is now reduced to £1,047,902, sundry assets having been written down by £678,000. The price of the shares is unchanged at 1⅜, and Marines at 18s. 9d. show no recovery from their last week's dulness.

The Radio Corporation reported a loss in its last quarter's receipts, the net being $391,000, compared with a net profit of nearly two million dollars in the March quarter. The Radio Corporation has refused to lower its prices, and cutting by rival companies is considered to be the chief cause for the decline just reported. The gross income for that same June quarter came to $4,600,000, against 15 million dollars for the March quarter. The Common shares celebrated the occasion by rising ⅜ to 11¼, leading to mild wonder, on the part of the London market, at the New York demand which caused the advance.

Brazilian Tractions are the chief feature of strength in their group, the price rising 2 points to 61, in consequence of the steady improvement in the Brazilian rate of exchange. The company is doing well, according to its last report, and any such rise in the exchange rate makes a very substantial difference to the company's earnings. Cape Electrics at 1⅛ are better this week.

The Eastern group of cable companies is quiet as regards its prices. Eastern Extensions are ⅛ better; Globe ordinary ⅛ lower. United River Plate Telephones have fallen to 7⅛. It was announced in Parliament last week that the sum of 35 million pounds sterling is proposed to be spent, over the next three years, upon the further development of the telephone system. Automatic Telephones are 2⅛ and Internationals 24s. Enfield Manufacturing ordinary have risen to 3 1/16. Johnson and Phillips weakened to 39s. 6d., Electric Constructions to 30s. 6d., British Insulated to 61s. 3d. On the other hand, Siemens are a little better at 25s. Babcock & Wilcox keep steady. Coal, engineering and steel shares maintain a moderately firm front. The Stock Exchange declined to believe in the likelihood of a lock-out taking place; so, although prices became dull and depressed, they were not flat. Rubber shares reacted from the best, business dropping into more normal and jogtrot grooves after the mad excitement which culminated in the frenzy of a fortnight ago, and was sufficient, in itself, to burn out the healthy vigour of any boom.

Share List of Electrical Companie

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price July 27, 1925.	Rise or fall.	Yie p.c.
Bournemouth and Poole	1	13	14	2⅝	—	5 6
Brompton Ordinary	1	10	10	1¾	—	5 14
Charing Cross Ordinary	1	14½	15	46/9		6
do. do. do. 4½ Pref.	1	4½	14½	17/6	—	5 2
Chelsea	1	12	12	1⅞	—	6 8
City of London	1	15	15	45/9		5 11
do. do. 6% Pref.	1	6	6	23/-	—	5 4
Clyde Valley	1	8	8	31/-	—	5 3
County of London	1	15	15	52/6	—6d.	5 14
do. do. 6% Pref.	1	6	6	22/6	—	5 6
Edmundson's Ordinary	1	7	7	20/6xd	—	6 16
do. 7% Pref.	1	6	7	21/6	—	d. 6 10
Elec. Supply Corporation	1	10	10	33/3	—	6
Kensington Ordinary	5	14	15	12¾	—	5 17
Lancs. Light and Power	1	7½	7½	25/6	—	5 17
London Electric	1	10	10	33/6	—6d.	5 19
do. do. 6% Pref.	5	6	6	5⅞	+ ⅛	5 7
Metropolitan	1	10	11	38/3	—	5 15
do. 4½% Pref.	1	4½	4½	17/-		5 7
Midland Counties	1	5½	6	23/3		5 4
Newcastle-on-Tyne Ordinary	1	6	7	22/6	—	6 4
do. 5% Pref.	1	5	5	18/3	—	5 9
do. 7% Pref.	1	7	7	24/-	—	5 16
Notting Hill 6% Pref.	10	6	6	10	—	6
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9
St. James' and Pall Mall	5	17½	17½	13⅜xd	—	6 1
South London	1	15	15	2⅞	—	6
South Metropolitan Pref.	1	7	7	1½	—	5 15
Urban Ordinary	1	4	4	17/-	—	4 15
do. 6% Pref.	1	6	6	20/-		6
Westminster Ordinary	1	15	15	45/-	- 6d.	6 13
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/6	—	7 13
Yorkshire Elec.	1	8	8	29/6	—6d.	5

HOME RAILS.

Central London Ord. Assented Stock	4	4	68	—	5 17
Metropolitan	,,	4	5	69½	—	7
do. District	,,	3½	3½	45xd		7 14
Underground Electric Ordinary	10	Nil	Nil	2⅜	—	
do. do. "A"	1/-	Nil	Nil	7/-		
do. do. Income Bonds	6	6	98	—	6

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref. Stock	6	6	102½xd	—	5 1
do. Def. ,,	1½	1½	24	—	6
Automatic Telephone	1	3	6	2⅛	—	2
Chili Telephone	5	6	5	5⅞xd	—	4
Cuba Sub. Ord.	10	5	5	6⅜	—	7
Eastern Extension	10	10	10	17½	+ ⅛	*5
Eastern Tel. Ord. Stock	10	10	17½	—	*5
Globe Tel. and T. Ord.	10	10	10	17⅜	— ⅛	*5
do. do. Pref.	10	6	6	10⅞	—	5
Great Northern Tel.	10	22	22	31	—	7
Indo-European	25	7	8½	41½	—	*4
Marconi	1	10	10	1⅜	—	7
Marconi Marine	1	10	7½	18/9	—	8
Oriental Telephone Ord.	1	12	12	2⅜	—	*5
United R. Plate Tel.	5	8	8	7⅛	— ⅛	*5
Western Telegraph	10	10	10	16½	—	*6

HOME AND FOREIGN TRAMS, &C.

Anglo-Arg. Trams First Pref.	5	5½	5½	3¼	—	8
do. do. 2nd Pref.	5	6	6	2⅛	—	10
do. do. 5% Deb. Stock	5	7	71½	—	6
British Electric Traction Ord. ,,	6	6	112	—	5
do. do. 6% Pref. ,,	6	6	104	—	5
Brazil Traction	100	4	4	61	+ 2	6
Brit. Columbia Elec. Rly. Pcc. Stock	5	5	89½	—	5
do. do. Preferred ,,	96/-	96/-	83½	—	*5
do. do. Deferred ,,	129/5	129/5	102	—	*6
do. do. Deb. ,,	4½	4½	76½	—	5
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	
London United Tram. Deb. Stock	4	4	42½	—	9
Mexico Trams, 5% Bonds	—	5	5	62½	—	8
Mexican Light Common	100	Nil	Nil	25	—	
do. Pref.	100	Nil	Nil	58	—1	
do. 1st Bonds	—	5	5	63½	—1	7
Yorkshire (West Riding)	1	5	—	17/6xd	—	5

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	12	2⅞	—	*4
British Aluminium Ord.	1	5	10	1⅜	—	6
British Elec. Transformer Pref.	1	Nil	7	17/6	—	...
British Insulated Ord.	1	15	15	3 1/16	— 1/16	4
Brush Ord.	1	10	10	1	—	10
Callenders	1	15	15	2⅜	—	5
do. 6½% Pref.	1	6½	6½	23/9	—	5
Crompton Ord.	1	Nil	Nil	⅝	—	...
Edison-Swan	4/-	10	10	8/-	—	5
do. 5% Deb. Stock	5	5	80⅜	—	6
Electric Construction	1	10	10	30/6	—9d.	6
Enfield Cable, Pref.	1	7½	7½	1½	—	6
English Electric	1	5	5	17/9	—6d.	5
do. do. Pref.	1	6	6	20/6	—	5
Gen. Elec. Pref.	1	6½	6½	23/6	—1/6	5
do. Ord.	1	5	7½	24/-	—	6
Henley	1	15	16	2⅛	—	5
do. 4½% Pref.	5	4½	4½	4⅜	—	5
India-Rubber	1	5	5	1	—	*5
Johnson & Phillips	1	10	10	39/6	—1/9	5
Met-Vickers, Ord.	1	8	8	20 9	—	7
do. Pref.	2	8	8	2⅜	—	6
Siemens Ord.	1	—	7½	25/-	+6d.	6
Telegraph Construction	12	20	20	26½	—	4

* Dividends paid free of Income Tax.

The First International Congress of Radiology.

(*Continued from page 112.*)

Light Sources Used in Actinotherapy.

Mr. T. THORNE BAKER contributed a paper on "The Analysis ıd Comparison of Light Sources used in Actinotherapy" be- ıre Section II (Electrotherapy and Actinotherapy) on July ıd. He pointed out that the recent extension of the work ɔne in actinotherapy had resulted in the use of a large num- ɛr of different illuminants. Artificial sunlight, so-called, was ɛing administered in some cases, ultra-violet light in others, ıd the time seemed to have arrived when some attempt at andardisation of these light sources should be made, as some them were being used a little indiscriminately. Arc lamps ere used with plain carbons and with carbons cored with ırious chemical substances; tungsten pencils, and pencils of uminium and other metals had been employed; the electric ɔcillatory spark had been similarly used, as well as the ıartz mercury vapour lamp and other types. These different ght sources varied enormously in spectral composition and their relative intensities in different regions of the spec- um, and the purpose of the paper was to give some very ɛneral ideas of their comparative energy distribution, as ɛtermined by the use of a large Hilger quartz spectrograph.

The pure carbon arc had been shown to approach most ɛarly the colour temperature of sunlight, and, owing to the ɔmparative continuity of the spectrum of the light from the ɔsitive crater, this source might be regarded as the best ɔproach to sunlight as a primary standard. The carbon arc so most closely approached the spectral distribution of sun- ght. The following table showed a comparison between the ılour temperatures of various light sources and sunlight:—

Source.	Colour temperature, degrees absolute.	
Tungsten lamp	2,360 deg. K.	
Gasfilled lamp	2,950 ,, ,,	
Carbon arc	3,700 ,, ,,	Approx.
Noon sunlight	5,000 ,, ,,	

Spectrograms of various illuminants were shown, and the ·sults of the author's investigations showed that, for all kinds sunlight treatment, the metallic or cored carbon arc lamps d not simulate sunlight anything like so accurately as the ɔsitive crater of the plain carbon arc or as the gasfilled metal- ament lamp; that metal arcs, or metallic-cored carbon arcs, ɔntained a high proportion of ultra-violet light which was ɔt present in the solar spectrum as measured through the mosphere at any known altitude, but that they did contain considerable proportion of irritant short rays; and that, if ese harmful rays were filtered out by boro-silicate glass, such ·cs could be made to simulate sunlight far more closely.

Finally, it seemed to be urgently necessary to carry out far ore extensive investigations as to the energy distribution in e spectra of the various illuminants using the photo-electric ll and not merely the photographic plate, with its limited ɔabilities, as at present many actinotherapists were working most as much in the dark as were radiologists in the early ɣys of X-rays. The author said that Mr. W. A. Balwain and mself were engaged in estimating the spectral intensity of e various therapy lamps for each 100 wave-lengths of the tra-violet spectrum by means of photo-electric cells. This ork would take some months, but it was hoped to communi- te the results to the Institute of Radiology.

The Industrial Uses of X-rays.

Before the Physics Section on July 2nd, Mr. C. Norman emp, of Edinburgh, read two short notes: (*a*) "The Appli- ɪtions of X-rays in the Technology of Coal" and (*b*) "X- ɣs in Industry, with Special Reference to Technical Radio- gy." Both the communications were in general terms.

With regard to the former subject, Mr. Kemp said it had ɛen shown in this way that coal contained two distinct pes of ash, one which was associated with the coal sub- ance proper and could not by any process be removed from , namely, the portion which under the stereoscope gave a ore or less uniform field, and the other, the free ash, which ıowed up as blackish banding and could be removed from the ıal by suitable treatment. This was of more interest than ɔpeared at first sight, because it facilitated removal of the ɔh and non-burnable material from the really useful portion the coal that was mined. Thus there was an important ɔld for the examination of coal by means of X-rays before it as put on the market.

In his second communication Mr. Kemp emphasised the ɪportance of introducing technical radiology as a distinct ıence and for providing facilities for teaching it. Generally ɛaking, at our universities and colleges there was a small diological laboratory in which some extremely useful work as carried out but otherwise, in the main electrical engineer- g departments of the large technical institutions in this ·untry the matter never seemed to have received any con- ɪeration at all until three years ago, when he was asked to ve a course at the Royal Technical College, Glasgow; that ork had since been continued, and had aroused a considerable nount of interest. In this country the utilisation of X-rays r industrial firms seemed to be rather behind that in others, notably France and the United States. If training in X-ray technology became a normal course for electrical engineers, they would at least be provided with knowledge which they could turn to account when the occasion arose.

Dr. V. E. PULLIN (Director of Radiological Research, Woolwich Arsenal) said the value of radiology to industry was a subject he had been trying to push for a great many years. There must be numerous undiscovered ways in which X-rays could be employed in industry. At the same time, as the result of very large experience, he felt that X-ray equipment at the present time was not in the state it might be in to enable them to obtain definite decisions upon industrial problems. There was also the danger of people being over-ambitious, and failure to do the impossible might react upon the science and result in its being condemned unjustly by prospective users. As an instance of the value of X-rays in solving practical problems, he mentioned the serious railway accident in the North of England last year, when the tire of a wheel gave way, and X-ray examination of it showed at once the nature of the fault which had led to this unfortunate accident. That involved the penetration of 4 in. of steel, which appeared to be the maximum possible at the moment. One of the most important pieces of apparatus, industrially, was the X-ray spectroscope, which had been used so much to study various materials. He felt very strongly that it was to the development of that instrument that industry must look for its more immediate benefits.

Mr. J. R. CLARKE (Sheffield) expressed some doubt as to whether X-ray technology could be included as part of the curriculum of engineering education, except at the expense of some other item.

Dr. H. MOORE (London) said that, although there were certain definite ways in which X-rays could be used for industrial purposes, there were difficulties; unless a flaw in steel, for instance, happened to be at right angles to the direction of the beam, it might not be observed as a flaw on the X-ray plate.

Dr. E. A. OWEN (National Physical Laboratory) said that, although they were doing a great deal of an industrial nature with X-rays at the N.P.L., he had never been able to obtain positive results. It was not at present possible to say that if a flaw was not discovered by X-ray examination, there was no flaw present.

Producing Current at Constant High Pressure.

An interesting discussion on this subject took place before the Physics Section on Friday, July 3rd.

Mr. C. E. S. PHILLIPS said that the introduction of any apparatus or device which would increase the precision with which the radiation dose could be administered, must be regarded as a step forward. For this reason, the introduction of apparatus for the production of current at constant high voltage was of very great importance. Work was being carried out with this end in view in all countries, and greater efficiency must follow the use of such apparatus. One of the chief difficulties in the construction of apparatus of this type was the avoidance of corona in the condenser, and it was desirable to know how to make a condenser which would be of reasonable dimensions for the required capacity, possibly of the order of 0.02 mfd, to withstand 200,000 volts or more at the terminals, the design to give accessibility for removing the large amount of soot and dust from the air which very quickly settled upon highly electrified apparatus in large cities. Special arrangements had been made in this connection in several of the types of constant high-pressure apparatus which were on the market, such, for instance, as that of the Radiological and Surgical Co. in this country and Messrs. Gaiffe & Gallot, of Paris.

Radiation from a Coolidge tube with such an apparatus was richer in short-wave lengths than those produced under analogous conditions by means of a transformer. There was, too, an important constructional advantage in being able to get a potential across the tube which was double that across the transformer. Other points in favour of the system were the steadiness of the meter reading and greater reliability in the reproduction of any set of conditions. Further, it was claimed that the time taken for an exposure could be considerably reduced, but the outfit did not give a homogeneous beam, due to obstructions and other irregularities at the target. Although the Wimshurst influence machine had definitely been proved to give a constant current at high pressure when connected to a non-inductive resistance, it failed to do so when a Coolidge tube was introduced into the circuit.

Prof. F. DESSAUER (Frankfort) gave an account of some experiments carried out during the past three years at the Frankfort University upon new systems for the production of current at constant high pressure. The result of this work had been the evolution of a system in which single storage battery cells could be connected in series or parallel at will. The apparatus described consisted of individual units capable of giving 25,000 volts, a series of these units being connected together to give a higher voltage. A circuit was shown of nine units connected together, the current being 30 milliamperes at 225,000 volts. Each unit consisted of the battery, transformer, and a kenotron, and was complete in itself, having only to be connected to others.

Dr. H. Moore (London) said the main advantage to be gained by the use of X-ray generators of constant voltage was that it allowed comparisons of results to be made in a much more accurate manner than was now the case. Another point was that if the current was being sent across the X-ray tube at a certain definite voltage, one could be certain of getting the most efficient working with the tube for the particular voltage in use, and one got a more nearly homogeneous beam of X-rays than with a transformer set or a coil set. Practically all constant-voltage sets—with the exception of two with which he had worked—had kenotron valves as rectifiers, and they also worked on single-phase current. When one put single-phase current through a kenotron valve and tried to smooth it out to get constant potential with a fluctuation, say, of not more than 5 or 10 per cent., it was necessary to use quite big smoothing condensers unless the frequency happened to be fairly high and it was difficult to design condensers to do that work satisfactorily.

Dr. G. Failla (New York) said he had heard that tubes did not last as long with constant-pressure apparatus as with transformer apparatus. Moreover, American experience showed that with the higher frequencies the insulators did not last so long as with the lower frequencies.

Prof. Dessauer said that he had found that tubes lasted very much longer with his system of constant potential, and that the kenotrons lasted 700 hours.

Dr. F. L. Hopwood (St. Bartholomew's Hospital, London) said that one of the most important aspects was the reduction in time of operation. At the present time one treatment lasted several hours, and it was hoped at St. Bartholomew's Hospital to change over to the constant-pressure system and to be able to diminish the time of treatment by something between 20 and 50 per cent. If that could be done, as he believed it could, it would diminish the sufferings of the patients tremendously.

Dr. Failla said that the use of water-cooled tubes resulted in very much shorter exposures being necessary. In several installations in the United States the treatment was now complete in from five to seven minutes.

Dr. Dessauer said the condensers in the system he had described were used in series as he had mentioned, and they gave an absolutely equal distribution with alternating current, which was very important.

The Chairman, in winding up the discussion, said that they could look upon the work of the Physics Section with considerable satisfaction, because it had made a recommendation with regard to an International Committee on measurement and standardisation, and had also proposed to take steps concerning methods of protection. High-pressure current at constant voltage was the thing of the future, and they should try to impress that fact upon their medical colleagues.

An International Committee.

On July 4th, there was a meeting of delegates at which an International Committee was formed, it having been decided at the preliminary meeting of delegates on July 1st to constitute the Congress a triennial one to be held in different countries.

A New Medical Carbon Arc Lamp.

Dr. A. Stein (Wiesbaden) before Section II (Electrotherapy and Actinotherapy) on July 2nd gave a description of a new type of medical carbon-arc lamp. He stated that following the work of Finsen and the treatment of disease by means of ultra-violet rays, it had been thought that these were the only active therapeutic agents in heliotherapy and that therefore the lamp that emitted no other rays must be therapeutically the best. Careful experiments and observations by a large number of modern practitioners, however, had led to the conclusion that not only the ultra-violet rays, but also some others, particularly the infra-red, were most effective as therapeutic agents.

Starting on these premises, therefore, Dr. Stein said that he set to work to find new sources of artificial sunlight which would resemble natural sunlight to the greatest degree. In his opinion the light produced by the passage of an electric current between two carbon points was far more similar to natural sunlight than that produced by quartz lamps; it was, he said, scarcely possible to produce a light that was less like natural sunlight than that of the mercury vapour quartz lamp. Taking, therefore, the carbon arc lamp for this purpose, the author set himself the two problems (1) of so arranging the lamp that the rays emitted by it should resemble as nearly as possible, in their spectral composition, those of the sun, and (2) of rendering the greatest possible percentage of the total energy set free by the arc between carbon points available for heliotherapeutic needs. So far as the first proposition was concerned, this had already been accomplished experimentally by mixing certain metallic salts in the points of the carbons. In this way it had been found possible to approach natural sunlight to a remarkable degree, although to repeat natural sunlight in every particular seemed almost impossible. In the lamp which he described, however, he claimed to have been successful in imitating natural sunlight to as great an extent as present-day knowledge permitted. The second proposition had been met satisfactorily by placing the two carbon points in parallel, a method never yet adopted for such radiations in heliotherapy; the idea of placing two carbons in parallel, of course, was not new, this method having been adopted as long ago as 1876 in the Jablochkoff candle.

Although this new lamp, which had been named the "Jupiter" lamp, was extraordinarily rich in ultra-violet rays its principal efficiency lay in the infra-red portion of the spectrum. It was not disputed that the ultra-violet rays set up an inflammation of the skin, but the great advantage claimed for the Jupiter lamp was that this could be avoided. One form of lamp was shown in which there were two pairs of parallel carbons, and thus a double arc. Both the pairs of carbons were placed inside a hemispherical aluminium reflector, which could be left open in front when general radiation was required, or partly closed with a funnel-shaped adapter for small local radiations. This lamp worked at 10 amperes and gave 6,000 c.p. The resistance necessary for the satisfactory working of the lamp was in a small case fitted at the back of the reflector. The lamp was so arranged, also, that it was adaptable for 110, 120, or 220 volts, a.c. or d.c. Other models of the lamp were demonstrated. A curious feature was that the gases emitted by these arc lamps had a certain therapeutic value, especially in cases of high blood pressure. No regulation of the carbons was necessary during burning, and there was an automatic arrangement which extinguished the lamp when the carbons had almost burned out, in order to avoid damaging the metal parts. The lamps were said to have been tried by a large number of German physicians with great success.

A New X-ray Tube.

A new metal X-ray tube for radiography and therapeutics was described to the Physics Section on July 2nd by Dr. A. Bouwers, physicist at the Philips Lamp Works in Holland. The metal wall of the tube consists of a chromium-iron alloy capable of being readily sealed to the glass and retaining a perfect vacuum. The heat conductance of this metal is so very small that it can be made red-hot at one end without injuring the seal at the other end. An incandescent kathode filament is placed within the metal vessel which has a circular opening, at a very short distance from which an insulated electrode is mounted, serving as an antikathode. The electrons are drawn towards the antikathode through this opening. Thus a sharply-focused spot is produced, the diameter of which depends upon the size of the opening which serves as an electron diaphragm. The X-rays issue from the antikathode at right angles through a window. The rays which do not emerge from the window are absorbed by metal protective walls of lead and brass arranged round the tube inside the chromium-iron casing, hence the tube can be used without any further protective devices. It is claimed that this type of tube, in addition to the general advantage of complete protection without external aids, also has an increased output as compared with the usual X-ray tubes.

The metal-encased tube has been developed in several types for various purposes, and such tubes are said to have worked perfectly satisfactorily for three years.

(To be continued.)

Power Companies' Costs and Charges.—In a letter to the Editor of *The Times*, a correspondent gives some interesting figures of the production costs of and the charges made (as published by the Electricity Commission) by 20 electricity supply companies, 10 provincial and 10 London, for the year 1922-23. The figures are as follows:—

Undertaking.	Total costs including interest.	Average price obtained.	Surplus
Provincial Companies:—	d.	d.	d.
Newcastle	0.74	0.76	0.02
Clyde Valley	0.66	1.02	0.36
Yorkshire	0.72	1.05	0.33
Lancashire	0.55	0.95	0.40
Mersey	1.08	0.79	0.29*
South Wales	1.07	1.09	0.02
North Wales	1.38	0.99	0.39*
Scottish Power ...	0.77	1.29	0.52
Fife Power	0.76	1.22	0.46
Shropshire, Worcester, and Staffordshire ...	1.12	1.49	0.37
London Companies:—			
County of London ...	1.78	3.44	1.66
City of London ...	2.43	3.95	1.52
Metropolitan	2.74	4.34	1.60
Charing Cross	2.52	4.04	1.52
St. James' & Pall Mall	2.80	4.08	1.28
Westminster	2.51	3.45	0.94
London	1.30	1.89	0.59
Brompton	3.24	5.28	2.04
Kensington	3.48	4.58	1.10
South London	1.68	3.53	1.85

* Deficit.

Czecho-Slovakian High-pressure Boilers. — Increasing attention is being devoted to the construction and use of high pressure steam boilers in Czecho-Slovakia. The Witkowitz Mining and Ironworks Co., of Witkowitz, has recently completed a battery for a Mahrisch-Ostrau concern to work at a pressure of 40 atmospheres and at a temperature of 400 deg. Celsius, and also one for its own collieries to work at 100 atmospheres and 490-500 deg. C. The last-named boilers are arranged to be fired with coke-oven gas, but may later be adapted to use pulverised coal.

Electricity at the Royal Agricultural Show.

Practical Demonstrations of Electrical Methods of Farming.

(*Concluded from page* 129.)

THE many electrical exhibits at the Royal Show at Chester, at which an important Conference on Electro-Farming, convened and arranged by the Agricultural Sub-Committee of the British Electrical Development Association, Inc., was held under the chairmanship of Lord Bledisloe on Wednesday, July 8th, proved of wide interest. Vistas of new possibilities for the application of electricity in agriculture were opened to the uninitiated, and it will not be inopportune to generally review some of the exhibits which attracted the attention of large numbers of visitors.

Scattered among the regular lines of agricultural implements were some thirty new inventions or improvements which had been entered for the Society's silver medals. Of these the new 12-h.p. wind-power plant, complete with a 5.5-kW. d.c.



Fig. 1.—Chester Corporation Tent and Transmission Line Exhibit.

generator, and a 58-ft. tower by Messrs. Young, Osmond and Young, of London, attracted much interest. This was undoubtedly the best electrically-equipped stand. It showed a 40-kW estate and farm power plant, comprising engine, generator, switchboard and battery, in conjunction with a kibbler, churn separator, milking machine, &c. An interesting feature of this stand was an electric tractor with caterpillar tracks. The device is designed to have almost the same freedom of movement as the ordinary oil tractor; a length of cable is employed, and is paid out or wound up according to the posi-

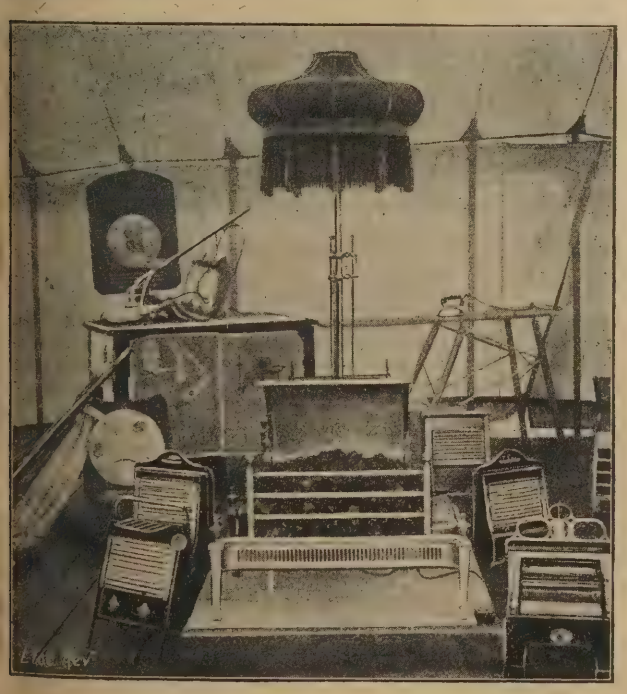


Fig. 2.—Part of the Corporation Exhibit.

tion of the tractor. This machine is to undergo practical field trials after the Royal Show. An improved electric crop dryer, in which the air is heated by means of self-contained electrical elements and blown into the stacks by means of an electric fan, was an important exhibit on this stand.

The Delco Light Co. exhibited an extensive range of electric light and power plant, including small generating sets, varying in capacity from 600 W to 1,250 W. "Frigidaire" electric refrigerators were also shown; the "Frigidaire" cooling coil is said to be equivalent to a 200-lb. block of ice, but maintains a temperature well below 50 degrees below zero.

Electricity in the homestead was demonstrated by the Chester Corporation, whose exhibits were housed in a tent 40 ft. by 20 ft. There were exhibits demonstrating the use of electricity for lighting and heating, "Hotpoint" cooking and ventilating; Beatty & Hurley washing machines, vacuum cleaners, boilers, ironers and other domestic apparatus, were also exhibited. Fig. 4 shows an electric fire which commanded great attention. Of outdoor apparatus there were churns, sterilising plant for the dairy, electric refrigerating plant, water pumps, barn machinery, an electric hay-chopping machine, a milk-separating machine, a churning machine, a sheep-shearing machine, a milk-cooling appliance, and a steriliser and water

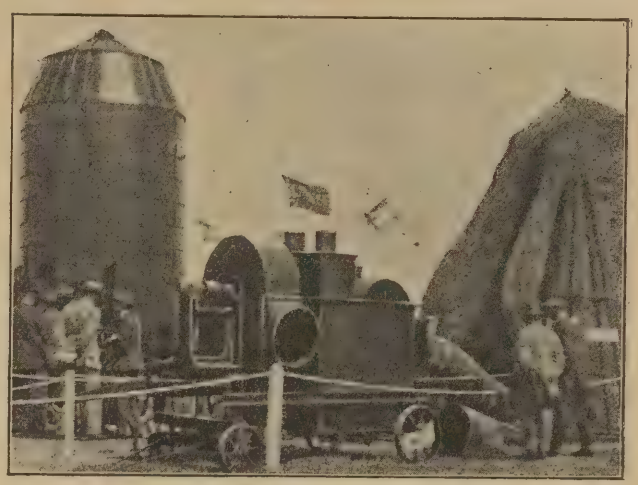


Fig. 3.—Electrical Crop-drying Plant.

pump. The tent was surrounded by a practical demonstration of the construction of a 6,000-V overhead transmission line, with a 6,600/400-V transformer, &c. Fig. 1 is a view of the tent and part of the transmission line.

At the stand of the Institute of Agricultural Engineers Oxford University, electric power was used for driving a blower, fig. 2, which forces hot air into a stack of green material, such as grass or cereals, for the purpose of artificial drying. The power required for this purpose is in the neighbourhood of 20 horse power.

Dynamo exhibits were displayed on seven stands. Various types of oil engine-driven electric lighting sets were shown by Messrs. Petters, Ltd., of Yeovil, including the "Alpha" Petters lighting set consisting of a 1½-b.h.p. petrol-paraffin

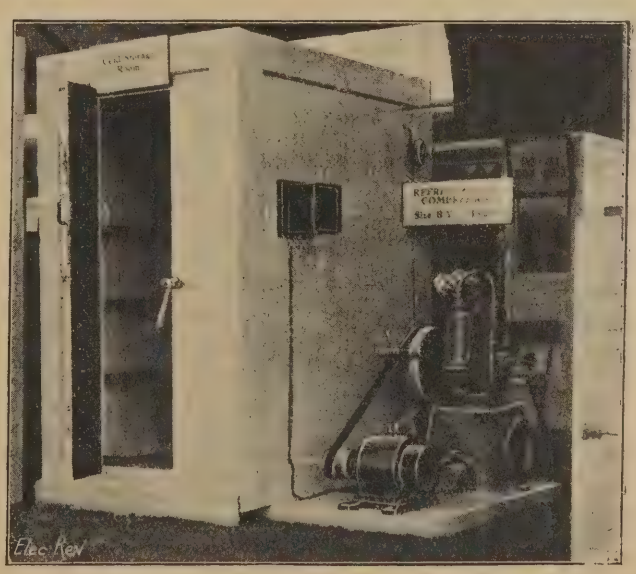


Fig. 4.—Cold Storage Equipment.

engine, dynamo and switchboard; and a 5-b.h.p. oil engine, dynamo, and switchboard set. Messrs. Blackstone & Co., of Stamford, had a big stand fully equipped with agricultural implements, including a spring injection heavy-oil engine directly coupled to a dynamo for supplying energy for general farm purposes. An electric lighting set, consisting of a dynamo belt-driven by a 2½-b.h.p. "Eagolyte" engine, for fifteen lights and upwards, was demonstrated by the Eagle Engineering Co., of Warwick, whose general exhibits were very comprehensive.

The Glasgow Electrical Engineering Company, Ltd., showed

a windmill electricity generating plant complete with a 22½-ft. mast, switchboard and battery. Although gas engines were the main point of appeal at the stand of the National Gas Engine Co., Ltd., a small vertical engine was demonstrated, working a small dynamo, whilst a horizontal unit, 4 b.h.p., was exhibited driving a heavier type of dynamo. To operate a mechanical lubricator of three types, the Vacuum Oil Co. employed a ¼-h.p. electric motor on a demonstration table.

Messrs. Bamfords, Ltd., had on view over 60 farming devices, including a 1-kW lighting set driven by a 2½-h.p. oil engine. Another well stocked exhibit was that of Messrs. R. A. Lister and Co., who showed a 100-V, 4-kW "Lister Bruston" lighting plant; a 1.5-kW direct-coupled Lister lighting set, complete with switchboard and stand; and a 1-kW belt-driven unit with switchboard, battery and rack. Messrs. Lister had a big range of dairying utensils on view.

Electric lighting plant of several types formed part of the composite display of Messrs. Boulton & Paul, Ltd. Interesting exhibits included an electric lighting plant, 1.5 kW, running on paraffin fuel, supplying energy for electric irons, churns, washing machines, &c., with a pulley for driving other



Fig. 5.—Cream Separators and Churns.

machinery; a petrol belt-driven 1-kW lighting set with a controller switchboard, suitable for an installation of 50 lamps; and a paraffin driven 4-kW electric lighting plant, suitable for power and lighting purposes for large country houses and farms. The Singer Sewing Machine Co., Ltd., demonstrated on the Corporation supply, twelve sewing machines of various sizes requiring from 45 to 200 W.

Amongst the standholders who employed electricity supplied free of charge by the Chester Corporation for the purpose of lighting, fans, and heating, were Reade Bros. & Co., Ltd., veterinary requisites; Polienta Co., Ltd., cattle medicinists; Spillers, Ltd., animal and poultry food merchants; agricultural information bureau, fertiliser stand, the British Sulphate of Ammonia Federation; Sutton & Son, seed specialists; J. Carter & Co., seed specialists; Gartons, Ltd., seed specialists; Zacharias & Co., waterproof makers; T. Grayson, Ltd., milk churn; Tangyes, Ltd., engines; the Sun Insurance Co.; the *Daily Mail*; Hewthorn & Co., veterinary preparations; Mappin & Webb, jewellery; Calthorp Bros. and Co., cattle food makers; Olympia Oil & Cake Co., Ltd.; W. Cooper; Nephewes, Ltd., veterinary preparations; Allied Newspapers, Ltd., heating and driving linotype machine; the Albion Cake Co., cattle foods; Charles Jones & Co., farm implements; Roger Errington, veterinary preparations; the ambulance room; fire station; the president's apartment and the secretary's office.

American electrical plant was exhibited by the Kohler Co., of London, which directed attention to automatic electric lighting and power plant, including the Kohler model D, 1,500-W, 110-V, d.c. set, with a 4-cylinder, water-cooled, combined engine; and the model S, 800-W, 110-V, d.c. automatic generator, with a 2-cylinder, air-cooled engine.

Lighting sets of 1½ and 3 h.p., operated by oil engines and equipped with 16-120-Ah batteries, made by Fuller's United Electric Works, of Chadwell Heath, were among the features of Messrs. Fairbanks, Morse & Co.'s exhibit.

The Haslam Foundry & Engineering Co. employed a 3-h.p. electric motor to drive a compressor for a cold storage refrigerating plant. Messrs. Watmough's, Ltd., showed the utility of the electric drive for grinding, crushing and pulversing corn and any other material, for which a 3-h.p. motor supplied adequate power. The Vigzol Oil Refining Co., Ltd., employed a ½-h.p. motor to drive an oil-refining plant. Using a 15-h.p. motor, Messrs. J. Harrison, Carter, Ltd., of Dunstable, demonstrated the operation of a cake crusher and a combined elevator and disintegrator for corn, food stuffs and fertilisers, having an output of 5 sacks per hour.

Of the fifty exhibits on the stand of Harrison, McGregor and Co., Ltd., several were shown in operation. For instance, a 3-h.p. motor was seen belt-driving a stationary binder, and a 15-h.p. motor propelling a countershaft from which was driven a complete set of barn machinery: this included a combined grinding and crushing mill, grinding 8 to 11 bushels, and crushing 25 to 30 bushels per hour; a chaff-cutter of 12 to 15 cwt. per hour capacity; a root cleaner and pulper, 4 to 5 tons per hour; and a double roller cake mill, 30 to 35 cwt. per hour.

Martins Cultivator Co., Ltd., had in service a 10-h.p. motor driving two swarth turners, a potato digger and combined side rake, a swarth turner and tedder, and also a ½-h.p. motor driving a rotary pump. To drive a corn mill with a capacity of 3 to 3½ sacks per hour, Messrs. Barford & Perkins, whose stand was well stocked with various farm implements, used a 5-h.p. electric motor.

Grinding machines were the speciality of Messrs. W. S. Barron & Sons, Ltd., of Gloucester, who demonstrated a 15-h.p. motor, belt-driving a countershaft from which was operated a geared impact grinding machine, and a 36-in. "Dreadnought" grinding mill; another 15-h.p. motor was direct-coupled to an impact grinding machine. Messrs. Robert Boby, Ltd., exhibited two motors, ¼ h.p. and 1¼ h.p., directly coupled and belt-driving respectively—in attachment with refrigerator compressors. Fig. 3 illustrates one of the compressors and the cold storage equipment.

The value of electricity to the dairy farmer was exemplified by Messrs. G. Llewellin & Son, of Haverfordwest. They showed a ¼-h.p. motor driving a 35-gal. separator and a similar motor driving an 18-gal. churn. The De Laval Chadburn Co., Ltd., exhibited a vacuum pump for a milking machine capable of dealing with the product of 40 to 60 cows. Fig. 5 shows some electrically-driven cream separators and churns.

An electric-driven flour milling machine of the latest type sextuble plansifter (for dressing flour), was the feature of outstanding interest at the stand of T. Robinson & Co. Messrs. Dawson Bros., Ltd., Gomersal, demonstrated an electrically-driven bottle-washing machine; this machine automatically soaks, brushes inside and out, rinses and sterilises 1,000 bottles per hour. The power unit also operated a milk bottle filling, measuring, and corking machine, capable of dealing with 160 dozen bottles per hour. To the Melotte Separator Sales Co., energy was supplied for four 1/5-h.p. motors, each direct-coupled to milk separators, dealing with 40 to 72 gallons of milk per hour according to size, one of which was demonstrated. Vaccar, Ltd., employed a 3-h.p. motor to drive a vacuum pump for a milking machine capable of dealing with 40 cows. The purpose of an installation driven by a 7½-h.p. motor, of Messrs. Thomas & Bishop, Ltd., was to depict good and bad belting. Messrs. W. H. Smith & Son showed a 3-h.p. motor, belt-driving a bottle-washing machine.

A model house (furnishing exhibit) by Richard Jones & Co. was equipped with electric lighting, kettles, cooker and irons. The electrical installation of this stand was supplied by Messrs. Williams, Gamon & Co. (Kaleyards), Ltd., Chester.

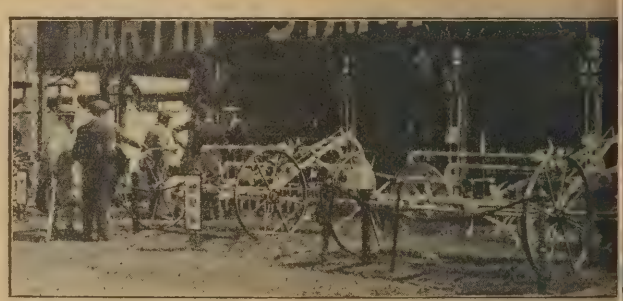


Fig. 6.—Electrically-driven Agricultural Implements.

The stand of Messrs. Ransomes, Sims & Jefferies, Ltd., Ipswich, was of unusual interest, showing as it did, self-contained electrical appliances and devices supplied from the Corporation mains. On view were a 20-b.h.p., d.c. motor mounted on wheels, for agricultural purposes; and a 15-h.p. motor belt driving a "Homestead" complete thrashing and finishing machine, capable of dealing with 45 bushels of wheat per hour, 50 bushels of barley, or 70 bushels of oats.

The only electric truck on show was that entered by Messrs. W. Goodyear & Sons, Ltd., of Dudley.

Fig. 6 shows some of the electrically-driven agricultural implements.

Petrol Tower Wagon for Tramways Department.—The Tramways Department of the Exeter Corporation has recently acquired a petrol motor tower wagon from the Associated Equipment Co., Ltd. The basis of the vehicle is a standard A.E.C. 28-h.p., 2-ton chassis. The tower, which is mounted immediately in the rear of the driver's cab, is built in two sections, one portion rising within the compass of the fixed section of the superstructure. A two-piece scaling ladder with iron sides and rungs is fixed on the near side, and as the tower is elevated it carries with it the ladder extension leading to the platform. The latter is so constructed that it can be turned in a complete circle and locked in any position in such a way that complete stability is ensured at its maximum elevation of 22 ft. At the rear of the vehicle is a commodious locker in which tools and other equipment can be carried.

Short-Wave Radio Communication.

Long-Distance Achievements by Amateurs.

HITHERTO when discussing long-range radio communication it has been customary to assume the expenditure of kilowatts of energy and the use of wave-lengths of thousands of metres. The remarkable facts which have recently come to light, however, have caused students of the subject to take stock of the situation anew. That attention has in recent times been re-directed to short waves, *i.e.*, under 100 metres, is due to amateur experimenters having obtained surprising results over long distances with very small power, and the investigation of the new effects which have been recorded may influence future development profoundly.

The McMillan Arctic Expedition.

The development of the short wave, in the neighbourhood of twenty metres, undoubtedly appears to be the most important aspect of radio research at the moment and it is for this reason that particular interest attaches to the American McMillan Arctic Expedition which left America on June 20th. Accompanying the expedition is Mr. John L. Reinartz, whose name is well known to every radio experimenter for his pioneering work with short waves. The receiver circuit bearing his name, which is becoming increasingly popular in this country, remains one of the most efficient of short-wave receivers, despite the introduction of much-advertised new circuits of late. Hitherto short waves have been almost entirely neglected and the work of Mr. Reinartz with the Arctic Expedition will be an extensions of his research in this direction, for he has taken with him a transmitter designed particularly for the twenty-metre wave-length; the Expedition is equipped with three other transmitters, for 40, 80 and 150 metres respectively, and the seaplanes are equipped with telephony apparatus. Mr. Goyder, who has just left Mill Hill School (N.W. London) succeeded in maintaining communication with the expedition for some days just before it crossed the Arctic Circle. He used a 250-watt valve and a wave-length of 40 m., with a single-wire aerial and a Reinartz receiver. The explorers hope to reach a hitherto unexplored region of the Arctic and the enormous distance which will separate them from receiving stations in America will make the tests severe ones, even for the short wave-lengths.

The Ridley Achievement.

Concerning recent amateur communication with Australia in daylight, as a matter of interest, it is understood that such communication was first established by Mr. J. H. D. Ridley (G5NN station, London) operating on a wave of 18 metres. When the oscillation frequency of such a short wave is taken into consideration, due credit must be given for the stable operation of the Mullard 0/250 transmitting valve that was used (fig. 1 shows a similar type). It is 14½ in. long and 5 in. in diameter; its anode current-grid voltage characteristics are shown in fig. 2 and a special feature is the method of assembling the internal parts so that filament renewals may be carried out without disturbing the other electrodes and internal structure. The long re-entrant glass tubes at either end provide high insulation between electrodes and the grid lead is kept far away from the filament leads. Mr. Ridley used an input of under 200 watts to the plate and a special loosely coupled circuit. His aerial is 37 ft. in length and 30 ft. high, the counterpoise being 40 ft. long and 10 ft. above the ground.



Fig. 1.—A Mullard Transmitting Valve.

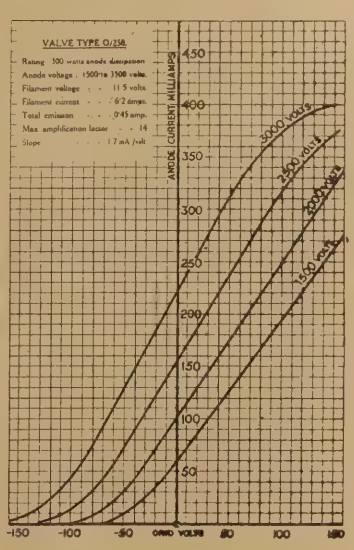


Fig. 2.—Type 0/250 Transmitting Valve Characteristic.

The message was received with the aid of a "low-loss" 2-valve tuner at 4.45 p.m. Melbourne time on April 26th, by Mr. B. Pringle, senior engineer on the staff of Amalgamated Wireless (of Australasia) Ltd., who logged all that was said about strength 6. It will be noted that the date precedes the transmission of 2OD (referred to below) so that Mr. Ridley has the distinction of being the first amateur operator to communicate with Australia on very short waves in daylight.

The Simmonds' Tests.

The recent achievement of Mr. E. J. Simmonds, the well-known amateur, in establishing radio communication between his Gerrard's Cross station (G2OD) and that of Mr. Maclurcan (A2CM) in Sydney, Australia, on a 20-metre wave is of interest for several reasons. On May 2nd signals were exchanged between 0552 and 0715 G.m.t., while on May 3rd messages were received and acknowledged for half an hour from 0520 G.m.t., the significant facts being that the short-wave messages travelled such a long distance when the whole of the path was in daylight and that they faded when darkness fell. In November last Mr. Simmonds established communication with Australia on a 100-m. wave, and he then found the signals were strongest and clearest during the hours of darkness. On May 17th, 18th, and 19th Mr. Simmonds communicated with New Zealand (NZ4AG) for the first time for three days in succession (wavelength, 22 metres) between 0500 and 0600 G.m.t., and it is interesting to note that these tests were accomplished with the aid of Marconi-Osram valves, the T 250 type (fig. 3) being used for transmitting and the D E Q type (fig. 4) for reception.



Fig. 3.—Marconi-Osram T250 Valve.



Fig. 4.—Marconi-Osram D E Q Valve.

The Marcuse Exploit.

Amateur experimenters met with such success last year that they are optimistically busy laying plans for next winter's work. Mr. Gerald Marcuse, who established communication with the Rice Expedition in Central America, recently established short-wave communication by telephony with the U.S.S. *Seattle* when she was 400 miles from Sydney, New South Wales. Mr. Marcuse first communicated with the ship by telegraphy; his signals were reported to be very strong, and he was requested to try speech. Despite bad interference at the Australian end, the speech was received well. Mr. Marcuse, who has quite a number of long-distance communications to his credit, including Brazil, Australia, and New Zealand, has recently added a modulating system and also an independent drive circuit to his transmitter in order to experiment with telephony. He uses Marconi-Osram valves of the T.250 type both for his modulator and main oscillator, and has found that the periods of audibility between this country and New Zealand are much greater on 45 metres than 90 metres.

Fresh Platinum Finds.—Reports of fresh discoveries of platinum come from the Pietersburg, Carolina, Waterberg, and Rustenburg areas. There is keen competition for farms, and the big groups are steadily increasing their interests.—*Financial Times.*

Electrical Development in Spain.

Important Water-power Schemes.

The British Commercial Secretary at Madrid (Capt. U. de B. Charles, C.B.E.), has forwarded a report* on the above subject to the Department of Overseas Trade. The report is dated March, 1925, and in the introduction it is stated that, apart from the poor harvest, the year 1924 showed considerable advancement. The wave of depression which has swept Europe has not affected Spain so seriously as other countries. The Moroccan problem remains, however, but it is considered that once this matter is settled the country should be in sight of the carrying out of a wide programme of development. The financial position of the State improved during the year 1923-24, and it was expected that the deficit would be still further reduced in the last financial year. With the possible exception of Barcelona there is very little unemployment in Spain at the present time. Labour troubles were few and far between during the period covered by the report, the only serious strike being that of the Asturias coal miners in November last which was settled in favour of the men. At the date of the report there was some talk of a metallurgical strike. Capt. Charles says that a feeling of stability and security has been established throughout the country.

Foreign Trade.

When the report was prepared the total figures relating to foreign trade during 1924 were not available. All that could be obtained was information regarding quantities imported and exported during the first six months of the year. Employing this as a basis of comparison it is observed that several important classes of electrical goods imported showed increases over the 1923 figures. For instance, the imports of dynamos, motors, transformers, switchgear, &c., during the first six months of 1924 amounted to 550 tons in the case of goods weighing from 1 to 3 tons and to 1,420 tons in the case of goods weighing upwards of 3 tons. In the first half of 1923 the quantities were 400 tons and 820 tons respectively. The share of the United Kingdom amounted to 100 tons in the first class and 65 tons in the second class. The imports of electrical measuring instruments rose from 47 to 95 tons (United Kingdom, 3 tons); electrical wires and cables, covered with textiles and exceeding 1 cm. in diameter, from 114 to 256 tons (United Kingdom, 124 tons), and aluminium cables from 6 to 165 tons. On the other hand imports of the following items decreased:—Insulators, from 500 to 240 tons; copper cables made of a wire of 0.5 mm. diameter or more, from 38,200 to 17,180 tons (United Kingdom, 17,000 tons); electric locomotives, from 380 to 80 tons; internal combustion engines, from 1,522 to 1,298 tons (United Kingdom, 223 tons); electric stoves, heaters, &c., from 41 to 18 tons; and accumulators, weighing 50 kg. or more, from 82 to 11 tons (United Kingdom, 1 ton).

Metal Production.

In the first nine months of 1924 shipments of copper pyrites amounted to 1,677,319 tons, as compared with 1,295,544 tons in 1923. The increase in output which commenced in 1923, after the signature by all European producers of an agreement under which output was adjusted to demand and selling prices raised to a remunerative figure, has been maintained, and many of the smaller mines have now resumed operations and the larger ones have undertaken development schemes. The high price of lead in the past year resulted in the re-opening of a number of mines which were practically closed down. In the Sierra Almagrera, the important lead district in the province of Murcia, pumping machinery is being actively installed and it is hoped to re-open the more important workings at an early date. The export of lead in bars during the first half of 1924 was 44,900 tons, as against 41,900 tons in the equivalent period of 1923. The increased output of zinc ore which was reported in 1922 was maintained in 1923, the exports of bars rising from 71,996 to 102,313 tons.

The increase in the use of electric power in mines and metallurgical works has been very rapid. The aggregate output of the motors installed in mines rose from 42,693 h.p. in 1922 to 59,472 h.p. in 1923. During the same period the aggregate power of electrical plant employed in furnaces, foundries and rolling mills, rose from 69,481 h.p. to 104,598 h.p.

The value of the finished copper output in 1923 was 60,639,678 pesetas, as compared with 34,915,337 pesetas in 1922. The equivalent figures for lead were 91,742,491 and 68,314,516 pesetas, and those for zinc 10,846,548 and 6,412,731 pesetas.

Hydro-Electrical Development.

The construction of water-power stations which had already been commenced proceeded slowly during the period under review, and there appears to have been little desire to embark upon any new hydro-electric schemes of importance. Only four undertakings were completed during 1924, *viz.*, a 2,000-h.p. development at Peñas de Castro on the Tagus for a cement factory, and three small stations (100 h.p. each) in the province of Guipuzcoa. Work is still proceeding on the Jucar River, where the Hidroeléctrica de Castilla has already expended 30 million pesetas on a station to develop 15,000 h.p. The plant of the Gallega de Electricidad on the Salto del Tambre (Galicia), which has cost 16 million pesetas, is nearing completion, and the Hidroeléctrica del Cantábrico is duplicating its 8,000-h.p. plant at Somiedo (Oviedo). The Hidroeléctrica Española has acquired the Tranco del Lobo falls, developing 3,000 kW, and has built a reservoir and provided an important reserve for its station at Molinar, which is lower down on the same river. The Sociedad Productora de Fuerzas Motrices has obtained further capital and formed a new company, the Sociedad Impulsora de Negocios Eléctricos, with a view to the further development of the hydro-electric resources of the Valle de Arán. In the Sierra Nevada the S.A. Tranvias Eléctricos de Granada has now opened the Durcal station which will supply power for the company's tramway and the new electric railway which has been opened from Granada to the Sierra. All the important power companies find it necessary to install reserve stations for use in the dry season. One of the most important recently constructed is the 15,000-h.p. steam station of the S.A. Electra de Viesgo, at Santa Cruz de Ujo (Asturias). This is capable of extension to 40,000 h.p. and will serve as a stand-by for the seven hydro-electric stations operated by the company. The steam station at Valencia of the Sociedad Anónima de Fuerzas Electrica, in which there are important British interests, was finished during the year. This has an output of 25,000 h.p., which will be distributed by a local co-operative society. It is reported that an agreement has at last been reached between two Spanish banks on the question of the much-disputed Douro Falls, which are estimated to be capable of producing 500,000 h.p., and it is hoped that the development of this important scheme will not be much longer delayed. There is also reason to believe that there is some prospect of working being commenced on the Alverche and Cafio Concessions (Madrid) in the current year. The approximate maximum water-power available is estimated at 6 million h.p. Concessions have already been granted in respect of over 4 million h.p.; 1,261,118 h.p. is in actual use, and 2,160,000 h.p. is under construction. At the close of the year water-power concessions were made subject to a number of special conditions. These include the requirement that Spanish plant and materials must be installed whenever they can be obtained. A recent Royal Decree designed to assist industry included a provision for compulsory expropriation in connection with hydro-electrical enterprises.

Railway Electrification.

A fair amount of railway electrification was completed during the year. The Puerto de Pajares section of the Norte Railway was opened for traffic and is said to be working satisfactorily. A new electrified line was opened between Granada and the Sierra Nevada during the year. This was built by private enterprise and links up a number of villages in the Genil Valley. The Granada Tramway Company has completed its line to Durcal, and a line from Durcal to Motril will probably be built later. The Bilbao-Santander Railway has obtained its shareholders' sanction to electrify the portion of the line between Bilbao and Algorta and tenders are to be invited immediately. The Ferrocarriles Vascongados has decided to electrify its line from Bilbao to San Sebastian. The work is to be supervised by an Italian engineer and the power will be supplied from a Diesel-engine station which is to be erected. Work is proceeding on the electrification of sections of the Transpyrenean Railway from Ripoll to Aix-les-Thermes.

On December 30th last the Gran Metropolitano de Barcelona opened to the public its line from the Plaza de Cataluña to the Plaza Lesseps. Further extensions will shortly be ready, providing two services of 3,600 and 4,500 metres respectively. Another company, the F.C. Metropolitano de Barcelona S.A., is constructing an underground railway at right angles to the above line, but it will be some time before it is opened to the public. In Madrid underground railway construction is also proceeding. In June, 1924, the Metropolitano Alfonso XIII opened the Sol-Ventas section and work is proceeding on two other sections. When this is completed there will be direct underground communication between the lines of the Madrid-Zaragoza-Alicante Railway and those of the Norte.

At the same time the development of the steam railways is proceeding and there is reason to believe that more than one British manufacturer has taken up the question of co-operating with existing Spanish factories, at any rate on the technical side, and in this way obtaining some share of the available business.

Methods of Business.

Capt. Charles says that the essentials of business in Spain can be summed up in two words—efficiency and adaptability. Although credit is absolutely indispensable to business in Spain, the danger of granting indiscriminate credits is, of course, greater during the depressed condition of some trades than in normal periods. Care is consequently necessary, but if the judgment of representatives of Manchester and other North of England firms with thirty years' experience is any criterion, Spain is one of the safest markets in Europe to-day if its peculiarities are studied. The language question is very acute; the knowledge or ignorance of Spanish often makes for a gain or loss of business. In spite of the high cost of British goods, Spain is certainly a potential market if British firms will only study and, what is more important, accept whenever possible, local conditions and requirements.

* Stationery Office. 2s. 6d. net.

The Inquiry at Southend.

Submarine Diesel v. Steam Plant.

OL. T. C. EKIN, M.Inst.C.E., on behalf of the Electricity ommissioners, held an inquiry at Southend on July 14th into ie application of the Corporation for sanction to borrow 40,000 for new plant and works; £7,100 and £2,980 in respect excess expenditure on previously-sanctioned loans; and 25,000 for a.c. mains, converting plant, switchgear and trans-rmers. Mr. J. A. Lee, engineer-assessor, and Mr. H. ouglas, financial adviser, sat with Col. Ekin; Mr. R. M. ontgomery, K.C., appeared for the Corporation, and Mr. raig Henderson, K.C., represented Westcliff Ratepayers' Asso-ation and the Southend branch of the National Citizens' nion. Watching briefs were held by Counsel on behalf of rtain ratepayers, Mr. R. Birkett, the borough electrical igineer, and members of the Town Council. We are indebted the *Thameside Mail* for the following notes of the oceedings

Mr. MONTGOMERY, opening the case for the Corporation, said at a majority of the Council favoured engines made by essrs. Belliss & Morcom, Ltd., on the lines of the Ger-an submarine Diesel engines of the war period and that ajority wanted permission to borrow money for the purchase two of those engines and the regularisation of excess ex-nditure on previous loans. After answering questions put the chairman regarding the method of selling the output id the rating of the engines already installed, Mr. Mont-mery said that while the simultaneous load on the three ations of the Corporation during the winter 1925-26 would 7,056 kW, the total capacity was 7,860 kW, leaving a re-rve of 10.4 per cent. The aggregate of the simultaneous mands on the stations would be 7,199 kW. Opposers of the heme held that Mirrlees engines would be preferable, but e applicants considered it better to have engines of a type ith which the staff was acquainted. He showed that there as a net difference of about £2,500 in favour of Mirrlees gines, G.E.C. generators being used in both cases. The dif-rence would be reduced to £1,300 if the Mirrlees engines ere fitted with oil-cooled instead of water-cooled pistons. Mr. W. H. Patchell was called as the first witness. He gave as his opinion that the submarine Diesel engines at present use at Southend were entirely satisfactory. The Belliss gines would afford interchangeability and the raising of eam at the rate of 1 lb. per kWh from exhaust gases for e by the steam plant at the London Road station. Under oss-examination by Mr. Craig Henderson, Mr. Patchell ad-itted that he had not been given sufficient notice to enable m to make an exhaustive examination of the Corporation's bmarine Diesel engines. He agreed that for outputs above 0-kW a slower-speed engine was superior; and he also con-rred in a suggestion by Mr. Henderson that the Corpora-n would eventually have to scrap the Diesel plant and go in r steam plant, but would not state whether it would be tter to do this immediately. He pointed out that he was not ked to give advice on this point, but to choose between the o types of Diesel engines in question.

Mr. ROBERT BIRKETT, borough electrical engineer, was called d stated that the original submarine Diesel engines ere installed on his advice and he had later advised the pur-ase of more of these engines until the Corporation's electrical licy had been definitely settled. He was without question favour of the type of engine preferred by a majority of the uncil. He agreed with Mr. Patchell on the questions of terchangeability of spare parts and labour.

COL. EKIN asked for estimates of the running costs of the irrlees and Belliss engines respectively.

Mr. BIRKETT produced these, and said that eight tenders had en received. The two in question had been accepted because ey were lower in price than the others except one which as rejected because it came from a German firm. It was oposed on the advice of Messrs. Handcock & Dykes to install nverting plant at the Leigh and Thorpe Bay stations to enable rrent to be interchanged with the London Road station.

Upon the following day Mr. BIRKETT continued his evidence d admitted that labour costs amounting to about £1,600 had en incurred in cleaning engines which were supposed to be w, and that Messrs. Belliss & Morcom had been paid an ount of £300 for an exhaust silencer which was extra to e contract. He agreed that in 1921 he had stated that the w-speed land-type Diesel engine was superior to the sub-rine high-speed type and that steam was more reliable than her. He had not tried to provide Southend with elec-city plant on a piecemeal basis; he was still turning over his mind the question of turbo-alternators. In reply to a estion by Mr. Henderson, witness admitted that he had owed Messrs. Belliss & Morcom to remove a quantity of are parts from the London Road station although the order r the new engines had not yet been signed. Examined upon s attitude to a report by the late Mr. C. H. Wordingham on e future supply of electricity in Southend, Mr. Birkett ad-itted that while Mr. Wordingham's estimate of future con-mption had been too small, his own had been 1½ million Wh lower than that. He considered that the alternator ommended by Messrs. Handcock & Dykes was unnecessary present, although he would use it if he was compelled to so. He admitted that he did not like to have to work with e experts in drawing up specifications, and the Electricity ommittee allowed him to prepare the specifications for the two engines which formed the subject of the inquiry. He also admitted that by including a long list of spares, not considered necessary by the makers but which he deemed essential, he had increased the tender of Messrs. Mirrlees, Bickerton & Day from £26,148 to £27,693 (including E.C.C. generators). The lowest tender was put in by Messrs. Mirrlees, Bickerton and Day, who quoted £27,693 against Messrs. Belliss & Morcom's £27,916 (using Lancashire generators). He denied that he informed his Committee that he had given an undertaking to the Electricity Commissioners not to use two-cycle engines, but he did state, on the authority of a discussion in his office, that Messrs. Handcock & Dykes would not approve of two-cycle engines. Mr. Birkett said that he was not misleading members of the Council when he sent them a "confidential" letter urging the purchase of German submarine Diesel engines from a Gillingham firm, which it was intended that Messrs. Belliss and Morcom should re-condition for service. It was not his wish to say anything against the Mirrlees engine. He maintained that the German Diesel engines had done their work well.

Councillor JOHNSON, a member of the Corporation, said that he believed the existing plant to be the best that the town could obtain.

Mr. CRAIG HENDERSON, K.C., in opening the case against the proposed loan, alleged that there had been a want of candour in one item relating to the excess expenditure of £10,080; this item, "overhaul, &c.," accounted for no less than £2,500. This included £1,100 for rough labour. Although the work was to be carried out by Messrs. Belliss & Morcom, Counsel said that the past few years had shown that Mr. Wordingham had been right and Mr. Birkett wrong. The latter had persuaded the Corporation to buy submarine Diesel engines and nothing but these had a chance. They asked for a full and proper scheme to be put before the Commissioners; he wanted the Inspector to be thoroughly satisfied whether the figures put forward were reliable. Mr. Birkett had condemned the submarine Diesel engine in his correspondence with the Commissioners, but he tried to find fault with the low-speed machine without knowing what it could do. He had claimed that submarine Diesels could be quickly reconditioned and erected and yet it took 11 months and cost £1,100 for rough labour to do the job. After stating that Mr. Birkett objected to a supply from the County of London Company, Mr. Henderson referred to the manner in which Messrs. Handcock & Dykes were "dropped" when their reports were unfavourable to the Electricity Committee, and said that if it were left to Mr. Birkett the a.c. mains would never be laid unless he was overruled. The whole electrical policy of Southend was opposed to that of the Electricity Commissioners throughout the country; Southend was isolating itself from other districts because it had three separate stations which were not linked by h.p. cables. With regard to the tenders for the new engines, Counsel said that "English-made land-type Diesels" were stipulated, but when the minute came before the Council the words "English-made land-type" were omitted. The attention of the Corporation had never been drawn to the facts that there were lower tenders than that of Messrs. Belliss and Morcom, and that the Mirrlees engines had a lower fuel consumption.

Mr. A. H. DYKES, called as a witness, said that he had been asked to report on the undertaking. He had difficulty at times in obtaining information. After inspecting the Mirrlees engine he recommended its acceptance. He considered that this was a cheaper and better engine.

Mr. TOWNEND, of Messrs. Handcock & Dykes, said that he had interviewed a deputation from Southend at his office. He considered that it would be a backward movement for Southend to continue to use an engine based on the type made by the Germans in 1917. The Mirrlees was a modern engine.

Major W. V. WEBER, a member of the Council, then gave evidence and said that he objected, in the case of the first three submarine Diesels, to the town paying £5,500 each for engines that had cost £1,100 each. The Electricity Committee was always told that the engines were new and were wanted immediately, but it had always taken nearly a year to install them. Major Weber complained that the Committee was never given full information or reports of breakdowns. He said that Messrs. Handcock & Dykes's report had been disregarded and Messrs. Mirrlees, Bickerton & Day wrote and asked why their tender, which was the lowest, had not been accepted. This letter did not reach the Mayor until three or four weeks later; it was found in the office of the borough electrical engineer. He maintained that the Corporation was retarding electrical progress, and said it was time that the Commissioners investigated the matter. Major le Masurier, C.B.E., also gave evidence.

In conclusion, Mr. HENDERSON contended that Mr. Birkett had set himself out to flout the Commissioners; he asked the Commissioners to compel Southend to come into line with the rest of the country.

Col. EKIN said that before coming to a decision the Commissioners would have to seriously consider the electrical policy of Southend. They would not come to a decision on the matter until they knew what the views of the Council were in respect of the future. He declined to proceed with the second part of the inquiry until after the long vacation.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A New Electric Block.

We recently saw the new electric block illustrated herewith, which is the latest product of Messrs. S. H. HEYWOOD & Co., LTD., Reddish, nr. Stockport, under test and giving favourable results. This machine, which is designed to give complete accessibility to all working parts, is constructed around a framework consisting of two cast-steel pan-shaped end plates rigidly connected by cross stays. The driving motor, fig. 1, is mounted on angle irons between the end plates,

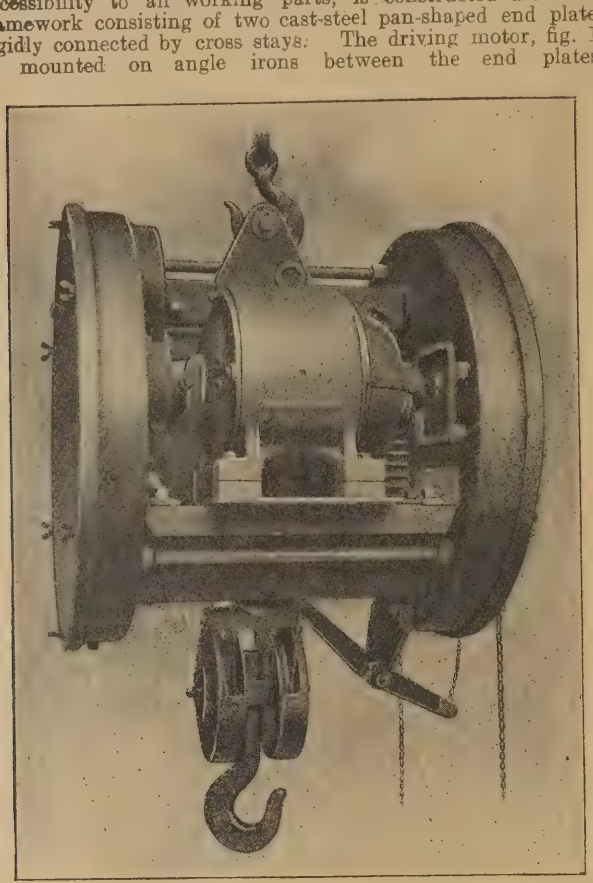


Fig. 1.—Electric Block, showing Motor Housing.

one of which contains the brake equipment, including the brake pulley, carried by one end of the motor shaft. This pulley is easily removable by means of a pulley-removing device of the usual type attached to the centre of it. The other end of the motor shaft carries the driving pinion housed in the opposite end plate. It can be readily removed by dismantling a grooved plate covering an aperture in the end through which the motor shaft with the pinion may be slid

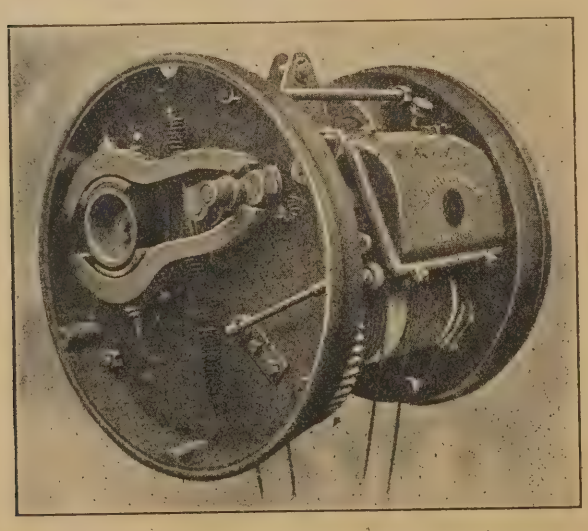


Fig. 2.—Electric Block, showing Brake and Controller.

with the motor from position, the end plate itself being internally cone shaped. The motor is of the standard "Hall" type.

The controller is of the drum type, and is situated on the opposite side of the frame, fig. 2. It has five positions other than the "start," and is operated by the usual chain and lever device. The resistances are carried in the opposite "pan," and are built on five cylindrical bobbins. The controller is totally enclosed, but every part is rendered accessible by means of a hinged door. The contact barrel is mounted on ball bearings, and the whole can be lifted from the bearin housings after a simple operation entailing the disconnectio of an extension of the barrel spindles, which carries a pinio affording the automatic operation of the brake. Arc shiel are fitted between all the fingers.

The automatic braking operation is effected by means cams engaging with rollers on the ends of the brake arm the cams being carried on a central spindle geared to th contact barrel shaft of the controller. The cam operati surfaces are so shaped as to give a uniform pressure increa during their operation. The brake shoes are lined with ha "Ferodo" fabric, and are suspended loosely about the pull from the brake arms, so as to ensure a uniform surfa pressure on the pulley. The equipment in both end chambe is completely encased by sheet steel covers, which are easi removed by means of thumb screws. The winding barrel mounted on a shaft supported between and by the two en cases. It may be removed bodily by withdrawing the sha through one of the ends. The barrel spur wheel is bolte by means of fit bolts to the barrel itself, thus eliminati the use of keys. The lubrication of all bearings is by scre down grease cups conveniently located outside the framewor

A Swiss Arc Welder.

Following a study of the phenomena of the electric arc produced between metallic electrodes, the SOCIETE DES ATELIE DE SECHERON, of Geneva, recently introduced portable alterna ing-current arc-welding apparatus which is claimed to gi satisfactory technical results, at least equivalent to those o tained with direct-current plant, and at a much lower fir cost, this being only about one-third of that of the d.c. outf The apparatus consists of a special static transformer t secondary voltage of which adapts itself automatically to t class of welding being done. A commutator regulated by hand wheel shows the current employed, the use of delica instruments being thus avoided. For use in erecting sho the coils may be wound to work with a.c. at 250, 380, 500 volts.

A "Flywheel" Motor Compressor.

Some interesting particulars are given in *Chemical a Metallurgical Engineering* of new type of air compress brought out by the CHICAGO PNEUMATIC TOOL CO., 6, East 44 Street, N.Y. This compressor uses a specially designed sy chronous motor, called the "flywheel" type, particula adapted to single straight line air compressor operation. T motor is designed with the rotating element outside the stat which is mounted in a cradle support bolted to the compres

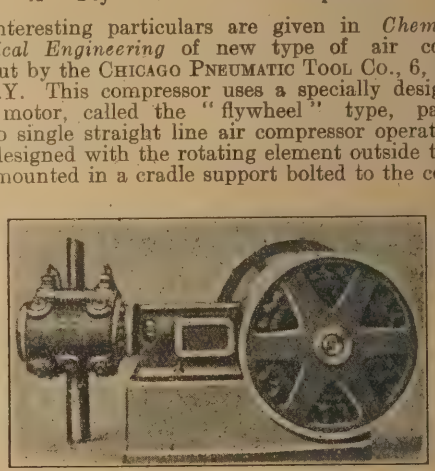


Fig. 3.—The "Flywheel" Motor Compressor.

frame. This support is bored concentric with the compres bearing to ensure alignment of the stator and a uniform gap when assembled. The rotor has the appearance of ordinary flywheel, the face being crowned for belting to exciter or other auxiliary. The poles are mounted on the in rim of this wheel. With this construction, the weight a consequently the cost of the motor have been greatly reduc

A New Shade Carrier Ring, Holder Lock and Flexible Gl

We have received from MESSRS. LAMLOK, LTD., 237, Ac Lane, Chiswick, London, W.4, a lampholder fitted with a n shade carrier so designed that the ring carries a sleeve, panded at the top end, which grips the shade. The act ring, with the usual milled edge, is at the bottom of the sle which is about ½ in. deep, thus allowing it to be adjusted the fingers in narrow shades which either necessitate the of a shade carrier ring remover or great inconvenience w the ordinary type of ring. The device also permits of mu quicker adjustment or removal, in that the ring is passed o a minimum number of the threads on the liner of the lar holder.

The holder also carries a locking device, consisting o threaded hole at one side of the top of the holder, into wh a pin is screwed which will engage with one of the side s in the porcelain. A flexible gripping nipple is also inc porated in the holder; this takes the form of a bush of in lating compound with a central hole through which the passes. It is screwed into the top of the holder from inside and when the holder is fixed, it is screwed down that the leads are gripped between the porcelain and the bottom of the bush.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Special A.C. Rectifiers.

In answer to "Rectifier's" letter in your issue of July 17th, we may say that we are now manufacturing apparatus by which the necessary high-pressure required by wireless receiving sets can be obtained from an a.c. supply, which is laid on in many households.

We are supplying large numbers of these outfits, and customers are more than satisfied with the results they are obtaining. We may say it is possible by simple adjustment to so smooth out the current that no continuous note is audible in a loud speaker.

It will interest your readers to know that the whole arrangement is effected by transformers and condensers, and the apparatus is therefore entirely free from liquid and other objectionable features.

Gent & Co., Ltd.
H. P.

Leicester, *July 22nd*, 1925.

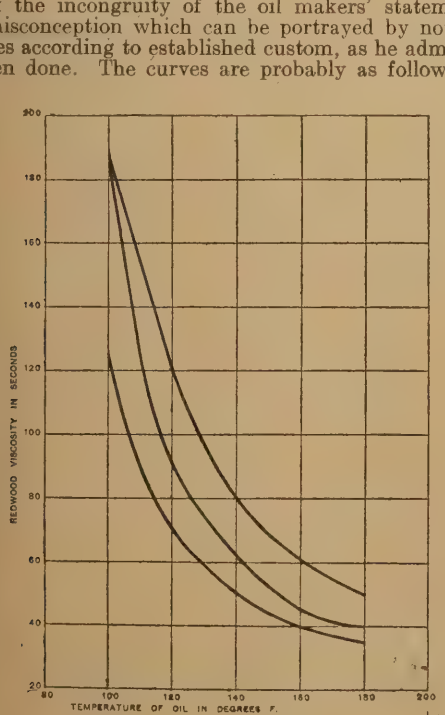
Lubricating Oil for Turbines.

As you have considered Mr. J. E. Stewart's letter dated July 2nd to be, as he suggests, of such importance to be published in your July 10th issue, I feel sure that a reply to the criticisms will not be out of place. I shall endeavour to deal with the points *seriatim*.

Mr. Stewart is under a misapprehension concerning the attitude of the turbine maker in his recommendation of lubricating oil. Final decision, it is true, is practically left in the hands of the turbine builder, as in the case of all other makers of machinery, because he is responsible for the well-being of the plant during the guarantee period. In most cases the process is simply that the oil supplier prepares an oil which he believes to be suitable and submits it to the turbine builder, who, if he thinks fit, tests it in a turbine, provided it conforms to the usual preliminary laboratory tests, which nowadays are fairly accurately understood and capable of interpretation. If the results of the running test are such as to commend themselves to the turbine maker, then the oil may be put on his list for recommendation. Thus, the decision is a dual one, and not one of shifted responsibility.

I am of the opinion that there are neither turbine builders nor turbine users who know any recognised turbine oil which does not possess a good temperature coefficient of viscosity, and I might go further and say that it is not customary to give the viscosity at one temperature only. The usual temperatures are 70 deg. F. and 140 deg. F., but when a third temperature is desired, it is usually taken at 100 deg. F. in the case of turbine oils.

The "curves" which Mr. Stewart gives are not really indicative of the incongruity of the oil makers' statements, but of the misconception which can be portrayed by not drawing the curves according to established custom, as he admits should have been done. The curves are probably as follows:—



which puts a very different construction upon Mr. Stewart's comments.

E. A. Evans,
Chief Chemist, C. C. Wakefield & Co., Ltd.

London, E.C.2.,
July 22nd, 1925.

We have read with interest the letter in your issue of July 10th of Mr. J. E. Stewart. We notice, however, that the statement is made therein that it is customary for oil manufacturers to give viscosity in seconds at one temperature only.

We cannot help thinking that Mr. Stewart's experience has been an unfortunate one as we believe it is the custom of most firms of repute to give viscosities at more than one temperature, it being well known to the oil trade that one temperature is by no means indicative of the quality of an oil.

The enclosed booklet issued by us on turbine lubrication may be of interest. We thank you in anticipation of your correcting a statement which, we think, may give rise to an altogether false impression as to the attitude of the oil trade generally. That there are certain firms which will wilfully withhold, either through ignorance or design, certain information is probably true, but this does not apply to any of the well-known houses, which are only too anxious, as a rule, to clearly state the merits of their products in such a way that the engineer or technical man can fully appreciate the quality of the article he is buying.

Sterns, Limited,
H. BELL THOMPSON,
Director and General Manager.

London, E.C.2, *July 24th*, 1925.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Carbon Electrodes. — On July 21st, Mr. O. NICHOLSON asked the Chancellor of the Exchequer why, seeing that American carbon electrodes were permitted to be imported into this country after payment of 33⅓ per cent. "Key Industries" duty without any additional deposit, an additional 20 per cent. was added to the 33⅓ per cent. "Key Industries" duty charged on carbon electrodes imported into this country from Austria.

Mr. CHURCHILL said he was informed that the values declared for the purposes of the assessment of key industry duty on carbon electrodes imported from Austria were considerably below those declared for similar carbons imported from America. The question whether the declared values of the Austrian carbons could be accepted was at present under consideration by the Commissioners of Customs and Excise, and, pending a decision, delivery of the carbons was being allowed on the deposit of a sum equal to the duty based on the declared values plus 20 per cent. of such duty. He understood that a decision on the question of value would probably be given at an early date.

Transmitting Radio Licences.—On July 21st, Captain W. BENN asked the Postmaster-General what scale of charges he proposed to lay down for transmitting licences under the new Bill; and whether he could give any undertaking that the scale would not be exceeded in the future.

SIR W. MITCHELL-THOMSON said that the fees for experimental sending licences were reduced some months ago, and the charges now made were an initial fee of 10s. and an annual fee of £1 where the power authorised did not exceed 10 watts, and an initial fee of £1 and an annual fee of £2 where the power exceeded 10 watts. The hon. member could not expect him to give a pledge that these fees would never be increased. He could give an assurance that no alteration was at present contemplated.

Unemployment Figures.—On July 22nd, Mr. BETTERTON Parliamentary Secretary to the Ministry of Labour, informed Sir F. Rice that the number of electrical wiremen, linesmen, and fitters on the registers of Employment Exchanges in Great Britain at June 1st was 6,937.

Wireless on Ships.—On July 22nd, Mr. B. SMITH asked the President of the Board of Trade, with reference to the Merchant Shipping (Wireless Telegraphy) Act Amendment Rules, 1925, issued on April 21st, 1925, whether he would seek powers which would enable the Board of Trade to require Class II vessels to carry more than one qualified operator, in the same way as he had secured powers to exempt foreign ships from the requirements of the Merchant Shipping Wireless Telegraphy Act of 1919.

SIR BURTON CHADWICK, Parliamentary Secretary to the Board of Trade, said he was not convinced that the alteration of the law proposed was necessary in the interest of safety of life at sea.

The London and Home Counties Electricity District.—On July 27th, Lt.-Col. MOORE-BRABAZON, Parliamentary Secretary to the Ministry of Transport, moved the approval of the Order made by the Electricity Commissioners constituting the London and Home Counties Electricity District, and incorporating the London and Home Counties Joint Electricity Authority. The Order was approved with slight modifications.

The Mersey Tunnel.—Further evidence has been heard by the House of Lords Committee, which is considering this scheme, during the past week, and it was expected that the hearing would be concluded during the week.

The Wireless Telegraphy (Explanation) Bill.—This Bill was read a second time in the House of Lords on July 27th.

Japan's Electrical Imports and Exports.

SINCE the earthquake in Tokio and Yokohama, which caused the destruction by fire of a quantity of the Government's statistical data, the Japanese import and export trade returns have not been issued in very great detail. It is, however, now possible to compare the figures for 1922, 1923 and 1924. The following table shows the values of Japan's imports and exports of electrical and allied material during these three years. It will be noticed that exports, except those of telephones and electric lamps, have declined progressively, whilst in 1924 imports of electrical machinery were unusually large.

Exports.

	1922. Yen (Thous.)	1923. Yen (Thous.)	1924. Yen (Thous.)
Insulated electric wire.—			
Total	7,816	1,609	1,373
To China	6,712	661	317
,, Kwantung	849	677	889
,, Hong Kong	164	63	91
Electrical machinery.—			
Total	3,028	1,851	1,755
Telephones.—			
Total	119	154	143
Electric lamps.—			
Total	1,244	1,335	1,829

Imports.

Insulated electric wire, submarine telegraphic or telephonic cables	831	443	736
Other cables	485	1,885	717
Wattmeters	1,409	1,252	3,868
Telegraphic or telephonic instruments and parts ...	1,359	859	4,338
Steam boilers and parts ...	6,403	2,949	5,473
Steam turbines	1,052	499	2,298
Steam engines	121	140	32
Water turbines	2,979	3,028	1,463
Dynamos, motors, transformers, &c.	11,947	10,835	20,978
Dynamo sets	877	525	368
Electric carbons	358	314	606

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

216. "Electricity meters." Measurement, Ltd. January 12th, 1923. (209,733.)

5,035. "Electric resistance units, rheostats, and the like." W. R. Micklewright and Micklewright, Ltd. February 27th, 1924. (236,248.)

7,969. "Control systems for electric circuit-breakers." British Thomson-Houston Co., Ltd. March 30th, 1923. (213,603.)

8,013. "Multiple wiring device for wireless receivers and the like." W. H. Franklin. March 29th, 1924. (236,261.)

8,110. "Telegraphic relays." Western Electric Co., Ltd. (Western Electric Co., Inc.). March 31st, 1924. (Patent of addition not granted.) (236,264.)

8,144. "Processes of manufacturing selenium cells for photo-electric work." R. Hart. March 31st, 1924. (236,266.)

8,336. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. A. Pollock. April 2nd, 1924. (236,277.)

8,374. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd., and W. Saville. April 2nd, 1924. (236,282.)

8,386. "Apparatus for testing the cells of secondary batteries." A. W. Rayworth. April 3rd, 1924. (236,284.)

8,399. "Electrical conduit fittings for jointing conduit tubes." F. H. Terry and W. Sale. April 3rd, 1924. (236,285.)

8,473. "Acoustic amplifiers, trumpets, horns or sound conduits for loud-speaking telephonic apparatus." E. A. Graham. April 3rd, 1924. (236,288.)

8,513. "Electric discharge devices for vacuum tubes." E. V. Hayes-Gratze. April 4th, 1924. (236,289.)

8,638. "Apparatus for heating liquids by electricity." W. A. White. April 5th, 1924. (236,292.)

8,639. "Electric circuit-breakers." E. B. Wedmore and British Electrical and Allied Industries Research Association. April 5th, 1924. (236,293.)

8,698. "Magneto-electric ignition machines." A. G. L. Neighbour. April 6th, 1923. (213,930.)

9,055. "Loud speakers." W. J. Davis and Edison Swan Electric Co., Ltd. April 9th, 1924. (236,298.)

9,236. "Automatic switches for use in telephone systems." Western Electric Co., Ltd. (G. Deakin). April 11th, 1924. (236,301.)

9,252. "Controllers for electric circuits." N. E. North and Metropolitan-Vickers Electrical Co., Ltd. April 11th, 1924. (236,303.)

9,607. "Electromagnetic transmitters and receivers for reproducing sound. A. F. Sykes. April 15th, 1924. (Addition to 160,223 as modified by 186,658 (236,313.)

9,834. "Electric accumulators." W. H. Simms (H. S. Potter). April 17th 1924. (236,316.)

10,111. "Means for controlling electric circuits at pre-determined times. A. Woosnam (L. Ederer). April 23rd, 1924. (236,318.)

11,299. "Protective devices for electric lamp regulators." E. Dick. Ma 7th, 1923. (215,762.)

11,444. "Valve-holders for wireless receiving apparatus." W. S. Gra Baker. May 8th, 1924. (236,333.)

12,390. "Crystal detectors for wireless reception." Sterling Telephone an Electric Co., Ltd., and T. D. Ward-Miller. May 20th, 1924. (236,340.)

12,674. "Electric protection of transformers." Electrical Improvement Ltd., and G. L. Porter. May 23rd, 1924. (236,343.)

13,001. "Means for introducing capacity effects in alternating electric cu rent systems and apparatus." T. F. Wall. May 27th, 1924. (236,350.)

13,816. "Devices for retaining a smooth and even surface on commutato and slip-rings of electric machines." J. H. Bennison and F. Pape. June 6t 1924. (236,355.)

15,111. "Devices for controlling electric circuits." British Lighting an Ignition Co., Ltd., and J. C. Hutton. June 23rd, 1924. (236,363.)

18,323. "Sound-reproducing instruments." British Thomson-Houston Co Ltd. January 25th, 1924. (228,102.)

18,413. "Electric batteries." Three Star Accumulators, Ltd., and Kendall. August 1st, 1924. (Addition to 185,989.) (236,398.)

19,499. "Apparatus for converting oscillating electric currents into sou and *vice versa*." British Thomson-Houston Co., Ltd., and A. P. Young August 16th, 1924. (236,403.)

29,827. "Arrangements of magnetos and dynamos applied to interna combustion engines." Crossley Motors, Ltd., and T. D. Wishart. Decemb 11th, 1924. (236,107.)

20,362. "Tuning device for use in wireless telegraphy and telephony H. F. Bowers and E. V. Bowers. August 28th, 1924. (236,410.)

29,938. "Telephone phantoms with reduced cross-talking phenomena, a a method of manufacturing the same." Felten & Guilleaume Carlswe Akt. Ges. January 4th, 1924. (227,095.)

23,195. "Electric time-limit relays of the induction type." W. H. Peters and Allmanna Svenska Elektriska Aktiebolaget. October 1st, 1924. (236,42

23,308. "Mechanism for effecting angular displacement of the brushes commutator dynamo-electric machines." British Thomson-Houston Co., L October 3rd, 1923. (222,877.)

23,667. "Electric current rectifier for use in effecting electrical measu ments and the like." W. J. H. Janvier. October 10th, 1923. (223,231.)

24,490. "Machines for making filamentary coils." British Thomson-Houst Co., Ltd. October 16th, 1923. (223,575.)

24,818. "Electrical switches." British Thomson-Houston Co., Ltd. Octob 19th, 1923. (223,598.)

25,283. "Control of dynamo-electric machines." British Thomson-Houst Co., Ltd. (General Electric Co.). October 23rd, 1924. (236,430.)

25,572. "Electrical condensers." Dubilier Condenser Co., Ltd. (forme Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 19 (236,431.)

27,045. "Electric short-circuiting rod." P. Gosslar. November 12th, 19 (236,437.)

27,678. "Telephonic receivers." E. A. Graham. November 19th, 19 (236,442.)

28,254. "Switching apparatus for use in telephone or like system Siemens & Halske Akt. Ges. January 26th, 1924. (228,113.)

28,605. "Variable inductance for radio signalling apparatus." Langenickel. November 28th, 1924. (236,100.)

28,888. "Electric time-switches." W. A. Andersen. December 29th, 19 (226,796.)

29,680. "X-ray apparatus." British Thomson-Houston Co., Ltd. Dece ber 10th, 1923. (226,208.)

30,885. "Electric outlet boxes." British Thomson-Houston Co., L December 31st, 1923. (227,099.)

30,886. "Electric outlet boxes." British Thomson-Houston Co., L December 31st, 1923. (227,100.)

30,981. "Maximum demand indicator and signalling device for electri meters." Landis & Gyr Soc. Anon. January 14th, 1924. (Addition 206,505.) (227,813.)

31,290. "Distributing box for electrical installations." R. Bosch Akt. G January 24th, 1924. (228,127.)

1925.

44. "Electrical controllers." Arrol & Co., Ltd., Sir W. Pitt, R. M. W. De Renzi. January 1st, 1925. (236,460.)

1,875. "Operating handles for electric motor control switches." Bri Thomson-Houston Co., Ltd., and C. T. Hanna. January 21st, 1925. (236,4

2,204. "Electric motor-starting switches." British Thomson-Houston Ltd. April 26th, 1924. (232,922.)

2,751. "Electrically-propelled vehicles." S. Attila. January 30th, 1 (236,477.)

5,457. "Light projectors." British Thomson-Houston Co., Ltd. Febru 28th, 1924. (230,086.)

5,757. "Electric drink-mixers." R. B. Gilchrist. June 14th, 1 (235,523.)

6,069. "Incandescent lamps for vehicle headlamps." British Thom Houston Co., Ltd. March 25th, 1924. (231,449.)

7,807. "Automatic or semi-automatic telephone systems." Automatic T phone Manufacturing Co., Ltd., and J. E. Ostline. April 1st, 1924. (Cogr application 7,808/25, a divided application on 8,569/24.) (Divided applica on 8,289/24.) (236,497.)

7,876. "Switch for use in connection with the electric lighting of vehicl Luma-Werke Akt. Ges. March 24th, 1924. (231,202.)

8,270. "Safety devices for electric cubicle switchgear." Crompton & Ltd., and W. F. Jones. March 27th, 1925. (236,498.)

12,142. "Radio receiving systems." J. E. Callahan. May 17th, 1 (234,094.)

14,549. "Electrically-driven fans." T. Frolich (firm of). June 6th, 1 (235,200.)

German Industry in June.—The Commercial Secret at Berlin (Mr. J. W. F. Thelwall) has forwarded to the D partment of Overseas Trade a review, based on the reports the Prussian Chambers of Commerce, of the commercial a industrial situation in Germany during June. He states t the position in the electro-technical industry was not unifor Where the general dearth of money was not immediately in view of the existence of a working balance, the influx orders was very brisk, particularly in the case of elect technical works and tramways, and it was endeavoured carry out improvements and extensions on a large sc Price increases for certain groups of apparatus occurred at beginning of the month. Foreign prices were also rais though with great caution and reserve.

The

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Statistical Co-ordination.

THERE are many things about Government Departments which are incomprehensible to the man in the street. Some of these are due to the apparent lack of co-ordination between the departments—each in its water-tight compartment seems to preserve its own individuality. That may in some cases make for good. To-day, however, when the truism "export or starve" is becoming a national shibboleth, it is important that we should be able to trace in every important industry the relation between external trade and direct unemployment in the industry concerned. Only by these means can we appraise claims for the protection which the Safeguarding of Industries Act is supposed to give.

At the outset, however, the student of statistics wishing to study the problem has to have recourse to two different publications—on the one hand, there are the monthly Trade and Navigation Returns published by the Board of Trade about the eleventh of each month, and there is also the Ministry of Labour *Gazette* which appears about eight days later. The former gives some 200 to 250 octavo pages to import and export trade—the latter gives about 10 foolscap pages to employment. In the *Gazette* there appear each month for 100 industries the numbers of insured persons unemployed during the third week in the month. The monthly percentage figures are based on the estimated number of insured persons engaged in each industry in the previous July.

Our readers are familiar with the form of the monthly import and export trade returns and their division as regards imports into thirteen classes of electrical goods and apparatus, and one class of electrical machinery, and as regards exports the same classes of electrical goods and apparatus, together with three classes of electrical machinery. If, however, they will expend the sum of sixpence on the Ministry of Labour *Gazette*, they will find that three out of the one hundred scheduled industries are as follows:—

"Electrical Engineering," employing 71,530 persons; "Electrical Wiring and Contracting," employing 12,850 persons; and "Electrical Cable, Wire and Electric Lamps Manufacture," totalling 74,940 persons.

Considering that each of the last two progressive industries, while important contributors to our export trade, differ widely in the values of their exports,* and

* For the three years ending December 31st last, "Electric Glow Lamps" averaged £347,547 per annum for exports, while "Electric Wires & Cables, Insulated," have averaged £4,038,018 per annum for export. As regards imports, "Electric Glow Lamps" have averaged £215,029 per annum and "Insulated Wires & Cables" £970,385.

differ even more widely in their nature in the materials and in the processes involved, we should have thought that the Ministry of Labour would have distinguished between these two trades. We note among the smaller trades such items as "Heating and Ventilating Apparatus," employing 5,760 persons, or "Wall Paper Making," with 5,480 persons. Yet a lumping together of these last two minor trades—or their relegation to "Other Industries and Services"—would be less open to criticism than combining lamps and cables (including those for telephone services!). Perhaps the Ministry of Labour will study a copy of the Monthly Trade and Navigation Returns—later, possibly they and (or) the Board of Trade, might issue for each month a comprehensive summary of the imports and exports of the commodities most nearly related to the main groups under which employment is catalogued.

Government Departments can, of course, reply: "Wait for the publication of the returns for this year under the Census of Production Act." We concede that this information—when we get it—will give us the whole story for one year. Then in another five years there will be another census. But in the changes of the intervening years, with the monthly ebb and flow of industry, it does not seem reasonable to treat the respective industries of cable and lamp manufacturers as statistically inseparable industries, and deal with them in this manner when recording changes in employment.

Independent Arbitration in Contract Disputes.

Well over twenty years ago we made a practice in these pages of summarising and commenting upon selected municipal corporation specifications and the conditions embodied in them for adoption by manufacturers submitting tenders. One of the main points upon which we repeatedly laid emphasis was the importance of contractors insisting upon provision being made for the settlement of any disputes that might arise between buyer and seller, by an independent arbitrator and not by the engineer or surveyor who was necessarily the servant of the purchasing party. The publicity that the matter received led to improvement, as some of our readers, at any rate, will recall. But whatever may have happened then, it is obvious from recent proceedings that things are far from satisfactory to-day, for one of the outstanding subjects in recent joint deliberations of the manufacturers' section of the London Chamber of Commerce and the Federation of British Industries designed to secure improved conditions in the municipal contract forms is this tendency which still persists for local authorities to stipulate that disputes are to be settled by one of their own officers. Early in the year the two organisations named interviewed the Association of Municipal Corporations and submitted proposals for the adoption of the principle of independent arbitration, and it is now announced that the Association recommends municipal authorities to accept that principle "so long as it does not involve the construction of the agreement or any question of law, and so long as it is made clear that pending the determination of the dispute the contractor is not relieved of his obligation to supply goods or in other respects to perform his obligations under the contract." Another point that came under attention in the conference related to quantities of goods and where purchaseable during the continuance of a contract. This and the question of independent arbitration are both conditions which the London Chamber and the F.B.I. urge tenderers to insist upon when submitting offers.

The German Stinnes Group.

In our issue of June 9th we referred to a declaration made by Dr. C. F. von Siemens, who stated that the Siemens and Halske Company, the Deutsch-Luxemburg Bergwerks Gesellschaft and the Electricity Works Company (late Schuckert), which are united in the community of interests of the Siemens-Rhine-Elbe-Schuckert Union, had never had any economic or financial connection with, or had any dependency upon, the firm of Hugo Stinnes or the Stinnes concern, and that the firm was solely a shareholder in the one or the other company, with the rights of any other shareholder. No information was given at the time by the chairman of the Siemens & Halske Company as to the extent of the shareholdings of the Stinnes group in one or other of the associated companies, but according to a message published in London from Berlin as far back as May, 1924, large realisations had already then taken place of the Stinnes interests in the Siemens & Halske Company and in other companies, so that it was then doubted whether the Stinnes estate was any longer the chief shareholder in these companies. It was added that just prior to his death, Stinnes was apparently hard pressed for ready capital, and that his heirs had had to realise quickly to keep the rest of the undertakings running.

Among the latest developments in connection with the Stinnes estate, prominence has been given in the German newspapers during the past week or two to the interests which the late Hugo Stinnes held in the Rhenish-Westphalian Electricity Works Company, of Essen, which was originally established by him many years ago as a customer for his pits on the one hand, and on the other for the supply of a great industrial region extending from Cleve and Emmerich, on the Dutch frontier, as far as Dusseldorf and Cologne. As a great pit bank undertaking, the works has gradually grown to be one of the largest of its kind in the world, the shareholders including many local authorities whose districts are supplied with energy by the company. In March, 1921, the company entered into a fuel delivery agreement with the Rodder Lignite Mine, and about the same time took over for 99 years the management of three of the Stinnes pits—the Viktoria Matthias, Graf Beust, and Friedrich Ernestine—the supply company guaranteeing to the collieries a fixed rate of interest, while the latter gave the former an option to acquire the shares, so that the pits in question might eventually become the property of the electricity company. Apart from the shares held by the Stinnes' subsidiary companies in the electricity works, the direct holdings of the Stinnes interests amounted to 12,000,000 marks out of the total capital of 140,000,000 marks, of which the local authorities are said to have owned some 52 per cent. As it has been deemed necessary to realise these direct interests, and as no single buyer has been able to come forward, the Government of Prussia has stepped in and acquired the shares at a price which is understood to be equivalent to about the par value. The participation of Prussia has been partly prompted by the desire to strengthen the electrical interests of the State in the Western provinces and to bring about close co-operation with the State-owned electricity works, especially that in Hanover.

Since the preceding lines were written, further developments have taken place. These include the sale to London and American firms of the Stinnes shares held in the mines and iron and steel works owned by the Deutsch-Luxemburg Co., at 13,250,000 marks for the shares of 21,000,000 marks. The various banks which have associated themselves together for the liquidation of most of the Stinnes assets, have also disposed of the shares of 5,000,000 marks held in the Siemens and Halske Co., and of those in the Berlin Handels Gesellschaft; the sites in Hamburg have been taken over by the State of Hamburg, and the Stinnes timber forests and shares in the Westphalian-Anhalt Explosives Co by the Prussian State, while the shares in the Barmer Bank Verein have been absorbed by other proprietors in that bank. All these transfers have had the result of redeeming about one half of the credits of 90,000,000 marks which had been granted by the banks down to last December.

The only comment which the situation of affairs seems to call for is an expression of surprise that it had been originally possible to obtain credit in so many quarters to take over and maintain large interests in such a num

ber of undertakings to which it was absolutely impossible for any one individual to devote the necessary attention. Horizontal expansion or the amalgamation of similar undertakings has proved of great advantage to various German industries, while the lines of vertical development, or the association of interests from the production of raw materials to that of the most highly finished manufactures, has also been of benefit when not carried too far. But there is no doubt that the promotion of the latter system to extreme limits and in the particular form adopted by the late Hugo Stinnes has brought about the downfall of the estate and the loss of a considerable amount of money.

Italy—a Difficult Market.

It cannot be said that the report of the British Commercial Secretaries at Rome, with which we deal in this issue, holds out any encouragement to British exporters. Indeed, we are inclined to think that the authors are perhaps too pessimistic regarding British prospects, for although this country's share of Italy's import trade fell slightly during the past year, we retained our position as the second largest exporter to Italy. The authors, however, probably take the view that if we do not continue to increase our trade we shall be left far behind, and there is truth in this. All of our chief competitors in the Italian market made headway in 1924; Germany wrested the third place from France, while the United States remained the chief supplier and Czecho-Slovakia nearly doubled her share.

The principal factor militating against British trade with Italy would appear to be the rapid strides which Italian industry is making. In the electrical branch, it is stated, Italy is capable of producing the majority of her requirements and is becoming less and less dependent upon foreign suppliers; Italian electrical manufacturers, moreover, are beginning to emerge as serious competitors for the business of other countries.

In the Italian market, as elsewhere, price is a stumbling block to British manufacturers, and this is where Germany secures her main advantage. The report points out that the Italians cannot afford to pay a high price for a superior article if they can obtain one not so good but capable of fulfilling its duties, at a lower cost. Some competitors show a disposition to cut prices after ascertaining the amount of British tenders.

Mention is made of the establishment of factories in the country by foreign groups and the acquisition of controlling interests in Italian firms for the purpose of obtaining business connections. In the face of these activities and of intensive German propaganda which is being carried on, British producers must continue their efforts to reduce prices to a competitive level, and to secure the interest of Italian buyers by a sympathetic consideration of their requirements. Personal contact is essential, and a real understanding can only be gained by representatives who have a command of the language.

Soviet Russia and Concessions.

In our recent leader on "Electrical Developments in Russia" (Elec. Rev., July 10th, p. 41) it was clearly shown that there was a growing appreciation that if the electrification of Russia was to proceed satisfactorily it was necessary to secure technical assistance from foreign works and to import more material from abroad. Subsequently it was reported that representatives were visiting this country for the purpose of expending considerable sums in the purchase of equipment and goods. A certain amount of business is being transacted in various ways at present, but it is a drop in the bucket compared with the requirements if electrification is to make headway. A *Reuter* dispatch from Moscow appeared in the London financial Press last week which credited Trotsky with views strongly favourable to the placing of concessions with foreign capitalist groups. He was addressing the German Labour Delegation with regard to Soviet "concession policy" and stated that the Government was more inclined than it was some years ago to "admit foreign capital to participate in the acceleration of the development of the technical and productive forces of the Soviet Union." He tried to impress capitalist groups with the advantage which they would derive by expressing a serious desire to acquire concessions. No doubt we have a long way to go before full recognition of past obligations will be forthcoming and therefore a long way to go before British capital will be prepared to run material risks, but the Trotsky attitude is worth noting as a straw showing which way the wind is blowing. The private property in Russia of British subjects is still considered as nationalised and confiscated. The Association of British Creditors of Russia in inquiring whether the Soviet Government's decree abolishing confiscation of private property is retrospective has reminded that Government that there are 500,000 individuals (company shareholders) who have been victimised and who will naturally be active agitators against any trading facilities being granted so long as restoration and redress are withheld. The Association holds, in common with the London Chamber of Commerce, the Association of Bankers and Credit Houses, and the Federation of British Industries, that "until Russia has settled with her creditors and thus restored confidence in her good faith, normal credit and industrial relations between the two countries cannot exist."

The Congress of Radiology.

Tentative suggestions for the holding of an international radiological Congress have been made from time to time; in fact, gatherings of radiologists have taken place, but they have not been truly international in character. British radiologists must, therefore, be proud of the fact that they were privileged to organise the first International Congress of Radiology, which was recently held in London. That the time was fully ripe for such a conference is evidenced by the attendance of nearly 500 delegates, representing no fewer than twenty-one nations.

A large number of valuable papers were read before the three sections—radiology, physics, and electrotherapy—the attendance being greatest in the first-named, and reference may be made to two constructive features: the first is that steps were taken to assist in the formulation of an X-ray unit of intensity which will be internationally acceptable, and the second is a recommendation that international agreement on X-ray and radium protection should be secured.

Amongst the new apparatus and methods described, the application of actino-therapy in the treatment of many diseases, such as tuberculosis of bones and rickets, is of special public interest at the moment; lamps for the production of violet rays, or artificial sunlight, are being improved, and rapid development in this direction is likely to take place in the near future. In X-ray practice, the most important development is probably the introduction of apparatus capable of producing current at constant high pressures up to 250,000 volts. Greater efficiency must follow the use of such devices, for they will not only increase the precision with which the radiation dose can be administered, but also reduce the exposure time, with advantage to the patients.

Industrially, X-rays have many possibilities; they are used for the detection of hidden defects in many substances, and it is now possible to penetrate 4 inches of steel. To power engineers, Mr. C. N. Kemp's work on the application of X-rays in the technology of coal would seem to be of special significance, and it may afford a ready means of examining coal before it is put on the market. Mr. Kemp also emphasised the importance of introducing technical radiology as a distinct science and of providing more facilities for teaching it. There must be many ways in which X-rays can assist industry. At the same time, however, the exhibition held in connection with the congress clearly demonstrated that X-ray apparatus at present is not in the state it should be in to enable definite decisions to be formed upon industrial problems. Moreover, the price of such equipment seems to be unduly high.

Industrial Illumination.

By C. T. PAYN.

Of the numerous applications of electricity, electric lighting is certainly the most widespread, for, with the exception of small towns and villages, it is to be met with on every hand.

Illuminating engineering is not wholly a matter of the selection and location of reflectors so as to throw the maximum light from lamps in some predetermined direction. An intimate knowledge of such other factors as glare, shadow, quality (colour characteristics), illumination of surrounding surfaces, and diffusion is necessary before a lighting system can be intelligently planned.

The proper illumination of our industrial establishments has become a matter of prime importance to the manufacturer, the workman, and the State; and success and efficiency are largely dependent upon it. Many factories still have conditions of illumination that are seriously injurious to the vision and general health of the operative. Bad illumination is *always* a poor investment, and results in dissatisfied workmen, spoilt material, and reduction of output. There is now no excuse for an inefficient lighting installation. The art of light production and illumination has been brought to such a state of excellence that an intensity comparable to that of daylight conditions in an average factory is easily attainable. It is peculiar that manufacturers will provide their employés with the best of tools and equipment, and yet forget that the final efficiency of the machine depends upon the efficiency of the individual workman who is seriously handicapped by poor light, adequate illumination being essential if the best is to be got out of him. Employers are generally aware of the danger to the eyes which exists from mechanical injury, but apparently they do not realise the insidious nature of the harm which accompanies poor lighting. Impairment of vision is a slow process, and may take months or even years before the individual himself becomes aware of it. Good lighting is an investment, not an expenditure.

Some manufacturers spend a considerable amount of money on their lighting installations, but it is not so much a case of spending money as of making the best use of what is spent. Much is wasted on brilliant lighting, ill-adapted to the particular kind of work which is being carried on. In many cases the lighting bill could be reduced by half, and still give more satisfactory results, if the installation had received careful attention in all essential details.

The planning of an industrial lighting installation requires a complete knowledge of all the modern methods and apparatus for the distribution of light. As in the case of a power installation, a complete set of wiring plans should be prepared showing the best methods of distribution to all parts of the building, location of main switch (or lighting switchboard), building risers, and position of fuse boxes. The last item is of extreme importance, and should receive careful attention. The distribution boards should be located as far as possible centrally with the load they are to supply, so that long runs are avoided, and voltage drop reduced to a minimum.

There has been a great deal of discussion on general *versus* local lighting, but the former is fast superseding the latter, and the reason is not far to seek.

The intensity of illumination is of as much importance as its distribution. The eye is able to adjust itself by the contraction and dilation of the pupil to suit a very wide range of intensities, and we are fortunately able to see and distinguish objects with equal ease under very different conditions. Nevertheless, limits exist, and therefore it is important to realise that artificial illumination may as easily fail by providing too much light as by too little. Although the eye can adjust itself to suit many intensities, it cannot be adjusted to suit two different intensities at the same time. Unless, therefore, the prime requirement of approxi mately even distribution is realised, the eye, as it turn from one direction to another, is obliged to adjust itsel to the new conditions. This not only produces fatigu and is injurious, but directly defeats the whole objec of the illumination. Generally speaking, we do no want to indulge in more light where we do use it, bu in more light where we do not use it—which i "General illumination."

General overhead lighting has a very wide applicatio in industrial work. It is usual to divide the ceiling o the shop to be lighted into squares (or rectangles a near a square as possible), and to locate a unit i each. Where machines are grouped, in certain area group lighting may be employed, and the units locate with respect to them. It is, however, far better to em ploy a strictly symmetrical arrangement, and to illu minate the entire shop uniformly so that adequat intensity is available, regardless of the disposition o the machinery. In a modern industrial installation re-location of entire departments is no uncommo occurrence. In assembly shops, benches are ofte located along the side walls, and for that reason it i

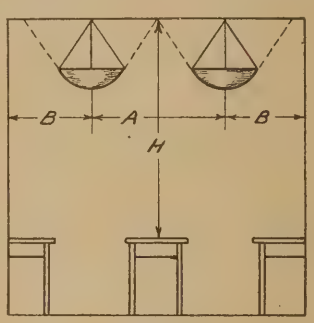


Fig. 1a.

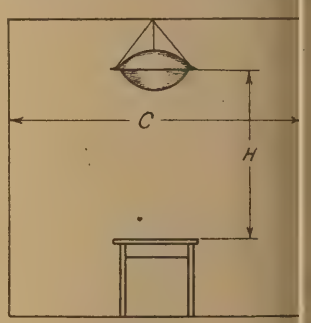


Fig. 1b.

advisable to locate lamps as near as possible to the walls It is particularly desirable for a given total wattag to employ the least number of units which will provid the best illumination, as not only is expense in wirin saved, but larger lamps have a higher overall efficienc *e.g.*, one 400-watt gasfilled lamp will give as much o even more light (light flux) than five 100-watt unit The problem, however, must be decided by the minimu number of units necessary to give uniform lighting an provide satisfactory illumination on both vertical an horizontal planes so that long, dense shadows will b avoided.

The following remarks will apply to all classes o lighting installations, and are the requirements gene ally met with:—

1. Sufficient light of uniform intensity on the worl ing surfaces—vertical or horizontal.
2. A comparable intensity on all surroundings—wall &c.
3. A light of suitable spectral character.
4. Light so diffused as to avoid objectionable shadow
5. Freedom from glare.
6. The *ensemble* to be in harmony with the surroun ings.
7. A suitable system of distribution which is reliabl simple and easy to maintain, the cost of whi is not out of proportion to the results.

All these conditions must be satisfied if efficie results are to be expected. This can be obtained by o or a combination of the three following systems i general use:—

1. Direct lighting.
2. Semi-indirect lighting.
3. Totally indirect lighting.

In selecting the system, the characteristics of the sh to be lighted must first be considered. If the work such that it is impossible to avoid large accumulatio of dirt and dust, and if the tone and colour of t

walls and ceiling are dark in colour, indirect or semi-indirect lighting is to be discouraged. The colour of the walls and ceiling can, however, be remedied by the liberal use of paint and whitewash.

A few additional points which must be borne in mind are:—

1. Objects are seen by the light which they reflect, and dark objects require a higher intensity than those light in colour.
2. At least 20 per cent. higher intensity than that actually required should be allowed for when designing indirect or semi-indirect systems to allow for depreciation, due to the accumulation of dust on the reflectors, lower efficiency of the lamp as it gets older, and darkening of ceiling and walls.

On investigation of an actual installation, the following figures were obtained. The installation consisted of semi-indirect units, a once white ceiling and walls, to a height of 5 ft. 6 in. from the floor:—

	Ft./candles.	%
Installation as it stood ...	3.5	100.0
After cleaning units ...	4.5	128.5
Adding new lamps ...	5.25	150.0
Re-whitewashing walls and ceilings	6.5	185.6

In the case quoted above, the ceiling was very dirty, but the figures are significant.

In a new installation for a large general office, an average intensity of 12 f.c. was aimed at, and 11 obtained with the actual installation. After six months the intensity was down to 8 f.c., so that the high figure at the start was amply justified.

The following is a description of an interesting experiment conducted in the Demonstration Room of the B.T.-H., and is quoted from the ELECTRICAL REVIEW, dated July 27th, 1923. The apparatus consisted of a small box in which a cylinder was caused to rotate at constant speed. Letters are printed on the cylinder so

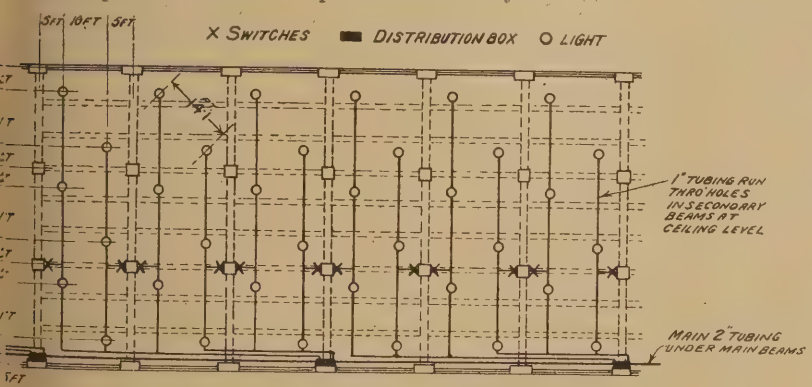


Fig. 2.

that they can be followed by the eye as it rotates. Lamps of various candle power were switched on at intervals, which produced the effect that the speed of the cylinder appreciably decreased as the illumination increased. This proves that the eye can see more quickly under high intensities. The article continues that the results of certain tests showed that production was increased by 10 to 25 per cent. with modern high-intensity lighting instead of the average standard.

Tables have been compiled from practical experience from which the spacing of the units can be determined. Table I has been used by the author, and has proved accurate in practice.

TABLE I.

System.	$\frac{C}{H}$	$\frac{A}{H}$	$\frac{B}{H}$
Indirect	1·30	1·50	0·6
Semi-indirect ...	1·15	1·50	0·6
Direct semi-enclosing ...	1·10	1·45	0·5
Direct	1·0	1·40	0·5

The meaning of the symbols can be ascertained from fig. 1.

The following is a brief description of an actual installation, in which the conditions are sufficiently common to warrant its description. As previously mentioned, the least number of units required to give a desired illumination should be used, but the proportions of the interior are very often such that consider-

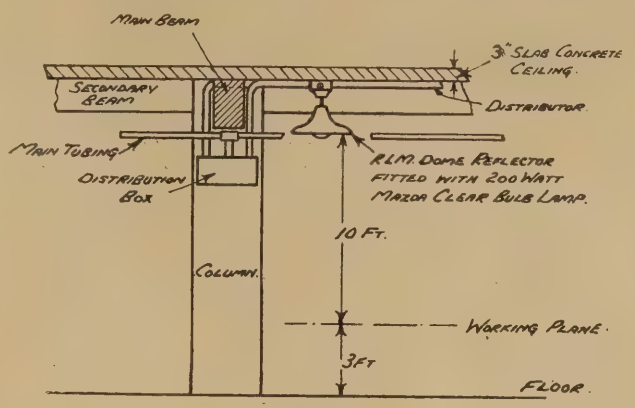


Fig. 3.

able planning is necessary. In this case the problem was that of 20-ft. square bays with deep main beams and shallower transverse secondary beams spaced 6 ft. 8 in. apart, with 1-in. diameter holes through them, as shown in fig. 2.

The correct position for the units was first ascertained, and plotted on the ceiling plan. Referring to fig. 2, the distance between the units (by calculation) is 14.1 ft. The nearest unit to the wall is 5 ft. 200-watt Mazda clear-bulb lamps of 191 m.s. c.p. were used. The reflectors, supplied by the Power Equipment Co., were dome-shaped polished enamelled reflectors (see fig. 3).

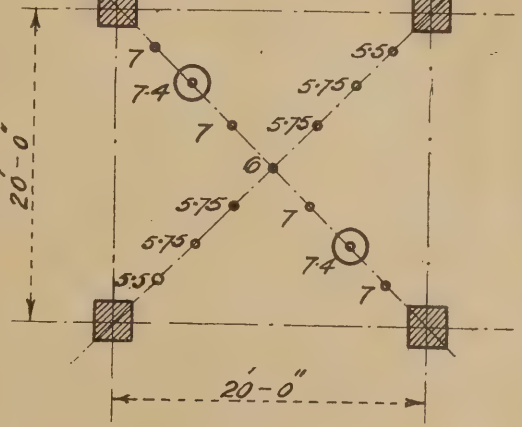


Fig. 4.

These were hung so that their edge was level with the bottom of the main beam; thus, unless the eye was cast directly upwards, all direct light from the lamps was cut off. The secondary beam, being only 1 ft. 1 in. deep, did not interfere with the distribution of light. Using Table I, it is found that such an arrangement gave the following ratios:—

$$A/H = 14.1/10 = 1.41 \text{ and } B/H = 5/10 = 0.5$$

This spacing being symmetrical and falling within the ratio limits, was adopted. As holes were left in the concrete beams 4 ft. either side of the main beams, the tubing supplying the lamps was run through them. If necessary, another unit (shown dotted) could easily be added, still retaining symmetry.

For distribution purposes the ceiling was divided into square sections of three bays long by three bays wide, a separate pair of feeders being run in the main 2-in. tubing under the main beams, which teed up into 10-way Parmiter, Hope & Sugden ironclad distribution boxes mounted on the side columns.

The photometer readings over one bay gave the foot-candle readings shown in fig. 4. The instrument used was a No. 167 Sharp-Miller photometer fitted with a No. 78B Wratten filter by Mr. Haydn Harrison, M.I.E.E.

The illumination thus provided was very satisfactory, free from glare, and shadows practically non-existent. The columns and walls were painted a dark green to a height of 5 ft. 6 in., thus avoiding surface glare on a level with the eye. The remainder of the columns and ceiling were whitewashed. The effect was pleasing and comfortable. In order to allow for extensions, all ceilling and through boxes were made 4-way, and spare outlets plugged. The switch lead, contrary to usual practice, was carried on and looped into each box in the run, so that in the event of partitions being erected, the lighting units could be shifted to suit the new requirements without disturbing the existing wiring. The unused switch-drops on the columns would be removed. The units were switched in groups of three. Throughout the installation standard material was used. All conduit, conduit fittings, and switches (ironclad) were supplied by Simplex Conduits, Ltd.; all fixing was made by means of Rawlplugs. Where necessary, the general lighting was supplemented by individual machine lighting.

In conclusion, a few words about "exterior lighting." Exterior lighting of industrial properties is required principally for the following purposes:—

1. The illumination of yards, thoroughfares, approaches, and passage-ways.
2. The identification and handling of materials stored out of doors.
3. The protection of buildings and materials against theft.
4. The guarding of boundaries against unauthorised persons.

Safety demands that any area which an employé is required to traverse after dark be adequately lighted. The requirements are more severe than for average street lighting, inasmuch as in emerging from a brightly-lighted building into the darkened area, the eye does not accommodate itself immediately to the lower intensity, and difficulty is experienced in seeing if this change is too great.

For this type of lighting the matter of shadows is of extreme importance, and deep, dense shadows must be avoided at all costs. If night work is carried on at all extensively in the yard, the intensity of illumination should be equal to that given for similar work in the building itself. The amount of light to be used as a protection for the building depends upon the importance of the property. A far greater use could be made to-day of flood-light projectors suitably erected on the angles of buildings. For general application, units having a beam spread of 30 degrees are most suitable. The ideal condition to be aimed at is a square space lighted by four flood lights, each unit so erected and trained that it covers the whole area; thus, even illumination is obtained, and shadows are eliminated. There is also the advantage of being able to focus the units on any desired spot, or to sweep surrounding areas.

The dome-type reflectors adapted for outdoor use are quite efficient, and give excellent protection from glare. Their cost is low, and except for occasional cleaning their upkeep is nil. These should be mounted not less than 15 ft. above the ground, and spaced apart about four or five times the mounting height. It is always preferable to increase, as far as possible, both the height and intensity of the unit. The ordinary cosine method of calculation of the intensity will be found sufficiently accurate in determining the illumination in foot-candles, which for general yard lighting should be between 0.25 and 0.75 foot-candles.

In conclusion, there are many classes of the public which have much to do with lighting, but understand little about it, and it would certainly be advantageous if the importance of the subject could be brought vividly before them, particularly in the education of works managers.

It is essential that better lighting should be used and that the industry and the public should understand the principles of good lighting, and recognise the standards of intensity which are adequate and suitable for various purposes. Possibly much that has previously been written has been of a too technical nature to interest those not engaged in the industry. It is hoped that this article will prove beneficial both to employer and employed.

Testing the Boiler.

By "STAN DARD."

The new turbo-alternator had been duly tested and accepted,* and some weeks afterwards word went forth to the testing engineer that a representative boiler in the new boiler-house was ready. The testing engineer, whose logical soul always revolted at such upside-down tactics as testing the boilers *after* the machine, accordingly assembled his faithful thermometers and more or less devoted staff.

On this occasion he removed his coat and collar. His assistant donned a dust-coat with pockets for two slide rules. Some of the old hands on the testing staff almost reached a state of nature before encasing themselves in dungarees, finished-off by rag neckties. Two students, under the wing of the testing engineer, were in a state of bewilderment and subdued excitement. The news that the Test Dept. was preparing to do some work spread like wildfire through the power station.

Before the test proper started, an hour's preliminary run was ordered, and during this the observers were settled down at their posts. Outside the boiler-house the coal was taken from a truck and then wetted; the wetting was to aid combustion and make even fires. The coal was then heaped near the boiler, and sackfuls were weighed and emptied into the hoppers which fed the fires. One man was told off to check the weighing, with a student to assist.

Several six-foot ironclad thermo-couples were pushed through the boiler wall at various places, and lead from these ran down to a table behind the boiler here a superior-looking tester took periodic reading on a milli-voltmeter, made mysterious corrections and translated the results into deg. F. The remaining observer below was the second student, who was gratified by being given the job of reading the manometers on the induced-draught and the uptake to flue

The boiler was isolated and was now fed from the hotwell of a turbine. Before the condensed steam from the latter was allowed to replenish the hotwell, it was measured; in this way periodical evaporation readings were given and the lb. of steam produced by the boiler accurately known. From the hotwell the condensate passed to the boiler. We can follow it aloft and see the remaining observers at work. Here, where the weather does not seem so cool, the height of the water in the boiler drum is taken; there are thermometer readings on the inlet and outlet of the economiser (where the water is heated up by the flue gases before entering the boiler), and on the superheater outlet while a special gauge gives the steam pressure.

During the preliminary run other characters appeared on the scene. The chemist, a department in himself, crystallised out behind the boiler and rigged up an Orsat apparatus. With this he analysed samples of flue gas drawn from a sampling pipe inserted in the boiler wall. Then appeared the contractor's representative, this worthy having breakfasted after some early hours spent in the boiler-house; his bowler hat was di

* "The Acceptance Test," Nov. 28th, 1924.

carded in favour of a greasy little peaked cap—memento of his marine days. He at once addressed himself to a close examination of the boiler fires, peering with a coloured glass through all available spyholes.

A sudden bellow announced to all in general (and the firemen in particular) that the boiler-house superintendent had entered. This official was familiarly known as "Old B. H." Some said that the letters "B. H." referred not to "boiler-house," but "bull-head," while others believed that the initials stood for one of his favourite exclamations. "Old B.H." led a dual life. Outside the boiler-house he was prepared, in the coolest and most scientific manner in the world, to debate upon things like net calorific values; but as soon as he came into the region of boilers his nature seemed to change. He underwent a metamorphosis. When he was "steaming" he became a holy terror and could out-glare the fiercest fire. And now, as he stood on the heap of coal and slated a fireman, one of the testers remarked upon his "nice, kind face."

After the preliminary run, the testing engineer, "Old B.H.," the contractor's representative, and the shift engineer held a round-table conference behind the boiler. During the conference the testing staff retired to the laboratory, which, to the chemist's great indignation, was at once christened "the chemist's shop." Here the older hands gloomily regarded the prospect of the six-hours' test run. The tester in charge of the thermo-couples was looked upon with envy, and that gentleman went to some pains to impress all present with the onerous nature of his duties. One of the students, inquiring as to how the boiler fires were lighted, received various answers ranging from "a match" to "they never go out."

The chemist was now summoned to the conference and, with an uneasy glance at his burettes and beakers, he departed. At the conference a hot discussion anent the fires was in progress. The chemist's CO_2 figures made the contractor's representative flinch; he had already been staggered by intractable coal and poor steam conditions. "Old B.H.," being in the exasperating vicinity of boilers, found the utmost difficulty in remaining polite and technical. The conference was witnessed by the power-station cat, which, by some mysterious faculty, had mounted to the main steampipe. Deciding to take a short-circuit to earth, she leapt down *viâ* a grating and "Old B.H.'s" head. This brought the conference to a close.

Half-an-hour afterwards the contractor's representative announced that he had now persuaded the "biler" to pull itself together. The thermo-couples showed that the mean flue-gas temperature was up, and the steam pressure and temperature near specification values. Alf, one of the firemen, was specially co-opted to keep even fires on the chain grates. The testing staff, just commencing tentative attacks upon their lunch, reluctantly left the chemist's shop. When the coal in the hoppers was levelled-off to the test mark, the word "go" went forth; the first weighed sacksful of coal were shot into the hoppers, and the feed-water and other measurements began.

During the first hour or so of the test everybody was intent upon his job—the student on the draught gauges, for instance, developing such meticulous skill as to read-off the draughts with unheard-of accuracy. One or two little accidents marred the commencement. The thermometer at the economiser inlet was sat on. An observer, unaccustomed to ladders and gratings, fell several feet, but fortunately dropped upon a fellow-observer. Another tyro seized an innocent-looking pipe which actually was nearly red-hot. But all these were just part of the settling-down process.

To the inward joy of the contractor's representative, conditions gradually improved. The chemist reported that the CO_2 figure was round about 14 per cent., and there were only faint traces of CO: this meant that the fires were good—and they would yet be better! Moreover, live-steam temperature was above the specification figure of 680 deg. F. Across the mind of the contractor's representative there floated the magic and entrancing figure of 85 per cent.—the efficiency of which the boiler was said to be capable!

Alf the fireman, armed with his 10-ft. poker, industriously attended the fires. While the boiler-house super. was absent, Alf relaxed somewhat and evinced great curiosity about the scientific apparatus. His imagination had recently been stimulated by the appearance of some Lea coal meters, and he was still somewhat incredulous over the fact that you could weigh coal without the aid of weights. You can judge of his petrifaction when he now found that the long rods thrust into the boiler were *electrical* thermometers! And when the testing engineer peered into the fire through an optical pyrometer, Alf learned that you could *see the temperature*! As he dazedly raked away, the marvels of science made him slacken—till a formidable bellow and a rise of temperature announced the vengeful arrival of "Old B.H." Pulling himself together, Alf, with great presence of mind, removed the red-hot poker from the fire.

Presently an interesting announcement was made: the contractor's representative had arranged for a catering firm to provide refreshments "on the job" and outside in an Army hut. Proof was soon forthcoming in the appearance of a waiter (a waiter!!) bearing a tray, but a boiler blowing-off caused a sudden retreat. However, the refreshments were duly brought back and the response was gratifying. One fellow began to read his thermometer to two places of decimals, and the general opinion of the boiler began to rise. The good news anent the hut spread elsewhere. People with no connection whatever with the test "dropped in," and were entertained by the waiter-in-charge. The shift engineer put on his "going-home" collar and coat, and, closely followed by the power-station cat, left his office. Presently he returned looking extremely pleased with the world. That cat did not accompany him.

The news was heard by Alf, who seized a suitable opportunity and vanished. The waiter-in-charge had by now had all his standards of social status completely upset, and greeted Alf as though he were the owner of the power-station, while the cat directed a fixed stare at the intruder. Alf, with a firm grip on his sweat-rag, hesitated but a moment, and ordered beer and sausages. Meanwhile, "Old B.H." had left the boiler-house and critically examined the appearance of the smoke. Hardly had Alf been served when he felt a mighty roar shake the hut and saw a well-known face glaring through the window. Seizing his refreshments, he dashed out in the nick of time.

Soon, to the general relief (and particularly that of Alf and the observers up aloft), the end of the long test-run drew nigh. By now the steam had reached 710 deg. F., and the testing engineer had removed his waistcoat. The contractor's representative was in a state of benevolent satisfaction. The fellow i/c of the coal weighing and his worn-out student-assistant now bore striking resemblance to coal-heavers. The chemist filled his last sample-tins of coal and clinker, and took a final check on the flue gases. "Old B.H." made one more request for a furnace temperature, and fumed and blew-off while millivolts were corrected and then converted into understandable degrees Fahrenheit. The power-station buzzer sounded 5 o'clock, and soon afterwards, when the hoppers had reached the mark, the test-run drew to a much-appreciated close.

Many days have passed since then. The testing engineer and his lieutenant have wrestled with their B.th.u.'s and degrees and lb. of steam. The contractor's representative has called several times; this seems to have helped matters, for on his last visit the efficiency figure had passed the 80 per cent. mark. The coal analysis shows that the B.th.u.'s were not as prolific as they should have been, while there was rather too much unburnt carbon in the ash. Grave arguments about the higher calorific value have been heard. Meanwhile, the "biler" and its mates are hard at work, and "will take some shifting." The testing staff remain strongly in favour of the boiler, and continually refer to the unexpected appearance of the canteen and waiters.

External Trade and Unemployment in the British Electrical Machinery Trade.

By W. P. DIGBY.

The student who seeks to appraise our tangled industrial conditions will find that, as regards the electrical machinery industry, a fairly exact co-ordination is possible between the amount of unemployment and the external trade. In the Ministry of Labour returns we have "Electrical Engineering" with 71,530 insured persons in July, 1924, "Electric cable, wire, and electric lamp manufacture," 74,940 persons, and "Electric wiring and contracting," 12,850 persons. It is with the first-named only that the writer is concerned in this article, which contrasts the unemployment figures with the exports and imports of railway and tramway motors and other generators and motors.

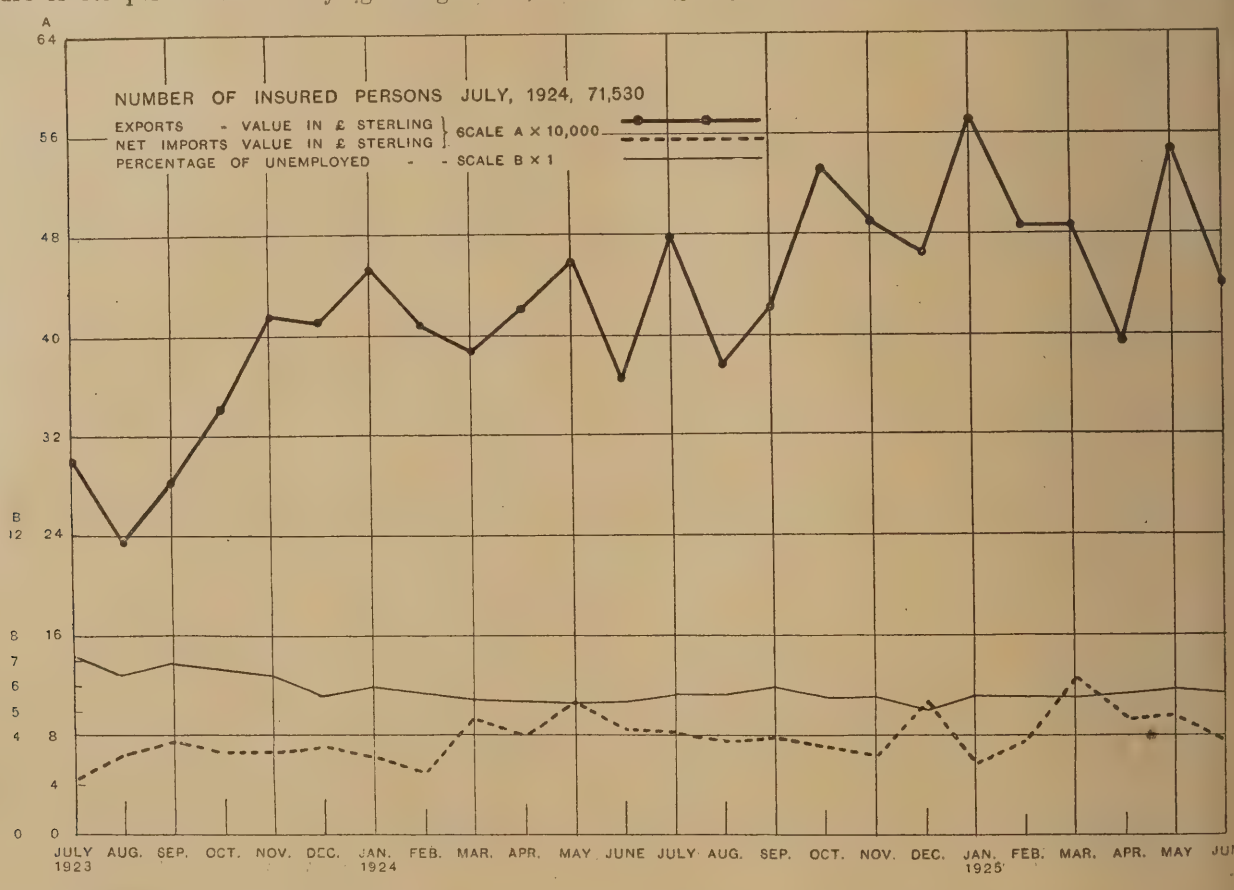
The monthly changes in the unemployment rate are set out in the accompanying figure. There have been no serious fluctuations—from July to December, 1923, there was a fall of 1.6 per cent.—thereafter the variations have been within one half of 1 per cent. of a mean figure of 5.5 per cent. Gratifying though it is, it is not the full measure of the healthiness of this industry. In July, 1923, the number of insured persons was 62,280; in July, 1924, there had been an increase of 11.5 per cent. to 71,530 persons.

The total imports in 1923 amounted to £906,111—in 1924 these had been increased by about £55,000 to £959,304 (*i.e.*, about 6 per cent.). Meanwhile the exports, which were £3,951,905, had increased to £5,262,581, or about 33 per cent. on a trade 4.3 times greater than the imports. The monthly variations both as regards total imports and total exports are shown in the accompanying diagram. Expressed per person insured, we have the following figures:—

Period.	Total imports per insured person. £	Total exports per insured person. £
1923 (whole year) ...	14.5	63.7
1924 (whole year) ...	13.4	73.6
1925 (1st half only)	7.13	42.4

The only regret that these figures can occasion is that other industries in Great Britain are not as well placed in finding employment for an increasing number of persons and in increasing the exports per person employed.

It is almost axiomatic that there are no industries so self-contained that their prosperity or adversity is without reaction on other industries. This is well exemplified in the electrical machinery trade; in addition to the primary employment within the industry itself, unemployment is reduced in other industries contributing the component materials such as pig iron or castings, steel forgings and castings, copper wire, core plates, and insulation. Further, an order for a generator for a steam-driven power station involves a prime mover, boilers, steam pipes, coal-handling plant, and very often structural steel for power-station buildings—electric cables and transmission line materials are necessary adjuncts, and even beyond these, lamps and electric motors. If the station is smaller and oil driven there are internal-combustion engines and storage tanks with similar external adjuncts. If it is a hydro-electric power station, there is the need for water turbines of one type or another and pipe line material. As regards the water turbines, firms in the United Kingdom have built and are building machines many times larger than was attempted before the war.



Much of the healthiness of the electrical machinery industry is due to the Trade Facilities Acts. It is possible that no other single industry has benefited so largely in a direct manner. Indirectly the reaction is a widely-spread one. Without the benefits of the Trade Facilities Acts, not only would there have been a different state of affairs to chronicle in the electrical machinery trade, but matters would have been slightly worsened in other trades. It is to be hoped that the Treasury will bear this in mind as and when further applications are made involving electrical plant.

The Manchester Mining Exhibition.

A Brief Review of the Electrical Apparatus Displayed.

(*Concluded from page 168.*)

Messrs. Switchgear & Cowans, Ltd., exhibited a fine range of ironclad oil-immersed switchgear. In the draw-out type section a three-panel board for pressures up to 3,300 volts and line currents up to 60 amp. was shown. All actuating coils, trip mechanism, and meter transformers are within the oil tank, and a supplementary gland is provided, by means of which a bitumen cable can be sealed below the point where the cores are splayed out to fill up any cracks in the bitumen insulation. Examples were displayed showing non-drawout switchgear (fig. 5) for wall and floor mounting, and of 3-phase oil-immersed gate switches (fig. 6), with time-limit overload and the Williams-Rowley protective system for ensuring adequate earth continuity up to the coal cutter. The gate switch will trip and cut all pressure off the motor and training cable in the event of the earthing becoming inefficient, the trailing cable becoming damaged, or any attempt being made to withdraw the pommels from either coal-cutter or gate switch. The plugs and sockets are massive, with self-aligning plug contacts, and designed to prevent the trailing cable being pulled out of the pommel or the pommel out of the socket. Ironclad air-break switchgear is shown in fig. 7; all "live" parts are carried on mild-steel bars covered with insulation on the "metal-mica" principle. The units comprise switches, fuses, and bus-bar chambers, and can be assembled to form boards of any number of ways. The fuse handles (fig. 8) are composed of a heat-resisting, non-hygroscopic, moulded material of greater mechanical strength than porcelain, and the fuse contacts, which are self-aligning, are very readily removed for replacement. The fuse wire is carried in a removable baffle chamber, where the arc is split up and discharges through vents so disposed as to cool and damp the flame. Two sizes of induction-regulating or boosting transformers were exhibited, of 10 and 25 kVA capacity, in addition to colliery transformers for tapping a single-phase lighting circuit off power mains. The latter are flameproof, oil-immersed, and controlled on the primary side by a d.p. oil switch with oil fuses. The fuseholders are withdrawable by raising a hinged lid interlocked with the switch movement so that no live parts can be touched.

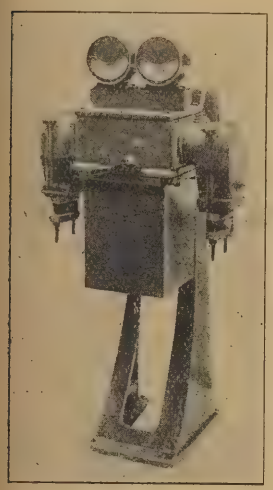


Fig. 5.—S. & C. Non-drawout Switch.

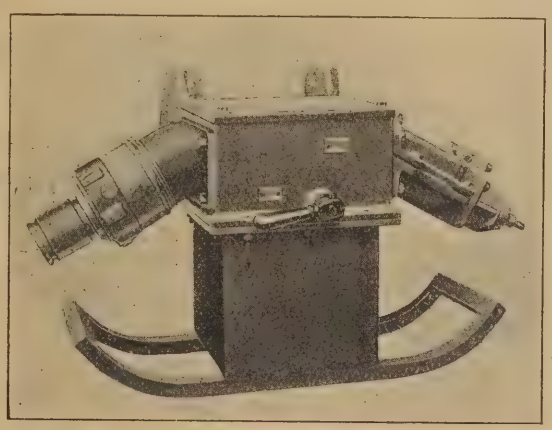


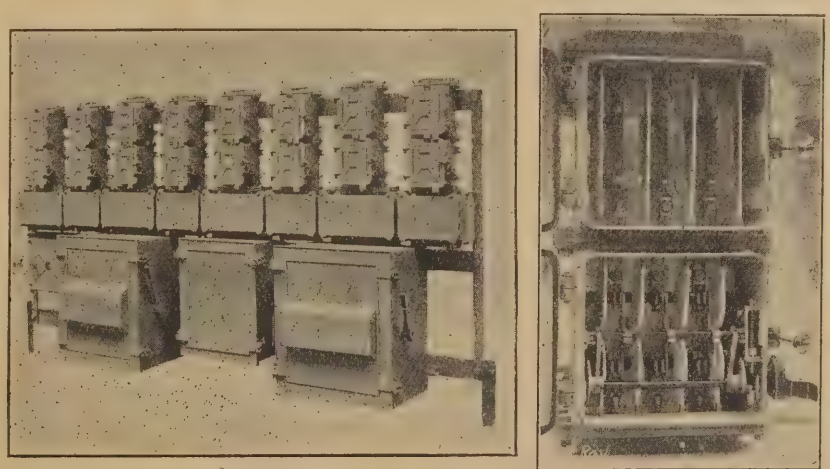
Fig. 6.—S. & C. Gate End Switch.

Alkaline Miners' Lamps, Ltd., exhibited electric safety lamps with alkaline batteries, and it is interesting to record that the Pearson-Nife lamp manufactured by this firm has been selected by the Government of New Zealand for use in the State mines.

The Ceag Miners' Supply Co. had on view the latest form of the lamp which won the Home Office competition in 1912. One of its features is the safety fuse device which, in the event of the well-glass breaking, at once disconnects all exposed "live" parts from the accumulator. The new 4-volt lamp (fig. 9) was also shown; the two "Ceag" circular accumulators are carried in a cast aluminium case, and all connections are made by contacts in the lamp top, which is an aluminium casting hinged from the case. The contacts are of the unit insulator type, so arranged that they can be quickly moved and the interior fittings removed in the usual manner by the bayonet-type ratchet retaining ring. The c.p. of the lamp is 12 in the forward direction and 4 c.p. all round when the reflector is not used. Various units of lamp-room equipment, such as charging stands, running tables, combined switch and magnets, &c., were on view.

Messrs. Mavor & Coulson, Ltd., showed a variety of coal-cutters; amongst them mention might be made of the "Universal" chain machine, "G" size, with 4-ft. jib, driven by a 3-phase motor, and the "Samson" disk cutter arranged to undercut 3 ft. 6 in. There were also a patent electric putter and conveyors and mining switchgear.

Messrs. Oldham & Son, Ltd., showed a variety of safety lamps, batteries, and stone-dusting appliance, together with other mining specialities. The exhibits were housed on two stands, a feature of one stand being the model lamp-room, containing a complete range of lamps and equipment as in every-day use, with a system of checking and accounting both for lamp-room and office records. On the other stand was shown in detail the evolution of the Oldham lamp from its commencement about 15 years ago to present-day types, including the newest 2-volt hand lamps. An interest-



Figs. 7 and 8.—S. & C. Air-break Switch and Fuse Gear.

ing exhibit was a working model of a boy operating a machine for removing and replacing accumulator lids. Although it has not been on the market more than about 18 months, Messrs. Oldham have sold over 100,000, and of this number over 30,000 have been supplied during the last six months. Another interesting item on the stand was a bulb-testing device, an arrangement which tests miners' electric lamp bulbs for shock, candle power, amperage, &c.

Messrs. Hugh Wood & Co., Ltd., exhibited the "Jeffrey" 24-A combination longwall-arcwall electric



Fig. 9.—"Ceag" 4-volt Miner's Lamp.

coal cutter, by means of which 20 headings, each 15 ft. wide and 6 ft. under, can be cut in a shift and over 1,000 yards fitted.

Messrs. Anderson, Boyes & Co., Ltd., showed an interesting range of coal cutters, chief amongst which were arcwall and longwall disk machines. Some of their mining switchgear was also shown.

Messrs. Beckett & Anderson, Ltd., had a large display of haulers. An interesting one was the new 5-h.p. main rope hauler, with internal gear in an oil bath; the drum carries 200 yards of $\frac{3}{8}$-in. rope, and the operation is similar to that of the well-known "Becander" 10- and 30-h.p. standard gear drum haulers. Fine adjustment and variation of speed can be attained with this machine, and as well as working into colliery dips it can be used for various purposes in other trades.

The Harland Engineering Co., Ltd., showed one 350-h.p. horizontal pumping set; the motor is 3-phase, 50-cycle, 3,000 volts, 1,500 r.p.m. There was also shown an E.F.V. $6\frac{1}{2}$-30 h.p. motor, 3-phase, 50 cycles, 440 volts, 1,000 r.p.m., and part of this stand was occupied by the Rheostatic Co., Ltd., which displayed



Fig. 10.—"Oldham" Miner's Lamp Lid-removing Device.

to good effect "Service" resistances, including air-cooled colliery resistance with a metal-mica terminal bar and boiler plate terminal chamber. There was also an oil-immersed resistance with an accessible terminal bar and corrugated explosion-proof tank.

The Lancashire Dynamo & Motor Co., Ltd., had a 45-kW motor-driven alternator set in operation, supplying power to many of the exhibitors. One 30-b.h.p. and one 50-b.h.p. flameproof slip-ring inductor motors, with explosion-proof covers over the brushgear, were shown as tested and certified under fiery mine regulations. There was also a 20-b.h.p. "Maxtorq" motor and a separate display showing the construction of its rotor; battery charging sets and other standard products completed this exhibit.

House Wiring at So Much per Set!

A Revolutionary Suggestion at the I.M.E.A. Convention.

By E. G. ROSS, A.M.I.E.E.

Mr. L. L. Robinson, of Hackney, struck a new note in the somewhat remarkable paper he read before the I.M.E.A. recently. He said, in effect, that he would like to see the time arrive when any man would be able, at will, to buy his own wiring installation, all ready to put together, just like a set of wireless components packed up in a box. To a certain section of the electrical trade this must have sounded like rank heresy; yet, from the report of the discussion, few, if any, of the subsequent speakers appeared to realise the significance of Mr. Robinson's words. Was this wilfully so, or inadvertently so? It is worth while to devote a few moments' consideration to the matter, as it is really suggestive of something revolutionary in electrical commercial practice.

Primarily, all must agree that, to the average man in the street, the *installation* of electricity in his home is a serious matter. Just now, to put in a decent installation costs him from £20 to £30, and this does not cover anything of an elaborate nature; rather the reverse, in fact. The rapid growth of municipal hire-purchase schemes is tangible proof of the desire to use electricity, but, simultaneously, is a very plain demonstration that the average man simply cannot, or will not, pay for the installation part of the business as a preliminary to the use of the power. The fact that he is willing to "pay as he goes" is a clear indication that he does not see why the means to use electric power should be also the means of depleting his pocket, in addition to the cost of the energy itself. He realises

very well, as the increasing sales of irons, table lamps, luxury fittings, &c., demonstrate, that he must pay *something* for the apparatus necessary to use power, but why a man's long time, plus a heavy shop oncost, plus an outside profit, should be charged to him is beyond his comprehension.

It must not be forgotten that, to the layman, the term "supplier of electricity" covers everything in connection with electricity, and the position of the contractor is more or less vaguely defined in his mind. Thus, when he applies for a supply of energy, he has the feeling that it should be put in free, or, at least, at a nominal charge. The fairness of this is, of course, debatable, but is not of moment here. Many years of gas companies' activities have brought about this state of affairs, since, when the present average house was built, gas was installed as a matter of routine construction. Any expense due to the gas installation has either been very small as money values go to-day, or has been so camouflaged that the consumer did not, and does not, realise a direct charge upon his means. Thus, for example, his rent, say, covers the first cost in certain instalments, and so on. With the newer houses, of course, electricity is now having a similar look-in, but the experience of years of gas will take much eradication. And here again, the first cost of the electrical installation is no mean item in the fixing of the rent. In certain large municipal housing schemes north of the Tweed the following rents obtain:—

Coal-fired house with electric light and gas boiler	£37
Same house, but "all electric" ...	£42

This is despite the fact that the all-electric scheme does away with the building-in of fireplaces and awkward vents! It certainly does seem absurd that the comforts of electricity should mean an increase of about 13½ per cent. in rent. The difference, perhaps less a small amount, is made up by installation charges and expensive utensils, *e.g.*, cookers, fires, kettles, &c.

Then, again, there exists a rooted dislike to "men coming in to make a mess." For this reason it is quite the thing in these days for a man himself to do odd jobs about his home, if time permits. If he is handy at all, the modern householder paints, papers, mends leaky taps, &c., himself, rather than have anyone enter his private precincts. Cost, of course, probably enters here too, but the point to be noted is that, to the householder, all such work is "jobbing" work, and as such "is better done by myself." Hence, at present, the wireman is largely regarded as a necessary evil before he commences work at all. If he does make a mess, the sooner he finishes it the better. Much worse is it when, having finished the job, he leaves the householder a budget of extra expense for getting walls patched up and repapered, or the family piano choked with lime dust. While the average electrician hardly goes so far as this, yet it is a fact that many a wireman leaves a memorable trail behind him. All this affects profoundly the most vital person of all—the housewife. If she, who really does the using of the power, is prejudiced at the beginning, how much less easily will she be guided to a proper appreciation of all that electricity really means! But even she, if father can hang a picture without smashing his thumb, will be satisfied if father can likewise install "the electric light" without causing her undue inconvenience. Despite much talk, it is thought that many electrical people do not yet realise that the person expressing the keenest desire "to do it by electricity" is the housewife—and she really does believe in the average husband's capabilities, however much he may be dubbed "dud," "curb-stoner," or any similar term.

From the trade point of view, the householder is unskilled, and, as such, ought not to be trusted to do wiring work. This idea, however, has largely become ingrained in trade minds through the activites of the "dud" contractor, whose slapdash work is the result of desperate price cutting coupled with sheer stupidity. But if the householder can procure good and suitable *material* at a fair figure, the question of price cutting does not arise in his case, and he is not, on the whole, a stupid person. The average man can be just as smart with his hands as can the wireman. Until now he has not been shown the "how" of wiring, due to natural economic and commercial circumstances. For example, he never enjoyed the hand and eye training in his younger days that his son does nowadays, nor, until the advent of the comparatively cheaply-obtained motor-car, did he have the opportunity of turning his thoughts in a mechanical direction. Further, the lack of public electrical education has made him, until now, hesitate to take on the job of wiring his own house.

All this is changing, however. The public is now waking up to the fact that electrical wiring is not such a big job as at first it appeared to be. Slowly, but with ever-increasing momentum, the public mind is broadening to electricalities of all kinds, perhaps most noticeably in the matter of wireless. After nearly three years of broadcasting, quite a large section of the populace understands clearly the principles governing the lighting of a valve, irrespective of its other functions. Another large section is fully conversant with motor-car lighting, &c. From this it is but a simple step to the house lamp.

Again, various technical schools have instituted "trade classes," which are largely attended by other than general technical students. Indeed, the student who is wiring every hour of the day rarely attends a wiring class; he goes to something more advanced. The trade class is known to be a favourite resort of handymen, old and young.

Thus, the fear of an electric shock is only a temporary phase in domestic wiring development, and even now an observant eye will notice, especially among, and inside, out-of-the-way ironmongers' and painters' shops, modest notices advising clients that estimates can be given for any size of electrical installation, or instructing them to "Electrify and paint together: it saves mess," and so on. This is particularly noticeable in the establishment of the "general domestic engineer," a comparatively new profession, which appears to have originated in furniture emporiums and the like. Possibly many of these people depend upon a genuine electrical contractor; possibly not; but the fact remains that they, at least, are beginning to regard house wiring merely as a side-line to tempt the householder.

Perhaps the most eager electrical tyro is the average schoolboy. Wireless mad, say, he can teach many of his superiors the rudiments and practical details of electrical continuity, insulation, &c., &c. What must be the result? In the course of a few years the ordinary house circuit will simply be regarded as a matter of course, instead of a shock bogey. The other rule comes in too, *viz.*, the rate of growth of a body is proportinal, . . . &c.

It seems inevitable, therefore, that domestic wiring will actually descend (?) to the level of mere jobbing, which will further accentuate the point previously raised anent the cost of installation. It seems, indeed, that the latter will decline through force of economic circumstances alone, *i.e.*, without any attempt to make it do so as a matter of normal trade competition.

To meet this future condition, then, it would appear that it is now time to set about, in earnest, the simplification which must come. This does not mean, of course, that there has not been a movement towards simplification already. There has: new surface-wiring systems are advertised every now and then with notable regularity, each new system claiming to simplify this, or eliminate that; but these systems have not been evolved to meet the consumer's point of view. They have been evolved through force of trading circumstances. Has anyone yet seen an advertisement stating the advantages of the "X wiring system" to the consumer? To the contractor, yes; but to the consumer, no.

This order must change, for, as the consumer becomes more educated electrically, he will become quick to appreciate the said advertised advantages at their face

value and naturally will turn them to his own use in so far as he is mechanically able to do so; which ability, since surface-wiring systems require few tools other than a hammer, screw-driver, drills, and pliers, will approach within reasonable distance of the skill now used by the average wiring electrician, who will perhaps only be superior in the fitting-up of the heavier tube and industrial installations, which, of course, will not concern the householder at all.

From this it will be seen that two main conditions will arise, *viz.*, (*a*) There will be an insistent demand for a very simple "boxed-up" wiring outfit, which, if *not* supplied, must lead (assuming present legislation to continue) to (*b*) home wiring on a large scale by the semi-skilled (?) using material not suited for use by them. We unfortunately know already what the real (*b*) means! At present we have many instances of deliberately scamped work, but in future the scamping (if any) will be much less deliberate than unconscious, which is perhaps worse. It will then be clearly in the interests of the community, as distinct from those of the trade, for the trade to produce and supply to the semi-skilled, the "boxed-up wiring set," ready suited to their needs.

How such a "set" will be put up will, of course, depend upon many factors, not the least of which will be the amount of standardisation admissible from various points of view, the factor of safety allowable by rules, &c., the best method of fixing cables and fittings, and so on. Possibly such systems in general will embody:—

(*c*) Non-metal-sheathed cables (to remove the vexed question of earthing), made with fixing lugs integral with the insulation and holed to take a screw.

(*d*) Light fittings ready wired complete, with suitable externally fixed ceiling roses, &c.

(*e*) Moulded non-metallic distribution boxes externally fixed and arranged one per floor or per standard section of wiring, and therefore

(*f*) standard fuses,

(*g*) switches, plugs, joint boxes, &c., all moulded to abolish the present wooden blocks, &c., and to allow of external fixing, and also so arranged inside that all cable holes and terminals are easily accessible from the top,

(*h*) main switch and fuses supplied and fitted by the supplier of energy,

and so on—to detail everything would require a separate article. The point is that, as an ordinary manufacturing proposition, the scheme is feasible enough. The difficulties will arise outside the factory, perhaps notably in the various policies of supply authorities, contractors, insurance companies, and the like. But that at the moment is by the way. As a commercial matter, the revolutionary (and evolutionary) character of the "wiring outfit" will cause quite sufficient disturbance to bring all points of view to the fore. The industry is healthy enough to stand up to either praise or gnashing of teeth with regard to any of its activities, and if the present remarks tend to focus attention upon a potential development of wiring, then so much the better.

The Daventry Broadcasting Station.

Official Inauguration of High-Power Plant by the Postmaster-General.

Although somewhat inaccessible geographically, the new high-power station of the British Broadcasting Co., Ltd., will well repay the time expended by those privileged to visit it. It is the latest of the 20 B.B.C. stations (9 main, 10 relay, and one high-power) and will take over the functions of the Chelmsford experimental plant, retaining, however, the familiar call signal, 5XX, and wave length of 1,600 metres.

The programmes will continue to be relayed from the London studios by means of a Post Office land line, but a small studio has been provided in the station buildings for use as occasion arises. The inaugural ceremony was performed on July 27th by Sir W. Mitchell-Thomson, H.M. Postmaster-General.

Situated on Borough Hill, Daventry, in Northamptonshire, at an average height above sea level of 650 ft., the two masts are each 500 ft. high, giving a total effective height of 1,150 ft. Each is a triangular lattice structure stayed at each angle by seven guy ropes, twenty-one ropes in all, both the foundation of the masts and the anchorage of the ropes being concrete blocks. The distance between the masts is 800 ft., of which 600 ft. is occupied by the aerial and two 100-ft. lengths by the supporting cable. The aerial is of the T-headed variety, and consists of 10 wires supported in hoops 5 ft. 6 in. in diameter.

The down-lead is a six-wire cage, and enters through the roof of the station. The ends of the aerial insulators, which are of porcelain and approximately 5 in. long, terminate on the live side in anti-corona rings. Winches are provided at each mast in order to lower the aerial for periodic inspection without necessarily having to climb the masts, which feat is reported to occupy 20 minutes to accomplish. The location of the aerial is approximately N.E.-S.W. On the platform of each mast is provided a bowl-shaped warning light for aircraft. Each bowl contains four lamps, two of which are in use alternately and two as a standby.

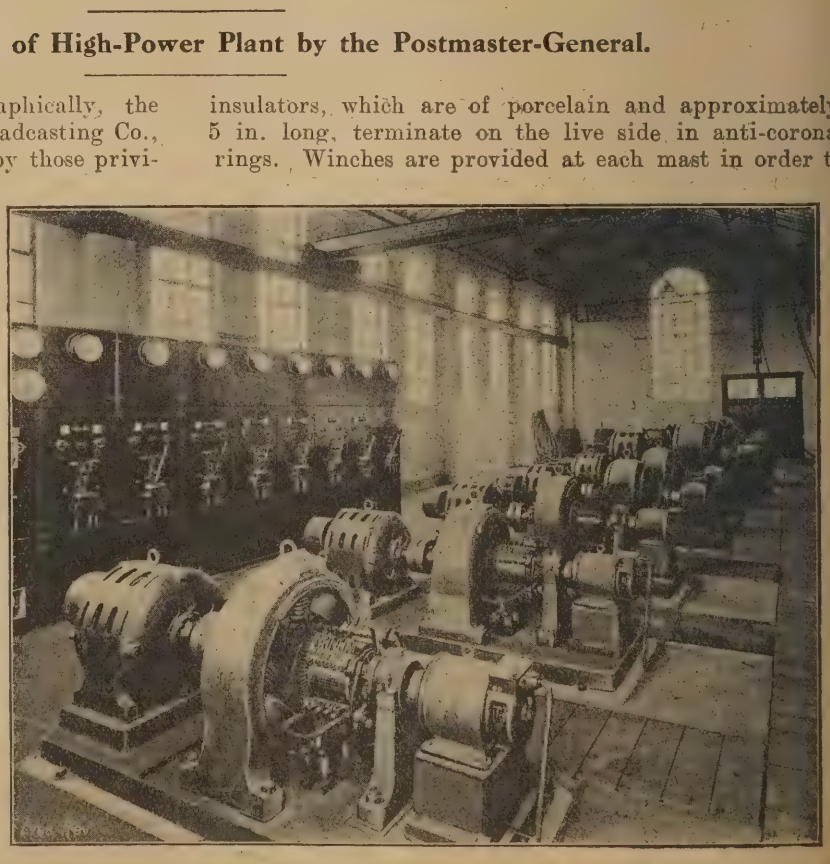


Fig. 1.—Machine Room and Power Switchboard.

The lamps are in series with two small bulbs within the station, and also a mechanical make and break device to switch the lamps off and on alternately. Should a lamp burn out, the small blubs will give occular warning.

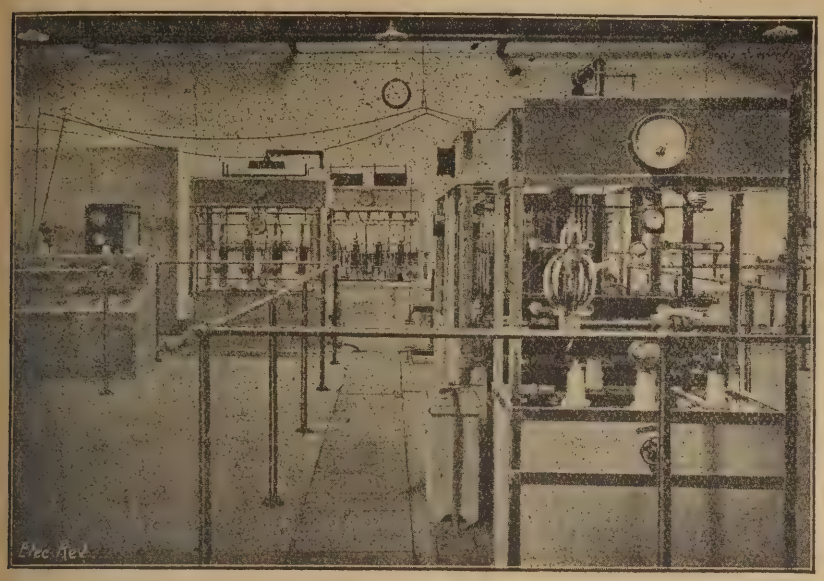


Fig. 2.—Transmitting Apparatus; Sub-modulator Panel in Foreground.

The earth system appears to be very complete, consisting in the first place of three copper sheets buried beneath the station itself, to which all machinery and frame work is earthed, and, secondly, of 36 zinc plates disposed round the station in a 100-ft. circle. Insulated wires from these earthed plates are each led on short masts over the roof of the building to the centre near the aerial down-lead, both the aerial and the connection of the 36 "earths" entering the roof near one another and proceeding directly to the tuning inductance beneath. Such an earthing system forms an electrostatic screen over the roof, and probably reduces aerial losses to some extent.

The power to operate the station is derived by duplicate cables from the Northampton Electric Light and Power Co. at 11,000 volts, the supply being 3-phase a.c., which is transformed down to 375 volts in a small sub-station. It was considered unsound to rectify the 3-phase power directly for supplying the valve transmitter, as a slight unbalance on any incoming phase might cause difficulty in maintaining the requisite degree of "smoothing," so rotary machines have been provided to furnish a single-phase supply. Besides pumps, &c., the power plant consists of three (one spare) 70-kW, 1,000-V, 300-cycle motor-alternators for supplying power to the modulator and magnifier valves; two 25-kW, 1,000-V, 300-cycle machines (one spare) for supplying power to the drive oscillator and for heating the filaments of all the rectifying valves; and three 10-kW motor-generators (one spare) delivering d.c. at from 20 to 30 volts for heating the filaments of the drive, sub-modulator, modulator, and magnifier valves. All these machines are fitted with individual self-exciters (fig. 1).

The independent drive unit comprises two air-cooled rectifying valves and one water-cooled oscillator, the former being arranged for full-wave rectification, and supply d.c. at 10,000 volts through the usual smoothing circuit to the oscillator anode. The drive oscillatory circuit is constructed of a pair of copper strip inductances astatically connected to reduce the external field, and an air dielectric condenser shielded by a metal case. The plate input to the drive oscillator is about 8 kW which is an unusually high ratio of the power supplied to the magnifier, but this permits of the magnifier grid excitation being secured with a very loose coupling, resulting in negligible reaction back on the drive and consequent freedom from frequency variation with variation of magnifier input.

The magnifier is formed of four water-cooled rectifier and three water-cooled oscillatory valves; the latter are capable of dealing with an input of 30 kW at 10,000 volts, and will be normally operated at 10,000 volts with a plate current of 2.5 amperes. The filament input is the same for all the water-cooled valves used, namely, 1 kW each at 20 volts and 50 amperes. The oscillatory circuit of the magnifier consists of an inductance of stranded cable and a shielded air condenser. The grids of the magnifier are excited inductively from the drive circuit, the direct grid-current required being about 300 milliamperes for the three valves. The grid circuit includes an anti-reaction coil inductively coupled to the plate inductance in such a manner that the internal valve capacity coupling is neutralised, so that it is not possible for the valves to operate as a self-oscillator if the drive excitation is removed. This adjustment is an important factor in securing stability of working and constancy of wavelength. The closed oscillatory circuit of the magnifier is inductively coupled to the aerial-tuning inductance, which is made of the same stranded cable as the closed-circuit coil.

The modulator portion consists of four water-cooled rectifiers and six water-cooled modulators; the modulating valves are similar in size and appearance to the oscillators, but have a much more open grid mesh with a low amplification factor. The modulator is worked with plate voltage and current equal to that of the magnifier, the current being adjusted by the setting of the grid negative voltage; for normal working this setting is between 1,200 and 1,300 volts, negative, thus a large grid sweep is possible during modulation without running into grid current. The grid negative voltage is obtained from a dry-cell battery, and as no current is taken, this source is quite satisfactory, as has been proved by twelve months' testing at the Chelmsford station.

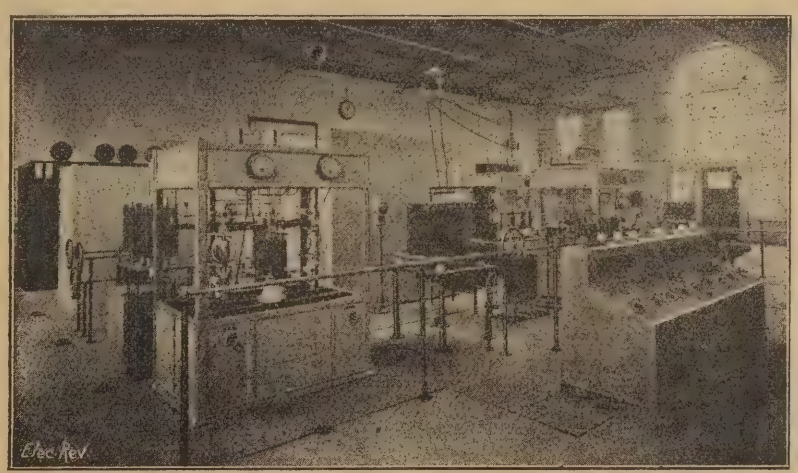


Fig. 3.—Transmitting Gear; Control Desk and Drive Panel in Foreground.

The smoothing circuits for a set of this size present something of a problem, as the permissible ripple is very small for high-quality broadcast telephony, and the smoothing units are necessarily somewhat bulky and costly. The condensers consist of zinc plates with glass dielectric, oil-immersed in porcelain containers; the total capacity used on each half of the circuit is approximately 3.5 microfarads, and the inductance about 16 henrys. The smoothing inductances are closed iron-core chokes in oil tanks, each choke containing about 5 cwt. of iron, and there are eight of them in all.

The one sub-modulator air-cooled valve is operated from the same h.p. source as the main modulator, and is coupled by resistance and capacity to the grids of the modulator valves. The grid of the sub-modulator is, in turn, coupled also by resistance and capacity to the sub-sub-modulator, which is a block of four valves supplied by a 400-volt accumulator battery and with accumulator-heated filaments. The usual land line amplifiers are situated in a separate room (fig. 4), removed as far as possible from the high-frequency apparatus, and are adaptable for amplifying either the audio-frequency currents coming over the land lines, or those from the microphone in the local studio.

Marconi-Osram valves are used, and as the anodes are at high potential, it is necessary to insulate the water jackets from the main supply of water. This is accomplished by running the water both into and out of the jackets through spraying nozzles; the water spray forms an almost perfect insulator, and no loss is sustained by leakage. The cooling water falls by gravity through the jackets, and the rate of flow is adjusted to allow about one gallon per minute through each valve. As it is important to use water free from lime or other ingredients capable of forming a deposit on the anodes, rain water is utilised; it is drained from the roof into

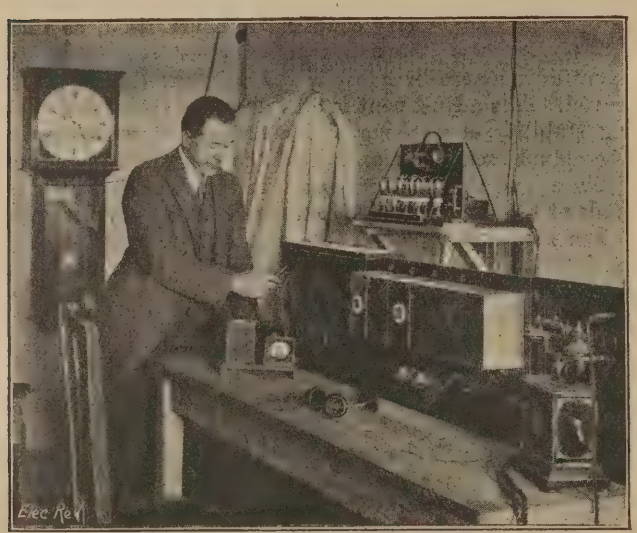


Fig. 4.—Mr. H. W. Litt (Engineer-in-Charge) in Amplifier Room.

a storage pond, a rainfall of one inch adding about 1,000 gallons to the pond.

London still remains the centre of the distribution system, and on reception of the signals at Daventry by land line they are amplified to the requisite strength to operate the sub-control valves, fig. 2, of the transmitter, while provision has been made for increasing the output to 50 kW should the necessity arise and permission to do so be obtained from the P.O. authorities.

A workshop and office accommodation have been provided, and the whole assemblage imparts an impression of light and spaciousness, the connections appearing to have been made with almost diagrammatic neatness. These features, together with reasonable duplication of lines and parts, should not fail to give adequate service when the new station has settled down to routine work. The transmitting apparatus has been designed and made by the Marconi Company on the "unit" system, that is to say, the apparatus for each separate operation is self-contained in polished aluminium framework, access to it being obtained through a safety gate which, when it is opened, makes it impossible to switch on the power. The control of the whole plant, including the operation of the running machinery, is effected by a control table in the transmitting room. Should any defect arise, the engineer on duty can switch off the entire plant merely by pushing one button. Prolonged experiments have been made on the land line in order to secure the best quality of transmission, and the B.B.C. has received the fullest co-operation of the Post Office engineers. The Western Electric Co., Ltd., designed the special line amplifiers; the Radio Communication Co., Ltd., was responsible for the masts and aerials, and the Electric Construction Co., Ltd., supplied the electrical machines and switchboards.

The B.B.C. is making no extravagant claims for its new station; the removal of 5 XX farther from London was a Government ruling, the authorities having stipulated that it must be situated north of a line drawn from the Severn to the Wash, and so located that as much as possible of the area served by it would be land; a 100-mile circle round the site encroaches on the sea in three places. To have worked with five different Postmasters-General and equipped 21 stations during the two years and a half the company has been in existence is no small achievement.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Adjournment.—The Prime Minister stated on August 3rd that it was hoped to adjourn to-morrow (Saturday) until November 16th.

The Mersey Tunnel.—Last week the Select Committee of the House of Lords concluded the hearing of evidence in connection with the Bill promoted by the Liverpool and Birkenhead Corporations empowering them to construct another tunnel under the Mersey between the two towns. The Committee passed the Bill.

Telephone Development.—On July 28th, Sir W. Mitchell Thomson, the Postmaster-General, in moving the second reading of the Telegraph (Money) Bill, said that it was proposed to authorise the State to raise credit for expenditure on the development of the telephone system at the rate during the next three years of, roughly, £1,000,000 a month. In 1925-26 it was proposed to spend £12,000,000; about £12,000,000 the year after; and £11,000,000 in the third year.

The Bill was read a second time.

Electricity in Mines.—On July 28th, during a discussion on safety in mines, a number of members urged the universal adoption of electric lamps in place of the present safety lamps. Electric lamps, it was contended, were far safer and more satisfactory. Further, the use of electric lamps would prevent miners' nystagmus.

Col. Lane-Fox, Secretary to the Mines Department, said that 350,000 of the lamps now used were electrical.

Lead Poisoning.—On July 28th, on the Home Office Vote, Lord H. Cavendish-Bentinck said that lead poisoning was rapidly increasing, and electrical accumulators were responsible for a large amount of it. There were 35 cases in 1921 and 101 cases in 1924.

Sir W. Joynson-Hicks, Home Secretary, agreed that most cases of lead-poisoning occurred in the manufacture of electric accumulators and in the work of ship-breaking. The manufacture of electric accumulators was one of the industries which had been booming. The subject had been under the careful consideration of the Home Office, and he had issued new regulations which, he hoped, would have the effect of removing the dangers in that industry.

Radio Licences.—On July 28th, Sir A. Holbrook asked the Postmaster-General if he would consider the adoption of a definite scale of fees in respect of transmitting licences for wireless telegraphy so that the efforts of British research workers might be encouraged and that the valuable work of experimenters, particularly in the direction of short-wave transmission, might not be hampered.

Sir W. Mitchell-Thomson said that a definite scale of fees for experimental sending licences was already in operation.

Municipalities and Electrical Apparatus.—On July 30th during the debate in the House of Lords on the Burnley Corporation Bill, Lord Banbury moved to leave out Clause 26, which empowers the Corporation to sell electrical fittings. Up to 1902, he said, powers were given to various Corporations to supply and sell electrical fittings, but after that year, there being a strong feeling against municipal trading no further powers were given to sell such fittings. Powers were given to supply electrical fittings on hire, because it was stated by the corporations that they were in a better position to do this than private contractors, and that it would probably encourage the use of electricity if they were allowed to let fittings on hire, but the purchase of fittings had to be made through a contractor. In 1912, the House of Lords adopted the House of Lords Model Clause, whereby any such sales or work required on consumers' premises had to be carried out through an electrical contractor. In 1919, by arrangement with the Electricity Commissioners and supply authorities Section 23 of the Electricity (Supply) Act, 1919, was agreed to. It gave local authorities power to provide and let on hire repair, and maintain electrical fittings, but prohibited them from selling them unless expressly authorised by their special Act or Order. But under the present Bill the Select Committee had practically turned down this clause and had given power to the Burnley Corporation to sell electrical fittings

Last year a Select Committee deleted a similar clause in the Wakefield Corporation Bill. He objected to municipal trading.

Lord STRACHIE, as chairman of the Select Committee, explained that such power was already possessed by some 80 other authorities. The Corporation was not asking for power to manufacture, only to sell, and the Committee was unanimously of opinion that the Corporation had carried out its electricity powers very well indeed. The rates were low, and the work was done efficiently. Arrangements were made for purchase of electrical fittings on the hire-purchase system. Without some system of hire-purchase or deferred payment, small-value houses could not get electrical facilities as quickly as they should. The expansion of electricity meant cheaper light and power, and, in addition, the greater the supply of electricity the greater the demand for fittings, lamps, and so on. This, in its turn, meant that there would be an increase in employment.

Lord DONOUGHMORE, chairman of Committees, supported the clause, but pointed out that there were now in the country three systems under which the municipal authorities supplied electricity. There were some with full power to sell fittings; some with no power to sell fittings; and some with power to sell solely through contractors. All three systems could not be the best, and it was only the best that should be adopted in encouraging the expansion of the electrical industry. He urged the Government to set up an inquiry in the autumn or next year, similar to the 1912 inquiry, when there was a Joint Committee of both houses, to settle the matter once for all.

Lord SALISBURY, Lord Privy Seal, undertook to transmit this suggestion to the proper quarter.

The amendment to omit the clause was negatived, and the Bill was read a third time.

The Rutenberg Concession. — On July 30th, Captain WATERHOUSE asked the Secretary of State for the Colonies what arrangements, if any, had been made by the concessionaire under the Rutenberg concession to erect the Yarkon power house; if any pressure was being brought to bear in order to expedite this work; and if, and when, the penalty clause under Clause 4 of the agreement would come into operation.

Mr. ORMSBY-GORE said that the greater part of the area covered by the Jaffa Electric Company's concession was already supplied from a fuel power station at Tel Aviv. The company had been required to submit a scheme within a period expiring in two months' time to supply the remainder of the area, which comprised the town of Petach Tikvah and the surrounding area, either from the existing fuel station or from a hydro-electric station constructed in accordance with the original plan. The Palestine Government would no doubt consider the propriety of bringing the penalty clause into operation if the scheme was not submitted within the time limit specified above.

Royal Assent.—In the House of Lords, on July 30th, the Royal Assent to the following Bills were notified:—Statutory Gas Companies (Electricity Supply Powers); London County Council (Tramways and Improvements); and the London Electricity Supply (Nos. 1 and 2) Bills.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

A Proposed Institute of Radio Engineers.

I think it has been quite clear in all the correspondence that the above society was proposed because there did not appear to be any body in existence in this country which catered sufficiently for the growing number of wireless engineers.

I am very pleased to say that by invitation of the Committee of the Wireless Section of the Institution of Electrical Engineers, I was present at a meeting of the Committee which took place on Friday, July 25th. Matters were discussed very fully, and I must thank the Committee for the businesslike manner in which it dealt with the subject. For the present it is sufficient for me to state that I am satisfied that entrance into the I.E.E. by those professionally engaged in wireless matters is not as difficult as I had imagined, and that it is realised by the Institution that radio matters are of great and growing importance.

I would like all those who have written supporting the proposed society to feel that they have done a great deal of good in demonstrating the need of more activity in wireless matters. Further criticisms on the position after perusing any statement the Council of the I.E.E. may make in the technical Press can be sent to Mr. Y. W. P. Evans, 66, Oxford Road, Manchester. All our friends may rest assured that their interests will be well looked after.

J. Nelson.

Prescot, *July 27th*, 1925.

[A communication from the secretary of the Institution of Electrical Engineers on this subject will be found in our "Notes" columns to-day.—EDS. ELEC. REV.]

Celluloid in Accumulators.

The letter from Mr. C. Lack in your issue of July 17th may give the impression that A.F.A. cells are the only make which are fitted in glass containers, and I should therefore like to make it clear that there are numbers of British batteries which are also fitted in glass containers, and are equally efficacious in the prevention of fire.

The A.F.A. cells referred to are presumably those which are made in Germany, and in furtherance of the policy that British-made goods should be bought in preference to foreign goods, I think it well to let your readers know that there is no need to buy foreign batteries when British-made batteries of better quality than the usual Continental make can be obtained readily in every town in the United Kingdom.

D. C. McLagan,
Secretary, The Accumulator Makers' Association.

London, S.W.1, *July 28th*, 1925.

The Evolution of Electric Cookers.

The comments and suggestions given in your issue dated July 24th are very interesting. It is to be hoped that the proposals contained in the last paragraph will be adopted.

With respect to heating elements, there is now available a non-metallic element which appears to meet a long-felt want in the domestic and industrial electric heating field.

The enclosed printed matter gives some technical particulars respecting these new elements, which are sold under the trade mark "Globar." The advantages to be obtained by the use of non-metallic elements are sufficiently obvious to be fully appreciated by the *user* of the apparatus, as "Globar" elements can easily and readily be replaced by unskilled labour without the use of resistance wire or refractory supports. In other words, the client can carry out his own repairs at a minimum of expense.

As the makers of "Globar" aptly state, "Globar is to heat what tungsten is to light."

A. Imbery.

Halifax, *July 29th*, 1925.

[We are obliged to our correspondent for drawing attention to this type of heating element. No details of its composition are given in the printed matter referred to, but it is stated that the elements can be used at temperatures up to 2,500 deg. F., or even 3,000 deg. Apparently it is made in the form of rods with metallic terminals, and it is said to be mechanically strong.—EDS. ELEC. REV.]

Is there an Age Limit?

With reference to the letter by "Too Young at Forty" in your issue of July 24th, it is obvious that the writer of that letter did not serve with the forces during the war. He seems to forget the debt which he owes those that protected him, and, in fact, would now make profit out of their patriotism.

A. G. Porter,
Major.

Spalding, *July 29th*, 1925.

Your correspondent "Too Young at Forty," in your issue of July 24th, accurately "Hits the tin-tack on the cranium" without any exaggeration, and I think that perhaps my analogous "tale of woe," told briefly, may interest some of my fellow valetudinarian readers.

My late employers—a London manufacturing electrical company—were compelled to close their works last March, owing to lack of capital, trade depression, &c., and thus after 12 years' service, with excellent testimonials, I became enrolled a "Member of the Micawber Million" (or more).

I had previously been engaged for 15 years with a Lancashire firm of electrical engineers—after a five years' apprenticeship at a well-known electrical works in the North of England—and although I am "two-score-and-ten," I have never experienced one day's illness during my working career.

Since last March I have replied to dozens of advertisements in the electrical Press, &c., but without success to date, notwithstanding that I have offered to accept a mere "existing" emolument, rather than be without means or occupation any longer.

Methinks, therefore, it seems palpably obvious that I am evidently "too fossilised at fifty," with visions of a "Pauper's Palace" distinctly looming ahead.

M.I.E.E.

July 31st, 1925.

French Water Powers.—It is reported from Paris that various schemes are in course of preparation which aim at the systematic utilisation of the water powers that are still lying idle, particularly in the south. It is proposed to render it possible for the farmers all the better to be able to carry on agricultural operations and at the same time more intensively to cultivate the soil. The systematic execution of the schemes, which are said to be connected with the Dawes plan, is expected gradually to render the country to a large extent independent of the imports of coal.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The N.A.R.M.A.T. Exhibition.—An exhibition of radio apparatus produced by members of the National Association of Radio Manufacturers and Traders is to be held at the Albert Hall from September 12th to 23rd. We have received a prospectus from the publishers of the official catalogue, Messrs. A. J. Wilson & Co., Ltd., 154, Clerkenwell Road, E.C.1, containing particulars of advertising rates, &c.

Employment after Apprenticeship. — In an article upon this subject in the July issue of *Industrial Welfare*, Sir Alexander M. Kennedy analyses the causes of parents' hesitation to apprentice their sons to skilled industries, finding that the principal fear is that employment will not be available when the apprenticeship has been served. The author considers, however, that whatever the temporary difficulties are, the ultimate prospects of remunerative employment for the skilled men of the rising generation are as great as they have ever been, and that the evolution in industrial machinery and methods has made skilled apprenticeship even more indispensable to industrial prosperity. To those who are charged with any responsibility in guiding young persons entering employment to-day, the author says that in his opinion the future status and opportunities of the young skilled craftsman will be such that they need have no hesitation in recommending lads to enter themselves in the skilled crafts.

Mersey Power Co.'s Extensions.—A new extension to cost nearly £250,000 is being carried out at the Mersey Power Co.'s station at Runcorn. The following orders have been placed:—A 12,500-kW turbo-alternator, with Messrs. C. A. Parsons & Co., Ltd.; four 45,000-lb. boilers, Messrs. Babcock and Wilcox, Ltd.; and engine-room and boiler-house buildings and condensing plant, Messrs. G. & J. Weir, Ltd. The Mersey Power Co. is now giving bulk supplies of current to the Mid-Cheshire Electric Supply Co., the North Wales Power Co., and the Wirral Rural District Council. We have already reported that the Government has guaranteed the principal and interest of a loan for the purpose of these extensions under the Trade Facilities Act.

Monomarks.—Mr. W. Morris, managing director of British Monomarks, Ltd., writing with reference to our notice of the Monomark system (Elec. Rev., July 17th) draws attention to the fact that a trader will use the prefix B.C.M., meaning British Commercial Monomark and the subscription in such cases ranges from two guineas upwards according to the nature of the Monomark. It is the private individual's monomark which uses the prefix B.M. and is 5s. per annum.

E.D.A. Activities. — The British Electrical Development Association has published a brochure (E.D.A. 569) illustrating and describing the exhibition of electrical appliances and the special lighting displays which were arranged by the Association jointly with the E.L.M.A. Lighting Service Bureau at Brighton during this year's convention of the Incorporated Municipal Electrical Association.

Trade Announcement.—Messrs. Allen-Liversidge, Ltd., Victoria Station House, Westminster, S.W.1, have just taken over the sole selling agency for Great Britain and Ireland of the electric welding products of Messrs. Buckley, Saunders and Co., Ltd. (Westminster and Birmingham), including the "Pontelec" resistance welding plant, electric rivet heaters, &c.

The Baghdad Concession.—Agreement Approved.—The amended terms of agreement submitted by Mr. Stanley, representing a London syndicate for the Baghdad Electric Lighting and Tramway Concession, have been approved by the Council of State. The concession will run for 60 years. The military plant is to be bought for approximately £50,000. Fifty per cent. of the net profits from the electric lighting branch of the undertaking and 30 per cent. of the net profits from the tramways are to go to the municipality. The charges per unit will be eight annas to the public and six annas to the Government. —*Financial Times.*

Westinghouse Interests in Japan.—Mr. E. D. Kilburn, vice-president of the new Westinghouse Electric Co. of Japan, recently stated that the objects of the company were to distribute Westinghouse products throughout Japan and to arrange for proper service to the many old, as well as the new, users of Westinghouse apparatus. Adequate stocks would be carried, repair and other service facilities would be provided, and engineering and construction assistance would be supplied to users of the company's products. The staff in Japan would be almost entirely Japanese. It was a simple matter to assemble this staff because there were scores of Japanese engineers who had been employed at the Westinghouse company's works at East Pittsburgh and elsewhere.

Social Event.—On July 18th, the employés of the Saxonia Electrical Wire Co., Ltd., Roan Works, Greenwich, S.E., went for their annual outing to Hastings. A stop was made for lunch at a hotel situated outside Hastings, and after reaching the town a tour was made through the famous St. Clement's caves. Swimming and other amusements on the front filled up the day till 4, when tea was served at the Scotch Café, the managing director, Mr. L. H. Euler, A.M.I.E.E., being in the chair.

Trade Facilities Guarantees.—An official paper issued last week states that the guarantees which have been given by the Treasury under the Trade Facilities Acts, 1921-1924, up to June 30th, 1925, amount to £54,452,936. Recent guarantees include £20,000 (guaranteed as to principal and interest) to the St Austell and District Electric Lighting and Power Co., Ltd. for the erection and equipment of a power station and provision of mains; £1,250,000 to the Benguella Railway Co. (guaranteed as to principal and interest for 25 years) for the purchase of rolling stock and railway materials in Great Britain; and £50,000 to the Nottingham Coal Carbonization, Ltd. (guaranteed as to principal and interest for seven years) for the erection of plant to treat coal by a process of low-temperature carbonisation.

Catalogues and Lists.—Siemens & English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, E.C.4.—Price List No. 132, dealing with all makes of Association radio valves.

The Hendon Electric Lamp Co., 104, Southampton Row, W.C.1.—A price list of "Hendon" lamps of various types.

The Leeds Electrical Construction Co., Ltd., Charmouth Street, Leeds.—An illustrated publication describing a new high-temperature electric furnace with automatic temperature control.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester.—Special Publication No. 7,117/3, describing a new "Cosmos" crystal set. Illustrated and priced.

Super-Centrifugal Engineers, Ltd., Imperial House, Kingsway, W.C.2.—An illustrated pamphlet advertising the "Sharples" "super-centrifugal" oil purifier.

The D.P. Battery Co., Ltd., Bakewell, Derbyshire.—A comprehensive catalogue (112 pp.) of the company's storage batteries for central stations, country houses, institutions, &c. Particulars are given of stands for these batteries, and the catalogue is fully illustrated and dimensioned.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—The "Osram Bulletin" for July, containing articles and notes on "Osram" lamps and radio valves and their employment.

The Steam Fittings Co., Ltd., West Drayton, Middlesex.—An illustrated and priced pamphlet describing a capacity multiplier for steam traps.

Pope's Electric Lamp Co., Ltd., 5, Arthur Street, New Oxford Street, W.C.2.—A blotter, bearing a calendar for August, advertising "Elasta" electric lamps.

The Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—A blotter advertising "Jackson" electric cookers with a calendar for August.

Messrs. Wm. Geipel & Co., Vulcan Works, St. Thomas Street, S.E.1.—A pamphlet illustrating and describing the "Quead" electric cooker; and a revised price of rubber covered wires.

Bankruptcy Proceedings.—A. O. Joyce, 7, Parade, Leamington, Warwickshire, electrician.—The receiving order herein was made recently on a creditor's petition. The statement of affairs shows gross liabilities of £315, of which £310 is expected to rank, against net assets of £19, or a deficiency of £291. Debtor attributes his failure to lack of capital and bad trade. He states that he commenced business on his own account as a radio engineer at the above address in November last. He had practically no capital of his own at the time, and he borrowed £100 from a friend, which remains unpaid. He had got into financial difficulties, and the Sheriff had sold his trade and household effects under an execution. Debtor admits having been aware of his position since two months prior to the date of the receiving order. The first meeting of the creditors was held on July 28th at the Official Receiver's office, Coventry, when the case, being a summary one, was left in the hands of the Official Receiver as trustee.

P. L. Symonds, 40, Victoria Road, Great Yarmouth, electrician.—The public examination of this debtor was held on July 28th at the Town Hall, Great Yarmouth. The statement of affairs showed liabilities of £368, with a deficiency of £21 In December, 1922, the debtor commenced business as an electrician. He took another into partnership, debtor finding £100, which was used to buy stock, and the partner brought in some stock. On December 31st, 1923, the partnership was dissolved, and since 1924 debtor had traded on his own account. He bought £130 worth of radio components, expecting a purchaser, but the purchaser went to another firm, and debtor was left with them on hand. He attributed his failure to overstocking and the decline in the wireless trade. The examination was closed.

E. G. Wicks, electrical engineer, 19, Ruby Street, Bedminster, Bristol.—Trustee, Mr. F. W. Dearle, Official Receiver, 26 Baldwin Street, released June 22nd.

I. Faulkner, 9, Derby Road, Weaste, Salford, electrical engineer, trading as the Provincial Lighting & Engineering Co.—Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester, released July 3rd, 1925.

H. RHODES, trading as the Victoria Electrical Co., Victoria Buildings, Keswick, Cumberland.—Trustee, Mr. K. J. Hough, Official Receiver, released June 28th.

A. WOOD, electrical agent, 67, Bradford Avenue, Cleethorpes, late of Great Grimsby.—Last day for the receipt of proofs for dividend, August 12th. Trustee, Mr. J. F. Wintringham, St. Mary's Chambers, Great Grimsby.

Company Liquidations.—P.S. WIRELESS MANUFACTURING Co., LTD., Ship Street, Brighton.—A meeting of creditors was held on July 27th at Brighton, when Mr. E. Webb, the liquidator in the voluntary liquidation, reported that the liabilities were £609, of which £300 was due to the trade and £309 to the bank. The claim of the bank had been guaranteed by three of the directors of the company. The net assets were £455, showing a deficiency, so far as the creditors were concerned, of £154. The company was registered on March 13th, 1924, with a nominal capital of £2,000, for the purpose of taking over the business previously carried on by Mr. H. L. Smith for the manufacture of radio instruments. The vendor was allotted 1,125 shares in the company as the consideration for the assets transferred, while 760 shares were subscribed for in cash. Preliminary accounts at December last disclosed a loss on the trading of about £200. A considerable amount of experimental work had been carried out. Up to the date of the liquidation there had been a loss on the trading of £718. The deficiency, so far as the shareholders were concerned, was accounted for by the loss on the trading, together with the depreciation written off the assets in the statement of affairs. A resolution was passed confirming the voluntary liquidation of the company, and an advisory committee was appointed, consisting of the representatives of Messrs. Hanningtons, Ltd., and Messrs. Orbell & Kirk.

The following are creditors:—

	£		£
Henderson & Co.	132	Stella Lights, Ltd.	21
Cable Accessories Co., Ltd. ...	25	Bankers	309
Ellis, W.	24		

KLYDO, LTD., 112, Belvedere Road, Waterloo, S.W.1, electric sign manufacturers.—A meeting of the creditors was held on July 27th at the above address. The liquidator of the company, Mr. E. H. Miller, presented a statement of affairs as at July 8th, which showed liabilities of £2,372, and a deficiency of £1,976. The company was formed in March, 1923, but traded without success. An agreement was entered into to fit "Klydo" signs at Wembley. The contracts were not carried out, and the directors of another company at Wembley acquired the shares of Klydo, Ltd., and endeavoured to put it on a sound financial basis, and several sums of money were advanced for that purpose. The trading was still unsuccessful, and accordingly on July 8th the creditors decided upon voluntary liquidation. The creditors decided that Mr. Miller should continue as liquidator.

The following are creditors:—

	£		£
Corbin, Greener & Cook	56	Hetley, James, & Co.	21
Gane, Jackson, Jeffries and Freeman	21	Coenigs & Hammer	62
Coleman, C.	99	Miller, Mills & Bantock	31
Crowden & Keeves	59	Rent	28

ROBB BROTHERS (GLASGOW), LTD., electrical engineers, 11, Bothwell Street, Glasgow.—At a recent meeting of creditors, Mr. A. E. R. Copeland, C.A., the liquidator of the company, presented a statement of affairs which showed liabilities of £2,723 and assets of £987, or a deficiency, so far as the creditors were concerned, of £1,736. The statement showed 8s. 2d. in the £, subject to the expenses of realisation. The company was formed in March, 1921, with a nominal capital of £3,000, of which £2,459 had been issued and was fully paid. During the year to March, 1923, there was a loss on the trading of £64, whilst in the following 12 months to March, 1925, there was a loss of £391. One of the directors of the company stated that they had been endeavouring for some time past to become members of the N.A.R.M.A.T., but had not been successful. As a result, they could not purchase on the same terms as the members of the Association, but had to pay higher prices and resell at the same prices as other merchants. That had the effect of reducing the gross profits which were earned. Last November a quantity of goods were purchased from a company and were found defective. Those goods were returned, and a credit note was given. In the interval a bill given to the suppliers had been transferred to another company, who instituted legal proceedings for the recovery of the value of the bill. As a result, the company became responsible for the bill of £400, and had not received anything to replace the goods which were returned. A resolution was passed confirming the voluntary liquidation of the company, whilst a committee of three of the creditors was also appointed.

E.S. Co., LTD.—Winding up voluntarily. Liquidator, Mr. S. A. Smith, C.A., 11, Queen Victoria Street, E.C.4. A meeting of creditors is called for August 14th.

COVENTRY WIRELESS SUPPLIES, LTD.—Winding up voluntarily. Liquidator, Mr. H. M. James, I.A., 14, High Street, Coventry. A meeting of creditors was called for August 5th. Particulars of claims to be sent to the liquidator, Mr. H. M. James, 14, High Street, Coventry, by September 3rd.

ELECTROPHONE, LTD.—Winding up voluntarily.

SOUTH-EASTERN AND CHATHAM CONSTRUCTION AND POWER Co., LTD.—Winding up voluntarily. Liquidator, Mr. R. D. Heckels, 65, Coleraine Road, Blackheath, S.E.3. A meeting of creditors is called for August 14th. These notices are purely formal; all creditors have been or will be paid in full.

RADIO INSTALLATIONS, LTD.—A meeting of members is called for September 2nd, at 14, St. Mary Axe, E.C., to hear an account of the winding up from the liquidator, Mr. G. W. Askew.

BISHOP'S CASTLE ELECTRIC LIGHT & POWER Co., LTD.—Mr. G. H. Hewitt, a creditor, has presented a petition for the winding up of this company. The application will be heard at the County Court, Leominster, on August 10th.

RODERICK ELECTRIC SUPPLIES Co., LTD.—Meeting of creditors, August 10th, at 19, Eastcheap, E.C.3. Liquidator, Mr. W. H. Cork.

ENGLISH RADIO CORPORATION, LTD.—A meeting of members is called for September 1st to hear an account of the winding up from the liquidators, Messrs. C. H. Baker and A. H. Whalley, at their offices, 12, South Parade, Leeds.

Private Arrangements.—D. G. NICHOLAS, radio specialist, 14, Victoria Square, Aberdare.—The creditors interested herein were called together recently at the offices of Messrs. Clarke, Dovey & Co., Cardiff, when Mr. S. E. Clutterbuck submitted a statement of affairs which disclosed liabilities of £469. The indebtedness to the trade was £429. The assets totalled £113, leaving a deficiency of £356. It was reported that the debtor commenced business in October, 1923, without capital, his father guaranteeing the bank up to £20. The debtor had at various times borrowed from his father sums of money totalling £40, which were still outstanding. At the outset the turnover averaged about £20 to £25 a week, but it had since fallen to £10 weekly. The total weekly expenses had averaged £6 10s. The debtor attributed his present position to want of capital and depreciation in the value of stock.

The debtor's solicitor made an offer of 5s. in the £, which was not accepted, and it was decided that the debtor should be given time within which to find security for the payment of a composition of 10s. in the £ by two equal instalments at one and three months. It was also decided that the composition should be paid under a deed in favour of Mr. S. E. Clutterbuck.

The following are creditors:—

	£		£
Aberdare U.D.C.	37	Metro-Vick Supplies, Ltd. ...	25
Brown Bros., Ltd.	36	McTaggart, H., & Co.	26
Cleave, H. R., & Co.	23	North British Rubber Co. ...	21
Houghtons, Ltd.	25	South Wales Wireless Installation Co., Ltd.	27
General Electric Co., Ltd. ...	77		

H. LEAKE, trading as Harold Leake & Co., 13, Garden Street, St. Annes-on-Sea, electrician, &c.—The creditors interested herein were called together on July 24th at the offices of Messrs. J. B. Boyd, Wrigley & Co., C.A., Manchester, when a statement of affairs was presented which showed liabilities of £3,216, of which £2,044 was due to the trade. There were partly-secured cash creditors for £1,572, who held securities valued at £400, leaving £1,172 to be included with the ranking liabilities. The assets were estimated to realise £3,026, less £79 for preferential claims, leaving net assets of £2,947, or a deficiency of £269. It was stated that the debtor had been in business for a considerable period, and apparently was able to trade successfully until a year or two ago, when he felt the effects of the bad trade in the locality. A balance-sheet was prepared last January, and it showed a surplus of assets over liabilities. The turnover for the last six months was thought to have been about £1,200, but for 1924 it amounted to £6,490. Three creditors had commenced proceedings, and a deed of assignment had already been executed to protect the assets. It was decided to confirm the deed already executed, and a committee was appointed. The trustee and committee were empowered to reassign the estate for a sum sufficient to pay a dividend of not less than 10s. in the £.

Dissolutions of Partnership.—WESTERN MANUFACTURING Co., radio factors, Lydney, Glos.—Messrs. W. K. Coxon, A. S. Prosser, and E. R. Weare have dissolved partnership. Debts will be attended to by Messrs. Coxon & Weare.

NYMAN & Co., THE DIRECT WIRELESS Co., and the WIRELESS HOSPITAL, Leeds.—Messrs. S. M. Nyman and R. Scott have dissolved partnership. Debts will be attended to by Mr. Nyman, who will carry on business as Nyman & Co. and the Wireless Hospital. Mr. Scott will trade alone under the style of the Direct Wireless Co.

Hungarian Electrical Imports.—The *Board of Trade Journal* publishes a table showing the sources of imports into Hungary during 1924. Included in this is the item "electrical machinery," in which Germany is shown as the principal supplier (5,052 quintals), being followed by Austria (4,459 quintals). The United Kingdom provided only 32 quintals, Czecho-Slovakia 810 quintals, and Italy 118 quintals.

Coal Stoppage Averted.—As a result of Government intervention, the complete stoppage in the mining industry which was threatened upon the expiry of the existing agreement on July 31st was averted. The Government has undertaken to make good any losses in the industry for a period during which a Committee of Inquiry will make a thorough investigation of the position of the industry.

For Sale.—The Ayrshire Electricity Board invites offers for a complete private lighting generating plant. Owing to the installation of larger plant, the Sutton Coldfield Corporation Electricity Department invites offers for one d.c. feeder booster, complete with switchgear. Mr. H. J. Shaw will sell by auction on August 25th at 85, Newington Causeway, S.E., the stock of an electrical goods factor. (See our advertisement pages to-day.)

Book Notices.—" The Structure of Light," by Sir J. J. Thomson, O.M. Pp. xii + 38; figs. 8. London: Cambridge University Press. Price 2s. 6d. net.

" Selected Papers from the *Journal* of the Institute of Electrical Engineers of Japan."—No. 5, " Jump in the Self-Excitation of d.c. Generators." No. 6, " New Method for Electrical Machine Design."

" Quarterly Bulletin of the British Cast Iron Research Association," No. 9, July, 1925.

" Fuel Economy and Smoke Prevention," by J. B. C. Kershaw, F.I.C. Pp. xiv + 268; figs. 91. London: Constable and Co., Ltd. Price 16s. net.

Electricity Meter Approved. — The Electricity Commissioners have approved the Metropolitan-Vickers Type " N.A." single-phase watt-hour meter in rated sizes from 2.5 to 20 A, at from 100 to 600 V, frequency 50 cycles.

United States Electrical Exports.—Although the value of the United States electrical exports during May ($7,198,803) was greater than that for May, 1924, the total for the first five months of the current year was about $1½ million less than in the equivalent period of last year. A comparison of the May exports with those of the previous May shows that generators, steam turbo-generators, and generator parts and accessories decreased by about 12 per cent., storage batteries by 17 per cent., transformers by 62 per cent., rectifiers, motor-generators and converters by about 50 per cent., electric locomotives by 72 per cent., protective devices by 71 per cent., railway motors by 50 per cent., fans by 59 per cent., electric furnaces and ovens by 86 per cent., and telegraph apparatus by over 50 per cent. On the other hand, increases occurred in the following items:—Primary batteries 35 per cent., meters 31 per cent., stationary motors, over 200 h.p., 65 per cent., flashlamps 80 per cent., motor-driven household devices 32 per cent., domestic heating and cooking appliances 40 per cent., radio apparatus 130 per cent., telephone switchboards 190 per cent., bells, &c., 70 per cent., ignition apparatus 105 per cent., lighting fittings 53 per cent., bare copper wire 190 per cent., insulated copper wire 10 per cent., and carbons 30 per cent.

Electricity v. Gas for Heating.—Messrs. Automatic and Electric Furnaces, Ltd., writing with reference to the remarks of Mr. D. Milne Watson at a recent " gas " meeting, reported in our issue of July 24th, say it is not surprising that engineering industries are not satisfied with electric power and lighting only. The economy effected in heating is best shown by the following tests, carried out by two engineering establishments, one in a " Wild-Barfield " electromagnetic furnace and the second in a gas furnace. The company gives the following figures:—

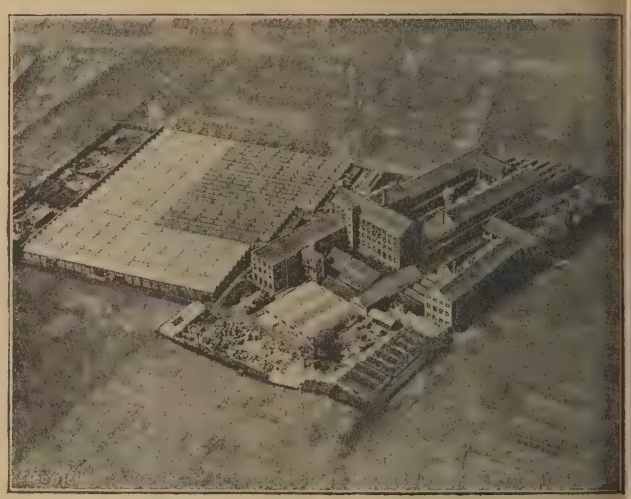
Electricity.	Gas.
Output per hour, 29.75 lb.	33 lb.
Consumption per hour, 3.41 kWh	250 cu. ft.
Price, 1d. per kWh	3s. 11d. per thousand.
Cost per lb. of steel, .1185d.	.355d.
Hardening cost per ton, 22s.	68s.

It will be seen from the foregoing that gas for hardening costs 3.08 times as much as electricity.

The German Electrical Industry.—The *Deutsche Bergwerks Zeitung* says that the rising movement in electrical shares which began early in July has directed attention to the business situation in the electrical industry. This industry is one of the few branches of German industry which are at present doing good business. Endeavours are now being made to make up for what had to be neglected during and since the war; works are completing and modernising their electrical equipment; existing power plants are being extended, and new plants built. According to a report of the Berlin Chamber of Commerce and Industry, the chief feature of the electrical industry during the past quarter has been the conflict between the urgent needs for electrical material and the lack of money and credit. Where these difficulties were not felt directly, as at electricity works and in the tramway undertakings, a large number of orders were given. In many other branches of industry extensions of plant were undertaken but generally, owing to the difficulty of procuring money, caution was observed. Business with the mining industry has been very quiet. On the whole, sales of cable, machinery and apparatus, meters and small material were satisfactory, and employment is assured for some months. There was a lively demand for measuring instruments for switchboards, heating apparatus, laboratories, and medical apparatus. Sales of telegraphic material were less satisfactory, and business declined further. Comparatively little business was done with manual telephone exchanges, but large orders were received for automatic exchanges. Sales of telephone apparatus to official and private customers were satisfactory. In the radio industry employment was good during May, but since that month the usual summer slackness has prevailed. Manufacturers of railway safety apparatus and electrical carbon products still complain of bad business. Sales of electric lamps have developed not unfavourably, but have been hindered abroad by the high Customs duties.—*Reuter's Trade Service* (Essen).

The Austrian Electrical Industry.—Until recently the electrical works of Austria were working at full capacity owing to the electrification of railways in the Tyrol and Upper Austria. As, however, these works are nearing completion, and some contemplated electrification works have been cancelled, some of the large works are suffering from a shortage of orders and have had to reduce their working hours as the only alternative to the dismissal of employés. The manufacturers entertain the hope that if the American investment credit is established the State will give them large orders for the extension of the telephone and telegraph services. The exportation of motors, dynamos, and other heavier electrical appliances is unsatisfactory owing to the competition of Germany, Czecho-Slovakia, and, lately, Poland. All these countries are able to underbid Austrian exporters, wages being much higher in Austria owing to the power of the trade unions. The most flourishing branch of the electrical industry is the radio apparatus section, which is progressing rapidly. It is noteworthy that while Austrian prices are relatively high for heavy electrical apparatus, they are low for " weak-current " appliances such as electrical toys, hand lamps, radio accessories, valves, telephones, &c. There is a huge export of the latter class to the Near East countries, Austria having very advantageous commercial treaties with these.

A Factory from the Air.—Aerial photographs have lost their novelty nowadays, but we think that the accompanying view of the Automatic Telephone Manufacturing Co.'s works at Liverpool is of interest, having regard to the importance which the company has acquired as a contractor for the provision of automatic telephones in Greater London. As viewed from the air, this extensive factory suffers from perspective, for the considerable expanse of roof ridges in the left of the picture covers one of the largest machine shops and switchboard-erecting shops in the North of England, in addition to housing certain of the assembly departments.



The Automatic Telephone Co.'s Manufacturing Works, Liverpool.

framework shop, &c. The ground area occupied is 9½ acres, the total floor area being over 270,000 sq. ft. The multi-storey buildings on the right are mainly given over to assembly, stores, packing, &c., and include an extensive suite of offices in the foreground. The large orders which are being secured for " Strowger " equipment have necessitated extensions which are now in progress. Among the orders now being executed at the works, in addition to British Post Office requirements, are " Strowger " telephones and equipment for Sydney (N.S.W.) and for the restoration of the Tokio telephone system, which was wrecked by the 1923 earthquake and fire, as well as for the Buenos Aires system. The works employ over 3,500 workpeople.

Radio Apparatus in Switzerland.—In a recent note upon the position of broadcasting in Switzerland, *Commerce Reports* states that the completion of the Basle station will give an impetus to the demand in Switzerland for radio apparatus. The local market is stocked at present with radio sets of French and German manufacture, although a limited quantity has been supplied by British firms. So far as is known, no American radio sets are at present in operation in Basle. Receiving sets now on sale in Basle retail at from 200 to 800 Swiss francs. The cheaper sets have not proved very satisfactory.

Lamp-Makers' Publicity in France.—A number of electric lamp manufacturers in France have recently joined together in a co-operative publicity scheme urging electric light users to support the French industry by only buying lamps which are really French. The announcement adds that the purchase of foreign lamps injures the credit of France.

Unemployment.—The " live " registers of the Employment Exchanges showed at July 20th a total of 1,221,900 wholly unemployed persons. This figure was 26,566 less than a week previously, but 180,116 more than in July, 1924.

German Lamp Patents in Belgium.—Before the war the Osram Gesellschaft, of Berlin, held certain Belgian patents in respect of incandescent lamps which were produced and sold by the A.E.G. This concern had a branch in Brussels which, when war broke out, was sequestrated by the Belgian Government and sold to a Ghent company. The Osram Company brought an action with respect to the patents, but lost the day in two lower courts. A final appeal was made to the Court of Cassation which, according to the *Elektrotechnische Zeitschrift*, has given a verdict in its favour, basing its decision upon the fact that patents are intellectual and not material properties, and are consequently not seizable either under the Versailles Treaty or the Belgian law.

Spanish Electrical Extension.—The Compania Sevillana de Electricidad, Seville, which is a large factor in the hydro-electric situation in south-west Andalusia, plans to spend 10,000,000 pesetas for extensions, involving the purchase of a considerable amount of electrical equipment of foreign manufacture.—*Commerce Reports.*

British Trade Mark Applications. — The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 29th :—

Cyldon. No. 458,685. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Sydney Sam Bird, manufacturing electrical engineer, Sarnesfield Road, Enfield Town, Middlesex.

Dubilier (lettering and design). No. 458,873. Class 8. Electrical condensers, resistances, and variometers. No. 458,874. Class 13. Electrical switches (ordinary). No. 458,875. Class 16. Electrical porcelain insulators. No. 458,876. Class 50. Electrical mica insulators.—The Dubilier Condenser Co., Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

Amplion. No. 459,481. Class 8. Telephonic apparatus.—Edward Alfred Graham, trading as Alfred Graham & Co., St. Andrew's Works, Crofton Park Road, London, S.E.4.

Carmalite. No. 459,448. Class 8. Apparatus for use in wireless telephony and telegraphy.—Merchants and Agencies, Ltd., 45, Basinghall Street, London, E.C.2.

Oliverna. No. 459,512. All goods in Class 8.—John Alfred Cockett, 74, Chestnut Avenue, Walthamstow, E.17.

Zigzag. No. 459,639. Class 8. Electric batteries.—W. A. Buckley & Co., Ltd., 137-138, Moorgate Station Chambers, London, E.C.2.

Kallede. No. 459,720. Class 40. Electric wires covered with india-rubber.—Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.

The Brazilian Electrical Market.—A recent *Commerce Reports* note stated that the Brazilian market for electrical goods was dull. Slowness in buying was attributed to anticipated technical improvements. Germany's competition was active on a price basis. The electrification of the Central Railway is in abeyance pending the forthcoming of the necessary funds.

A Brazilian Railway Contract. — It is reported that the Metropolitan-Vickers Electrical Co., Ltd., was the sole tenderer for the electrification of the branch line of the Oeste de Minas Railway, Brazil, from Barra Mansa to Augusto Pestana —a distance of 73 km. A seven-year loan has been granted to the State for this work.

Annual Holidays.—The works of MESSRS. S. H. HEYWOOD AND CO., LTD., will be closed from August 8th to 17th.

New Italian Companies. — A new electrical engineering company has lately been formed at Saronno with a capital of 30 million lire and the title La Societá per Costruzioni Elettromeccaniche "Cemsa." A number of new electrical engineering and electricity supply companies were also formed during last month.

New Belgian Companies.—Among the recently-constituted Belgian companies are the following :—Gaz et Électricité de Herstal (Brussels), capital four million fr., to produce and distribute electricity and gas for all purposes; and l'Electricité de la Lesse (Anseremme), capital 300,000 fr.

Manufacturing in Argentina. — The *Review of the River Plate* says that in embarking upon manufacturing, Argentina has been able to take advantage of the accumulated experience of other countries. The Argentine manufacturing industries are for the greater part working with up-to-date machinery for the simple reason that it is only within the last six years or so that the industries employing this machinery have come into being. There are few manufacturing or power-producing plants built ten years ago which could remain efficient without complete renovation in the light of the progress which has been made since their inauguration. A committee appointed by the Department of Navigation and Ports has reached the conclusion that certain falls in the province of Corrientes could, with an outlay of a little over $100,000,000 on plant and installation, be made to yield electrical energy of which the provinces of Corrientes, Entre Rios, and Santa Fé, as well as the Federal capital, could draw almost unlimited supplies. Our contemporary points out, however, that there are other more easily realised and more urgent schemes to be attended to first.

Threatened Tramway Strike.—The introduction of motor-omnibuses by the Stalybridge Joint Tramways and Electricity Board has caused a disaffection amongst its tramway employés. Their principal grievance is that tramwaymen are being replaced and that the wages paid to omnibus drivers are lower than those paid to tramcar drivers. It was reported that seven days' notice had been given, to expire on Wednesday midnight (August 5th), of the men's intention to cease work unless certain conditions were agreed to by the Board.

Lighting and Power Notes.

Algeria.—HYDRO-ELECTRIC DEVELOPMENT.—A Government inquiry was recently held in connection with a project to utilise the water power of the Upper Cheliff river between Boghari and Lavigerie for electrical purposes. It is proposed to build several dams to form storage reservoirs, the first of which would be near the Gribbs Gorge above Dolfusville (Amoural). The dam would be nearly 200 ft. high and would form a reservoir of a capacity of approximately 50,000,000,000 gal.

Australia.—MELBOURNE.—*Year's Working.*—We have received from Mr. W. H. Alabaster, city electrical engineer, a copy of his report together with the statement of accounts on the working of the electricity undertaking for the year ended December 31st last. The revenue account records a total income of £458,307, as compared with £437,905, and working expenses of £281,626, as against £276,407. The gross profit was thus greater by £15,184 at £176,682. After providing for capital charges, there was a net surplus of £64,656, as compared with £61,997, of which £25,000 was allotted to the city fund. During the year £147,950 was spent on capital account, the chief items being £75,615 for mains, £22,086 for machinery, and £14,603 for sub-stations, transformers, &c. The sales of electrical energy increased by 914,792 kWh to 65,491,808 kWh, and the maximum supply demanded from 25,700 to 28,100 kW. The load factor showed an improvement of 7.03 per cent., at 31.99 per cent. During the year arrangements were completed for the taking over by the Council of the Melbourne Hydraulic Power Co.'s undertaking.

GREATER BRISBANE.—The Town Council has received a report from the Electric Light, Power and Transit Committee with regard to the erection of a super-power station to meet the needs of Greater Brisbane, in which it is recommended that before proceeding with the scheme, preliminary negotiations be entered into with the City Electric Light Co., Ltd., for the acquisition by the Council of the undertaking, the Committee being of opinion that the electricity company's supply in the area should be controlled by the Council. The recommendation has been adopted, and a proposal to borrow £10,000 for the completion of the Ithaca lighting scheme has also been approved.

Bethesda.—PROPOSED SCHEME HELD UP.—Some time ago the Urban Council decided to provide electric light for the district, a scheme being approved which would cost about £8,000. Opposition arose, and an inquiry was proposed. The Gwynedd Trust offered to work on its own account, but owing to considerable delay in the holding of the inquiry the Trust withdrew its offer. As a result the Electricity Commissioners have announced that they will not hold an inquiry, and the project is in abeyance.

Birkenhead.—TEMPORARY SUPPLY.—The Electricity Committee has considered the question of obtaining a temporary supply of current to cope with the load during the forthcoming winter. The electrical engineer has reported that Messrs. Cammell Laird & Co. have agreed to give such a supply by arrangement for an interchange of current, and the Committee has agreed to an interchange of current whereby an additional supply of 1,000 kW will be available to the Corporation for the forthcoming winter at the price charged by the Corporation for any current supplied to the company. The engineer has been authorised to provide the necessary transformer, main connections, and switchgear at an estimated cost of £850.

LOAN.—Sanction has been obtained to a loan of £39,682 for electricity purposes.

ELECTRICITY AGREEMENT.—The Electricity Committee has received from the Town Clerk of Liverpool, an intimation that his Committee is unable to recommend the City Council to accept the amendments of the Birkenhead Council in the terms and conditions of the proposed agreement for the supply to Birkenhead of electricity in bulk.

Brighton.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer, Mr. John Christie) for the year ended March 31st last, show a total income of £201,095, as compared with £185,017 in the preceding year. Working expenses totalled £134,939, as against £130,551, leaving a gross profit of £66,156 (£54,466). After deducting capital charges there was a net surplus of £23,646, to which was added a balance from the previous year of £13,492, making a total of £37,138. Of this amount, the surplus from the preceding year was contributed to the borough fund, and the remainder carried forward. During the year £53,721 was spent on capital account, the chief items being £12,992 for machinery and plant, and £24,633 for mains. The sales of electrical energy increased from 15,666,907 to 18,122,667 kWh, and the average price per kWh obtained fell from 2.57d. to 2.42d. The maximum supply demanded rose from 10,200 to 11,400 kW.

Cambridge.—PURCHASE OF UNDERTAKING.—The Town Council in May last decided to take steps to acquire the local electricity undertaking owned by the Cambridge Electric Supply Company, but the company states that it is advised that the right of purchase given to a local authority cannot be exercised without the consent of the Electricity Commissioners, which the Council has not received. In the circumstances the Electric Supply Committee has recommended that no further steps be taken in the matter at present.

Chile.—Electrical Development.—The Compania Chilena de Electricidad is now operating two hydro-electric and one steam-operated power stations with a total capacity of 60,000 kW. By means of 110,000-, 44,000-, and 12,000-V h.p. lines, and 220-, 380-, and 440-V l.p. mains, the company is supplying electricity to over 30,000 consumers in the Santiago district and in the Aconeagua Valley.

Clitheroe.—Electricity Scheme.—At a recent meeting of the Town Council, Councillor J. Bootham submitted the estimate of Mr. Hawtayne, consulting engineer to the Corporation in connection with the proposed supply of electricity to the borough. This covered three years, the estimated capital expenditure during the first year was £17,880, second year £7,720, and third year £7,000, a total of £32,000. It was decided to apply for sanction to borrow the last amount.

Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation an Order made by them for the supply of electricity by the Town Council within the borough and part of the rural district.

Continental.—Italy.—A 12,000-kVA three-phase alternator built by the Società Ansaldo, of Cornigliano Ligure, has recently been installed at the Rovesca power station of the Società Generale Edison di Elettricita, in Milan.

France.—In order to meet the increasing demand two new boilers and additional 45,000/10,000-V transformers are being installed at the Comines generating station of the Société de l'Energie Electrique du Nord de la France. When the work in hand is completed the plant will have a total capacity of 60,000 kW.

Spain.—La Sociedad Electrica del Viesgo has applied to the Spanish Government for authority to establish a 95,000-V transmission line between its hydro-electric stations at Urdon and Camarmena.

A large hydro-electric plant for the municipality of Murcia is shortly to be erected by the Seville Electric Co., which controls all hydro-electric facilities in South-West Andalusia. The estimated expenditure is 10,000,000 pesetas; a large amount of foreign equipment will be purchased.—*Reuter's Trade Service* (Bilbao).

Germany.—It is reported that the Siemens-Schuckert Co., of Berlin, has contracted to construct and finance a big electricity distribution system extending over the whole of the Gross-Strehlitz district of Upper Silesia.

According to a report recently issued by the Berlin Stadtische Elektrizitatswerke, the cutput of the electricity stations last year amounted to 462 million kWh, an increase of 26 millions over 1923. In order to provide for the rapidly increasing demand, plans have been prepared for the establishment of a large new power station at Rummelsburg, to finance which it is reported, efforts are being made to raise a loan in the United States.

Edinburgh.—Price Reductions.—The Corporation Electricity Committee has recommended the following reductions in the charges for electricity:—Ordinary power rates: For the first 1,000 kWh, from 2d. per kWh to 1.5d., while as against the old charge of 1d. for the next 39,000 kWh, it is proposed to substitute a rate of .85d. for the next 30,000, and the charge of .75d. per kWh under the old scale to consumers of over 40,000 kWh, is to be extended to users of over 31,000 kWh. The Committee has approved of a proposed special power rate for the lighting of shop windows after closing hours.

Erith.—Electricity Supply.—The new agreement with the Woolwich Town Council for a bulk supply of electricity having been finally settled, the Urban District Council has received sanction to a loan of £13,910 for the duplicate main transmission line.

Herne Bay.—Inquiry.—Col. T. C. Ekin held an inquiry on July 28th into the application of Messrs. Hunt & Sons for an Order to supply electricity in the urban district and in the parishes of Herne and Reculver, and into an application by Major B. Prescott-Westcar, of Strode Park, for a Special Order to supply electricity in the parish of Herne south of the Southern Railway. For Messrs. Hunt & Sons, Mr. Jacques Abady said that the area scheduled by Major Prescott-Westcar was subsequent to that of Hunt & Sons. The dispute was therefore as to whether Hunt & Sons' area should be cut short by the railway line or should include Herne and Reculver south of the railway as originally scheduled. It was intended to take a bulk supply of electricity from the Canterbury City Council. After a conference it was announced that the dispute had been settled on terms. The result was that the application of Major Prescott-Westcar was withdrawn, as also was the opposition to the application of Messrs. Hunt and Sons.

Ilkley.—Street Lighting.—The street lighting in the town is being converted from gas to electricity.

India.—Hydro-Electric Development.—On July 21st, according to the *Daily Mail*, Lord Goschen, Governor of Madras, turned the first sod of the great Metur dam and irrigation scheme designed to provide irrigation for 400,000 acres, and costing more than £2,000,000. The project consists of a masonry dam 200 feet high and 6,352 feet long on the Cauvery, and an 80-mile main canal and distributors. Important hydro-electric development proposals in connection with the dam are under consideration.

Jersey.—Power Station Inaugurated.—The first power station to be constructed in Jersey was formally inaugurated at Albert Pier on July 27th by the President of the Piers and Harbour Committee.

Kent.—Electricity Order.—The London Electric Supply Corporation, Ltd., is to apply to the Electricity Commissioners for an Order to supply electricity in bulk to the West Kent Electric Co., Ltd., and the Kent Electric Power Co., Ltd.

Lancaster.—Electricity Schemes.—The Town Council is applying to the Unemployment Grants Committee for assistance in respect of a scheme for the extension of the h.p. feeder cable from Bralk to Bowerham sub-station, and for the purchase of two transformers and the alteration and extension of the switchgear at the sub-stations at a cost of £6,000; also for laying l.p. mains in various parts of the borough at a cost of £4,000. Sanction to borrow £10,000 will be applied for.

Leeds.—Electricity Agreement.—The Electricity Committee has agreed to terms with the Yorkshire Electric Power Co. for an interchange of electricity supply at Farsley.

London.—St. Pancras.—The Electricity Committee is applying for sanction to loans of £21,340 for mains, £3,500 for meters, and £1,500 for domestic apparatus.

Sanction has been received to the borrowing of £11,700 for mains and £17,135 for converters and switchgear.

The report on the working of the electricity undertaking (engineer: Mr. S. W. Baynes) for the year ended March 31st last shows an income of £214,391, against £213,299 for the year 1923-4. The working costs amounted to £120,560, against £111,204, leaving a gross profit of £93,830 (£102,094). The net result of the year's working is a profit of £18,157, against £31,500 for the preceding year. The capital expenditure during the year amounted to £114,959 paid out of loan, plus £658 paid out of revenue, bringing the total capital expenditure up to £1,062,224. The energy sales amounted to 21,047,231 kWh, compared with 19,548,215 for the previous year. The maximum demand was 13,493 kW, an increase of 1,999 kW, and the average price per kWh during the year was 2.35d.

Southwark.—The Committee of Local Authorities Owning Electricity Undertakings has decided that it will be more economical for the Southwark Borough Council to extend its generating station than to take bulk supplies from authorities or companies, and representations are being made to the Electricity Commissioners accordingly.

Hammersmith.—A fire which occurred at the switchboard of the Borough Council's electricity works disorganised the electricity supply of the district for two hours on July 31st, light and power being cut off until the defect was remedied. Four of the works employés were overcome by fumes and were treated at West London Hospital, but soon recovered.—*Times.*

Morecambe.—Electricity Supply.—The borough electrical engineer has reported that generation of electricity at the old Woodhill Lane station of the Corporation has now entirely ceased and all the energy used by the town is supplied under the joint scheme from the Lancaster generating station. A sub-committee has been appointed to offer the Woodhill Lane plant for sale.

Offices and Showroom.—The Electricity Committee has appointed a sub-committee to arrange for the provision of central offices and showroom for the Corporation's electricity distribution undertaking.

Ramsbury.—Electricity Scheme.—The local Council has appointed a committee to consider a scheme for public lighting by electricity submitted by a Mr. Smith, who has stated that he is prepared to put down plant providing for 1,000 lamps.

Seaham Harbour.—Electricity Supply.—The Urban District Council has under consideration a scheme for a supply of electricity to the town.

South-East Lancs. Electricity Board.—Schemes Recommended.—Proposals by the Oldham Corporation for the erection of a new power station at Chadderton were considered at the last meeting of the Engineering, Advisory and Finance Committees of the South-East Lancashire Electricity Board, which decided to recommend the Electricity Commissioners to sanction the erection of the station. The following plant and mains extensions received approval:—Manchester Corporation, six 33,000-V cables (two of them to be laid only if financial assistance is granted by the Government); Stockport Corporation (two 10,000-kW turbo-alternators, to be installed in two sections); and other applications from the Bury and Buxton Corporations, and the Lancashire Electric Power Co. (Radcliffe station).

Willesden.—Loan Sanctioned.—The Urban District Council has obtained sanction to borrow £2,698 for the erection of a transformer station at Churchill Road.

Wimbledon.—Loan Sanctioned.—The Electricity Committee has obtained sanction to borrow £47,000 for mains and services, and £8,500 for transformers and sub-station equipment.

New Plant.—The Committee has recommended the installation of plant of 3,000-kW capacity, and is seeking sanction to a loan of £20,000 for the purpose.

Sub-Stations.—Sites are to be secured on the Merton Park estate for the erection of transformer sub-stations.

York.—Electricity Charges.—The Electricity Committee has recommended to the City Council that the charge for a supply of electricity to an electrically-fitted four bedroomed house be 10d. per week, plus a "unit" charge of ¾d.

Tramway and Railway Notes.

Continental.—SPAIN.—Application has recently been made to the Spanish Government for a concession in respect of a projected electric railway between Renteria, Lezo and Pasages de San Juan. A line is also to be constructed between Lezez and Ferreira, province of Pontevedra.

GERMANY.—A company has recently been formed, and is receiving the support of the provincial authorities concerned, for the purpose of constructing a high-speed electric railway between Cologne and Dortmund. The estimated cost of the line is approximately 15 millions sterling.

Doncaster.—TRANSPORT CONFERENCE.—A private conference was held at the Doncaster Mansion House, last week, as to whether the tramway track to Bentley should be relaid or the system replaced by a railless-car service or motor 'buses. The conference was attended by a representative of the Ministry of Transport, members of the West Riding County Council, the Doncaster Corporation, and the Bentley Urban District Council.

Dover.—RAILLESS CARS.—The Tramways Committee has recommended to the Town Council that application be made for powers to run railless cars in the borough.

Dudley.—TRAMWAY ROUTE TO CLOSE.—It is reported that the tramway between Dudley and Wordsley is to be abandoned and a motor-omnibus service substituted.

London.—ACCIDENT.—A number of passengers were injured in a tramcar smash which occurred on July 31st at Dog Kennel Hill, East Dulwich. One of the tramcars had nearly reached the top of the hill, when it started to run backwards. The brakes were applied, but failed to act, and the car ran into a stationary car at the bottom of the hill. Of the injured, only the driver of the stationary car was detained at King's College Hospital.

LONDON ELECTRIC RAILWAY ORDER, 1925.—The Minister of Transport has approved and proposes to issue an Order authorising the London Electric Railway Co. to acquire land at King's Cross for the construction of railways and works described in the Order.

Leeds.—FARES.—The tramway manager (Mr. W. Chamberlin) has recommended to the Committee that the tramway fares be reduced as follows:—Maximum fare to 3d.; 3d. fares to 2½d.; 2½d. to 2d.; the penny fares to remain as at present.

Salford.—THROUGH RUNNING.—The Tramways Committee has recommended the Town Council to support a proposal for the through-running of tramcars from the borough to Middleton *via* Rhodes. Negotiations are proceeding with Manchester Corporation in this connection.

Telegraph and Telephone Notes.

"Beam" Radio Station.—PROGRESS.—The Marconi Co. expects to complete the Post Office "beam" wireless station at Borth Petherton, near Bridgwater, on a site of about 300 acres, by the end of September, says *The Times*. It will consist of two sections, one of which will be used for receiving communications from Canada and the other from South Africa. Each aerial system will be supported by five steel lattice masts, 400 ft. high, 12 ft. square at the base, and 139 ft. apart. Fifteen feet from the top of each will be a cross-arm support, from which will hang the aerial and reflector wires. The transmitting station for the system is in course of erection at Rhondda.

Brazil.—NEW RADIO STATION.—The American, English, French, and German Consortium has obtained the approval of Brazilian authorities to construct a large radio-telegraph station at Pernambuco, says *T. & T. Age*. The Minister of Marine has approved the project, and construction will commence as soon as arrangements can be made with contractors. The station is to have seven towers, each 150 metres high, and will be used primarily as a receiving relay station between the United States and Europe, on the one hand, and Rio de Janeiro and Buenos Aires, on the other, and is regarded as necessary to maintain uninterrupted service, because of poor receiving conditions at Rio. The station will be equipped to communicate directly with both the United States and Europe, and it will take from 18 months to two years to finish.

Czecho-Slovakia.—RAILWAY TELEPHONY.—From Prague it is reported that negotiations are in hand for the installation of the Huth telephone system on one of the express trains of the Czecho-Slovakian State railways in order to enable passengers to make telephone calls while travelling.

France.—TELEGRAPH CONGRESS.—An International Telegraph Congress is to be opened in Paris on September 1st; among the matters to be dealt with is the revision of the international telegraph agreement.

Germany.—LONG-DISTANCE TELEPHONY.—A direct long-distance telephone line has been established between Posen and Berlin, *via* Frankfurt on Oder, and an effort is also being made to establish direct communication with Breslau.

Italy.—RADIO-TELEGRAPHY.—The Compania Italo Radio, which is now exploiting the Italian radio-telegraph system, has recently established regular communication between Italy and the United States.

Pacific Cable.—DUPLICATION SURVEY.—It is reported that the cable steamer *Isis* was to leave New Zealand early this month on a surveying expedition in connection with the duplication of the Pacific telegraph cable from Fiji to Vancouver.

The Telephone Service.—KIOSK EAVESDROPPERS.—A device to prevent eavesdropping outside telephone call-boxes is being tried at Fleetwood Post Office. Fleetwood uses the trunk lines more than any other Lancashire town, as most of the business of its fishing industry is transacted over the telephone, and complaints have been received that people outside the telephone call-boxes overheard conversations, thereby obtaining important business information. The Post Office, therefore, has installed a "buzzer," which comes into operation as soon as the caller closes the door. It cannot be heard inside the box, but prevents those outside from overhearing the conversation.

PHONOGRAMS.—The postal authorities in Leeds have inaugurated the acceptance of telegrams through ordinary slot-meter telephone call boxes, the user paying the telephone call and telegram fees into the box in pennies. Liverpool followed suit on August 1st, and the scheme, which is being tried in Manchester, will be extended if successful.

Radio Notes.

Czecho-Slovakia.—NEW STATIONS.—An American firm has obtained a contract from the Ministry of Posts and Telegraphs, says *Commerce Reports*, for constructing a broadcasting station in Prague, to be completed within six months at a cost of 3,000,000 Czech crowns. The new station will be used for broadcasting over the entire Republic; its power will be five kW and the wave-length 500 metres, which it will be possible to increase to 2,000 metres. It is also planned to erect stations, each of 1 kW, in Brno, Bratislava, and Kosice; they will broadcast on a 500-metre wave-length.

Germany.—NEW STATION.—The new Elberfeld broadcasting station has been completed, and tests on a wavelength of 207 metres have been very successful. The station will begin regular programmes probably this week, says *The Times*.

Japan.—NEW STATIONS.—Mr. Y. Niwa, chief engineer of the Nippon Electric Co., which is affiliated with the International Western Electric Co., is in New York studying radio matters, and announces that early next autumn Tokio and Osaka will each have a broadcasting station; the former city has hitherto been served by a temporary station.

Radio Leagues.—RIVAL BODIES.—The "Wireless League," which was formed last March by the efforts of the *Daily Express* and claims to have 81,000 members, but has apparently not yet been legally registered, now has a rival. It is reported that certain "founder" members, claiming that the committee was not appointed in accordance with the proposed constitution of the League, have expressed their dissatisfaction by incorporating the "New Wireless League."

Shanghai.—RADIO EXHIBITION.—What was said to be the first radio exhibition held in China, took place on May 9th and 10th. It was promoted by the International Amateur Radio Association of China and was well attended, says *Commerce Reports*, and the exhibits included all types of receiving sets from crystal to superheterodyne; transmitting sets were also shown, as well as some short-wave receiving equipment. Although the importation of radio sets into China has been officially reported as falling within the arms embargo, radio sets have filtered into the market from various unknown sources. One station in Shanghai broadcasts daily on a wavelength of 356 metres.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—State Electricity Commission. September 21st. 250-kVA, 22,000-V transformers and spares.

September 15th. Postmaster-General's Department. (Sched. C.36). Telegraph equipment. Tender forms from High Commissioner, London.

NEW SOUTH WALES.—New South Wales Railways. October 7th. One 20,000-kW turbo-alternator for White Bay power house.

NEWCASTLE.—September 22nd. Caledonian Collieries, Ltd. Ward-Leonard electric winding engine for Aberdare central colliery, complete with balancer, exciter, and the necessary switchgear.

Dundee.—August 19th. Town Council. Electric lighting for Lawton housing scheme (200 houses) and Stirling Park scheme (20 houses).

Egypt.—CAIRO.—September 9th. Ministry of Education. One 50-h.p. Diesel engine, generator, electric motors and machine tools for the Mansurah Trades School.*

Fleetwood.—August 24th. Urban District Council. Feeder cable and pillar. (See this issue.)

Glasgow.—August 11th. Corporation. Electric light installation for Elder Park Child Welfare Clinic, Govan.

Ilford.—August 18th. Urban District Council. 660-V paper-insulated cable.

India.—India Store Department.—August 11th. 313-kVA, 3-phase alternators and exciters and accumulator cells. (July 24th.)

Kettering.—August 28th. Electricity Works. One cooling tower and tank circulating water pipe. (July 31st.)

London.—August 26th. Metropolitan Asylums Board.—Installation of additional electric lighting at North-Eastern Fever Hospital, Tottenham. (July 31st.)

Acton.—August 28th. Borough Council. Overhead wiring at the Council's Isolation Hospital, Wales Farm Road, Acton. (See this issue.)

Lowestoft.—August 14th. Metropolitan Asylums Board. Overhauling and refitting two electric generating sets (Willans and Robinson) at St. Luke's Hospital, Lowestoft. (See this issue.)

Manchester.—August 12th. Education Committee. Electric lighting installation at Harpurhey High School.

August 18th. Electricity Department. One water-tube boiler, &c. (July 24th.)

August 20th. Electricity Department. Supply and erection of constructional steelwork at Burnage sub-station.

August 11th. Tramways Committee. Supply and delivery of steel girder tramway rails, steel fishplates, steel clip plates, and coach screws. Specifications and forms of tender from Mr. H. Mattinson, general manager, 55, Piccadilly, Manchester.

Newbury.—August 10th. Board of Guardians. Electrical generating plant at the Poor Law Institution. (July 31st.)

Newport (Mon.).—August 15th. Electricity Department. Ferro-concrete foundations for a 10,000-kW turbo-alternator and condensing plant, and one 49/50-ton engine-room crane, &c. (July 24th.)

New Zealand.—Wellington.—September 22nd. Post and Telegraph Department. Bituminous tape.*

September 29th. Public Works Department. 560 galvanised steel transmission line towers, complete with cross-arms, ground stubs, and accessories. (A.X. 2.250.)*

Preesal.—August 17th. Urban District Council. 6,600-V cables, l.p. distribution and service cables, including excavation and reinstatement. (July 24th.)

Salford.—August 12th. Board of Guardians. Electric lighting installation at Old People's Homes, Pendleton. (See this issue.)

South Africa. — Johannesburg.—September 3rd. South African Railways and Harbours. Five 4-wheeled traversers and two tractors.*

October 13th. Electricity Supply Commission of South Africa. Equipment and buildings for an electric power station at Durban:—Complete boiler-house equipment, also other plant and piping; boiler-house installation, including pulverised fuel equipment, with buildings, piping and other plant; steel-frame buildings; overhead electric travelling crane; coal- and ash-handling plant; two 12,000-kW turbo-alternators; condensing plant and auxiliary apparatus; transformers for power station; and switchgear and auxiliary plant. (July 31st.)

Bulawayo.—September 29th. Municipal Council. Plant for the extension of the electricity works.*

Stockport.—September 5th. Board of Guardians. Conversion of lift at Stepping Hill Hospital from hydraulic to electric power. Particulars from the Steward at the hospital.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—Victorian Railways. Accepted:—
15-ton electric travelling Goliath crane (£2,005).—Babcock & Wilcox, Ltd.—*Tenders.*

Brighton.—Lighting Committee. Accepted:—
Coal-handling plant at Southwick (£10,530).—Strachan & Henshaw, Ltd.
E.h.p. switchgear and panel (£1,346).—A. Reyrolle & Co., Ltd.
75-h.p., 3-phase motor (£150).—Fuller Electrical & Manufacturing Co.
Two 1,000-kW La Cour converters (£4,114 each).—Bruce Peebles & Co., Ltd.
9-way neutral feeder panel (£226).—Metropolitan-Vickers Electrical Co., Ltd.

Tramways Committee. Accepted:—
100 tons steel-girder track rails (£9 per ton).—Anglo-Belgian Improvements Corporation, Brussels.

Carlisle.—Electricity Committee. Accepted:—
Erection of new electricity works, Willow Holme (£18,238).—Messrs. Durham & Veevers.

Erith.—Urban District Council. Accepted:—
Wiring 14 bungalows at Bedonwell (£63).—Erith Electrical Co., Ltd.

Glasgow.—Electricity Committee. Accepted:—
Erection of sub-station at Bishop's Road (£879).—James Crawford.
Erection of sub-station at Fleurs Avenue (£848).—R. Murdock & Son.

Housing Committee. Accepted:—
Electric lighting installation at Langlands housing scheme (£795).—Robert Mickel.

Halifax.—Tramways and Electricity Committee. Recommended:—
Supply and erection of e.h.p. switchgear at Highroad Well depôt (£8,447 8s.).—British Thomson-Houston Co., Ltd.

Accepted:—
Foundations for four additional cooling towers.—P. Fulcher, New Road (£5,760); J. Berry, New Bank (steelwork).

Hastings.—Electricity Committee. Recommended:—
Selective panel to switchboard (£99).—Messrs. W. T. Glover & Co., Ltd.

Hebden Bridge.—U.D.C. Accepted:—
Installation of electric lighting in houses at Eaves Bottom.—Bell Electrical Co. (Northern), Ltd.

London.—Stepney.—Electricity Supply Committee. Recommended:—
Feeder and sub-feeder boxes (£424).—British Insulated & Helsby Cables, Ltd.

Fulham.—Board of Guardians. Accepted:—
Renewal of 100 cells in the storage battery at the Union.—Hart Accumulator Co., Ltd.

Westminster. — General Purposes Committee. Recommended:—
Modernising electricity installation at Caxton Hall (£205 10s.).—Belshaw and Co., Ltd.

Sowerby Bridge.—West Riding County Council. Accepted:—
Installation of electric light at police station.—Mr. J. Quain.

York.—Education Committee. Accepted:—
Installation of electric lighting at Castlegate School (£276).—H. Mandefield

Electricity Committee. Recommended:—
Erection of sub-station at Wringhouses (£144).—R. Turner & Son.
Boiler foundations at Foss Islands station (£222).—W. Birch & Sons, Ltd.

Notes.

A New Electrically-equipped Dock. — A new dry dock 515 ft. long, has been built at Sunderland for Messrs. T. W Greenwell & Co., Ltd. The machinery throughout is elec trically driven from the Sunderland Corporation supply. Th bulk of the installation has been provided by the Sunderlan Forge & Engineering Co., Ltd. The sub-station containing th high-pressure switchgear, &c., also accommodates an air-com pressing plant, with a maximum capacity of 1,650 cu. ft. pe min. at 100 lb. pressure. A d.c. 100-V motor-generator set i installed in the pump-house supplying lighting for the doc and ships in dock, and also a portable electric-welding plant A new electric travelling crane, built by Messrs. Samuel Butle and Co., Ltd., has been installed on the north-west side of th dock, and embodies the most modern ideas; it is capable o lifting a load of 50 tons at a 40-ft. radius, or 25 tons at th centre of the dock, the maximum radius being 120 ft.

N.A.S.E. Scholarship Scheme. — The third annual com petition in connection with the W. E. Highfield scholarshi closes on Monday next, August 10th, at 12 noon, by whic time all papers submitted by candidates must be in the hand of the secretary at 43, Russell Square, London, W.C.1.

London Electrical Engineers.—27th A.A. Battalion R.E (T.A.). Honorary Colonel, Colonel R. E. B. Crompton, C.B Officer Commanding, Lieut.-Col. C. H. S. Evans, O.B.E A.M.I.E.E. The following orders have been issued fo August:—

304th Company (Major W. H. Merrett, T.D., A.M.I.E.E.).—Mondays, 7 p.m. to 9.30 p.m. Overhaul and packing of plan for annual camp. The Company proceeds to annual camp o Sunday, August 16th, and will man five detached lights.

305th Company (Major A. W. M. Mawby, O.B.E A.M.I.E.E.).—Tuesdays, 7 p.m. till 9.30 p.m. The Compan proceeds to annual camp on Sunday, August 30th, and will ma five detached lights.

306th Company (Major F. C. Clarke, A.M.I.E.E.).—Friday 7 p.m. to 9.30 p.m. The Company proceeds to annual cam on Sunday, August 30th, and will man five detached lights.

Final musketry practice at Rainham Ranges at 12.30 p.m August 9th. All vehicles and plant will be entrained on Augu 13th. Twelve searchlights at the British Empire Exhibitio will be manned by 305th Company and 306th Company fro August 16th to August 30th, and by 304th Company fro August 30th to September 13th.

The annual camp will be held from August 16th to Septem ber 13th at Watchet (near Minehead, Somerset). Headqua ters at 46, Regency Street, S.W.1, will continue to be open t 8 p.m. on weekdays, and 1 p.m. on Saturdays.

The Officers' Mess during camp will be at A.A. Camp, Dor ford, Watchet, Somerset.

Belt and Rope Driving.—Errata to article, p. 169, Ju 31st, 1925:—

In (2) $T/t = e^{\mu\phi}$ should be $T/t = e^{\mu\phi}$; 2nd column, 3 line below illustration, $2R = 2.926\ (2 - \phi)$ should be $2R = 2.9$ $(T - t)$.

In (14) P = total 42,700 n × horse power/v should be P = 42,700 n × horse power/v.

In (18) the denominator $R \times n$ should be $R \times N$.

Electricity Commissioners' Advisory Committee on Domestic Supplies.—We have been informed that the constitution of the Advisory Committee on Domestic Supplies and Methods of Charging appointed by the Electricity Commissioners, which we announced in our issue of April 17th last, includes two representatives of the Conference of Officials of the London Electric Supply Companies. The names of these gentlemen, Mr. W. A. Pearman and Major H. Richardson, should have appeared in the announcement as representing their organisation on the committee.

Fatality.—An explosion resulting in the death of one electrician and serious injuries to another, occurred on July 8th at the Clyde Navigation Trust electric power station, Govan Graving Dock, Glasgow. Deceased, Alex. Marshall (22), Shettleston, was ascertaining the pressure generated by the main air compressor motor. There was an explosion and the cover of the air compressor motor was blown through the glass roof of the building and struck a man working in another part of the pressure house. Considerable damage was done to the building.

Educational.—West Ham Municipal College.—Day and evening courses in civil, mechanical, and electrical engineering have been arranged at the College. Particulars from the Principal of the College. (See our advertisement pages to-day.)

Ship-Shore Telephone Communication. — The cable ship *Faraday*, owned by Messrs. Siemens Brothers & Co., Ltd., of Woolwich, recently returned after a voyage to South America during which she carried out the laying of a submarine telegraph cable for an Italian cable company between the island



Siemens Portable Receiver in Brazil.

Fernando Noronha (off Brazil) and Rio de Janeiro. It is of interest to note that during the operation communication between the vessel and the island was maintained both ways by means of radio telephony with the aid of the receiving apparatus shown in the accompanying illustration. The set is the standard Siemens portable type-M.I.P. receiver.

Irish Free State Electricity Bill.—The Electricity Supply (Special Powers) Bill, 1925, which has been read a second time in the Saorstat Eireann appears to be of a sweeping character, and it seems to place the whole of the electricity supply industry at the disposal of the Minister of Industry and Commerce. The Bill has been drawn up to allow all electricity generating undertakings to render mutual assistance and enable them to meet the normal demand until power becomes available from the State River Shannon hydro-electric scheme. Its object is to save the expenditure of money on new plant, which might be rendered useless four or five years hence by the State scheme referred to. Such additional plant might in Dublin alone involve an expenditure of £40,000 or £50,000. When an agreement is entered into in pursuance of a requirement of the Minister he is to settle its terms, and voluntary agreements are to be subject to his approval. Local authorities may borrow money under the Electricity (Supply) Acts, 1882 to 1919. for the purpose of carrying out such agreements, and the Bill is to supersede all existing provisional orders and Acts of Parliament. The Committee stage of the Bill has been fixed for November 3rd, 1925.

Aluminium Alloys.—From a paper read recently before the American Society of Mechanical Engineers by Messrs. R. Greeter and P. Faragher, dealing with the properties of alloys of aluminium, *Machinery* give some interesting notes. It is pointed out that by the addition of relatively small amounts of other elements to commercially pure aluminium, it is possible to produce alloys which possess very satisfactory mechanical properties and good foundry characteristics, and at the same time retain in a large measure the desirable properties of the commercially pure metal. The most commonly-used alloying elements or "hardeners" are copper, silicon, zinc and manganese, and to a lesser degree nickel and magnesium.

In comparing the accuracy with which aluminium alloy products can be produced, the following comparison is of interest. For die castings tolerances are discussed in thousandths of an inch, for permanent-mould castings in thirty-seconds and sixty-fourths, while for sand castings tolerances are considered in eighths and sixteenths. In a table showing the mechanical properties of some of the more commonly used alloys the following figures are of interest. With a composition consisting of 10 per cent. copper, 1.2 per cent. iron and 0.25 per cent. magnesium, the maximum tensile strength in lb. per sq. in. is given as 30,000; the maximum elongation per cent. in 2 in. as 1.5; and the Brinell hardness number as 85-105. With 10 per cent. silicon the maximum tensile strength is 29,500; 5.5 silicon and 4.5 copper, 29,500; 10 copper, 29,000; 5.5 copper, 1.0 iron and 1.0 tin, 26,500.

Russian Railway Electrification.—According to the *Railway Gazette* it was decided at a recent meeting of the Gosplan (State Planning Commission) to begin work on the electrification of the Moscow suburban railways, and the Commissariat of Ways and Communications was requested to proceed at once with the preparation of a plan so that the work could be started in October. An expert is to be sent abroad to study questions connected with the electrification of railways.

Radio Engineers and the I.E.E.—Qualifications for Membership.—The Institution of Electrical Engineers has issued the following statement:—Recent correspondence in the Press indicates that there is some misconception as to the eligibility of wireless engineers for membership of the Institution, and it is therefore necessary to state that it is possible for an engineer to become a member with qualifications of a purely wireless nature. For the admission of wireless engineers to the class of associate member (A.M.I.E.E.) it is necessary, in addition to the possession of adequate professional experience for a period of at least two years, in the case of those who do not possess an exempting examination qualification, or do not submit a satisfactory thesis, to pass the A.M.I.E.E. examination in the following subjects:—(1) English essay, or translation from a foreign language; (2) applied mechanics; (3) heat, light, and sound, or inorganic chemistry; (4) electricity and magnetism; and (5) wireless and high-frequency engineering.

The Committee of the Wireless Section of the Institution has recently considered the above syllabus, and is of opinion that it represents the minimum amount of professional knowledge which a qualified wireless engineer should possess. No conditions are laid down by the Institution as to how or where an applicant may have obtained his training. For others who are unable to pass the examination, there is provided the class of Graduates, but it must be pointed out that admission to this class does not confer any professional standing, the requirements being a good education and employment in an engineering or scientific capacity in the applications of electricity. In order to become a member of the Wireless Section it is necessary that the member of the Institution shall be actively engaged in the study, design, manufacture, or operation of wireless or high-frequency engineering apparatus. The meetings of the Wireless Section are not, however, confined to members of the Section, but are open to all members of the Institution.

It has also been stated that the Committee of the Wireless Section consists nearly always of the same body of men. This is not the case, as the rules of the Section provide for the retirement of one-third of the ordinary members of the committee each year. Some valuable suggestions have emerged from the recent correspondence, and will receive the careful consideration of the Wireless Section Committee, more particularly as regards the type and number of papers read and as to increasing the activities of the Section outside London. As regards the suggested formation of a new society, the Wireless Section Committee considers there is no need for it, because, as indicated above, wireless engineers can obtain membership of the I.E.E., and amateurs are already catered for by the Radio Society of Great Britain.

New Leeds Generating Station. — The Electricity Committee brought before the City Council, on July 29th, a proposal that application be made to the Electricity Commissioners for power to borrow £865,000 for the first portion of a proposed new generating station for the city. The City Council approved of the recommendation without discussion and Mr. N. Hefford, city electrical engineer, and representatives of the Committee will interview the Commissioners. Mr. Hugh Lupton, chairman of the Electricity Committee, has stated that the demand in Leeds is growing so quickly that it is obvious that in a few years the big station at Whitehall Road will be inadequate, and therefore steps must be taken to secure additional supply. He did not state where the proposed new station might be, but said it would not be at Whitehall Road. In 1912 there was a proposal in Leeds to establish a very large station on a special site and expert advice was taken. It was decided, however, that for the time being and for a number of years the need could be met by extensions and alterations at the Whitehall Road works which have enabled that works to carry on up to the present time, when the output is about five times as much as in 1912. Possibilities of further extensions at Whitehall Road are now exhausted. Asked for further details, Mr. Lupton said: "Until the project has been discussed and decided by the Commissioners, there is nothing more to be said about the scheme."

Long-Burning Flame Arc. — Some particulars are given in the *Illuminating Engineer* of a new German enclosed flame arc lamp which is claimed to work for 125 hours without recarboning, and even 140 hours' burning has been obtained in some recent tests. The consumption of the lamp is approximately 0.25 W per c.p. (mean spherical), and it operates at from 7.5 to 10 A. Carbons can be furnished to give white, yellow or red-orange light, the last being preferred in cities where fogs are frequent. Exhaustive tests of these lamps have recently been carried out, and several have been erected for comparative tests with 1,000-W gas-filled incandescent lamps.

Accident.—By accidentally touching a cable, an electrician is reported to have been seriously burned in a street manhole in Glasgow on August 3rd.

A H.p. Phase Testing Device.—The accompanying illustration, fig. 1, is of a device, described in *Power*, designed for phasing out feeders, transformers, &c., on a 6,600-V system. The apparatus consists of two metal points, each connected to one of the inner coatings of two Leyden jars. The outer coatings of the jars are connected by means of flexible leads to the terminals of a neon lamp. The Leyden jars are mounted

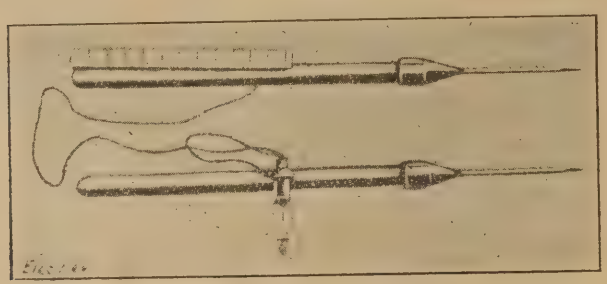


Fig. 1.

in handles of dry, well-seasoned and varnished beechwood. The top parts, which carry the metal points, are made of bakelite. The jars are made of glass tube, ⅝-in. in diameter and 5½ in. long, with a 1/16-in. wall closed at one end. The outer coatings are of brass tubing and the inner of tinfoil. The

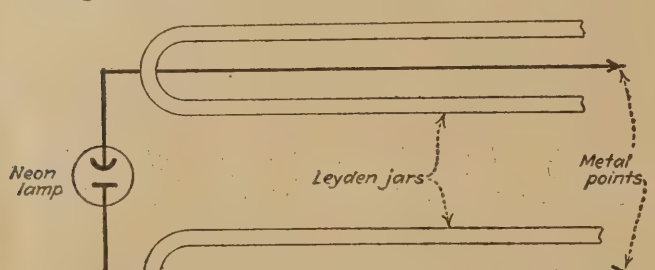


Fig. 2.

lamp is mounted on one of the handles. In operation the metal points are brought into contact with the conductors under test, and if a pressure difference exists between them, the lamp glows, and the operator is subjected to a minimum of risk. The device gave indications up to 20,000 V on test. A sketch diagram of the connections is shown in fig. 2.

Appointments Vacant.—Instructor in electrical engineering (two evenings per week), for Technical Institute, Kingston-on-Thames; two charge engineers, chief draughtsman, and switch control room attendant, for Wolverhampton Corporation. (See our advertisement pages to-day.)

Women Want Electricity.—The Plymouth Corporation has received a request from the local Co-operative Women's Guild that it shall insist upon all new houses being electrically wired for both cooking and lighting purposes.

Institution Notes.

Institution of Electrical Engineers.—Chartered Electrical Engineers in the Irish Free State.—Under the by-laws of the Institution of Electrical Engineers, its corporate members are designated "Chartered Electrical Engineers," and the care exercised by the Institution in admitting to corporate membership has conferred a definite professional status of a high order upon such members. It is satisfactory to know that the Irish Free State Government recognises this, and that the corporate members of the Institution practising in the Free State are regarded by it as possessing full professional qualifications.

In view of the altered conditions in 1925, the Council of the Institution specially authorised the Committee of the Irish Centre, which meets in Dublin, to advise the Irish Free State Government on matters concerning electrical engineering, if such advice is desired, and although no official steps have as yet been taken, the relations between the Free State Ministry of Industry and Commerce and the Irish Centre have been entirely satisfactory. Informal assistance has been given whenever asked for, and there is little doubt that in any legislation which may be effected in the future the position of chartered electrical engineers in the Irish Free State will be fully safeguarded.

Iron and Steel Institute.—Among the 18 papers to be read at the Autumn Meeting of the Iron and Steel Institute, which will be held at the University, Edmund Street, Birmingham, from September 9th to 11th, are "High-Frequency Induction Furnaces," by Mr. D. F. Campbell, and "The Magnetic and Electrical Properties of Cast Iron," by Mr. J. H. Partridge.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

Luton Corporation has increased the salary of its electrical engineer from £1,000 to £1,200 per annum.

The Brighton Corporation Lighting Committee recommends the following increases of salary:—Mr. Christie, chief electrical engineer, from £1,450 to £1,650 per annum; Mr. G. Claughton, assistant engineer, from £750 to £850; and Mr. G. T. Joyce, assistant manager, from £600 to £700 per annum.

At a meeting of the Engineering Advisory Committee of the South-East Lancashire Electricity Advisory Board on July 28th, Mr. W. J. H. Wood, the borough electrical engineer of Bolton, was appointed chairman in succession to Mr. S. L. Pearce, and Mr. S. J. Watson, of Salford, was appointed vice-chairman. Mr. Pearce's successor at Manchester, Mr. H. C. Lamb, was welcomed by Mr. Wood upon joining the Committee.

The Lancaster Town Council has decided to increase the salary of Major G. C. Milnes, borough electrical engineer, from £600 to £680 per annum.

The impending departure of the manager of the Walsall Corporation tramways (Mr. C. Burgess) to take up an important post in the East was the subject of a special reference at a meeting of the Town Council recently, when a resolution was unanimously adopted expressing regret at his resignation and high appreciation of his services. The Midland Association of Municipal Tramways has presented to Mr. Burgess a gold watch and to Mrs. Burgess a silver tray.

The Preston Town Council has appointed Mr. J. A. Robertson, consulting engineer for four years from January 1st, 1925, at a salary of £400 per annum, in connection with the new electricity undertaking. His services are to be retained in connection with the installation of the third turbo-generator at Ribble power station and of the Blackburn and Preston joint cable.

The Ilford Urban Council has decided to consolidate salaries of officials as under as from April 1st last:—Mr. A. H. Shaw electrical engineer, £997 10s., based upon the scale fixed by the I.M.E.A., but supply to the tramway undertaking to be calculated upon basis of 50 per cent.; Mr. L. E. Harvey, tramway manager, £835; Mr. H. H. Simpson, works superintendent, £330, rising by £10 a year to a maximum of £350; Mr J. C. Richards, traffic superintendent, £310, rising by £10 a year to maximum of £350.

Mr. Fredk. J. Collis has been appointed secretary to the Electrical Accessories Manufacturers' Association, and communications may be addressed to him on behalf of the Association at the offices, 39, St. James's Street, London, S.W.1.

The English Electric Co., Ltd., announces that, during the absence on leave of Mr. P. J. Pybus, Mr. Victor Watlington will act as managing director of the company.

Mr. C. H. Goodwin has been appointed assistant electrical engineer to the Bangor Corporation. He was formerly works superintendent.

The International General Electric Company announces that Mr. Clark H. Minor, former vice-president of the company has been elected president to succeed Mr. Anson W. Burchard who has been both president and chairman of the board. Mr Burchard will continue as chairman. Mr. Minor recently returned from Europe, and Mr. Burchard left to proceed there. Mr. Loren Emery, former assistant merchandising manager of the company, has been made general merchandising manager. Mr. R. G. Henderson, who has been in Europe for the past year and a half conducting important negotiations for the company with particular reference to merchandising lines, has been relieved of the duties of general merchandising manager, and has been assigned to special work in connection with problems of sales promotion.

The Keighley Corporation has fixed the salary of the borough electrical engineer (Mr. H. Webber) as from April last at a minimum of £800 per annum, with an allowance of £20 for every complete 1,000,000 kWh sold above 10,000,000 kWh in each financial year, and as from April 1st, 1926, £30 for every reduction of .03d. in the works cost in each financial year below the figure for the year ending March 31st, 1926.

Mr. John H. Parker, deputy electrical engineer to the Croydon Council, has been appointed borough electrical engineer at West Hartlepool, at a salary of £1,015 per annum. There were 88 applicants for the position. Mr. Parker was educated at Bath and Weston-super-Mare, and served his apprenticeship with Messrs. Alley & McLellan, of Glasgow. While an evening student at Glasgow Technical College he won the Malcolm Ker bursary for Natural Philosophy tenable for three years

at the day classes, and took the electrical engineering course. On the recommendation of Dr. Magnus Maclean, Professor of Electrical Engineering, he was given a junior position on the staff of the Greenock electricity department, and in four years rose to be works superintendent of the new power station, which had a refuse destructor attached as an adjunct to the main boiler house. Three years later he was given the position of staff engineer and was later appointed chief assistant engineer. In 1915 he went to Croydon as deputy electrical engineer, and during the last five years has been engaged principally on the complete reconstruction and extension of the power station of that undertaking, involving a change of periodicity and the application of 3-phase generation to an existing single-phase network. Mr. Parker has been closely identified with the recent movement for improving the qualifications, status and conditions of employment of supply engineers. He was one of the original members of the Chief Technical Assistants' Association of London, which was formed in 1915, and was one of the two delegates sent by that body to negotiate an amalgamation with the newly-formed E.P.E.A. At the first National Executive Council of the E.P.E.A. Mr. Parker was elected a vice-president, and he was closely identified with all the negotiations in 1919, resulting in the Stoker award of 20 per cent. plus £90 and the formation of the National Joint Board. In 1920 he succeeded Mr. Lunn and became the second president of the E.P.E.A. During his year of office the Stoker award was increased from 20 per cent. and



Mr. John H. Parker,
who has been appointed Borough Electrical Engineer at West Hartlepool.

£90 to 20 per cent. and £120, and he captained the group of four which negotiated the salary schedule and conditions of employment and was largely responsible for the tactics which led to that award being adopted by the large majority of undertakings throughout the country. When the salary schedule was revised in 1922, he was again a member of the negotiating committee.

Obituary.—Many of our readers will desire to join with us in expressing deep sympathy with Sir Charles and Lady Bright on the death of their only son, Mr. Geoffrey C. C. Bright, who passed away on July 30th, aged 23, at a nursing home, after a long illness.

Sr. A. Pereira.—The death recently occurred in Lisbon, at the age of 72 years, of Sr. Alfred Pereira, a former Director-General of the Portuguese Post and Telegraphs. The deceased, who started life as a postman, presided over the International Telegraph Conference in Lisbon in 1915.

Prof. Otto Lummer.—The death recently occurred of Prof. Dr. Ing. Otto Lummer, for many years director of the Physical Institute of the University of Breslau.

Mr. H. L. Williams.—We regret to record the death which occurred on July 25th, at the age of 52 years, of Mr. Hugh Lawrence Williams. A correspondent of *The Times* states that after Mr. Williams left Charterhouse and Trinity College, Cambridge, he qualified as an electrical engineer. "He was one of the principals in the firm of Balfour, Beatty and Co., Ltd., since its inception in 1909, and, indeed, had been associated with Mr. George Balfour, M.P., the head of that firm, for some ten years before. He was thus closely concerned in the electric supply and other public utility enterprises with which his firm was identified, and, particularly on the technical side, did much to assist in their successful development."

New Companies Registered.

Cleartron Radio, Ltd. (207,568).—Registered as a public company on July 29th, with a nominal capital of £55,000 in 50,000 8 per cent. cumulative preference shares of £1 and 100,000 deferred shares of 1s. The residue of the distributed profits remaining after paying the dividend on the preference shares is to be divided amongst the deferred shareholders. In a winding up the assets available for distribution are to be applied in repaying capital on the preference shares, and any residue remaining divided amongst the deferred shareholders. Objects: To acquire the registered trade marks "Cleartron" and "C.T.," and to adopt an agreement with A. H. Carlisle and to carry on the business of manufacturers of wireless instruments and parts, electrical fittings, loud speakers, valves, telephones, accumulators, batteries, glassware and kindred articles, &c. Minimum cash subscription, £7. The directors are:—A. H. Carlisle, Trafalgar Buildings, 1, Charing Cross, S.W., merchant banker (managing director); T. F. Grundy, Copthall House, Copthall Avenue, E.C., incorporated accountant. Qualification (other than first directors appointed by the subscribers), 500 shares. Remuneration, £150 each per annum (chairman, £250), free of income tax. Solicitors: De la Chapelle and Co., 34/6, Gresham Street, E.C.2. Registered office: Trafalgar Buildings, 1, Charing Cross, S.W.1.

Kathoxyd, Ltd. (207,560).—Private company. Registered July 28th. Capital, £1,000 in £1 shares. Objects: To acquire the business carried on at 41, High Holborn, W.C.1, by W. Wolsey, as Kathoxyd, together with the exclusive rights to use the name "Kathoxyd," and to carry on the business of manufacturers of and dealers in chemical compounds, metals and mineral ores, and other substances used as crystal detectors for wireless receiving sets, in particular the crystal known by the above name, manufacturers of and dealers in wireless sets and accessories, &c. The permanent directors are:—W. Wolsey, 29, Gloucester Road, Finsbury Park, N.4 (director, Sylvex, Ltd.); A. Zeitlin, B.Sc., A.S.C., 144, Theobalds Road, W.C., chemist. Qualification, 1 share. Registered office: 41, High Holborn, W.C.1.

Swan Radio Co., Ltd. (207,562).—Private company. Registered July 28th. Capital, £200 in £1 shares. Objects: To carry on the business of wholesale and retail manufacturers and repairers of all wireless apparatus and accessories, &c. The first directors are:—J. F. Dolan, 41, Orchard Road, Sutton; C. B. Kersting, 1, Elmworth Grove, West Dulwich. Secretary: J. F. Dolan. Registered office: 18, Kingsland Road, Shoreditch, E.

Finston Manufacturing Co., Ltd. (207,423). — Private company. Registered July 22nd. Capital, £10,000 in £1 shares (6,000 cumulative preference shares and 4,000 ordinary). Objects: To carry on the business of manufacturers of and dealers in electrical batteries, lamps and torches, hand, cycle and other lamps, electrical instruments, and novelties, films, brackets, globes, filaments, shades, glasses, &c. The managing directors are:—G. F. A. Stone, 22, Hooking Green, Pinner, manufacturer; P. R. Shackel, 32, Rodway Road, Roehampton, S.W., manufacturer. Qualification, £100. Remuneration, £50 each per annum. Solicitors: Turner & Co., 89, Chancery Lane, W.C. Registered office: 45, Horseferry Road, Westminster, S.W.

Thomas & Stinchcomb, Ltd. (207,541).—Private company. Registered July 27th. Capital, £2,000 in £1 shares. Objects: To acquire the business of an electrical engineer now carried on by E. A. Stinchcomb at 6, Narrow Wine Street, Bristol, as "Thomas & Stinchcomb." The permanent directors are:—E. A. Stinchcomb, A.M.I.E.E., Camden House, St. Michael's Hill, Bristol, chartered electrical engineer; P. J. Strong, 46, Northville Road, Felton, Bristol, salesman. Qualification, £1. Registered office: 6, Narrow Wine Street, Bristol.

Liskeard Gas and Electricity Co., Ltd. (207,549).—Registered July 27th. Capital, £8,000 in £1 shares. Objects: To adopt an agreement with F. T. Depree, S. Simpson, C. J. Ennor, W. H. Huddy, J. Sweet and A. E. Knight, to manufacture, sell and supply light, heat and power in the borough of Liskeard and vicinity, &c. Minimum cash subscription, 7 shares. The first directors are:—F. T. Dépree, "Newlands," Exeter, gas engineer; S. Simpson, "Meresyke," Exmouth, engineer; C. J. Ennor, "Hollywood," Liskeard, statutory civil engineer; W. H. Huddy, Dean Terrace, Liskeard, retired jeweller; J. Sweet, "St. Malo," Liskeard, granite merchant; A. E. Knight, The Parade, Liskeard, bank manager. Qualification, £1. Remuneration (except managing directors) as fixed by the company. Secretary: J. C. Isaac. Registered office: The offices of J. C. and C. Isaac, Pondbridge, Liskeard, Cornwall.

Flinders (Wholesale), Ltd. (207,521).—Private company. Registered July 25th. Capital, £7,000 in £1 shares (4,000 ordinary and 3,000 convertible 8 per cent. preference). Objects: To acquire the wholesale portion of the business of Flinders, Ltd., now carried on at 121, High Street, Colchester, and to carry on the business of wholesale dealers only in the apparatus connected with wireless telegraphy and telephony, and accessories, &c. The directors are:—A. F. Hitchcock (chairman and managing director), 121, High Street, Colchester (managing director of Flinders, Ltd.); G. C. F. H. Vernon (general manager), Grove Hall, Retford, Notts (both permanent subject to each holding £500 shares). Remuneration, £500 each per annum. Secretary: Miss Winnie Blomfield. Solicitors: P. A. Moodie, Excel House, Princes Court, Whitcomb Street, Pall Mall, W.C. Registered office: 18, Butt Road, Colchester.

Coventry Magneto Co., Ltd. (207,481).—Private company. Registered July 24th. Capital, £100 in £1 shares. Objects: To acquire the business of manufacturers of magnetos and magneto parts carried on by W. C. Couch and C. F. H. Foster at Foleshill, and at Grey Friars Lane, both in Coventry, and certain of the assets. The first directors are:—W. S. Couch, Fedalma, Solihull, Warwickshire, merchant; C. F. H. Foster, 24, Beaconsfield Road, Stoke, Warwickshire, engineer. Remuneration as fixed by the company. Solicitors: Rowlands & Co., 41, Temple Row, Birmingham. Registered office: Grey Friars Lane, Coventry.

Official Returns of Electrical Companies.

International Wireless Manufacturers, Ltd.—H. Smith, A.L.A.A., F.I.S.A., of 4, York Buildings, Adelphi, W.C.2, was appointed receiver and manager on July 17th, 1925, under powers contained in debentures created December 2nd, 1924.

G.W.I. Valves, Ltd. — L. A. Bartlett, of 639, Salisbury House, E.C.2, was appointed receiver and manager on July 16th, 1925, under powers contained in debenture dated December 2nd, 1924.

Midget Lamp Company (1924), Ltd.—Particulars filed of £500 debentures authorised July 10th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Warnolite, Ltd. — Issue on June 30th of £110, and on July 7th, 1925, of £30 debentures, parts of a series already registered.

Wainwright Manufacturing Co., Ltd.—Issue on July 20th 1925, of £1,000 debentures, part of a series already registered.

Shenton & Co., Ltd. — Particulars filed of £4,000 first mortgage debentures authorised July 16th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital (if any), the amount of the present issue being £3,500.

F. J. Jones & Sons, Ltd. — Charge on the company's undertaking and property, present and future, dated July 20th, 1925, to secure all moneys for which the mortgagees may become liable by virtue of a guarantee given to the company's bankers to the extent of £1,000. Holders: Mrs. V. B. Harvey, Deganwy, Church Hill, Aldershot; and W. Ridley, Maesmaur, Llangollen.

J. Churley Cann, Ltd.—Particulars filed of £900 debentures authorised July 23rd, 1925, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

W. H. Franklin (Cardiff), Ltd.—E. C. Phillips, of Princes' Chambers, 4, Working Street, Cardiff, was appointed receiver on July 16th under powers contained in debenture dated March 23rd, 1925.

W. S. Laycock, Ltd. — Charge dated May 5th, 1925, to secure £106,153 19s. 2d., charged on the company's undertaking and property, present and future, except uncalled capital, ranking after the charge created by deed poll of even date in favour of Bentinck Coathupe as receiver or manager, but priority to trust deed dated June 27th, 1919, securing debenture stock and interest thereon and all other moneys thereby secured except that any sums hereafter accruing due to the trustees for their remuneration and in respect of costs, charges and expenses incurred by them shall rank as a charge on the property in priority to the charge now created. Holders: Barclays Bank, Ltd. Registered July 19th by permission of the Court.)

H. G. Cooper, Ltd.—Land Registry charge on certain freehold land and buildings in the parish of St. Saviour, London. Holders: E. Edwards and C. E. Edwards, 193, High Street North, East Ham.

Colne Valley Electric Supply Co., Ltd.—Trust deed dated July 4th, 1925, to secure £75,000 debenture stock, charged on the company's undertaking and property, present and future, including uncalled capital. Trustees: Union Commercial Investment Co., Ltd., Dashwood House, 69, Old Broad Street, E.C.2.

Rose Bros. Electrical Co., Ltd.—Issue on July 16th, 1925, of £1,000 debentures, part of a series already registered.

Midget Lamp Co., Ltd. (old company).—L. Jacobs, of 3, 4 and 5, Queen Street, Cheapside, E.C., ceased to act as receiver or manager on July 20th, 1925.

Watford Electric and Manufacturing Co., Ltd.—Satisfaction to the extent of £500 on May 31st, 1925, of mortgage debenture dated May 31st, 1923, securing £3,000, leaving £2,000 unsatisfied.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Marconi's Wireless Telegraph Co., Ltd.

The annual meeting was held on July 31st, Senatore G. Marconi presiding. In proposing the adoption of the report (*vide* our last issue, p. 189), the chairman, after dealing in detail with the accounts, said that with the issue of 500,000 new shares last February the directors considered that they had sufficient funds to enable them to carry out their present programme of Empire, European, and other foreign services. Last year he referred at some length to the revolutionary changes which were taking place in long-distance communication by the introduction of the beam system, in conjunction with the discoveries which he and the technical staff of the company had made with regard to short waves. Since last August tests and researches carried out under his direction had proved conclusively that still shorter waves were capable of covering world-wide distances as well, and perhaps better, by day than by night, thereby ensuring communication with such distant parts of the Empire as Australia and Canada for the whole of the 24 hours. During recent tests carried out continuously for four days and four nights, communication had been maintained with Australia and Canada. For that reason he felt that they were justified in stating in the report that "there is good reason to anticipate that the company will not only be able to carry out the guarantees of performance which it has given the Home and Dominion Governments, but that these guarantees will be substantially improved upon." Dealing with the objective which the directors had had continually before them for some years past, namely, the creation of a world wireless telegraph system, he said that the original telegraph services opened by the company were necessarily of an experimental nature, but in more recent years each circuit had been added with the knowledge that it would be a complete success from the date of opening. During 1924 they handled 32 per cent. more telegraph traffic than in the previous year. The equal rates quoted by the competing radio and cable routes had not been brought about by the raising of the radio rate, but by a reduction of the cable rate to the wireless level. This equalisation, which took place on their main transatlantic services in the middle of 1923, might have been expected to have caused a considerable diminution in the number of radio telegrams, yet there was an increase of traffic in the service to New York of no less than 22.87 per cent.

The Right Hon. F. G. Kellaway, P.C., managing director, in seconding the motion, said he felt it incumbent upon him to speak with complete frankness as to the position of the company. In the last two balance-sheets the directors had been compelled to allocate a sum of over £3,000,000 from the general reserve account to meet extraordinary losses and to write down various assets. Two years ago the general reserve stood at £3,986,354. In the present accounts that reserve had been reduced to £1,043,120. These were figures which demanded the fullest explanation. Before he could give that explanation he must say something of what had happened during his association with the company. He had now been associated with the company for over two and a-half years, and had held the position of managing director for eight months. About 18 months ago it became clear that under the organisation then existing the directors were not receiving such information with regard to the world-wide interests of the company and its financial commitments as would enable them properly to discharge their responsibility to the shareholders. As soon as he was convinced of that fact, he proposed to the board that a finance committee of directors should be appointed to control the financial and general policy of the company. That committee was formed on June 3rd, 1924, and as soon as it got to work it became obvious that drastic changes in the company's methods were required. They were especially disturbed by the fact that their interests in subsidiary and associated companies were being taken into the accounts at figures which did not represent their real value. They were also disturbed by the growth in the company's expenditure—a growth which had gone on at the same time that shareholders were being asked to accept a lower return on their capital. The finance committee went through every one of the interests in the company's books, and examined them with a full determination to write down the figures to real values. Last year it wrote down to the extent of £2,335,608. This year it had had to make a further writing down to the extent of £677,985. The shareholders would naturally ask if finality had been reached or if they would be faced next year with yet another drastic cut in the company's reserves. He could not prophesy as to the future, but he could assure them that in the general reserves of £1,043,120 which now appeared in the balance-sheet they believed that they had real and substantial values. If conditions abroad improved there should be corresponding appreciation in the reserve; if the course of foreign currencies continued unsatisfactory, still further writing down might be required. The directors realised that their first concern must be to proceed as rapidly as possible to rebuild the reserve, and a step would be taken in that direction this year by placing to the credit of the reserve the premium of 7s. 6d. per share on the 500,000 shares issued in February last. Referring to the future, Mr. Kellaway said he had abundant faith in the future prosperity of the company. His faith was based principally on the intrinsic value of the work of Senatore Marconi and his brilliant assistants. But there were other reasons for confidence. During the past six months they had made a number of agreements with some of the principal electrical and broadcasting companies in this country and abroad for an exchange of patent rights and for the payment of royalties. These should have a favourable influence on the revenue of the company. The progress already made with the beam stations under construction for the Government and in the Dominions and India was satisfactory, and the whole of those services should be working before the end of next year. The Canadian and South African services should be in operation before the end of this year. The revenue from the Dominion end of these services and the royalty which the Government would pay to them on the receipts from the home stations would constitute entirely new sources of revenue. They had taken in hand the reorganisation of certain subsidiary companies which in the past had lost money. Referring to the arbitration by Lord Buckmaster on their claims against the Government, he said that the preliminary stages were proceeding as rapidly as the nature of the work would permit. He could not anticipate the date when Lord Buckmaster would be in a position to make an award, or the amount of the award, but every step would be taken properly to present the case of the company to the arbitrator so as to ensure that the company received just and adequate compensation for the use made by the fighting forces of the company's patents both before and during the war. In conclusion, Mr. Kellaway referred to the beam system, and paid a tribute to the genius of Senatore Marconi. The report and accounts were adopted.

Yorkshire Electric Power Co., Ltd.

The report for the half-year ended June 30th last states that the progress of the company and the rate of new connections have been maintained in spite of the unsatisfactory trade conditions in Yorkshire and the directors feel justified in declaring interim dividends at the rate of 6 per cent. per annum on the preference and ordinary shares as in 1924. Referring to the failure of negotiations with regard to the West Riding (Aire and Calder) Electricity District scheme, the directors state that they consider it impossible to hold up any longer the development of the area covered by the original powers conferred upon the company. They have therefore decided to proceed at once to make a supply available throughout the whole of the area covered by the existing powers of the company. The construction of the new station at Ferrybridge is proceeding and the first generating set will shortly be delivered for erection. Mr. E. R. Benson has been appointed to the board.

French Companies.

The *Compagnie de Signaux et d'Entreprises Electriques*, of Paris, reports net profits of 2,500,000 fr. for 1924-25, and a dividend at the rate of 15 per cent.

The *Société l'Equipement Electrique*, of Puteaux (Seine and Paris, reports a gross turnover of 6,293,000 fr. in 1924, against 4,874,000 fr. in the previous year. As a result of a fire at a depôt last year, the net profit only amounted to 53,000 fr.; this has been carried forward.

Electrical Distribution of Yorkshire, Ltd.

In announcing an interim dividend at the rate of 7 per ent. per annum, the report for the half-year to June 30th states that during that period there has been a large increase in the sale of electricity and considerable developments have taken place in ıe company's areas of supply. The company is making appli-ıtion for a number of new Orders for supply which can be :onomically worked with existing undertakings. To meet the .creased demands the nominal capital is to be increased to 500,000. If this is approved an issue of capital will be made) the shareholders in the coming autumn.

Wellman Smith Owen Engineering Corporation.—The :ofit for 1924, after providing for taxation, was £16,039; the ım brought forward makes available £32,568. An interim ;vidend at the rate of 5 per cent. was paid, but the directors) not recommend a further dividend and propose to carry for-ard £19,918.

Fuller's United Electric Works, Ltd.—The meeting ad-urned from July 27th, at which a resolution creating a prior en debenture for £75,000 in favour of the bank and increasing ıe rate of interest on existing stock, is to be continued on :onday next, August 10th.

City of London Electric Lighting Co., Ltd.—A dividend 1s. per share has been declared on the ordinary shares for ıe half-year to June 30th.

Tokyo Electric Light Co.—*The Times* reports that a New ork syndicate offered during the current week $24 million 3-year 6 per cent. gold notes of this company. The issue ice was 98¾. The company has recovered rapidly from the fects of the earthquake, its revenue now being at a very gh level. It has never paid less than 8 per cent., and since ıe earthquake the dividend has been raised to 10½ per cent.

Enfield Cable Works, Ltd.—The directors' report for the ar ended June 30th last, which is to be submitted at to-day's nual meeting of the company, show a profit of £100,107, to hich is added £14,892 brought forward, making £114,999. irectors' fees, depreciation, and interest require £10,659, aving £104,340. The preference dividend absorbs £65,000, a interim dividend of 5 per cent. on the ordinary shares took 10,103, and it is proposed to pay a final dividend of 15 per nt. on the ordinary shares (making 20 per cent. for the year), quiring £30,308. The reserve receives £14,849 (making it 20,000), and a balance of £34,079 is carried forward.

Para Electric Railways and Lighting Co. Ltd. — The rectors announce that interest of 2½ per cent. is to be paid a the 5 per cent. debenture stock for the six months ended ay 31st last, together with interest at the rate of 7 per nt. per annum for the three months to August 31st next.

Brompton and Kensington Electricity Supply Co., Ltd.— n interim dividend at the rate of 10 per cent. per annum, ee of tax, has been declared on the ordinary shares, and one the rate of 7 per cent., less tax, on the preferred shares. milar dividends were paid last year.

Bristol Tramways and Carriage Co., Ltd.—The directors ve declared an interim dividend at the rate of 3 per cent. ss tax) for the half-year ended June 30th on the ordinary ares.

Chelsea Electricity Supply Co., Ltd.—An interim dividend the rate of 9 per cent. per annum has been declared on the dinary shares.

City of Buenos Ayres Tramways Co. (1904), Ltd.—A divi-nd of 1s. 3d. per share (at the rate of 5 per cent. per annum) s been declared in respect of the three months ended July st.

Westminster Electric Supply Corporation, Ltd.—An in-rim dividend at the rate of 1s. per share has been declared r the half year ended June 30th (as in 1924).

Swan, Hunter & Wigham Richardson.—An interim divi-nd of 3 per cent., free of tax, has been declared on the dinary shares, as last year.

Thomas Bolton & Sons, Ltd.—A final dividend of 2½ per nt. is being paid (making 5 per cent. for the year, as before) d £19,523 is carried forward.

Stocks and Shares.

MONDAY EVENING.

JSTOM, linking arms with the interest which comes from oking back, dictates, at this week in the year, the matching current Stock Exchange prices against those that ruled seven onths earlier. At this particular juncture, markets are suffer-ig from the after-effects of the disturbance produced by the heaval in the coal trade. Bank Holiday made a merciful tervention between worries and work. The Stock Exchange parated, for the three days' holiday, in a subdued frame of ind. August is nearly always a stagnant period in stocks d shares, and even the rubber share optimists admit the strong probability of business remaining languid until the later autumn, as the prophets vaguely forecast.

The influence of the threatened miners' lock-out made itself felt in most Stock Exchange markets, but the electricity supply section suffered singularly little from the effects of the crisis. Present quotations are below the top prices reached since the end of last year, but the passage of the two Electricity Bills, in the spring, sufficed to keep the list firm, notwithstanding the inevitable profit-taking which followed the materialisation of long-protracted eager hope.

How the market has fared, on balance, over the past seven months, this table shows :—

Ordinary Shares.	Dec. 30th, 1924.	Now.	Rise or fall.
Brompton ...	1⅞	1⅞	— ⅛
Charing Cross ...	2⅜	2⅛	+ 1/16
Chelsea ...	37/6	37/6	—
City of London ...	47/6	45/9	— 1/8
County ...	52/6	52/6	—
Kensington ...	10¾	12¾	+2
London ...	33/6	33/-	—6d.
Metropolitan ...	1⅝	38/3	+9d.
St. James' ...	12⅛	13⅜	+ ⅜
South London ...	2¼	2 7/16	+ 3/16
Westminster ...	11	2¼	+ ¼

In the above group, it will be observed, with interest, that the Kensington and St. James's shares are the only surviving members of the £5 denomination. The others are now all of £1 each, and the alteration has done much to render the share market more flexible. The change has taken place without its leading to any noticeable increase in mere speculation. All the fears that used to be entertained on this score have been disproved by what has actually happened.

The outstanding feature amongst cable issues is a rise of £9 in Indo-Europeans. Apart from this, the variations are of no great consequence, as this comparison illustrates :—

Share.	Dec. 30th, 1924.	Now.	Rise or fall.
Anglo-American Pref. ...	104½	102½	—2
Eastern Extension ...	17	17⅛	+ ⅛
Eastern Telegraph ...	172½	172⅝	—
Globe Ord. ...	17⅞	17⅞	+ ⅛
Great Northern ...	29¾	31	+1¼
Indo-European ...	32½	41½	+9
Marconi ...	1⅜	1⅜	— 1/16
United River Plate ...	6 15/16	7⅛	+ 3/16
Western Telegraph ...	17	16¼	— ¾

Marconis have proved a source of disappointment to their supporters. The dividend of 10 per cent. is being maintained, but the reserve fund has had to be reduced. Nothing more has been received from the Government in respect of war claims. When the money which is still owing is finally paid, this will go to fortify the reserve.

Home Railway stocks have experienced a bad time. For not more than a fortnight at a stretch has the market been free from alarms and excursions of one kind and another. Traffics have been poor. The Wembley Exhibition is no extra bull point. With the threatened lock-out of miners, and a general transport strike on top of it, railway stockholders have in many cases decided to put in the knife and to cut their losses. The Underground group published a batch of dividends less encouraging than had been expected. Here are the price comparisons :—

Stock.	Dec. 30th, 1924.	Now.	Fall.
Central London Ord. ...	74	69½	4½
Metropolitan ...	83	69½	13½
District ...	56	45	11
Underground Ord. ...	38	26	12/6
" "A" ...	9/6	7/-	2/6
" Inc. ...	100	98	2/-

News of the "strike settlement," as it was called, came too late to affect prices on the eve of the holiday. There was the customary newspaper talk of record Bank-holiday crowds, &c., although the weather uncertainties may make their force felt in the traffic statistics. Home Rails offer good yields on the basis of the last-paid dividends. Doubt is felt as to whether the rates may not have to be cut; the Metropolitan and the District Railways should, however, find no great difficulty in keeping up their distributions.

The boomlet in rubber shares served to concentrate attention upon the market, and, at the same time, it led to a slight dulness in prices of shares in companies that are large users of the product. Nevertheless, the result of this year's working is favourable in many cases to proprietors of manufacturing shares, as these prices show :—

Share.	Dec. 30th, 1924.	Now.	Rise or fall.
Babcock	2⅜	2 7/16	— 1/16
British Aluminium	29/3	30/9	+1/6
Callender's	2 1/16	2⅛	+ 1/16
General Electric	21/6	24/-	+2/6
Henley's	2 1/16	2 1/16	—
India Rubber	17/6	19/6	+2/-

Johnson & Phillips have risen substantially to 45s., on the idea that the dividend, at present 10 per cent., may be raised by degrees to 15 per cent. Enfield Cable Works have also spurted sharply, to 3 1/16, on publication of an excellent report. General Electrics increased their dividend by 2½ per cent.—from 5 to 7½ per cent.—and Siemens are now paying 7½ per cent. Most of the companies in this group are doing well. Engineering shares reflected, in their falling values, the failure of trade to revive in the "heavy" industries. The boomlet in rubber shares stands out as a feature of the year, having come about by reason of a rise from 1s. 6d. per lb. to 4s. 6d. per lb. in raw rubber. A sharp reaction led to a general setback in rubber share prices.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price July 31, 1925.	Rise or fall.	Yield. p.c.
Home Electricity Companies.						
Bournemouth and Poole	1	13	14	2⅞	—	5 0 10
Brompton Ordinary	1	10	10	1⅝	—	*5 14 3
Charing Cross Ordinary	1	14½	15	46/9	—	6 8 2
do. do. do. 4½ Pref.	1	4½	14½	17/6	—	5 2 10
Chelsea	1	12	12	1⅞	—	6 8 0
City of London	1	15	15	45/9	—	5 11 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	30/-	—1/-	5 8 3
County of London	1	15	15	52/6	—	5 14 3
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	20/6	—	6 1 7
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	33/3	—	6 0 4
Kensington Ordinary	5	14	15	12¾	—	5 17 8
Lancs. Light and Power	1	7½	7½	25/6	—	5 17 8
London Electric	1	10	10	33/-	—6d.	6 1 2
do. do. 6% Pref.	5	6	6	5⅛	—⅛	5 7 10
Metropolitan	1	10	11	38/3	—	5 15 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	23/3	—	5 4 4
Newcastle-on-Tyne Ordinary	1	6	7	22/6	—	6 4 5
do. 5% Pref.	1	5	5	18/3	—	5 9 7
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	13⅜xd	—	6 1 10
South London	1	15	15	2⅞	—	6 3 1
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref.	1	6	6	20/-	—	6 0 0
Westminster Ordinary	1	15	15	45/-	—	6 13 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/6	—	7 13 10
Yorkshire Elec.	1	8	8	29/6	—	5 8 6
Home Rails.						
Central London Ord. Assented	Stock	4	4	68	—	5 17 8
Metropolitan	,,	4	5	69½	—	7 3 11
do. District	,,	3½	3½	45	—	7 15 7
Underground Electric Ordinary	10	Nil	Nil	2⅛	+⅛	Nil
do. do. "A"	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds		6	6	98	—	*6 2 5
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	3	6	2⅛	—	2 18 2
Chili Telephone	5	6	5	5⅜	—	*4 13 0
Cuba Sub. Ord.	10	5	5	6¾	—	7 8 2
Eastern Extension	10	10	10	17⅛	—	*5 16 9
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 15 11
Globe Tel. and T. Ord.	10	10	10	17⅜	—	*5 15 1
do. do. Pref.	10	6	6	10⅞	—	5 10 4
Great Northern Tel.	10	22	22	31	—	7 1 11
Indo-European	25	7	8½	41½	—	*4 4
Marconi	1	10	10	1⅜	—	7 5 6
Marconi Marine	1	10	7½	18 9	—	8 0 0
Oriental Telephone Ord.	1	12	12	2⅛	—	*5 12 11
United R. Plate Tel.	5	8	8	7¼	—	5 12
Western Telegraph	10	10	10	16¼	—	*6 3 1
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3½	—	8 16 0
do. do. 2nd Pref.	5	6	6	2½	—	10 4 4
do. do. 5% Deb.	Stock	5	7	71½	—	6 15 2
British Electric Traction Ord.	,,	6	6	112	—	5 7 2
do. do. 6% Pref.	,,	6	6	104	—	5 15
Brazil Traction	100	4	4	60½	—½	6 11 10
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	88½	—1	5 11 9
do. do. Preferred	,,	96/-	96/-	83½	—	*5 15 0
do. do. Deferred	,,	129/5	129/5	102	—	*6 7 9
do. do. Deb.	,,	4¼	4¼	76½	—	5 11 1
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	62½	—	8 0 0
Mexican Light Common	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	58	—	Nil
do. 1st Bonds	—	5	5	68½	—	7 17 6
Yorkshire (West Riding)	1	5	—	17/6	—	5 14 3
Manufacturing Companies.						
Babcock & Wilcox	1	12	12	2⅞	—	*4 18 6
British Aluminium Ord.	1	5	10	30/9	+9d.	6 12 6
British Elec. Transformer Pref.	1	Nil	7	17/6	—	..
British Insulated Ord.	1	15	15	3⅛	—	4 18 0
Brush Ord.	1	10	10	1	—	10 0 0
Callenders	1	15	15	2⅞	—	5 4 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅝	—	.. ..
Edison-Swan	4/-	10	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	30/6	—	6 11 2
Enfield Cable, Pref.	1	7½	7½	1¼	—	8 0 0
English Electric	1	5	5	17 9	—	5 12 8
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23 6	—	5 10 8
do. Ord.	1	5	7½	24/-	—	6 5 0
Henley	1	15	16	2½	—	5 8 11
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	19/6	—6d.	*5 2 6
Johnson & Phillips	1	10	10	2¼	—5/6	4 9 3
Met Vickers, Ord.	1	8	8	20 9	—	7 14 8
do. Pref.	2	8	8	2⅝	—	6 14 9
Siemens Ord.	1	—	7½	25 9	+9d.	5 16 9
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemical and Metals.

It should be remembered, in making use of the figures appearin in the following list, that in some cases the prices are only gene and they may vary according to quantities and other circumstanc

CHEMICALS, &c.		Price August 4th.	Fortnigh inc. or de
a Acid, Oxalic	per lb.	5¾d.	...
a Ammoniac, Sal	per ton	£60	...
a Ammonia, Muriate (large crystal)	,,	£52	...
a Bisulphide of Carbon	,,	...	...
a Borax	,,	£25	...
a Copper Sulphate	,,	£25 10s.	..
a Potash, Chlorate	per lb.	4d. to 4½d.	...
a ,, Perchlorate	,,	5½d.	..
a Shellac	per cwt.	£15 15s.	.
a Sulphur, Commercial	,,	£7 15s.	...
a ,, Roll	,,	£7 15s.	...
a Soda, Chlorate	per lb.	3¼d. to 3½d.	.
a ,, Crystals	per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks	per lb.	4d.	...
METALS, &c.			
b Aluminium, Ingots	per ton	£120 to £125	...
b ,, Wire	per lb.	1/9 to 2/6*	...
b ,, Sheet	,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net	£239	£8 in.
Grade II	,, ,,	£169	£ in.
Grade III	,, ,,	£95	£3 in.
c Brass (rolled metal 2" to 12" basis)	per lb.	9⅝d.	¼d. inc.
c ,, Tubes (solid drawn)	,,	11¾d. to 1/-	...
c ,, Wire, basis	,,	10¾d.	¼d. inc.
c Copper Tubes (solid drawn)	,,	1/1	...
c ,, Bars (best selected)	per ton	£91	£1 inc.
c ,, Sheet	,,	£91	£1 inc.
c ,, Rod	,,	£91	£1 inc.
d ,, (Electrolytic) Bars	,,	£67 15s.	10s. inc.
d ,, ,, Sheets	,,	£148 10s.	...
d ,, ,, Wire Rods	,,	£77 15s.	10s. inc
d ,, ,, H.C. Wire	per lb.	9¾d.	⅛d. inc
f Ebonite Rod	,,	2/- to 3/6	...
f Sheet	,,	2 - to 3/6	...
n German Silver Wire	,,	2/8	...
h Gutta-percha, fine	,,	9/9	6d. inc.
h India-rubber, Para fine	,,	4/1½	½d. inc
l Iron Pig (Cleveland Warrants)	per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qual.	,,	£21	£2 dec.
g Lead, English Pig	,,	£18 5s.	£2 inc.
g Mercury	per bot.	£13 15s. to £14	5s. dec
e Mica (in original cases) small	per lb.	8d. to 3/-	...
e ,, ,, medium	,,	4/- to 8/-	...
e ,, ,, large	,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	,,	1/3½	...
p ,, ,, drawn bars & rods	,,	1/8	...
p ,, ,, rolled strip & sheet	,,	1/2¾	...
p ,, ,, wire	,,	1/3¾	¼d. in.
o Platinum	per oz.	£26	...
d Silicium Bronze Wire	per lb.	1/0¼	...
r Steel, Magnet, in bars	,,	7¾d.	...
n Tin, Block (English)	per ton.	£264 10s. to £264 15s.	£3 inc
n ,, Wire, Nos. 1 to 16	per lb.	3/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Lt
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
o C. Clifford & Son, Ltd.

W. F. Denn s & Co.

I.E.E. Wiring Regulations (Buildings).—Considerat of the comments and suggestions made in connection with eighth edition of the I.E.E. Regulations for the Electr Equipment of Buildings issued about a year ago has indica to the Wiring Rules Committee that much of the critic which has arisen has apparently been due to a misun standing of the objects underlying some of the clauses. T will be dealt with in the next revision by amending the wo ing of the clauses in question. A few amendments have, h ever, been considered by the Committee to be of suffici urgency to warrant their immediate publication, and on recommendation of the Committee the Council has decided issue these in the form of an alteration sheet. Other ame ments, not materially affecting principles, are under revi including those arising in connection with the difficulty exp enced in some cases in wiring standard plugs with flexible co and cables of the sizes recommended in the regulations. T matter is still under consideration jointly by the Institut and the B.E.S.A. from the point of view of whether it is p ferable to alter the I.E.E. rating of flexible cords and cab or to amend the dimensions of standard plugs. In connect with the alteration to Condition (xviii) in Regulation Class T1, it has been urged that screwed steel-conduit fitti complying with British Standard Specification No. 31 are necessarily heavy and costly, and the B.E.S.A. has accordin been asked to reconsider this specification. Pending its vision, the Regulations do not require conduit fittings comply with it. Copies of the alterations can be obtained application to the secretary of the Institution, Savoy Pl Victoria Embankment, London, W.C.2.

The First International Congress of Radiology.

Exhibition of X-Ray and Electro-Medical Apparatus.

(*Continued from page* 192.)

n addition to various social functions, arrangements were le for the delegates to visit a number of the London ospitals and the Radiology Division of the National Physical oratory; a selection of radiograms was on view at the ish Institute of Radiology, while X-ray, electro-medical, sical, and other apparatus was exhibited by some 30 ish, American, French, German, and Dutch manufacturing s at the Central Hall, Westminster.

ne of the most important subjects discussed by the Con- s, as indicated last week, was the demand that has arisen higher voltages than can be commercially obtained by the of transformers; this has given fresh impetus to the ch for means of energising X-ray tubes which shall be both ient and capable of precise control. Immersed induction are efficient in so far as the actual excitation of the tube oncerned, but they would scarcely be described as instru- ts of precision; moreover, a coil, as also the ordinary type ansformer, is intermittent in action, the efficiency increas- with frequency of impulse, from which it is evident that tant-pressure apparatus would be more efficient electrically therapeutically, in that dosage could be standardised as rds source and due allowance made for other variable ors. Such a current can be obtained by employing closed- transformers, the impulses from which are fed into con- ers through valves of the electronic or hot-cathode types, condensers being used with each transformer, so that the le cycle of the alternating current is used and maximum sure obtained.

The Gaiffe-Gallot Apparatus.

his has been done experimentally by various workers, Hull he General Electric Co. of Schenectady) having so trans- ed 150 volts a.c. to 0 volts with a fluctua- of approximately 1 per , or even less for lower ges, but it has been o Messrs. Gaiffe-Gallot ilon, of Paris, to place the market the first tant-pressure appara- with an output of 00 volts and sufficient rage to run two s, having a fluctuation ss than 5 per cent. this apparatus Messrs. on & Sons (Electro- cal), Ltd., have ob- d the sole manufac- g rights for Great un and Ireland. Fig. a diagram showing the od employed, with

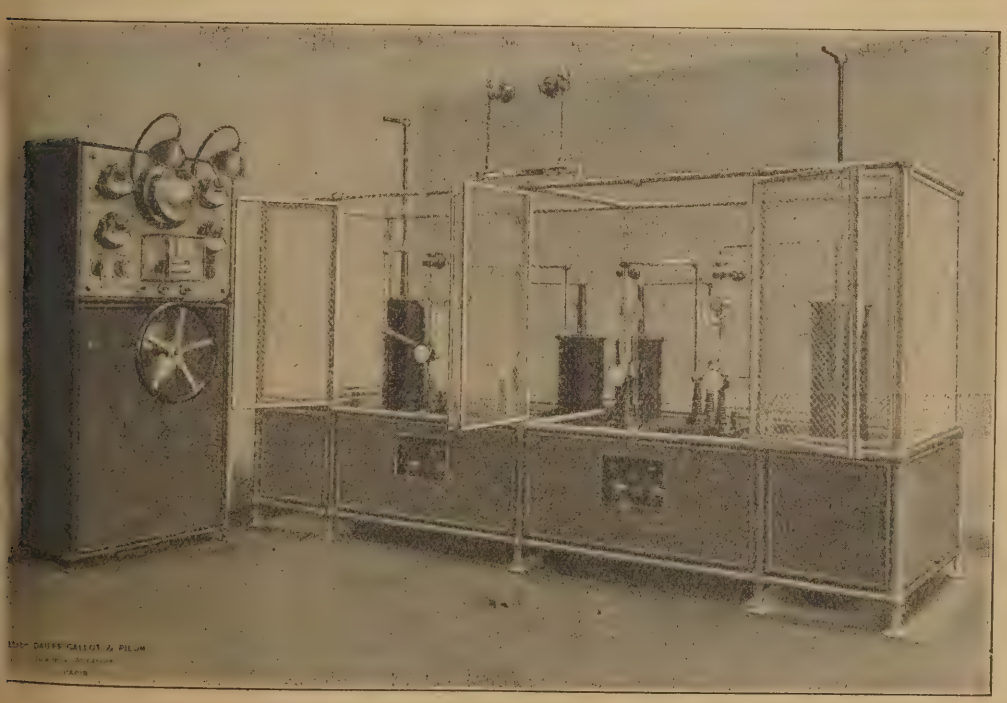


Fig. 3.—General View of Gaiffe Outfit.

transformers in series to attain the output stated , while figs. 2 and 3 are a plan and general view of the apparatus respectively. The two h.p. transformers T (rated at 75,000 volts) are connected in series, each charging two condensers C to 62,000 volts, the margin allowed tending

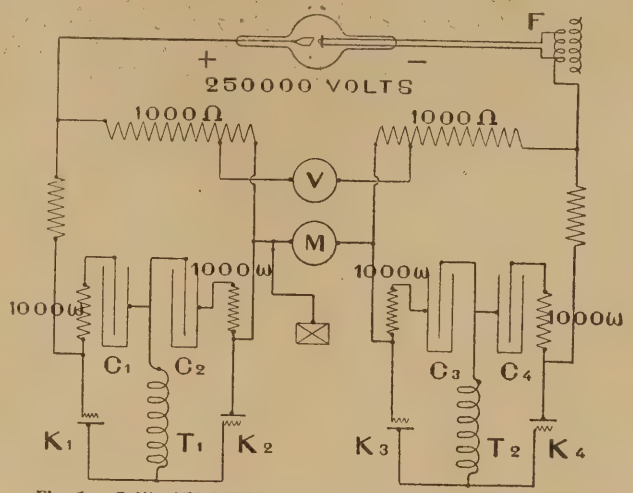


Fig. 1.—Gaiffe 250,000-V Apparatus; Diagram of Connections.

to prolong the duration of each discharge and so augment the constancy of the resulting current; the capacity of the con-

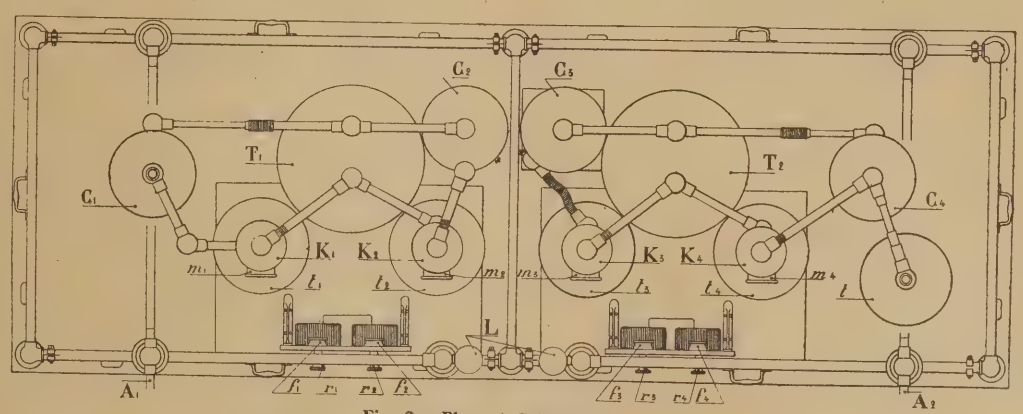


Fig. 2.—Plan of Gaiffe Outfit.

densers is approximately 0.02 microfarad. The four electron valves are designated K, while X is the Coolidge tube and F (*t* in fig. 2) the transformer for heating its filament; M is a milliamperemeter at earth potential, and V a voltmeter reading to 250,000 V in steps of 5,000, the intensity of the current measured being reduced for safety by two resistances of 1,000 megohms each. A_1 A_2 are the h.p. positive and negative terminals respectively; the fuses for the valve transformers are marked *f*, the valve filament voltmeters *m*, their controlling resistances *r*, and the valve filament transformers t_1 t_2 t_3 t_4, and L is a sphere gap.

The installation illustrated is capable of furnishing 10 mA at 250,000 V with a variation of intensity of less than 5 per cent. at full load when fed with 50-cycle a.c. The control cabinet to be seen on the

left of fig. 3 contains a choke coil, which is regulated by the large wheel shown, above which in the square glass case is the milliampere meter used for measuring the intensity of the X-ray emission at any moment and therefore the dosage when calibrated. The generator described above was only one item of Messrs. Watson's large exhibit; for instance, amongst their newest products is a portable X-ray outfit made up into packages for hand carriage. Four packages comprise everything necessary for use on a.c. not exceeding 125 volts, one additional package being necessary for higher alternating voltages, and two when required for use on d.c., and the output reaches 90,000 peak volts, despite which the set can be connected up to an ordinary domestic lighting circuit. The radiator Coolidge tube is specially constructed for this apparatus, differing in size and method of protection from the standard pattern, and the transformer is oil-insulated, with an additional coil wound over one of the h.p. secondaries for heating the cathode filament, and is fitted with a sphere gap.

"Solus" Transformers.

The "Solus" Electrical Co. has adopted oil insulation for all its transformers, irrespective of size, it being of the opinion that wax insulation will not stand the test of time. Each transformer is filled with oil in vacuum so as to exclude air

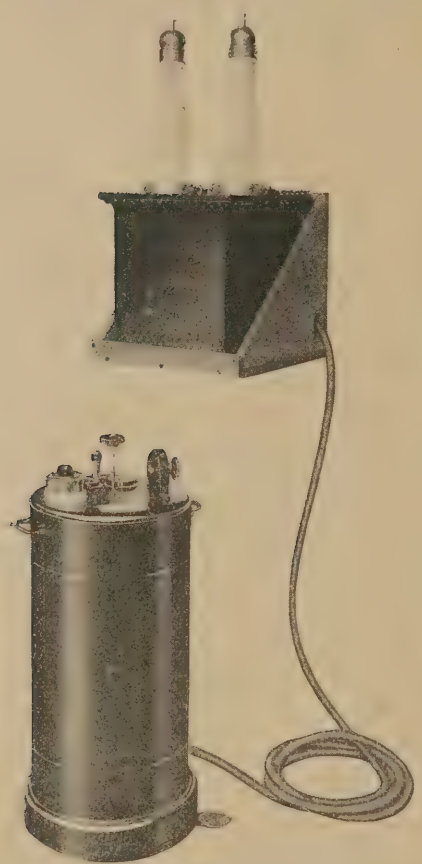


Fig. 4.—"Solus" 30-mA Transformer and Control Gear.

pockets and, moreover, all the company's insulators are oil-filled also. The outfit shown in fig. 4 is specially made for operating a 30-mA, self-rectifying, hot-cathode X-ray tube, and represents simple apparatus for diagnostic work. Owing to the absence of any moving part, it is silent and most compact, while the only floor space required is that taken by the control unit, which is about 15 in. in diameter. The transformer is mounted on a wall bracket, and the filament transformer is fitted in the same tank that houses the h.p. unit. The control table is all metal and carries a foot-operated exposure switch, which can also be used for controlling room light, and a cable is provided for this purpose within the one multiple cab-tire cable. The auto transformer gives as many as 45 settings with only two volts between each, and the means of regulating milliamperage and penetration are quite independent. The company's 10-mA outfit is claimed to be the lightest made; its total weight is no more than 90 lb., of which the transformer accounts for 44 lb.

"General Radiological" Apparatus.

Amongst the various apparatus of the General Radiological and Surgical Apparatus Co., Ltd., much interest was shown in Prof. Holfelder's field selector, which is said to be probably the most accurate means of ascertaining the ports of entry on a patient and, at the same time, of determining the exact dosage for the part to be irradiated.

Of the firm's X-ray apparatus, the "Peo" set shown in fig. 5 is specially constructed for use with Coolidge tubes, and attention may be drawn to its simplicity of manipulation and high output (100 mA at 75 kV).

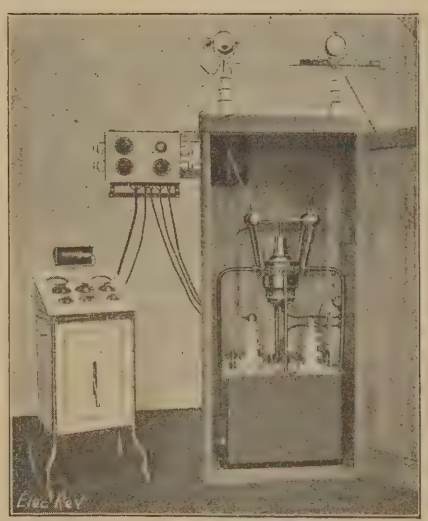


Fig. 5.—"Peo" X-ray Outfit.

For deep therapy the company showed its latest radiati device, namely, Prof. Wintz's tube stand and exposure tab fig. 6; the former is characterised by its extremely ea movement and the excellent protection which is afforded the tube that encloses the Coolidge tube entirely, so th no rays can pass any way except through the compressor the patient. This tube box has been passed by the Natior Physical Laboratory as complying with the requirements the British X-Ray Protection Committee. The exposure tal is of the oil-pump type and allows very fine adjustments any direction, all movements being on ball bearings. T "Polydor" apparatus is the company's most powerful dia nostic set; it is provided with valve-tube rectification, a is also noiseless when working. Various accessories were a on view, such as the plate-changing device for successi

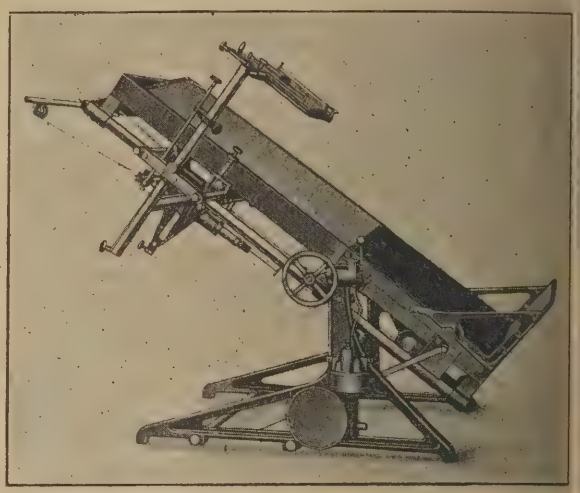


Fig. 7.—A Motor-driven "Clinoscope."

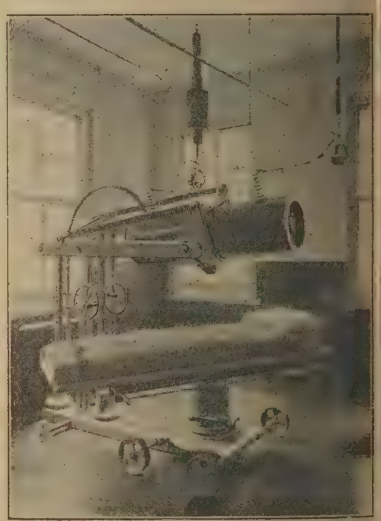


Fig. 6.—The Wintz Irradiating Device.

photographs, metal cassettes, and "Sinegran" intensifyir screens. The "Clinoscope," fig. 7, is an examining apparat with motor-driven movements which can be used as a scree ing stand or couch, and by means of which patients can examined or photographed in any position and at any ang This apparatus is a very fine specimen of mechanical co struction.

(To be continued.)

Indian Railway Development.—Some items of intere concerning the development of the Indian railways are give in the *Railway Gazette*. All the railway companies have hand numerous constructions of new lines, remodelling yards and stations, and improvements in carriage and wag supply. The construction has just been sanctioned of 26 mil of railway of 5 ft. 6 in. gauge by the Bengal-Nagpur Railwa from Barkakana, South Karanpura Colliery, to Chandi. Tl Madras & Southern Mahratta Railway has in hand the co struction of a marshalling yard at Tondiarpet, increased ligh ing arrangements, renewal of rails, girders and engines, an the elimination of level crossings. The Nizam's Guarantee State Railway has in mind a big scheme for overhauling th old workshops at Lalaguda and remodelling them for the r quirements of the next ten to fifteen years. It is estimate that the provision of suitable cranes, pneumatic and electric equipments alone, will amount to nearly Rs. 5 lacs. M G. R. G. Huddleston is in charge of this remodelling scheme

Italian Trade and Industry.

The Development of National Production.

Messrs. J. H. Henderson, O.B.E., and H. C. A. Carpenter, Commercial Secretaries at the British Embassy, Rome, have forwarded to the Department of Overseas Trade a report,* revised to March, 1925, upon the commercial, industrial, and economic situation in Italy.

The report commences with a general review of the economic position in which it is declared that in this respect Italy is stronger than she has been at any time since the war. In public finance there is a good prospect of the Budget balancing in the current year; the internal national debt is lower; and the revenue from taxation has been increased by a re-assessment of the value of property and better methods of collection. The cost of living is high, due principally to the dependence of Italy upon foreign foodstuffs and raw materials, and the question of employing the surplus population is acute. It is thought that this surplus will have to be absorbed by industry as the land is already supporting as many workers as it can bear. From the point of view of British export trade, it may be said that the present economic situation of the country is such as justly to inspire confidence in the credit and stability of the market. At the same time, it is becoming increasingly difficult for British manufacturers and traders to secure and retain a footing in Italy, largely on account of the growing competition from local industries, and they cannot afford to spare any effort if they are to achieve success.

In reviewing the financial position, the report says that among the industries in which the banks are principally interested are the electrical, traction, and metallurgical industries. During 1923-24 there was a net increase of 588 million lire in the capital invested in the electrical industry. Italian financiers have provided funds for the construction of electrical works outside Italy, including investment in the "Steweag," a hydro-electric undertaking in Styria; and the Société des Forces hydro-électrique de Syria, in which an Italian group is said to be financing the construction to the extent of 100 million lire. As regards the investment of foreign capital in Italy, it is said that a certain amount of foreign capital has been attracted in connection with the concession of the telephones and radio-telegraphy and telephony to private enterprise.

Foreign Trade and Market Conditions.

It is shown that the United Kingdom took the second largest share of Italy's import trade in 1922, 1923, and 1924, the amount increasing each year to 2,176 million lire out of a total of 19,388 million lire in 1924. The United States occupied the first place, Germany coming third (reparation imports being excluded). Details of Italy's electrical imports and exports were published in our issue of June 12th (p. 953). The report says that Germany has always been foremost in the manufacture and supply of electrical apparatus for, and she still heads the list of countries which export to, Italy. There is every reason to suppose, however, that in time Italy will become more and more independent of outside assistance. The largest generators as well as the smallest motors can be turned out in the Italian factories, which are dependent on foreign material but can command excellent technical skill, and, with training and experience, production is bound to improve. Great Britain has little place in this market, her principal contributions being in items other than the above. It is interesting to note that orders for transformers for South America have been placed in Italy, though German influence has hitherto been predominant in that part of the world. The majority of the accessories (not including certain accessories for motor-cars) for the electrical trade can be manufactured in Italy to-day. There are also several factories turning out electric lamps, which were previously derived from Great Britain and Holland. Swedish and American firms have been making a speciality of metal goods such as electric vacuum cleaners and electrical household and barbers' requirements, selling them in Italy at prices far below those charged for similar articles in England.

The delay in the reorganisation of the telephone and telegraph systems has hindered business in this direction. The arrangements for the transfer of the telephones to private enterprise are now, however, well advanced, and when they are complete it may happen that the increased demand which is bound to occur for apparatus will divert a portion of the trade to Great Britain. There is certain to be a brisk demand for radio receiving sets, and British manufacturers may find it to their advantage to make certain sacrifices of prices to get a firm footing in this market, which is bound to develop.

Industry and Production.

The latest reports tend to show that Italian industries were, on the whole, actively employed during 1924, and some of them appear to have enjoyed a period of prosperity in marked contrast with the depression which they passed through between 1919 and 1922. Parallel with the electricity producing and distributing concerns, the electro-technical industry of Italy has continued to develop, and it is claimed that at present it can produce almost all the requirements of the country in electrical goods, including hydro-electric sets of any power. Electric meters were formerly imported from the United States and Germany; now the importers have to meet local competition. The only apparatus of which the production is not yet developed on a large scale are machines such as converters, transformers, and other appliances of a similar nature. The output of hydraulic turbines for Italy's power stations from five important firms and a few others up to the end of 1923 was 7,589 machines producing an aggregate of 3,337,274 h.p. It is stated that some of the firms propose to extend their activities into foreign markets. Other firms have specialised in batteries for lighting railway carriages and in accumulators. Electric wires and cables are made by a firm in Milan and Turin, which not only dominates the home market, but also does an export trade. Magnetos and electric incandescent lamps are also produced; the latter, however, are not manufactured in sufficient quantities to meet the national demand, which is more than double the production. As regards telegraphic and telephonic material, the greater part is imported from America or Germany, and a small proportion made in Italy in factories controlled chiefly by American or German groups. Radio material is largely imported, but is also made in the country by the Italo-Marconi Company in its factory near Genoa, and by other firms. The electro-technical industry has had a good season, and the factories have been able to run continuously both for home requirements and for export.

Hydro-Electric Development.

According to a recent publication of the Consiglio Superiore delle Acque, 4,129 water-power concessions, covering 3,430,209 h.p., had been granted up to December 31st, 1923, and it was estimated that 60 per cent. of the power represented was in full use at that date. The capital invested in hydro-electric undertakings is stated to amount to 3,500 million lire, the average return upon this being 6.75 per cent. Plants capable of producing 2,209 million kWh annually are under construction, and plans have been prepared for a further 56 stations to generate 3,908.5 million kWh. The consumption of hydro-electric power in 1923-24 was about 6.5 milliards of kWh, which is considered to be equal to about 6.5 million tons of coal. The Tirso reservoir and hydro-electric plant in Sardinia (Elec. Rev., June 6th, 1924, p. 925) was formally opened by the King last year. The work on the dams of the artificial lakes on the Sila in Calabria is said to be advancing satisfactorily, and the first central station, generating 100,000 h.p., is due to be finished by the end of the current year. The linking-up of the various hydro-electric power stations of the Alps and the Apennines has already made some progress. The energy produced on the Adamello (Alps) is now transmitted when required to the Ligure-Toscana (Apennines); the Società Bresciana (Alps) transmits its energy to the Emiliana (Apennines) and *vice versâ*; the Edison Co. (Alps) has been linked up with the Emiliana Idroellettrica "Ligure" and Nevri (Apennines). Work is in progress for the interconnection of many other stations, and the network of lines which will thus be constituted will probably be the most powerful system of transmission of Alpine electrical energy in existence.

Railway Electrification and Construction.

During the year to June 30th, 1924, about 82 km. of line was electrified, bringing the total length of electric railway to 780 km.; a further 810 km. is in course of electrification. An Appendix to the report contains details of the lines already electrified or in course of electrification on July 1st, 1924. The most important of the lines already electrified is the Torino P.N. Ronco system (*via* Isola del Cantone), which has a length of 137 km. The sections in course of electrification include the Genova P.B.-Livorno, 181 km.; the Bologna-Firenze, 132 km.; the Roma-Sulmona, 172 km.; the Foggia-Benevento, 101 km.; and the Faenza-Firenze, 101 km. Work on the last line is at present suspended. The system of traction adopted is three-phase, 3,700 V, with two overhead wires. There are three exceptions to this, two of which employ direct current at 650 V (third-rail system), the other using direct current at 3,000 V (overhead wire).

It is reported that a provisional contract for the construction of an underground railway in Rome was signed, in August last year, by the Municipality and an Italo-French group. Plans have been submitted to a committee, which recommends an exhaustive examination to dispel the doubt which exists as to the possibility of carrying out the scheme. In the meantime the option granted to the Italo-French group is being contested by the Sindicato Italiano per la Metropolitana di Roma, which requires to have its scheme for the railway taken into consideration.

Telegraphy and Telephony.

Although no steps had been taken up to the end of last year to transfer the telegraphs to private management, a scheme for the transfer of the telephones was published in September last. This provides that the preponderance of the capital subscribed shall be Italian, and measures have been taken to prevent concessionaires from increasing the tariff

* Stationery Office, 4s. net.

rates during the first three years; indeed, it is expected that a reduction will be effected by competition between the various groups.

Since the concession to the Società Italo Radio in 1923 of radio-telegraphic services, the company has been actively preparing itself for the functions which it has undertaken. Its capital is being increased from 7 million to 60 million lire, and technical and traffic agreements have been made with the Marconi interests, the Telefunken concern, and the Cie. Générale de T.S.F. to ensure the use of foreign patents and co-operation with other companies' stations in all parts of the world. The Italo Radio largely participates in the Compagnia Radiotelegrafica Brazileira and the Transradio Argentina. The station at Coltana was the first to be put into operation, the aerial system being improved and 800 kW of transmitting plant installed. From this station communication with South America is assured. Stations to deal with North American and European traffic are being erected. The second centre, at Rome, is to consist of two transmitting stations for European and trans-Continental traffic respectively, and there will be a third centre at Milan. Coastal stations for communication with ships will function at Genoa, Trieste, and Naples.

A Royal Decree of July 10th, 1924, approved the text of regulations governing broadcasting. Under these regulations a licence fee of 75 lire is charged upon each receiving set; of this the Government retains 25 lire, the balance going to the broadcasting concessionaire. A tax, of which 15 lire is payable to the Government, and from 20 to 180 lire (according to the number of valves) to the concessionaire must be paid before the apparatus is exhibited for sale. The Government reserves the right of increasing the fees by 300 per cent. in the case of foreign apparatus, but has so far made no use of this reservation. Broadcasting was commenced from the Rome station by the Società Unione Radiotelefonica Italiana in October last; other broadcasting stations are planned to be erected at Milan and Palermo.

Reference is made in the report to the submarine cables connecting Italy and America, and it is stated that a Royal Decree of December 13th last confirmed a convention with the firm of Pirelli (Milan), which conferred on the company the task of laying and keeping in order the submarine cables which are the property of the State.

Difficulties and Methods of Trading.

Under this heading one section of the report gives, as usual, information regarding the conditions to be met by traders. It is said that the activity of the Italian factories, while it may lead to a reduction of imports in a number of lines, may possibly result in a demand for the finer and more expensive qualities of goods in which British factories have always taken the lead. As we have already mentioned, German competition is severe, much of the success being due to the intensive campaign of German representatives in Italy. It is important for British traders to realise, as the Germans do, the necessity for securing that real acquaintance with the needs of the market which can only be obtained by means of personal visits by representatives with a thorough knowledge of Italian. If correspondence is resorted to, it should be in Italian, or, at least, in French, as should also catalogues and specifications. Italians in many cases are accustomed to giving long credits, and they expect the same treatment from abroad. It may be stated that a large number of German and a few American firms have decided to establish factories in Italy to avoid being driven off the market; in other cases a controlling interest has been obtained in Italian concerns. Price is, after all, the dominating factor; Italy is not a country which can afford to pay a higher price for a superior article when an inferior one which will answer the same purpose can be obtained more cheaply. The problem is not an easy one, because competitors, especially German and Italian, have often enough in reserve to drop their prices and still maintain a reasonable profit. It is the practice of some firms to discover what is the lowest British quotation and then quote 5 per cent. or or so less.

Boiler Explosion.—We have received a copy of the Report of a Preliminary Inquiry into the explosion which occurred at the power station, Upper Boat, Pontypridd, of the South Wales Electrical Power Distribution Co., when a superheater tube was fractured for a length of 7½ in. The explosion was caused by the tube becoming so reduced in thickness as to be unable to withstand the pressure to which it was subjected. As the superheater was not insured, it was not inspected at the time of inspection of the rest of the boiler.

A New Electric Hammer.

Centrifugal Force in the Conversion of Rotary into Reciprocating Motion.

At a recent interesting demonstration held at the headquar of the Kango Co., Ltd., we were afforded the opportunity seeing the application of an invention of Professor Goldschm in which centrifugal force is used for the conversion of rot into reciprocating and progressive motion, in a new elec hammer which this company is about to put on the marke

In the "Kango" hammer the reciprocating and progres effect, which amounts to definite blows, is obtained by rotation of two heavily loaded bevelled gear wheels pla facing each other, each driven through the same bevel pin carried by a spline shaft, in opposite rotational direction the other. The weights of the loaded gear wheels are brou into juxtaposition at two points in their path of rotation each revolution, each time converting their centrifugal fo into a sharp oscillating motion forming the blow which is veyed to the chisel or other tool through a transmitter l in position by an oil-retaining leather diaphragm; the reco taken by a spiral spring which serves to kill vibration adds impetus to the blow on the tool. A section of the h mer, with the important features indicated, is shown in fig

The drive from the motor shaft to the spline shaft, of wh the bevel pinion is an integral part, is taken through a spe form of centrifugal coupling which obviates any sudden ch on the spline shaft being conveyed to that of the motor. coupling consists of a square box on an extension of the ar ture shaft, and two weighted links which fit in slots in periphery of the box, and which are in turn connected by pins to a driving piece fitted with internal splines makir free fit on the spline shaft. When the hammer is at rest external points of the links are at the inside extremities of slots at an acute angle with the driving piece, but as speed rises they fly out in alignment with the driving p and respond instantly to any retardation of the spline sh leaving the internally splined driving piece absolutely free the shaft so that it can move up and down freely with friction.

The M.L. driving motor is universally wound for either

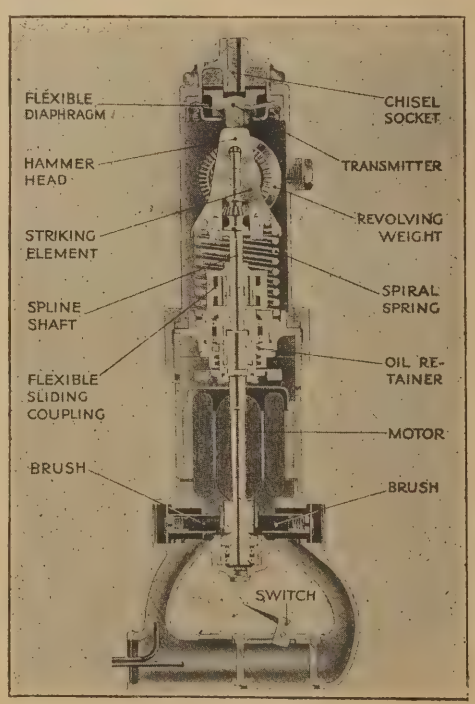


Fig. 1.—The Goldschmidt Hammer in Section.



Fig. 2.—Exterior View of the Hamm

200 or 220 V, and is encased separately with its brushes at end nearest the stirrup handle and switch, the whole b ventilated by a special fan. An oil-tight joint separates mechanical unit from the motor, the mechanical element ning in an oil bath.

The motor speed, which is in the vicinity of from 9,0 10,000 r.p.m., is reduced at the bevel gearing in the rat 3 to 1; the current consumption of the 220-V hamme approximately 1.4 A.

It will be seen that, by virtue of the sliding coupling, actual percussion blow of the hammer is essentially a flo one; this ensures against overloading the motor.

The hammer in its present state is not sufficiently pow for ordinary riveting and work of equal weight, but witnessing a few of its applications we feel assured that it a wide field and that its prospects of superseding the I

atic hammer are good. One most interesting point involved the principle of the invention which favours the development larger hammers is that variation in speed produces a harmonic variation in the reciprocating motion, and as the speed increased blows of proportionately increased intensity to ose obtained at one blow per revolution of the crown wheels n be obtained at every second or third revolution.

Some of the demonstrated uses of the hammer were: chisel oss-grain cutting of wood, producing a smooth surface cut; rip cutting from 3/16 in. mild steel and groove cutting into ild steel; drilling and cutting into brickwork, stone and arble. A test on marble resulted in a $\frac{5}{8}$-in. hole being drilled in. deep in 60 seconds.

Fig. 2 illustrates the external appearance of the hammer, e weight of which is 9.25 lb.

outh American Electrical Notes.

(From Our Special Correspondent.)

v electrical plant is to be constructed at Bluefields, Nicaragua.

ıe market for wiring devices has broadened in this part of ıntral America of late, but, to a great extent, supplies are ovided by American houses.

An electric light plant is to be installed at Cascavel, in the ate of Ceará, Brazil. The concession has been granted for a riod of 25 years, at the expiration of which time the plant ll become the property of the municipality without compentiom. No taxes are to be collected in the meantime, and the achinery and plant, for which tenders will be invited from road, will be allowed to enter the country free of duty.

The electric light and power plant established in Guayaquil, uador, is about to be considerably extended, a foreign corration having purchased a controlling interest in the underking.

With the plenitude of funds now at their disposal owing to ə improved financial condition of Argentina, several of the itish-managed railways in that Republic are proceeding with ə work of installing large new electrical plants. While due ention has been, and is being, given to the requirements of ə rapidly-extending suburban districts of the capital, addinal facilities are being introduced into certain of the railway tions such as those of the Southern, at Plaza Constitución, d the Western. Further electrification on the Central Argene line is also to be commenced this month (July), while the n of 7,000,000 pesos (paper) has been allotted by the Pacific ilway Company for additional improvements and extensions its terminus at Retiro. Among native-owned railway enterses, the Spanish-Argentine Electricity Company (Compañia spano-Argentina de Electrícidad) is about to erect a new wer-house which will considerably alter the appearance of, d increase the facilities provided in, the capital. The plans l for the erection of an electric power station with a chinery installation of 250,000 h.p. When this work has en completed the station—it is claimed—will rank with the gest in the world. It is expected that the construction and ə installation of the specially planned equipment will be npleted during the year 1927.

The Brazilian authorities, after considerable hesitation, have nted permission to the A.E.F.G. consortium (American, glish, French, and German) for the construction of a large w radiotelegraphic station at the port of Pernambuco. The ntractors have already been appointed, and are busy prepar- plans and materials. It is estimated that the station can- be completed before 18 months or two years from the date it the works are started. With seven towers, each 150 tres high, the station will be used primarily as a receiv- relay station between Europe and the United States on one hand, and between Rio de Janeiro and Buenos Aires the other. Such an installation has long been regarded as ispensable for the maintenance of an uninterrupted service, ause of the poor receiving conditions existing at Rio de neiro. In addition to the usual services, the Pernambuco tion will deal with relayed transmitted messages from Rio Janeiro and Buenos Aires. Much, however, will depend on the sending conditions in the south. The station is being ipped to communicate directly with both the United States l Europe.

n Brazil, the sale of radio apparatus has fallen off considery during the past few months. The slackness is said to be to anticipated technical improvements. The greater part he apparatus sold at present is of German origin.

rom Peru it is learned that the recent inauguration of radio adcasting created considerable local interest, with attendant d sales of apparatus. Owing to the existence of a local imt monopoly of these manufactures, and the United States ota of 50 per cent. of total purchase having been exhausted, remainder of trade demands must be purchased from the ited Kingdom. It is understood that stocks of supplies are y low and importers are anxious to replenish them.

Notes from Canada.

(From Our Special Correspondent.)

English readers will be interested in hearing of the winning of a $5,000 prize, offered by an American firm, by Mr. David Cowan, a young Englishman now resident in Canada. Messrs. Bonbright & Co., a firm of bond brokers in the United States, recently offered prizes totalling $10,000 for the best essay on the development of the electrical industry to cover the ten-year period 1920 to 1930. It will be seen that half of the period covered would require a description of actual events, while the other half would necessarily be prophetic. Mr. Cowan secured the first prize in competition with 437 others from various parts of the North American Continent. The judges in this competition, the American Superpower Corporation, have offered a single prize of $10,000 to be awarded to the competitor whose prophecies shall be found in 1930 to be most nearly correct for the five-year period 1925 to 1929.

Some three months ago the Hydro-Electric Power Commission of Ontario applied to the Dominion Government at Ottawa for permission to develop power on the St. Lawrence river near Morrisburg. This power site lies on a stretch of the river, the water rights on which, both for power and navigation, belong jointly to the United States and Canada. For this reason it was necessary for the application to be made to the Dominion and not to the Provincial (Ontario) Government. It has recently been announced that the application cannot be considered until the Joint Engineering Board, appointed last year by the two countries, has issued its report on the whole subject of power development on the St. Lawrence.

The statement has recently appeared in the daily papers that the Hydro-Electric Power Commission of Ontario has been granted permission to go ahead with the development of 250,000 horse-power on the Ottawa river at a cost of $25,000,000. This power will serve the needs of the eastern part of Ontario, which has so far had very little power available for local use.

An Ontario organisation, the Association of Municipal Electrical Utilities, recently held a convention at Niagara Falls, Ontario, and though Sir Adam Beck, chairman of the Hydro-Electric Power Commission, was unable to be present, he sent a letter in which he gave some interesting figures relating to the work of the Commission. During the past year the number of municipalities under contract with the Commission has increased from 356 to 386 and the aggregate amount of power generated by the Commission's various plants, in December, 1924, reached the total of 780,000 horse-power. In 1924 the capital investment in this provincial undertaking amounted to about $263,000,000 and the annual revenue is now nearly $19,000,000.

According to the *Electrical News* (Toronto) some three million horse-power is available for development in the province of Quebec on the following rivers:—Chicoutimi, Aux Sables, Shipshaw, Saguenay, the Peribonka, and others, all within a radius of 50 miles of the small town of Chicoutimi, which a year ago had about 9,000 people. This town now claims 13,000 or 14,000 owing to power developments in progress in the vicinity, as the Quebec Development Company is completing a plant of 500,000 horse-power capacity on the Saguenay river, and plans are now under way for the use of the same water, under twice the head, about twenty miles downstream.

As already mentioned in these pages, the Premier of Quebec, M. Taschereau, recently stated officially that the Cabinet had approved plans, submitted to the Government by certain interests, for the development of the Chute à Caron, involving an expenditure of about $75,000,000. The promoters propose to start almost immediately building a model town with a thousand houses. The interests referred to are said to have informed the Government that they intend to lodge a population of about 6,000 families, or some 30,000 people in the vicinity in the near future. The power is being developed primarily for the manufacture of aluminium.

Two Large Electric Winding Installations.—Particulars are given in *Chemical Engineering and Mining Review* of two large mine hoist equipments recently installed at the Porphyry shaft of the Inspiration Consolidated Copper Co., Inspiration, Arizona. Both are of the Ilgner-Ward Leonard type, an automatic one for ore hoisting, and a hand-operated one with automatic safety features for handling men. The ore hoist consists of a 2,150-h.p., 650-V, d.c. motor, running at 51 r.p.m., direct connected to the hoist drums; and a motor-generator set consisting of a 1,600-kW, 500 r.p.m., 650-V generator, a 1,900-h.p., 500 r.p.m., 6,600-V, 3-phase, 25-cycle, slip-ring induction motor, and a 78,000-lb. flywheel. This equipment is capable of lifting 10,000 tons of ore in 16 hours from a depth of 1,485 ft. The main hoist consists of a 600-h.p., 400 r.p.m., 550-V, d.c. motor geared to the hoist drum, and a motor-generator set consisting of a 450-kW, 750 r.p.m., 550-V, shunt wound generator; a 500-h.p., 750 r.p.m., 6,600-V, 3-phase, 25-cycle, slip-ring induction motor; and a steel plate 16,500-lb. flywheel. Except that a master switch and contactors are used for controlling the generator field instead of a drum controller, the control for this equipment is the same as used on other hand-operated Ward Leonard equipment.

Modernising Electric Tramcars.

Some Interesting London Experiments.

Under the deluge of criticism levelled against electric tramcars, the general public has almost lost sight of the fact that the modern tramcar, at any rate so far as London is concerned, is a very different vehicle to its pre-war brother. This is not surprising because no generally noticeable alteration has been made as regards external appearance, and with few exceptions, although the equipment has been vastly improved, the only visible difference internally has been the use of white paint.

During the past few years, however, Mr. C. J. Spencer, general manager of the three tramway companies associated with the London Underground group, has been fully considering improvements, and numerous tests and experiments have been carried out in order to discover what would best suit the peculiar and strenuous conditions of the traffic dealt with by his undertakings.

Modern Electrical Equipment.

In the first place, 40 cars have been fitted with new Metropolitan Vickers motor equipments and 70 with the latest types of magnetic brakes, and the following tables indicate the improvement which has taken place as the results of the improved acceleration. Starting from rest, the cars accelerated to the following speeds in the times stated :—

Speed.	Time taken from standstill. New Equipment.	Old Equipment.
12 m.p.h.	8 sec.	9 sec.
14 m.p.h.	10 sec.	13 sec.
16 m.p.h.	13 sec.	19 sec.
20 m.p.h.	24 sec.	52 sec.

On a service test of 6 stops per mile, each stop being of 5 seconds duration, it was found that the cars fitted with old equipment averaged 11 m.p.h., whilst those having new equipment averaged 13½ m.p.h.

Speed on Grades.	New Equipment.	Old Equipment.
Grade 1 in 21	13½ m.p.h.	10½ m.p.h.
Grade 1 in 72	18½ m.p.h.	13½ m.p.h.

The new light-weight motors are provided with ball and roller bearings on the armature shafts; the weight of the motors is only 39 lb. per horse power, as compared with the 81 lb. per h.p. of the old motors, and it is interesting to note that the reduction in unsprung weight has resulted not only in very quiet and smooth running, but the experience gained after two years' running shows that there is a very distinct reduction in the liability of corrugations being formed on the rails.

Maag gears have been fitted to the cars, hardened by a special process, which has resulted in very quiet running, and



Fig. 1.—Improved Tramcar Interior and Novel Lighting Fittings.

it is anticipated that the life of the gear wheels will be in the neighbourhood of 15 years. The important feature of quietness has been gained by the use of these gears and light-weight motors, to which possibly the ball bearings, with consequent accurate alignment, have contributed.

Standard of Comfort.

The standard of comfort of travelling in London during recent years has become a very important factor where competitive forms of transport facilities are provided. It must be admitted that, from this aspect, tramcars generally have not made any real advance since they first commenced to run 20 years ago as a means of conveyance, with hard-wood seats and no real pretensions to comfort.

The internal appearance of the cars has received careful consideration and several have been entirely redecorated in harmonising colour schemes, such as light oak and white enamel, white and french grey, cream and brown, &c. The main experiment in seating has been with cross seats. Apparently, the London public has taken kindly to cross seats for the reason that, instead of looking at the passengers opposite they can look out of the window in the direction of travel.

The designing of really comfortable cross seats for tramcar is complicated by the necessity for reversing the backs at th termini, a difficulty that has been got over by mechanicall connecting the seat to the back so that the former moves fo ward slightly and also tilts so that the maximum comfort obtained in either direction. For the first time in London th top deck has also been fitted with spring upholstered seats an backs, both top- and lower-deck seats being covered wit moquette of pleasing blue and fawn colouring.

The lower saloon floor is covered with rubber ¼ in. thic instead of slats, and as the accompanying illustrations sho the lighting has been improved and additional lamps fitted special attention having been given to the equal distribution light and avoidance of glare; special ventilation arrangement



Fig. 2.—Improved Lighting and Cross Seats.

have been designed to give a clear current of air through th car, but avoiding draughts.

Amongst other details are open handgrips of washable mat rial on hand straps. On the top deck hand rails are fitted the roof for the convenience of passengers passing to and fro seats. Special headlights are fitted which give ample illumin tion, the colour of the light being slightly yellow with a vie to being effective in fog. Route numbers are fitted at the sid and ends of the cars and air-impulse bells are provided wit push buttons distributed at convenient points.

This type of car's seating capacity is reduced by a total six seats, but the tramcar, if it is to evolve out of its chrysal state of being chiefly the workman's vehicle, must follow th lead of the omnibus and give the public comfort and attractiv ness. The day has passed when utilitarianism is the on thing that matters, and the tramcar can do all that the omnibu does, and more, both in comfort and utility.

Quick acceleration and deceleration with a good averag speed, luxury, and safety, are the present-day requirements the London public, and to supply them costs money, but the can be considered cheap when compared with lost passengers

The Municipal Tramways Association.

"Far from tramways being a back number, I am of th opinion that there is no form of transport which can compe with the tramcar of the present day," said Mr. P. Priestle manager of the Liverpool tramway undertaking, in speaking a recent gathering at Plymouth in connection with the annu meeting of the managers' section of the Municipal Tramwa Association. "It is a significant fact that during the cour of a year the whole population of Great Britain is carried the tramways several hundred times," he continued, "and wonder if the man in the street who reads articles advocatin the scrapping of the tramways realises what it would mea if the tramcars of the United Kingdom were really done awa with."

These remarks were made in replying to the toast of "Th Municipal Tramways Association," proposed by the Mayo who remarked that the Association represented a capital e penditure of £71,000,000 and commanded an income £26,000,000, mostly in coppers.

Mr. John Barnard, of Bolton, in proposing "The Plymou Corporation Tramways," said that when he last visited th town eleven years ago the Corporation owned 34 cars and ha 230 employés; to-day it was running 140 cars and 27 'buses, an had 900 employés. In 1914 the undertaking carried nine m lion passengers and the gross profits were £16,000; to-day th number of passengers was 38,000,000, the receipts £240,000,00

and the gross profit £68,000,000, which was an answer to critics who asserted that municipalities were not capable of running tramways. Mr. Barnard firmly believed that transport in the big towns was as much the duty of the municipalities as was the provision of gas, electricity, and water supplies, and all they asked from the Government was that they should be put on an equal footing with private individuals.

Alderman W. H. Welsford, in replying on behalf of the Tramway Committee, said he remembered the first tramlines being laid in the streets of Plymouth 53 years ago. They had no fear for the future of the Plymouth tramway system while Mr. Stokes was at the head of affairs.

Mr. H. P. Stokes, who also responded, mentioned that Plymouth was the first town in this country to introduce street transport, and street transport by steam. So far as motor omnibuses were concerned, Plymouth had shown broad vision.

Mr. E. A. Earl presided over the dinner, during the course of which an excellent programme of music was rendered by the Plymouth Corporation Tramway Orchestra, directed by Mr. S. H. Palmer. The dinner was followed by a dance, and the conference, which met for the first time in the West of England, was attended by the managers of eighty tramway undertakings of the large towns of Great Britain and Ireland. It opened with a civic reception by the Mayor and Mayoress of Plymouth, Alderman and Mrs. R. W. Winnicott, and among the visitors were two from Australia, Mr. P. J. Pringle, of the Victoria Electricity Supply and Tramway Co., and Mr. Strangward, of Melbourne.

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

Portable Meter and Service Switch Cabinet.

Particulars are given in the *Electrical World* of a portable meter and service switch box made by the DAYTON POWER AND LIGHT CO., for outdoor emergency or temporary use. The cabinet is made in sizes suitable to carry installations of up to 400 A capacity, and is supplied equipped, wired and ready for use. The cabinet is made of wood and has a suitable roof and double doors, one at the top for the meter and the other at the bottom for the service equipment. Suitable weather-proof connections are made for the outlet wires to both the supply and consumers' mains. The service switch is of the safety type, with the main fuses separated from the consumers' fuses and sealed from access by the consumer. The service switch is operated by an external handle which is accessible to the consumer.

An Automatic Electric-Buoy Lamp.

The Venner-Dyke automatic electric-buoy lamp illustrated in fig. 1 which is made by MESSRS. VENNER TIME SWITCHES, LTD., 45, Horseferry Road, Westminster, London, S.W.1,

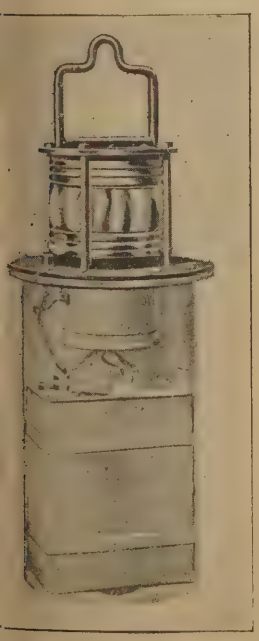


Fig. 1.—The Automatic Electric-Buoy Lamp.



Fig. 2.—Shade for Table Fitting.

has been designed principally for use on cable buoys in connection with the repair of submarine cables. The lower casing is of heavy gauge Manchester plate. It contains a 10-Ah, 4-V storage battery of 0.5-A discharge rate; and a "BF" type Venner time switch with an 18-day clock fitted in a cast metal box fixed to the underside of the closure plate which is held down by 12 brass bolts and nuts, a rubber gasket being used to make the joint watertight. The closure plate carries a 5-in. dioptric lens on its top side, in which are the electric lamp (2 W) and the lamp holder. A watertight, screw-down switch is also fixed outside the closure plate and is arranged in series with the time switch so that the lamp may be kept from being switched on when not required. Except the battery, the whole of the electrical equipment may be lifted with the container cover in one piece. By using special crosstrees provided for this lamp, its attachment to the buoy-staff takes only a minute or so, no lashings being necessary, and to facilitate the attachment, two brass lugs are provided at opposite diameters on the bottom rim of the container, and a handle on the top closure plate above the lens.

Reciprocating Switch with Moulded Composition Cover.

The latest product of the HART MANUFACTURING CO., 76 and 77, Rochester Row, Westminster, London, S.W.1, is the "Diamond H" switch fitted with a black moulded composition cover, illustrated in fig. 3. It has been designed to meet

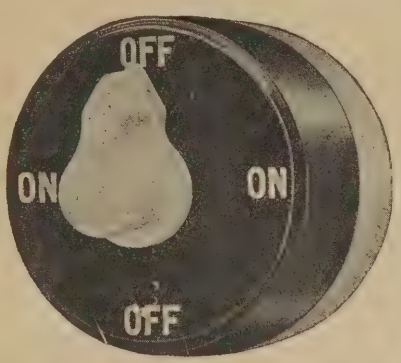


Fig. 3.—Reciprocating Switch with Moulded Composition Cover.

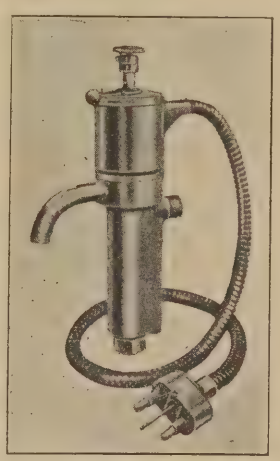


Fig. 4.—The Electric Tap.

the demand for a shockproof switch for use on electric cooking apparatus, &c., and it entirely obviates the necessity of earthing the switch cover. The cover is strong; it is claimed that it will withstand a 10-ft. drop test, has a very high heat resistance, and is absolutely non-hygroscopic. The switch is of the 3-heat type, and the indications are sunk into the face of the cover and filled with white compound, giving a distinctive result.

The moulded covers are being supplied in 7½- and 10-A sizes for 3-heat switches, and for 10-A single- and double-pole reciprocating switches. The switch has a quick action and is provided with a white porcelain arrow-indicating handle.

An Electric Tap.

The accompanying illustration, fig. 4, is of an electric tap which is being marketed by MR. ALAN WRIGHT, Sentinel House, Southampton Row, London, W.C.1. The tap is designed, it is claimed, to give satisfactory results at temperatures between 70 deg. and 140 deg. F. and regulation between these limits is easily obtained by turning the knob at the top of the tap. The loading is 2½ kW.

New Designs in Lamp Shades.

The illustration herewith, fig. 2, is of one of several types of lamp shades, marketed by the EFFICIENCY LAMP SHADE CO., 3, Took's Court, Furnival Street, Holborn, E.C.4. These all embody a somewhat unique design of hinged flaps which enables the glass panels to be instantly removed for cleaning or replacements and renders the insertion of transparencies and stencilled or written advertisements a simple and quick operation, without removing the shade from the lampholder. Another important feature is that the glasses are standardised and interchangeable, being made in two sizes, 6 in. by 4 in. and 6 in. by 5½ in. The shades are made in varying designs of the pendant, bracket and table fitting types and the glass panels can be supplied with any lettering, artistic design, trade mark, &c. The fitting illustrated is fitted with ornamental top and mounted on a silver oxidised standard for table use.

Two New Quick-make-and-Break Switches.

Two recent productions of MESSRS. THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, taking the form of quick-make-and-break switches, are shown in the accompanying illustrations. The suspension switch, fig. 5, is made in both one-way and two-way patterns; it is of robust construction and provided with a rapid movement. A novel feature in the design is the provision of black and white buttons on the pressel bar, for indicating whether the switch is on or off. This switch is claimed to be capable of effectively controlling 3 A at 250 V.

The " straight-through " pattern, fig. 6, is specially designed for insertion in the flexible of toasters, irons, and similar portable domestic appliances, enabling them to be controlled in

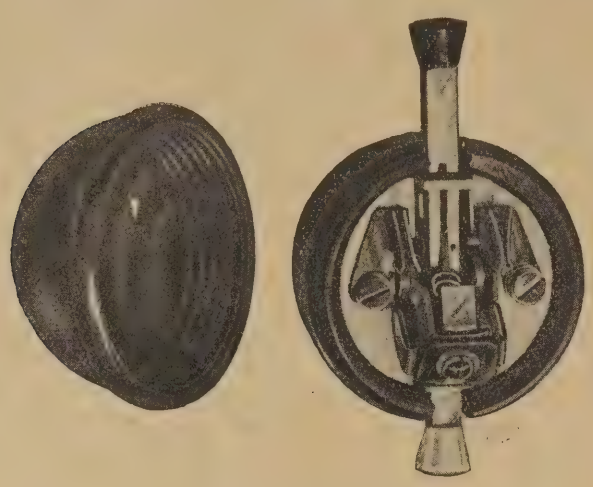


Fig. 5.—The Suspension Type Switch.

the most convenient manner. This type of switch is very desirable, and becomes almost a necessity where any particular piece of apparatus has no closely adjacent method of swit control, such as, for example, an iron being used from ordinary lampholder. The movement in this pattern is simi to that in the one-way and two-way switches, and is claim to be capable of carrying currents up to 3 A at 250 V.

The cases of both switches are of well seasoned hardwo

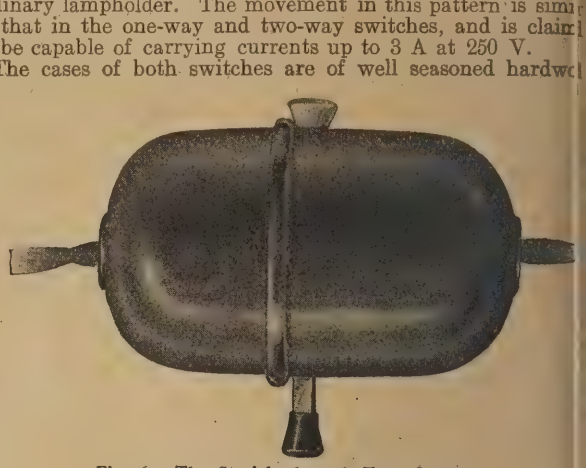


Fig. 6.—The Straight-through Type Switch.

(lignum vitae), and can be supplied in either the standa polished finish or white enamelled. They present a neat a pearance, and their overall dimensions are no larger th those of the old " flow make " type.

South African Municipal Electrical Engineers.

Review of the Proceedings at the Sixth Convention.

We have received a copy of the proceedings of the sixth Convention of the Association of Municipal Electrical Engineers of South Africa, held at Durban, Natal, from December 8th to 12th, 1924.* In the address of the retiring President, Mr. G. H. Swingler (Cape Town), reference was made to the inquiry by the Association early in 1924, into the vexed question of the allocation of profits made by electricity undertakings to the relief of the general rates. It was reported that the Electricity Department of the County Borough of Halifax had, during the course of its existence, contributed a net amount of over £90,000 to the relief of the rates, and because of this, there was an overdraft on the revenue account of £98,000, and the Department carried forward a deficit on revenue account of £36,000, against which there was a reserve fund amounting to only £1,800. The Halifax Corporation had, therefore, not only relieved the rates from the profits made by the undertaking, but had mortgaged future profits to the extent of the deficit. The case was an extreme one, but it was thought that the views of other undertakings on the matter would be of interest. A questionnaire on the subject was sent to a number of undertakings, and out of 119 replies received it was found that only 46 had received moneys at one period or other from the rates to make up deficiencies. Out of the 119 replies, eight were in favour of relieving the rates from electricity profits while every other reply was against such a policy. The President suggested that it would be to the benefit of the industry and the towns generally if it were made compulsory by law for all undertakings to be operated in a similar manner with regard to profits as applied in the case of the Commissioners' undertakings.

In his Presidential address, Mr. John Roberts, M.I.E.E. (Durban), in referring to the work of the Electricity Supply Commission, said that he hoped that the Commission would not adopt a too rigid control of new enterprises or insist on a uniformity of plant and method. Electrical machinery, as well as systems of supply, had been characterised by its great diversity of type. The best only had survived, and it was greatly due to the absence of central government control, which had resulted in a practical trial having been given to so many different methods, that the modern power station and distribution system to-day had evolved to the high state of efficiency and reliability it had reached.

Mr. Jacobs (Electricity Supply Commission), in reply to the President's address, said that the engineers of the Commission recognised that the development of the electric generator and prime mover to their present-day state of efficiency had been a slow process. They had not got to the end of that development and any new undertaking in connection with which the Commission might be consulted as to its economic possibilities, in so far as it complied with the Commission's idea of its duty, would be subject to no limitation of development.

A paper was read by Mr. Roberts and Mr. T. C. Shearer (Chairman, Durban Electricity Committee), on the " Control of Municipal Trading Undertakings." The authors suggested that the private company possessed an advantage over the municipality in having a more direct and simple organisation, also that the present system of municipal control entailed such an enormous amount of work by councillors, most of it co cerning comparative trivialities, that busy men grew impatie at the waste of time and gave up in disgust. They suggest that the work of the Municipal Council should be divid among six separate executives, with three councillors up each, and that the practice of the Legislative and Provinc Assemblies should be followed by payment of these executiv to the extent of £200 to £300 per annum per member, amou ing to the payment of councillors. Each of these executiv should be given full power to carry out the Council's instru tions.

After a lengthy discussion on " Standard Supply Pressure a resolution was carried, to the effect that the Conventi approved of 220 V as the uniform standard pressure at co sumers' terminals for lighting supply. (In the case of 3-pha this pressure was to be that between each phase and neutra

Mr. H. A. Eastman (Cape Town) read a paper dealing wi the commercial development of electricity undertakings, which he reviewed generally the progress of the electrici undertakings throughout the Union with particular attenti to installation work, which culminated in the following re lution being unanimously carried :—

" That the attention of the various Municipal Councils ow ing electricity undertakings be directed to the advisability calling the attention of the Architects' Associations in the district, to the necessity of embodying in their specificatio the provision of suitable and adequate accommodation in buildings for the installing of the Electricity Supply Authoritie service equipment."

After a discussion on the paper by Messrs. Roberts a Shearer, concerning the question of contributions to the reli of rates, the following resolution was carried unanimously :

" That this Convention of Municipal Electrical Enginee reaffirm the following resolution adopted at the 1917 Conve tion in regard to electrical contributions to the relief of rat and that the various municipal councils in the Union of S. owning electricity undertakings be advised accordingly.

" 1. That all charges arising between different departmen of a municipality should be based on standard tariff charg where such exist, and in the absence of such standa charges should be based on the net cost of services given received.

" 2. That we are of opinion that it is unsound policy militating against the successful financial operation of mun cipally-owned electrical undertakings to allocate net su plus profits for the relief of rates or for municipal funds, to make indirect charges so as to unfairly reduce net surpl profits.

" 3. That the rapid introduction of new and improve machinery for the production of electricity renders it im perative that every electricity undertaking shall set asid out of its net surplus profits an adequate amount to writ off obsolete plant.

" 4. That the only legitimate outlets for net surplus profi are the building up of an ample obsolescence fund, and th reduction of charges to the consumer in order to encourag the use of electricity."

* See Elec. Rev., January 23rd, 1925; p. 130.

Pulverised Fuel.

By DAVID BROWNLIE, B.Sc.

(Abstract of a Paper read before the Manchester Geological and Mining Society (Institution of Mining Engineers).)

The paper deals with recent developments in the use of pulverised fuel as applied to steam generation, briefly describing pulverised fuel installations, and the bearing of pulverisation on the subject of low-temperature carbonisation. It suggests to the colliery companies the adoption of low-temperature carbonisation at the pit head.

The first large boiler plant installation in Great Britain with pulverised fuel was at the Hammersmith electricity station, the original order for a "Holbeck" equipment for one boiler having been placed early in 1919, and the plant started up in December, 1920. Two more boilers fitted on this principle were set at work in April, 1923. It is unfortunate that detailed performance figures of this installation have apparently never been published, but it is stated the plant has been a success. In one comparative test with this pulverised fuel equipment there was shown, as against mechanical stoking, an advantage of 16 per cent. increase in thermal efficiency which is equivalent to £13,000 per annum.

To the mining industries the most interesting pulverised fuel fired power station is the 300,000 kW station at Cahokia, on the Mississippi, which belongs to the Union Electric Light and Power Co. and supplies the town of St. Louis. In this station "Lopulco" plant was adopted largely because of the difficult character of the cheap low-grade Illinois (Belleville) coal fuel, which is an almost impossible material to burn with any reasonable efficiency with mechanical stoking, but nevertheless the boiler plant efficiency with pulverised fuel was guaranteed at 85 per cent. for test conditions. The largest pulverised fuel equipment at present in operation in Europe is at the works of the Société anonyme Ougrée-Marihaye, Ougrée, Belgium. It consists of Raymond mills and the "Quigley" system of handling the pulverised fuel by means of compressed air conveyors at about 70 lb. per square inch pressure, "shooting" the charge to the burner bins, the total length of the conveyor type circuit being 2,300 feet and the capacity from 46 to 80 tons per hour. Both metallurgical furnaces and steam boilers are supplied, the capacity being 33 tons of coal per hour. In this case the degree of pulverising is excessively fine, 97 per cent. through 100 mesh and 84 per cent. through 200 mesh. The modern vertical gravity coal dryer on the "Wood" principle was operated experimentally at the Oneida Street station of the Milwaukee Electric Light & Power Co. for the two years 1921-1922, and the first large installation was that at the Cahokia station, whilst to-day the principle is in operation or being installed at Cleveland, Trenton Channel, and many other stations in the United States, at Vitry and Gennevilliers near Paris, and at Willesden, St. Pancras, Birmingham, and Derby in Great Britain. It consists of the use of a comparatively small vertical cylinder placed between the crushed coal bunker and the pulveriser containing inside two louvred pipes of narrow diameter cylinders, the coal passing downwards by gravity as taken away by the pulverisers underneath.

Part of the hot exit chimney gases, roughly about 10 per cent. of the total, equal to 3 lb. of gas and air per 1.0 lb. of coal, are taken by means of a fan and trunking, usually mixed with air to give a temperature of about 215 deg. F., and circulated continuously through the dryer back to the chimney again. The total power required is only about 3 kW per ton of coal, say, equal to 0.15 per cent. of the steam production of the plant.

The latest development of the continuous vertical gravity dryer is the use of air combined with exhaust steam heaters instead of air mixed with hot flue gas. The heaters are on the lines of the ordinary gilled steam radiator and are placed in the vertical drying cylinder, whilst the steam passed through them is either the exhaust of any convenient steam-driven auxiliary plant or "bled" specially from the turbine. The hot condensed water is returned to the boiler plant so that the dryer really functions as a condenser in which the heat is usefully employed in drying coal instead of being lost in the cooling water. In this new type of dryer about 30 square feet of heating surface per ton of coal per hour is required for every 1 per cent. moisture, whilst the amount of air passing through is about ⅓ that of the hot and waste heat dryer; that is, 1 lb. of air per lb. of coal. This is because the air from the boiler house is moderately dry and does not contain already a large amount of moisture as in the case of hot flue gases.

Fine grinding, such as 65 per cent. through a 200-mesh, is unnecessary, provided that uniform particles are obtained, say, 70 per cent. through 100 mesh. Roughly speaking, with modern mills and average fuel 90 per cent. through a 100 mesh is equal to all through 50 mesh and 70 per cent. through 200 mesh.

All kinds of refinements are being continually introduced. The Lakeside air-cooled walls of much lighter construction have been adopted with a 4½-in. patent brick ("Silocel") outer wall lined internally with steel instead of the heavy brickwork usually employed. The water screen is continued as usual, but the ash pit at the bottom slopes downwards at an angle of 38 deg., as compared with the previous flat shape, so as to facilitate the continuous discharge of the ash to the conveyor at the bottom. Another refinement is a housing over the outside of the arch setting and drawing over it the 10-15 per cent. of cold air required for combustion, which is passing to the adjustable-speed fuel feeders supplying the burners. This raises the cold air to about 75 deg. F., cooling the arches without wasting any heat.

One of the most remarkable of later inventions is the water-tube or "fin" wall, the invention of Thomas E. Murray, and first applied about 12 months ago at the Hell Gate power station, New York, in conjunction with multiple retort mechanical stokers. Essentially the principle consists in constructing the two side walls of the combustion chamber and the back wall as well, if necessary, of 4-in. steel tubes placed at 7-in. centres. To the side of each tube is welded a projecting steel plate or fin, one of which is 2½ in. and the other 1¾ in. from the tube surface. These plates or fins overlap, so that the wall is built up of 4 in. tube and 3 in. steel plate. The feed-water circulates through the tubes, and the result is an enormous increase in the net heating surface of the boiler next to the combustion space for the absorption of radiant heat, and remarkable results have been obtained at Hell Gate, up to 92.7 per cent. boiler plant efficiency, with mechanical stoking, by the use of this appliance.

One of the most striking results of pulverised fuel firing has been the size of water-tube boilers that is rendered possible. It is possible with one boiler for no less than 400 000 lb. of water per hour to be evaporated comfortably, and the Cleveland and Trenton Channel boilers will give this figure for long overload duty.

The flexibility of pulverised fuel firing has made possible the almost completely automatic boiler plant. The entire control of the working of a steam boiler from a distant switchboard was first developed at the Ford plant, and there has now been developed automatic control in which the rate of flow of the pulverised fuel and the air is controlled electrically by means of steam meter mechanism, which is operated by the actual flow of steam in the pipes. This regulates both the pulverised fuel feeders and the dampers, being so arranged that the relative proportion of fuel and air always remains constant for maximum efficiency.

The continuous thermal efficiency of steam generation that is being obtained by means of pulverised fuel firing can only be described as a revolution. The guarantees alone in a number of cases are over 86 per cent., whilst at Cleveland 87 per cent. is being obtained, with as high as 92.9 per cent. for single 24-hour tests.

The utilisation of refuse fuels is of importance to the colliery industry, and the Cahokia plant is therefore of particular significance. Pulverised fuel has enabled us to take practically any kind of fuel, except very low volatile anthracite and coke, and burn it at the highest efficiency, over 80 per cent. continuously, in any required amount so as to give in water-tube boilers an evaporation equal to the normal figures with good-class coal. That is to say, if a colliery had material of 50 per cent. ash and 25 per cent. water contents, it could still be utilised in, say, a 50,000 lb. per hour evaporation boiler and give this evaporation merely by increasing the amount of fuel passing through the burners. Mechanical stokers will not do this to the same extent, because they become clogged up with ash and clinker and all kinds of complications occur, such as the volatile content and the sulphur.

At the present time a "Lopulco" plant is being installed at the McCalls Ferry on the Susqehanna River, for the Pennsylvania Water and Power Company, where it is intended to burn anthracite refuse dredged up from the Susquehanna River above the dam. This material averages in the dry condition 15 per cent. ash, which includes some sand, and has about 4½-5 per cent. volatile matter. Another low grade fuel which is to be burnt by this method is Texas lignite, a plant now being in course of erection for this purpose in Trinidad for the Electric Bond and Share Company. In this case the raw fuel averages about 28-30 per cent. moisture and will be partially dried down to 15-20 per cent. before passing to the furnaces, while the ash content is low.

The position is so lamentable that it is difficult to give the plain facts without appearing to exaggerate, but this country could save with the greatest ease from 40,000,000 to 50,000,000 tons of coal every year, that is to say, from £50,000,000 to £75,000,000, simply by improving already existing methods and without spending millions of money on super-power station schemes. Out of the 260,000,000 tons of coal raised in Great Britain, about 75 per cent., that is, 195,000,000 tons, is consumed at home, apart from marine work. Of this something like 90,000,000 tons is used for stationary land boilers, and it will be remembered that the 58 per cent. average net working efficiency means that 20,000,000 tons every year could be saved in this direction alone, since the efficiency of boiler plant in general ought to average from 72.5 to 75.0 per cent.

The average hardness of the boiler feed water in Great Britain seems to be about 11 deg., representing 2,000 tons of scale a week deposited in the boilers, and probably a loss of 5,000,000 tons of coal per annum. Lack of superheating, efficient covering of steam pipes, including the flanges and condensation losses in general, probably represents another 5,000,000 tons. Many of the operations carried out in the iron and steel industries are so inefficient that less than 10 per cent. thermal efficiency is commonplace, in spite of the fact that producer gas firing would give 20-25 per cent. The author mentions two large iron and steel concerns that were squandering 500 tons of the best-quality coal per week on the boiler plant alone.

The colliery industry cannot expect that Great Britain will go on squandering 40,000,000 tons of coal every year, and pulverised fuel firing is a significant warning of this fact. It is suggested that the colliery concerns of this country should co-operate and concentrate on research and investigation work on low-temperature carbonisation and similar methods for the scientific use of raw coal.

Legal.

Stoller v. Davidson & Co.

At the Whitechapel County Court on July 29th, Mr. A. J. Stoller claimed the sum of £3 15s. 6d., representing the value of an accumulator which, it was alleged, was destroyed by fire while in the defendants' possession being charged. Judge Cluer pointed out that the plaintiff would have to prove negligence, and the latter held that leaving accumulators on charge at night unattended was negligence. The Judge, however, would not agree to that. He said that a point of law was involved which he would have to inquire into, and reserved judgment.

J. & M. Stone v. McCalla.

In the Lambeth County Court, on July 28th, before Judge Parry, Messrs. J. & M. Stone, 373, Brixton Road, S.W., electrical engineers, sued Mr. H. McCalla, Brixton, S.W., to recover £16 1s. 6d., for work done and materials supplied for the repair of the defendant's radio set.

Mr. Kauffman, in the employ of the plaintiffs, said that the firm supplied the defendant with a "Fellophone" valve set, in about 1922. There were no complaints until in 1924, when some new things were put into the set, but during that time they charged the accumulators.

Defendant said that he paid £66 5s. for the set, and was given no guarantee. The witness said that the firm did not give guarantees, as it did not get guarantees from the makers, but he went round to see that the set was in working order.

Judge Parry asked if the defendant had called anybody who knew something about radio, to give evidence for him. The defendant replied in the negative and the judge therefore adjourned the case for the defendant to bring an expert to state if the cost of the repairs was reasonable.

Miller v. The Scintillating Sign Co.

In the Chancery Division on July 28th, Mr. Justice Eve heard a motion in this case for leave to the Royal Bank of Scotland, the landlord of premises at Charing Cross occupied by the defendant company, to re-enter into possession. Mr. Beaumont, for the bank, said the motion was not opposed. The action was a debenture holder's action, in which a receiver of the defendants' property had been appointed. The receiver had written to say that he did not see how he could get out of the premises. The premises were let at £2,000 a year for the first year and £2,500 afterwards. The rent being in arrear, the landlord asked for leave to re-enter.

His Lordship granted leave as asked.

Tucker v. Wandsworth Electrical Manufacturing Co., Ltd.

Mr. Justice Tomlin, in the Chancery Division on July 29th, delivered his considered judgment in the action brought by Mr. John Bristow Tucker, of the firm of Tucker & Co., of Solihull, Birmingham, against the Wandsworth Electrical Manufacturing Co., Ltd., of Ludgate Hill, Birmingham, for an injunction restraining an alleged infringement of a patent relating to improvements in electrical switches. The defendants denied infringement, and alleged that the patent was invalid. (See Elec. Rev., July 10th, p. 53; and July 17th, p. 119.)

His Lordship said that electrical switches were made in various forms, the three principal being the rotary, tumbler, and knife-blade types. All these might be made with the quick make-and-break action whereby snap action was obtained, which produced rapidity of movement of make-and-break and adequate separation between the contact arm and the contact points, thus excluding danger of arcing. The plaintiff's first claim was for an electrical switch adapted to operate by quick make-and-break action by a compression spring element pivotally co-operating, on the one hand, with the contact arm, and, on the other, with an operating member, which member was utilised also for positively displacing the contact arm in the operation of make-and-break throughout the entire stroke as distinguished from positively displacing it only in the initial part of the stroke. The second claim was for a specific tumbler switch. The inventor did not limit his invention to any particular form of switch, though his drawings did not extend beyond the tumbler switch form. Switches had, in fact, been made in accordance with the drawings, and there had been a large demand for them. They were good switches and their utility was not questioned. The attack on the validity of the claim was based on prior specifications, the number of which was reduced to three, *viz.*, Rose, Cox, and Crabtree, prior user of Rose, and common general knowledge. It was admited that the first claim was not limited to tumbler switches and, having regard to Cox's patent and existing common knowledge as to the idea of positive actuation throughout the stroke of the contact arm, he did not think the plaintiff's first claim was valid. As to the second claim—for a tumbler switch—upon the material which he had before him, he had come to the conclusion that it could be supported. Cox's switch seemed to be substantially different in design and it remained to be considered whether the defendants' switch was an infringement of this claim. It was admitted that, with one exception, it could not be distinguished from the plaintiff's switch. It was true that the spring was of the push compression kind instead of pull compression, but the difference emphasised by the defendants was the fact that in a groove on the operating member there was a slide containing a small compression spring. It was said that the slide constituted an intermediate integer between the spring element and the operating member, and therefore the spring element was not positively co-operating with the operating member. In his opinion the slide element was an integral part of the operating member, and the spring element was pivoted on the operating member. The result was that the action succeeded with regard to the second claim, and there would be a proper injunction and an inquiry as to damages. The defendants must pay the costs, except so far as they were increased by the first claim, and the defendant's costs, as thus increased, must be paid by the plaintiff. There would be the usual set-off.

He granted certificates in respect of five particulars of objection, and agreed that the operation of the injunction should be suspended if the appeal was proceeded with speedily.

Reviews.

Practical Water Power Engineering. By W. T. Taylor, M.Inst.C.E., M.I.E.E. Pp. vi+270; figs. 33. London: Crosby Lockwood & Son. Price 36s. net.

Certain branches of engineering lend themselves less readily than others to exact quantitative treatment and consequently depend, for successful practice, very largely on the experience and judgment of individuals. Where the data, on which a design must be based, are difficult to obtain with exactness and the considerations to be weighed are numerous and conflicting, the application of hard and fast rules is impossible and the personal element is all-important.

Such a subject is that of "Water Power Engineering," and the position is aptly described by Mr. Taylor in the following terms (p. 147): "One of the characteristics of hydro-electric work is that it is almost futile to lay down fixed laws. . . . Each particular case must be governed by its own law—whether it be the catchment, the stream, the developed waterways and plants, or the power load."

In such a subject the existence of sound text-books is a matter of great importance and the difficulty of writing them is correspondingly great. To produce a treatise which will present a clear account of the somewhat indefinite principles involved and their application in practice is no small matter. Mr. Taylor has, however, succeeded admirably in this difficult task and has at the same time managed to steer clear of the danger of overburdening his book with the numerous scanty descriptions of existing installations, which make so many "practical" treatises little better than a sketchy encyclopædia or a collection of extracts from manufacturers' catalogues. This book, which is based to some extent on articles which appeared previously in the Electrical Review, is also free from the tendency to reiteration and lack of unity that often characterises books founded on a series of separate articles.

The subject of "Water Power Engineering" can be roughly divided into four branches: the study of the source of supply; the transport of the water to the power plant; the conversion of hydraulic into electric power; and the transmission of the electric power to the place of utilisation.

The first of these divisions is undoubtedly the one which presents the greatest difficulties. The only satisfactory basis for estimating the quantity of water available is a complete set of observations on stream flow extending over many years and it is seldom that these are available. Even where adequate rainfall records exist there still remains the problem of deducing therefrom the probable run-off in the catchment area. On pp. 26 and 27, Mr. Taylor lists twelve methods which may be used to express the relationship between rainfall and run-off (and these do not include all the formulæ that have been pro-

posed). These hydrometric questions of rainfall, run-off, storage and stream flow are dealt with very thoroughly in Chapters 1 to 5. As a matter of detail it may, however, be permitted to doubt whether the method suggested on page 78 for determining stream flow by adding salt in known quantities and measuring the conductivity of the water would give accurate results in view of the influence on the conductivity of the many possible impurities.

The design of conduits and pipe-lines is discussed in detail in Chapters 6 to 8. Numerous tables and charts are given to facilitate the computation of the formulæ required in this connection and should prove of assistance to the designer. It is to be regretted, however, in the case of these charts as well as those which occur elsewhere in the book, that the nomographic method of charting equations was not adopted instead of the system involving a network of scales. The very distinct advantages of the nomographic method, which does not yet appear to be used in this country as extensively as it deserves, lie in the small number of lines (one for each variable) constituting the chart, which is thus easily read. There is also a considerable gain in accuracy since interpolation is made along a scale rather than between curves, and furthermore it is possible to note instantly the change in one variable consequent upon changes in the others. It is to be hoped that this type of chart will be used when a second edition is contemplated.

A subject of special interest in relation to the possibilities of water power development in Great Britain is dealt with in Chapter 9, where the question of small water power plants with automatic control is discussed. Since there are few large water power schemes feasible in this country, future developments must largely take place on the lines of utilising the smaller powers. That there is room for such development is shown by the fact that Great Britain has developed less of her available water power (8 per cent. of the total) than any other large country except Russia. In the case of small water power plants automatic control enables operation costs to be reduced to a minimum and often becomes the determining factor in deciding whether a given scheme is economically possible. The development of these smaller water-powers can be gradually increased to meet the demand by linking up more plants with a central control station. The possibility of operating such plants in conjunction with large coal-using power stations is also a considerable advantage.

The question of high-voltage power transmission is dealt with in some detail in Chapters 12 to 14. Although this subject might at first sight appear somewhat removed from the scope of "Water Power Engineering," it is to be remembered that it is almost entirely due to the developments of the last thirty years in the possibilities of economical power transmission over long distances that many water power schemes have been rendered feasible, since many suitable sources of water power are situated at some distance from the place of power demand. It is therefore logical to assume that the water power engineer should be acquainted with the design and economics of transmission lines, as these form an integral part of any hydro-electric scheme which must be considered as starting with the rainfall in the catchment area and finishing at the place of consumption of the power generated.

On the whole, Mr. Taylor's book should be very welcome to those interested in hydro-electric engineering on account of its lucid exposition of fundamental principles and the application of them to the practical and economic problems involved.

A. J. V. Underwood.

An Outline of Automatic Telephony. By William Aitken, M.I.E.E., Assoc. A.I.E.E. Pp. 143; figs. 43. London: Ernest Benn, Ltd. Price, 5s. net.

This small handbook is written with the object of providing within a small compass a description of the various telephone systems in use in the world to-day. It will also be found to furnish an introduction to the author's large work "Automatic Telephone Systems."

There are, in all, ten chapters dealing with systems and apparatus, both self and power driven; and including the W.E. Co.'s rotary system and panel system, the Ericsson, Stockholm, system, the Director system, and semi-automatic working. Prominence has been given by the author to the details of the Director system because of its adoption in the London and other large areas. In this connection it is pointed out that the student should realise that principles and fundamental features of one system are frequently applicable to the solving of problems in others," and hence the necessity for avoiding a too exclusive consideration of one system only.

There are no fewer than 42 illustrations throughout the text to assist the reader in obtaining a clear idea of the actual apparatus described, and to enable him to trace the various switching operations by means of circuit diagrams. In addition, a lengthy extract is given from a paper read by Col. T. F. Purves, Engineer-in-Chief to the Post Office, before the Institution of Electrical Engineers, in which an outline is given of the A.T.M. Co.'s Director system for London.

The book will be of great service to those who desire to have a suitable introduction to larger works dealing with automatic telephony—conspicuous amongst which is the author's own three-volume work—and will undoubtedly be useful for class work purposes to students who are taking the City and Guilds courses in telephony.

Low Temperature Distillation. By S. H. North and J. B. Garbe. Pp. viii+216; figs. 40. London: Sir Isaac Pitman and Sons, Ltd. Price 15s. net.

An authoritative general treatise on this interesting and important subject is welcome, in view of the close attention that is being given to the better utilisation of our stores of coal, the provision of smokeless fuel, and the production of fuel oil within our own borders. That these problems will ultimately be solved we have no doubt, though much of the labour expended upon them in the past has proved unfruitful, yet we learn by failure as well as by success, and the authors, by giving the history of the subject and describing the earlier work as well as more recent developments, have done good service to the inventors of to-day. It is worthy of note that by low-temperature distillation the greatest yield of oil of good quality is obtained, and seeing that the use of oil as fuel is rapidly extending, whilst the natural supplies of oil are likely to be short-lived, the bearing of the matter on the production of energy with high economy is obvious. According to the authors, if low-temperature carbonisation became general (apart from gasworks and coke ovens, which consume 38 million tons per annum), 150 million tons of coal annually treated thus would yield at least 450 million gallons of motor spirit and 250 million gallons of crude oil, of which 50 per cent. is high-class Diesel oil, the result being an enormous reduction in the national coal bill and a great saving in subsidiary expenditures due to the burning of coal by the present wasteful methods.

The numerous systems projected or in operation are described and illustrated, the raw materials and the resulting products are discussed, and the possibilities of utilising lignite, peat, and shale are examined; and in an appendix a large amount of information in the form of analyses, &c., is given. As large users of fuel, electrical engineers are being led or forced by circumstances to study the nature and treatment of coal more and more closely, and the growing use of pulverised fuel is further stimulating attention to this subject, which is of fundamental importance in the production of energy by thermal methods. That they will eventually, either independently or in conjunction with gas producers, endeavour to use coal more efficiently and without loss of the valuable by-products, cannot be doubted, and this book should help towards that end.

French-English and English-French Dictionary of Technical Terms. By J. O. Kettridge, F.S.A.A., A.C.I.S. Pp. xvi+1,137. London: George Routledge & Sons, Ltd. Price 50s. net.

This is a monumental work, and the work not of a symposium but of one man, whose industry must be inexhaustible—for the same author has already written a similar dictionary dealing with financial and business terms. His aim has been to cover all branches of engineering, as well as of the numerous departments of science upon which engineering is based, and he includes a method of telegraphic coding to enable any entry in the volume to be expressed by a 10-letter word with indicator and check. The dictionary gives the translations of 100,000 words and phrases, arranged alphabetically on a consistent and efficient system which facilitates reference, and the user need not be familiar with both languages—a knowledge of either is sufficient. Not only single words, but also compound words and phrases are dealt with, and where the meaning of a word differs in accordance with the application of the moment, a separate paragraph is allotted to each sense; thus the word "box" in the English-French section appears 43 times, *e.g.*, "box car," "box connecting-rod end," "box-coupling," &c. The author has been generous in his selection of phrases; thus under "fit" we find "fit in," "fit out," "fit up," and under "form," "form a favourable opinion (to)." "Lord Kelvin's mirror galvanometer" appears as an entry.

We cannot but admire the author's achievement, which represents the fruit of immense labour. It is true that, covering so wide a field, which bristles everywhere with technicalities, he could not be expected invariably to grasp the true meaning of an unfamiliar word—for example, "commutatrice," which does not mean "commutator"; and in so great a mass of words and phrases, the specifically electrical items appear to be comparatively scarce.

The word "self" does not appear as an entry in the French section, though it is used in a translation, and the word "mil" is absent from the English section. No doubt we could find many faults in so huge a target; but we could doubtless find as many merits, and we prefer to commend the work as a most praiseworthy attempt to deal with a problem which can never find a perfect solution.

Electricity Supply Costs and Charges. By H. M. Sayers, M.I.E.E. Pp. 80; figs. 6. London: The Electrical Review, Limited. Price 2s. 8d. post free.

The author of this book describes it as an "attempt to set out the general relations governing the cost of electricity supply and to suggest methods of detailing the costs in forms which afford guidance to a progressive policy"; and every reader of it, whether or no he agrees with all its conclusions, will congratulate the author on the thoroughness with which he has treated his subject. In the unfortunate absence of efficient facilities for generating electricity for stock and storing it, as water can be pumped into a reservoir, or gas fed into a gasholder for a limited number of hours a day at a constant rate quite unrelated minute by minute to the demand of the moment, electrical generating stations (to quote the author's

words once more) "do not on the average work at their capacity for six hours per day, but they have all the costs of keeping running for 24 hours per day, as well as the capital charges which might well be spread out over . . . [a greater] production." The book discusses with great minuteness every item of the cost as it affects and is affected by these peculiar conditions, and deals with the problem not only as it arises in the generating station but also as it concerns the much more difficult area of the distributing system. The author does not hesitate to suggest that it may touch controversial subjects, but, as he says, "dissent and discussion . . . imply thought and examination, out of which come knowledge and assurance"—a sentiment with which it is impossible to disagree, provided the dissenting and the discussing are done by the proper persons. There has been far too much said in public, that is, in the hearing of consumers, about costs and charges and tariffs. These matters are for discussion amongst those who understand them and those who ought to understand them, just as medical subjects are debated more or less behind closed doors and not with a gaping crowd of possible patients looking on. It is not necessary even for every person engaged in electricity supply or in electrical engineering generally to understand them; they are, in fact, the province of a special type of mind, the fortunate possession of a few who are engineers gifted with a sense of economics and with imagination in addition—the type of mind that thinks of saying, as the author does on page 77: "The sweet simplicity of Kelvin's law expresses a truth which the author would be the last to condemn, but the requirements of a road authority in respect to excavation and making good a cable route may easily swamp the benefit of conformity to that law, when reduced to the common denominator of £ s. d." Just as an accountant is brought in from outside to design a set of books for a business concern, so the engineer-accountant, a very highly cultivated expert, should be entrusted with the task of examining the particular conditions of an electric supply concern and of designing a method of recording, in proper form, the information required, as the author points out, before any intelligent prediction can be made of the effect of new load on costs and therefore of what charge should be made when the new load comes on, both for it and possibly also for existing loads. It is scarcely to be expected that so specialised a piece of work can be carried out by the ordinary station staff; and the more suitably it is done in the first instance, the more easily will it be kept going by the ordinary staff afterwards.

The book deals with costs and with charges in a general way rather than with tariffs in particular, but the bearing of these on the question of tariffs is obvious. It is essential somehow to get down to a simple and easily applied tariff; and it is impossible to have it changing frequently even though conditions change. It is exceedingly difficult, or let us say impossible, to devise a tariff logically and correctly applicable to every consumer; here, as so often, compromise is the solution, and the value of the book under review is that it is a contribution to the understanding of its subject that will lead to the best compromise because it shows how to take into account all the factors influencing it. There is ample evidence that it is the present cost of electricity that prevents its wider adoption for both domestic and industrial purposes; and the better the whole subject is understood by those who ought to understand it, the more ably will they convince those who ought to use electricity that it is to their interest to do so.

Of the book itself it may be said that it is well-produced, except perhaps for a rather awkward four-page section between pages 44 and 49, and except for the few misprints that seem inevitable nowadays in every book. They are not serious; but it may be suggested that in a reprint it would be useful if the four diagrams (pages 41 to 44) were redrawn so as to match each other in their scales, and if the zeros of both axes were shown (the latter comment applies also to figs. 5 and 6), particularly because the whole point of the diagrams is that the coal consumption is not zero for zero output, and this is not obvious in their present form.

The writer of this review has no connection with any supply undertaking except as a consumer alleged to be too modest in his demands; he is therefore one of the "gaping crowd of possible patients," and, as such, ought never to have seen the book at all. But he is grateful for it; some of us have an insatiable inquisitiveness. So one who has absorbed every word of the book with thanks for its clearing-up of many important points would say to any other who may have come with him to this end of the review: Go, and do thou likewise.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

490. "Continuous transmission of visual images by wire or wireless." L. H. Sensicle. January 8th, 1924. (236,464.)

3,033. "Manufacture of electric conducting and resistance material." H. Wade (Nederlandsch Technische Handel Maatschappij Giro). February 5th, 1924. (236,880.)

5,632. "Electric motors." Lancashire Dynamo & Motor Co., Ltd., R. S. McLeod, G. E. Mason, and W. Stansfield. March 5th, 1924. (Cognate application 8,218/24.) (236,609.)

6,128. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. and A. A. Pollock. March 10th, 1924. (236,611.)

7,632. "Device for connecting electrical conductors and the like." Deutsche Gasglühlicht Auer Ges. September 7th, 1923. (221,471.)

7,707. "Device for connecting electrical conductors and the like." Deutsche Gasglühlicht Auer Ges. December 28th, 1923. (Addition to 221,471 (226,770.)

7,758. "Cathodes for vacuum electric devices." E. Y. Robinson. March 26th, 1924. (236,615.)

8,478. "Method of fixing the caps of thermionic valves, electric lamp bulbs and the like." P. V. Castell Evans and J. M. Longe. April 3rd, 1924. (236,618.)

8,482. "Electrical insulating material." E. B. Wedmore, W. S. Flight and British Electrical and Allied Industries Research Association. April 3rd, 1924. (236,619.)

8,922. "Electrical operations of railway points and signals." B. H. Peter, L. H. Peter, and Westinghouse Brake & Saxby Signal Co., Ltd. April 8th, 1924. (236,640.)

8,977. "Transmission systems." Western Electric Co., Ltd. April 9th, 1923. (214,249.)

8,985. "Portable electric safety lamps." T. H. Baily and W. Evans. April 9th, 1924. (236,645.)

9,038. "Radio signalling systems." R. D. Bangay. April 9th, 1924. (236,647.)

9,039. "Means for obtaining negative resistance effects and for generating electric oscillations and radio receivers." H. J. Round and N. M. Rust. April 9th, 1924. (Cognate applications 9,040/24 and 17,733/24.) (236,648.)

9,048. "Sound amplifying conduits." J. S. Flizikowski. April 9th, 1924. (236,650.)

9,154. "Protective arrangements for alternating-current systems." British Thomson-Houston Co., Ltd., and A. S. Fitzgerald. April 10th, 1924. (236,656.)

9,187. "Railway signalling systems." Automatic Telephone Manufacturing Co., Ltd., and A. E. Hudd. April 10th, 1924. (236,660.)

9,232. "Electrical connector." E. W. Bonson. April 11th, 1924. (236,66

9,460. "Systems for the transmission of electromagnetic radiant energy." W. J. Mellersh-Jackson (A. Taylor). April 14th, 1924. (236,673.)

9,634. "Crystal detectors for wireless telegraphic or telephonic apparatus." F. K. Woodroffe and R. N. Dawson. April 16th, 1924. (Cognate application 28,488/24.) (236,678.)

9,849. "Electric cables." J. Delon and Compagnie Générale des Câbles de Lyon. December 29th, 1923. (226,771.)

9,851. "Telephone receivers and transmitters and the like electromagnetic instruments and the manufacture thereof." British Thomson-Houston Co. Ltd., and A. P. Young. April 17th, 1924. (236,680.)

10,024. "Wireless systems for communication between ships and the like." H. Leuner. April 22nd, 1924. (236,683.)

10,640. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd. September 17th, 1923. (222,079.)

10,858. "Telephone receivers." F. J. Hooper and W. H. Derriman. May 2nd, 1924. (236,691.)

10,940. "Thermionic valves or electron discharge tubes." Mullard Radio Valve Co., Ltd., C. F. M. Hayes, and L. Grinstead. May 3rd, 1924. (236,692.)

11,514. "Reclosing circuit-breaker systems." British Thomson-Houston Co., Ltd. August 8th, 1923. (220,275.)

12,159. "Diaphragms for use in sound-reproduction." J. Graham. May 17th, 1924. (236,699.)

12,417. "Substitute for batteries in radio receiving sets." P. B. Frost. May 21st, 1924. (236,702.)

13,742. "Crystal detectors for wireless receiving apparatus." B. Mathieu. June 5th, 1924. (236,711.)

14,717. "Construction of rotors for high-speed machines." English Electric Co., Ltd., and A. D. Sloan. June 18th, 1924. (236,717.)

16,236. "Loose couplings for use in radio reception." F. H. P. Monkhouse. July 7th, 1924. (236,726.)

17,420. "Electric cooking appliances." J. Lyons & Co., Ltd., and P. Douglass. July 21st, 1924. (236,735.)

18,445. "Motor-vehicle lamps." J. Lucas, Ltd., and O. Lucas. August 1st, 1924. (Cognate application 23,094/24.) (236,774.)

19,077. "Mountings for the terminals of selector switches." Western Electric Co., Ltd., and B. B. Grace. August 11th, 1924. (236,749.)

19,334. "Tiltable electric conducting liquid switch." Lurgi Apparatebau Ges. March 6th, 1924. (230,406.)

20,022. "Magnetic separators." H. H. Thompson, A. E. Davies, and W. E. Box. August 25th, 1924. (236,758.)

20,407. "Electric power transmission." A. M. Taylor. April 28th, 1924. (Divided application on 221,304.) (236,759.)

21,401. "Cooling systems for thermo-electronic apparatus." British Thomson-Houston Co., Ltd. November 21st, 1923. (225,177.)

21,977. "Electric measuring apparatus." International General Electric Co. Inc. September 20th, 1923. (222,132.)

25,354. "Electrical conductors." M. J. Railing, C. E. Cutting, and F. Quance. October 24th, 1924. (236,786.)

25,556. "Electrical condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (236,788.)

27,120. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. November 13th, 1923. (224,905.)

27,139. "Electric contact plugs." Pathé Cinema Anciens Etablissements Pathé Frères. December 1st, 1923. (225,532.)

27,220. "Inductance coil plug." B. Ross. November 14th, 1924. (236,8

28,567. "Electron discharge devices." British Thomson-Houston Co., Ltd. February 19th, 1924. (229,634.)

28,878. "Zone poles for magnetic separators." P. C. Rushen (F. Krupp Grusonwerk Akt. Ges.). December 2nd, 1924. (236,808.)

29,430. "Filament supports for use in electric discharge tubes, incandescent lamps, and the like." British Thomson-Houston Co., Ltd. December 15th, 1923. (226,196.)

30,084. "Portable electrical rectifying devices." H. A. Gill (Deutsche Telephonewerke und Kabelindustrie Akt. Ges.). December 15th, 1924. (236,816.)

30,392. "Process for the production of a good contact surface for bonding the rails of electric railways." Siemens-Schuckertwerke Ges. February 15th, 1924. (229,269.)

30,871. "Electric motors combined with gearing." J. F. Monnot. December 23rd, 1924. (236,821.)

1925.

2,523. "Head-lights for vehicles." L. J. Bleret. February 2nd, 1925. (228,552.)

5,124. "Incandescent cathodes for Röntgen and like discharge tubes." Siemens & Halske Akt. Ges. February 26th, 1924. (230,067.)

5,758. "Electric drink-mixers." R. B. Gilchrist. March 3rd, 1925. (236,857.)

6,299. "Telephone systems." Telephone Apparat Fabrik E. Zwietusch & Co. Ges. Kommanditges. March 7th, 1924. (230,485.)

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London's Electricity Supply.

AT last—on July 31st—a definite stage has been reached in the reorganisation of the supply of electricity in the Metropolitan area—an area comprising a population of some eight million souls. The labours of the Electricity Commissioners, who have been engaged for five years in endeavours to solve this knotty problem, have at last borne fruit, and one can imagine them heaving a sigh of relief, though their work is far from finished. Under the new *régime* the aspirations of the Commissioners are only in part fulfilled, and compromise is written large over the Order which will now come into operation. The attempt to induce the public and private undertakers to work together for the common good broke down disastrously; like so many other projects designed to promote the welfare of the public, it was wrecked on the rocks of vested interests and parochial patriotism, and the dream of a single all-embracing scheme, such as that which is in successful operation in Chicago, was dissipated, or at least its realisation was postponed for half a century to come. But many changes may take place in that long time; and anyhow, it will fall to another generation to deal with the problem.

The proposal to divide London between the rival claimants was surely the last resource—as drastic a conception as that of King Solomon, and as little worthy of being called a "solution" of the problem as Alexander's cutting of the Gordian knot; it was, however, a way out of the blind alley into which the parties had strayed, and as such we must accept it. Had the Commissioners been endowed with larger powers the outcome would have been very different; and here again we see the inefficiency that invariably results from Parliamentary control of industry—particularly the electrical industry, which it has hampered from its birth. The Commissioners have made the best of a bad job, and they have our sympathy.

Accepting the situation we find London and the Home Counties shared out between two power companies, two groups of authorised supply companies, an uncom-

bined group of municipal undertakings, and a similar group of unassociated company undertakings, the whole subordinated—more or less—to a Joint Electricity Authority of which the constitution is mainly municipal. The power companies have statutory rights, and will be largely responsible for the conduct of electricity supply in their own areas; the London companies will operate as two separate undertakers; the other companies and the municipal authorities, apparently, will continue to work on individual lines, subject, like the company groups, to the Joint Electricity Authority. It will be seen that the unification of London's electricity supply is still a long way off.

And what will be the outcome of the new arrangement? Perhaps the most important factor will be the security of tenure granted to the London companies, in exchange for the adoption of a sliding scale of prices and dividends. It will no longer be necessary for them to build up reserves in anticipation of a crisis in 1931; they will be able to lay out capital on the extension of their mains, and to adopt a policy of welcoming new consumers and increased consumption, which some of them have hitherto endeavoured to discourage by charging prices which can only be described as exorbitant; they will be impelled by the operation of the sliding scale to lower their tariffs in order to increase their dividends; they will be able to generate electricity more economically by shutting down wasteful plant, erecting large up-to-date works, and interlinking their areas, and other economies will also become feasible. The position of the local authorities will not be so materially changed, but at least we may hope to get rid of some of the small stations and to economise on generation, and to see a forward policy adopted throughout the area. But all this will take time, and no appreciable improvement is likely to accrue for a year or more.

In conclusion, we would once more point out that, whilst abundance of supply can be achieved with ease by erecting large power stations, and various small economies can be effected on the lines mentioned above, real cheapness can only be attained in one way—and that is by supplying more energy per pound invested in plant. The utmost thermal economy, as we have shown, can have but little effect on the selling price: *a greater ratio of output to capital* is the one indispensable factor of cheapness. Let the supply authorities bear that fact in mind, and let them remember that to this end the co-operation of the consumer is essential. Hence an educational campaign is necessary to tell the public what electricity can do for it. If every private consumer in London doubled his average consumption, by increasing his use of electricity for purposes other than lighting, the price of electrical energy could at once be lowered by a greater amount than if coal were supplied to the power stations free of cost.

Electricity and the Coal Mining Industry.

Electricity supply in this country being almost wholly dependent upon coal as the prime source of energy, the fortunes of the coal mining industry are necessarily of immediate interest to electrical engineers. There is perhaps a tendency to look no farther than the pile in the coal store, or at most the loaded trucks on the station siding, but that is a somewhat short-sighted view; coal is the raw material from which the engineer produces light, heat, and power—a magical transformation indeed!—and the maintenance of a continuous and adequate supply is of the utmost importance not only to the station manager but also, though less directly, to almost every branch of the electrical industry. Our readers, therefore, must have received with a feeling of relief the announcement that for the next nine months at least peace in the coal mining industry is assured—whatever may be their views as citizens regarding the method employed to attain this result. We have on previous occasions recorded our opinion that the adoption of the seven-hour day and the minimum wage would bring disaster to the industry, a forecast which has proved only too accurate. We trust that the exhaustive inquiry into the conditions of the industry which is now to be carried out will lead to a solution of the difficulties which beset it, though we cannot affect to be optimistic on the subject.

But the mining industry in turn is a customer for electrical products, and in this relation the prospects are much more encouraging. In our issue for July 31st we summarised the report of the Secretary for Mines for 1924, which showed that the use of electricity for mining purposes was steadily advancing; out of 2,855 mines at work, 1,630 are electrically equipped, and the aggregate horse-power of the motors in use increased last year by 117,187 h.p. to a total of 1,481,932 h.p. Nearly half the coal-cutting machines in use are electrically driven, and the electric safety lamp is gradually ousting the flame type. But there is still immense scope for development in all departments. Over 1,200 mines are classed as not electrically equipped, and even in those which are more fortunate, full use is not yet made of electricity; for instance, though 216 conveyors were installed at the coal face in 1924, the total number of conveyors at work was only 1,373. Electric haulage below ground employed motors of 343,586 h.p., but this amount would be greatly increased if electric locomotives could be used to replace ponies, and it is to be hoped that the recent competition for the design of a suitable tractor will help to solve this problem, not only in the interests of economy but also on humanitarian grounds. That British electrical manufacturers are ready and able to cope with any requirement of the mining engineer was well shown at the Manchester Mining Exhibition, of which a report appeared in our last two issues, and the article on motors for electric coal-cutters which we publish to-day, explaining the severe conditions under which these machines have to work and the special designs which have been evolved to cope with them, will be found of interest even to those who are not directly connected with the mining industry.

Progress in Industrial Lighting.

It is satisfactory to see, in the annual report of the Chief Inspector of Factories for 1924, a very sympathetic reference to the importance of good industrial lighting. Here one may trace the influence of the co-operation of the Illuminating Engineering Society, and its representatives on the Home Office Departmental Committee. The experience of inspectors is that since the issue of the third report, two years before, there has been decided progress. These years have been utilised in bringing the suggestions of the Committee to the notice of managers of factories, and in inviting the co-operation of industrial councils in determining the conditions desirable in the various industries. We read that offers to send inspectors equipped with illumination photometers have been almost invariably warmly welcomed. Measurements thus made have given encouraging results. In most of the factories visited the working illumination exceeded the minimum recommended for "fine" work (3 foot-candles). In many cases the minimum for "very fine work" (5 foot-candles) was also exceeded, and one well-equipped installation (where originally only 1 foot-candle was recorded) now registers values of from 13 to 23 foot-candles. One knows, of course, that there is a very great deal to be done, and that there are still many factories of which the lighting is far behind modern ideals (some sections of the textile industry seem to be backward in this respect). But one forms the impression that these defects are due simply to want of knowledge, and that in course of time, as educational efforts are proceeded with, appreciation of better lighting will become more general. The essential thing is that assistance is welcomed. This, we believe, is ample justification of the lenient and sagacious way in which the Home Office has handled the matter. It is always easy to impose severe regulations, and it requires much more effort

and patience to bring about results by persuasion rather than by force. The former slow but sure method is much to be preferred, and the electrical industry should be grateful for the good work that the Home Office Factory Department is doing, and support its efforts in every possible way.

Electricity in Time-keeping.

That electricity is the handmaid of science and industry is a truism of which innumerable examples are readily forthcoming, and to the science of accurate time-keeping it has been especially helpful—indeed, its aid has been indispensable. The Royal Observatory at Greenwich, which was established by Charles II in order to facilitate the determination of longitude at sea, a matter which depends upon the accuracy with which the time is known, was enabled to distribute the true time to important centres on land by the adoption of the telegraph for this purpose, and the time service was later extended to the whole country and even to individual subscribers by similar means, whilst nowadays the B.B.C. has rendered it available by radio-telephony at infinitesimal cost to almost every householder.

But it is not only in the transmission of time signals that electricity is indispensable: it has also been of the greatest value in recording the time, and in securing uniformity of time-keeping throughout large establishments at small expense by means of master-clocks actuating subsidiary dials. The electric clock has always been a fascinating subject for study and invention, and has been steadily improved by the elimination of wheel after wheel until only a simple escapement remains to maintain the motion of the pendulum and to enable it to control, by electrical impulses, even the largest turret clock.

It would seem that one could go no further; but the ingenious device of Mr. W. H. Shortt, M.Inst.C.E., working in collaboration with Mr. F. Hope-Jones, M.I.E.E., chairman of the British Horological Institute, whereby the last vestige of clockwork—namely, the escapement—was removed and the pendulum was left absolutely free and untrammelled, whilst the work of control was transferred to a "slave" pendulum, was in reality the most important step of all. According to Prof. Sampson, of Edinburgh Observatory, as recorded in our "Notes" to-day, other clocks are "hardly able to serve as a check upon it," and thus the supremacy in accurate time-keeping, which was won for us by Tompion, Graham, and Harrison two centuries ago, but wrested from us by Germany in 1890, has now been regained for this country. Several other observatories, including Greenwich, have installed "free-pendulum" clocks of the same make.

Trade Representatives Abroad.

The need for securing new and larger export markets for the disposal of our manufactures, and the importance of cultivating inter-Imperial trade to the fullest possible extent, are points that have been so often stressed in public speeches, that it may seem unnecessary to mention the subject again so soon. The matter arises, however, in connection with a consideration to which we have frequently given emphasis when urging the efficient exploitation of overseas markets and to which Sir Edwin Stockton has given prominence when dealing with Malaya. The point is this: That we need the very best and the very keenest of the rising generation to go overseas to champion our cause and build up Imperial trade. The special fitness required of electrical men who are sent upon such expeditions has long been recognised, and some very good men have been produced by our manufacturing and trading concerns. The present active state of the electrical trade may be partly due to the attention that has been devoted to better export organisation in recent years, but as it is necessary for us not only to maintain, but wherever possible to increase, that trade, the work of selection, training, and promotion of export travellers and representatives is not a class of activity in which we can afford to slacken off. There are overseas markets from which the complaint comes to hand that they are seldom, if ever, visited by British commercial and technical trade representatives, although agents from other manufacturing nations are there full of zeal and energy. If the complaint of former days that there is a lack of suitable men still holds good, we must select and train more members of the existing home staffs for Colonial and foreign service. Sir Edwin Stockton has called attention to the need for proper treatment of our younger men who go overseas to build up our commercial fortunes, and at such a time as this when we are more challenged than ever by competition, the best men must be obtained, they must be well treated and encouraged, and given a reasonable chance of prosperity in their own and their families' interests. He holds that, if this matter is not properly attended to, we shall suffer for it not merely in the long run, but in the very near future. As we are not unfamiliar with the ungenerous terms which are sometimes offered to British engineers and traders when invited to leave these shores for British foreign technical and trading positions, and as we have had occasion to compare them with the better conditions, status, and authority accorded to such men by companies operating from across the Atlantic and from the Continent, we record Sir Edwin Stockton's views for consideration by electrical and allied authorities.

Workmen's Compensation.

All disputes between employer and employé in reference to compensation claims are settled by arbitration in accordance with the Workmen's Compensation Acts, 1906 to 1923. The arbitrator under such circumstances is the County Court Judge of the district in which all the parties concerned reside, or if they reside in different districts, the Judge of the district in which the accident happened or where the employer resides or carries on business.

In the case of "Hunter *v.* Stadtische Hochseefischerei Gemeinnutz Gesellschaft," difficulty arose as to the jurisdiction of the Court because English law is ineffective in foreign countries on account of the difficulty of its enforcement.

Briefly, the facts of the case were that on February 15th, 1922, Thomas Hunter injured his knee on the German ship *Konigsberg* lying in Tyne Docks, South Shields. The German firm admitted the liability and paid the workman until June, 1922. Later the knee became bad again, and a claim for compensation from May 16th, 1924, to date was made against the liquidator in Bremenhaven, as the German firm had since gone into liquidation. The liquidator denied liability on the ground that as he represented a foreign company registered in Germany, he was not within the jurisdiction of the Court. The workman contended that he had a right to compensation against any employer, and that if a foreign employer chose to employ a British workman to work in the United Kingdom he did so with the obligation to make compensation in case of an accident whatever his own nationality or the situation of the registered office of the company might be. The County Court Judge upheld the liquidator's objection and refused to hear the case. The workman appealed.

In the Court of Appeal the Master of the Rolls said that by Section 1 of the Workmen's Compensation Act, 1906, liability attached to the employer notwithstanding any contract to the contrary, and there, special facilities were given against the owners of a ship liable to pay compensation under the Act. A County Court Judge could issue an Order under Section 11 of the Act detaining the ship until compensation was paid, or security given for it. The terms of the Act brought within its ambit all contracts of employment in Great Britain and gave a remedy against a non-resident—a remedy now enlarged by Section 20 of the Act of 1923. The Master of the Rolls sent the case back to the County Court Judge for hearing. This point of law applies to all cases irrespective of the vocation or calling.

Electric Coal-cutter Motors.

The conditions under which they work, and the special features incorporated in their design.

By PERCY HUGGINS, Assoc.A.I.E.E.

THE reports of the Secretary for Mines and H.M. Chief Inspector of Mines for 1924 (abstracts of which were published in the ELECTRICAL REVIEW for July 31st last) revealed that at the end of 1924 there were 6,830 coal-cutting machines in commission in Great Britain, of which 3,044 were electrically driven. Daily association with collieries and coal-cutter manufacturers enables the writer to estimate that there must be now over 7,000 coal-cutters in commission in Great Britain, of which nearly half are electrically driven.

Thus the electric coal-cutter motor is beginning to form no mean contribution to the electrical engineering industry; while its novel features, and the departures in design devised to overcome its exceptional difficulties promise to be of great general interest in the industry, for in some respects they would appear to be leading in the science of dynamo-electric machine design.

The first patent for electric coal cutting was applied for by Robert Ridley, of Leeds, and James Grafton Jones, of Pentonville, in 1863; and the early history of electric coal cutting may be written around the period between that date and 1910. Such history records many weird contrivances and grave doubts, but out of many trials have evolved recognised types of coal-cutters which to-day are accepted as an essential part of the equipment of a modern colliery. In fact, their application is rendering it possible to work at a profit many coal seams (particularly thin seams of from 10 to 20 inches) which otherwise it would be economically hopeless to attempt to exploit. Contributing in no small degree to the successful development of mechanical coal-cutting has been the production of an efficient electric driving unit, for it is steadily outpacing its compressed-air rival on the score of cheapness of running.

Working Conditions.

The types of machines specifically mentioned and illustrated herewith are designed primarily for "long-wall" working, as this is the system chiefly adopted in this country, but the writer's general remarks on the motors are equally true of all coal-cutter motors and many underground-conveyor motors.

A "long-wall" machine has to undercut or otherwise cut a seam of coal so that its removal becomes a simplified matter. Cutting is effected by means of numerous small picks, which are projected at 250 to 500 ft. per minute into the mineral matter by being mounted on a rotating and travelling member which may take the form of a disk, a chain round a jib, or a bar. Hence these "long-wall" machines have sifted down to the following three types:—(*a*) The disk; (*b*) the chain; and (*c*) the bar. Each of these types is readily divisible into three parts, *viz.*, the cutting unit complete with gears; the hauling unit complete with gears; and the driving unit. The popular type for the average seam is the chain coal-cutter, a typical example of which is illustrated in fig. 1.

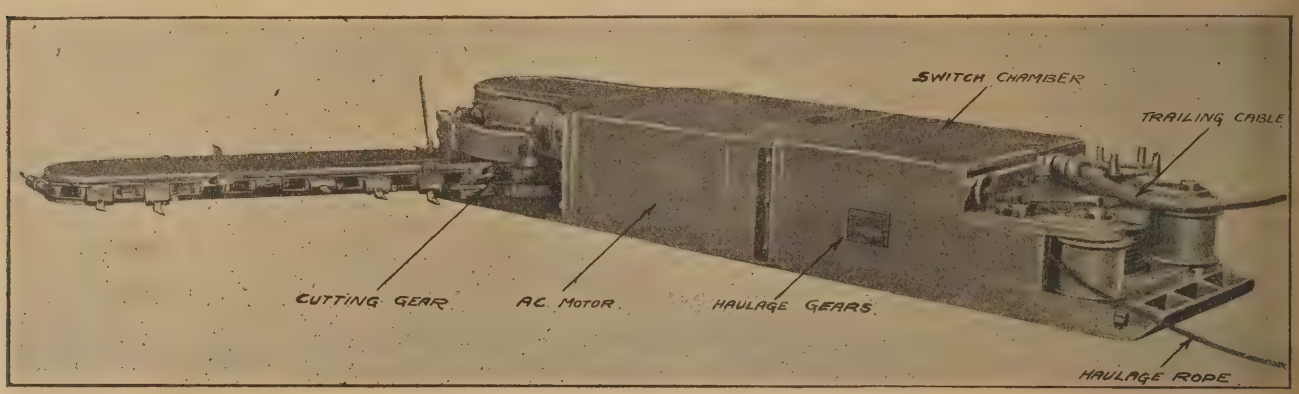


Fig. 1.—Chain Coal-cutter driven by A.C. Motor.

Often seams can be worked economically only by removing no more than the 4 to 5 inches depth of undercut, plus the bare seam of coal, which in this country may be anything up to 80 inches, but often is only 10 to 20 inches. The "long-wall" machine cuts in each travel a depth of 36 to 72 inches, and hauls itself along the face at a rate of 12 to 36 inches per minute, traversing from 90 to 180 yards per shift—the above figures are the extremes found in practice. Hence the coal-cutting machine must be able to follow, in the course of years, miles into the seam, and a standard machine for universal application must not have a height exceeding 12 to 17 inches.

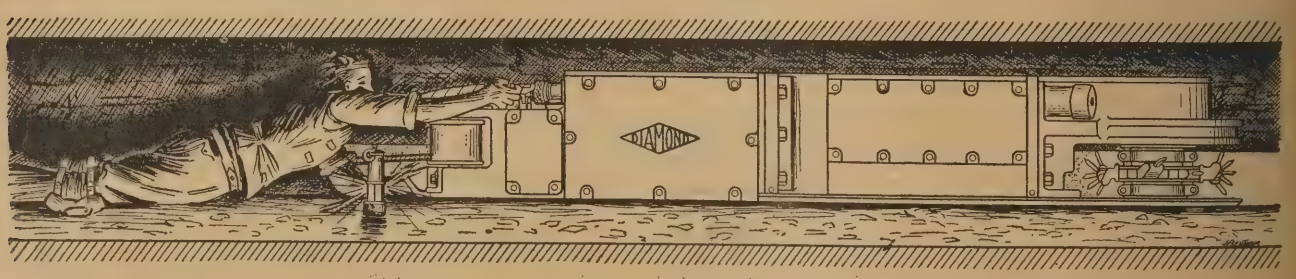


Fig. 2.—Chain Coal-cutter (side view) in working position.

Figs. 2 and 3 illustrate a chain coal-cutter at work as viewed from the side and back respectively. The end view (fig. 3) has been drawn as it would appear were a section cut through the face of the coal.

The conditions at the coal face are the most difficult under which electric motors are ever required to operate; dust and dirt are always present in the atmosphere, many coal faces are extremely wet, explosive gas may be present, and minor falls of rock from the roof and sides are frequent—a combination of circumstances which dictates, without question, total enclosure of the motor. Take into account, with the restricted height and total enclosure of the motor, the fact that a modern coal-cutter absorbs from its driving

unit anything up to 40 h.p., and it will be appreciated that no motor of the usual industrial type can be utilised to meet these requirements.

The Rating of Coal-Cutter Motors.

Generally speaking, present methods of describing the capacity of coal-cutter motors are extremely vague and cause much annoyance to their purchasers, who naturally want to know what they are buying. In America high rating of these motors is the convention, and the official publications of the U.S.A. Bureau of Mines indicate that it is the common practice in that country to state as the h.p. of a coal-cutter motor that which it would do for one hour only, with a temperature rise of 135 deg. F.; but in Great Britain manufacturers are more conservative in rating their motors, as regards both temperature rise and period of run. As a consequence, the nominal h.p. stated (which often is given without mention of the fact that it is a short-time rating) may be no fair indication of the actual capacity of a coal-cutter motor, and is misleading when comparing tenders.

However, it is intended here to indicate what coal-cutter motors actually have to do on site, as this is what the electrical designer has to ascertain to ensure that motors of his design shall be of adequate capacity, and to leave it to the consciences of the sales engineers to decide how to sell them.

The writer regards the b.h.p. absorbed during normal cutting as the b.h.p. at which the motor should be rated. However, under actual working conditions this load cannot be maintained continuously during a shift owing to such incidental work as periodic inspections, relaying haulage rope, changing picks, &c.; and a satisfactory 7- to 9-hour shift would include only three to five hours' actual cutting. Advantage is taken of the intermittent nature of the load to keep down the size and cost of motors by basing the h.p. on an intermittent or short-time rating.

The writer, as the result of spending many shifts with coal-cutters working in various districts, has established in one factory the undermentioned works tests as appropriate for coal-cutter motors. These tests

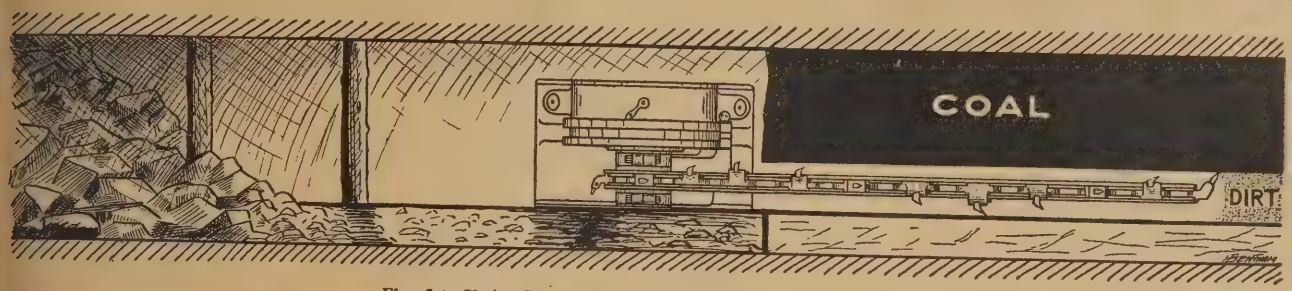


Fig. 3.—Chain Coal-cutter (end view) in working position.

are found to produce temperature-rises equivalent to the maximum produced under working conditions, even with double shift working, the permissible temperature-rise being regarded as 90 deg. F. as recommended for totally-enclosed motors by the B.E.S.A.:—

"The first three coal-cutter motors of any new design shall be run at rated h.p. for periods of 45 minutes with 30 minutes at standstill between runs. This cycle shall be repeated continuously for $5\frac{3}{4}$ hours, thus giving an aggregate of $3\frac{3}{4}$ hours on load during this time. In addition, they shall be tested continuously for two hours at rated h.p., starting cold."

The latter is the equitable short-time rating which

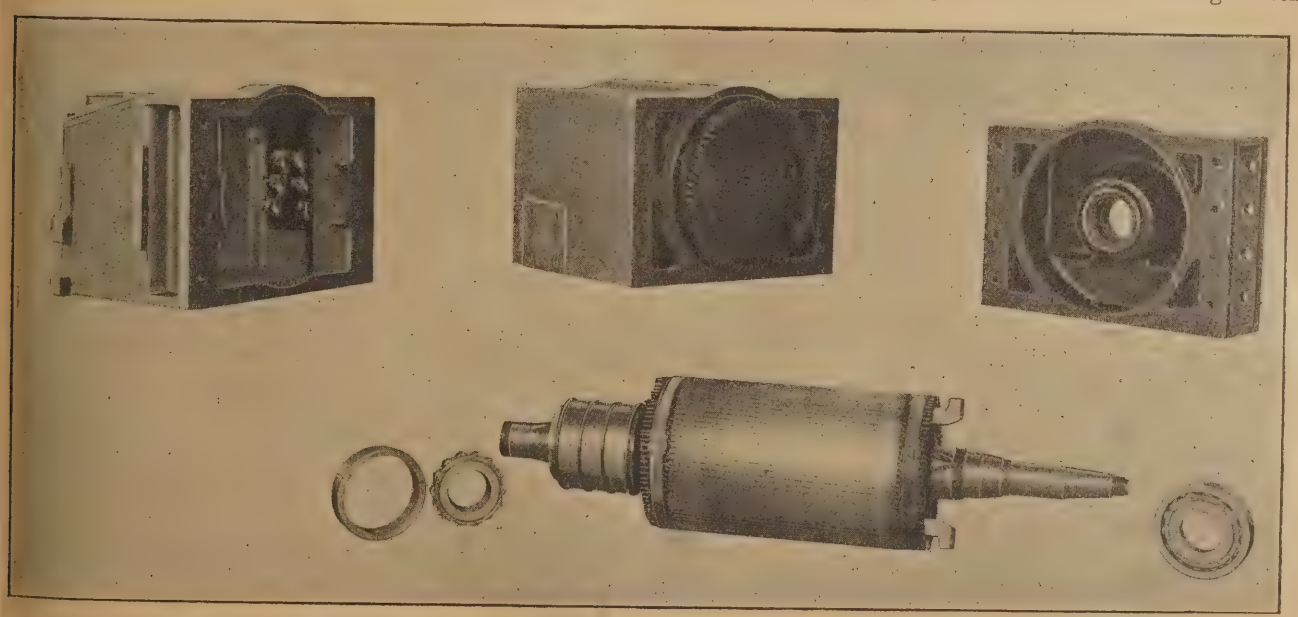


Fig. 4.—Typical Coal-cutter Motor Dismantled.

The actual h.p. transmitted by the motor shaft during normal cutting largely depends on (*a*) the type of coal-cutter; (*b*) the depth of cut; and (*c*) the nature of the substance cut. Manufacturers ensure satisfactory operation by basing a motor on the maximum conditions which could obtain on site with the particular type and size of coal-cutter which it has to drive. With the majority of coal-cutters the normal cutting load on the motor is of the order of 15 to 30 b.h.p., but this may be somewhat exceeded. The highest-rated b.h.p. motor which the writer has proved on site is on a battery of large modern disk machines cutting exceptionally hard clay in a pit in the Glasgow district, where the load on each motor is fairly consistent at 40 b.h.p.

is used for testing subsequent motors, and may be used for selling purposes. However, the intermittent test is considered to prove more positively the capacity of any standard construction of motor to *dissipate* heat under prolonged intermittent service; with a short-time run the capacity of the motor to *absorb* heat becomes a larger factor determining the temperature rise.

Core Dimensions and Performance.

When the electrical designer settles the proportion of diameter to length of an armature-core or stator-bore, he is acquainted with cost and performance curves plotted against varying values of this proportion for the given rating (and hence approximately settled

D^2L value); and for usual work it is expected that he will select proportions which will coincide with, or be a compromise between, the lowest cost-point and the point of highest efficiency. All text-books on design are laid out to assist the designer in basing his proportions on the above-mentioned considerations. However, it will be evident from preceding remarks that coal-cutter motors have to be proportioned entirely on the basis of permissible height, and the designer has to apply all his knowledge of the manner of change of performance and cost with varying diameter to determine how the former can be kept up and the latter kept down on machines with proportions departing considerably from usual practice. Happily cost and performance curves are very flat on the side of decreased diameter, and this enables coal-cutter motors, with their extremely small diameters and great lengths, to be constructed (as the following figures will illustrate) with quite reasonable performance characteristics, and at a cost of only about 130 per cent. of that of motors of usual proportions.

Fig. 4 is a view of a typical coal-cutter motor of the slip-ring type dismantled to reveal the general construction. It is two-hour rated at 40 b.h.p., 500 volts, 3-phase, 50 cycles, 720 r.p.m., and below are some interesting figures abstracted from the design and test sheets of this and also of a squirrel-cage coal-cutter motor and a direct-current coal-cutter motor. For purposes of comparison, corresponding values found on average industrial type totally-enclosed motors of exactly similar rating have been tabulated at the side.

—	Slip-ring motor, 40 b.h.p. 2 hr. rated, 3 phase, 50 cycles, 500 volts.		Squirrel-cage motor, 23 b.h.p. 2 hr. rated, 3 phase, 50 cycles, 500 volts.		Direct-current motor 40 b.h.p. 2 hr. rated, 500 volts.	
	Coal-cutter type as illustrated.	Average industrial type.	Coal-cutter type.	Average industrial type.	Coal-cutter type.	Average industrial type.
R.P.M.	720	725	720	720	800	800
Number of poles ...	8	8	8	8	4	4
Diameter of stator bore or armature ...	12 in.	18¾ in.	11·21 in.	16½ in.	11¼ in.	14½ in.
Core length	22 ,,	7½ ,,	17 ,,	6⅝ ,,	18¼ ,,	8¼ ,,
Overall height of motor frame... ...	17 ,,	30 ,,	15 ,,	26½ ,,	15 ,,	33 ,,
Efficiency at F.L. ...	88½%	89½%	87½%	88½%	88½%	89½%
Power factor at F.L.	·82	·86	·85	·87	—	—

Generally the stator bore or armature core of a coal-cutter motor has a diameter of 60 per cent. to 80 per cent., and a length of 200 per cent. to 350 per cent. of that of the average industrial type totally enclosed motor of the same rating.

Type of Enclosure and Other Salient Mechanical Features.

It will be apparent from preceding remarks that the cases of coal-cutter motors have to be flame proof (U.S.A. term: explosion proof), watertight, and not readily damageable by contingencies such as falls of rock from the roof, ignition of inflammable gas inside the motor case, &c.

As until recently there was doubt as to what constituted flame-proof enclosure, the writer proposes to mention some of the knowledge which engineers have acquired in designing plant to conform to the standard provisionally formulated by the British Engineering Standards Association, that "a flame-proof machine is one in which the enclosing case can withstand, without injury, any explosion of gas that may occur within it, and will not transmit the explosion to any inflammable gas outside." The test which is regarded as the most reliable consists of exploding, by means of a spark plug, a maximum explosive mixture of methane and air (specially transported from Welsh mines) within the motor, while the motor is within a chamber filled with a similar explosive mixture. Much assistance has been rendered to the mining industry by the Sheffield University, where in a laboratory specially equipped to conduct these tests was investigated the reliability of typical examples of manufacturers' apparatus in the presence of manufacturers' engineers. It is now general for purchasers to accept as evidence of the compliance of a motor with the clause *re* flame-proofness, a certified test on a motor identical in all essential details with the one purchased. It is extremely gratifying to the mining industry to find that through the happy collaboration of the B.E.S.A. and B.E.A.M.A., the Sheffield University, which hitherto has been regarded as the unofficial authority for issuing such certificates, in future is to be the recognised authority in Great Britain for this important function, which will proceed under the direction of an officer nominated by the Mines Department.

Experimenters have found that it is impossible to transmit an explosion of methane gas and air through small apertures, although spurts of flame are observed to pass; and it is now known that a definite minimum amount of heat, and not merely a flame, must pass in order to transmit the explosion. However, in order to ensure flame-proofness of a coal-cutter motor, all parts and covers of the motor frame are provided with machined joints of good depth—a minimum of 1¼ inches being accepted by most engineers as good practice. A joint of such depth accurately fitted will not pass flame; and any flame which can be passed owing to slight roughness has been observed during experiments to be so limited and cooled by the leakage surface as to fail to ignite inflammable gas with which the motor is surrounded.

By the use of manometers, the momentary internal pressure arising from an explosion of gas within a motor has been ascertained to be slightly higher if the motor is running at the time, owing to the then turbulent state of the mixture; but under all conditions the explosive pressure may be taken to be between the limits of 20 and 50 lb. per sq. in.

On no account must screw or bolt holes be drilled right through the case in such a manner that, if one is accidentally left out, a clear passage is left communicating between the inside and outside of the case.

The armature or rotor invariably is mounted on heavy roller or ball bearings, and the entire satisfaction which the arrangement has given affords yet further corroboration of the opinion generally accepted to-day that such bearings are eminently suitable for motors driving through gearing.

The motor frames are generally components of the complete coal cutter. If the air space which in an induction motor is so introduced in the corners and the sides exceeds certain proportions, it becomes advantageous to ensure that such air is not left "dead" by providing an air circuit having an axial return path between the rotor-core and the shaft, and preferably also small radial type fan-blades at one end of the rotor. Such fan-blades may be seen to have been fitted on the motor illustrated in fig. 3. By this means more heat is carried to the sides and corners of the frame, and the increased dissipation of heat from these parts has been ascertained to cause a reduction of from 10 to 23 deg. F. in the maximum temperature rise of the internal parts. This appears to accord with the principles of design practised in this country and America for many years, but it was recently proclaimed as new in German publications.

System of Electric Supply.

Much has been done to promote electric driving for coal-cutters by the excellent progress made towards the standardisation of electricity supply below ground. Not many years ago manufacturers had to cater for direct current of various pressures and alternating current of 60, 50, 40 and 25 cycles at all pressures from 190 to 650 V; but so much has been achieved in recent years that to-day the term "coal-cutter motor" almost necessarily implies one designed to operate on a three-phase, 50-cycle, 450/550-volt supply. It is interesting to note, in connection with the entire output of electric coal-cutters this year by one of the largest manufacturers, that nine out of every ten have been ordered for this system of supply. This will explain why the writer is dealing mainly with coal-cutter motors of the three-phase induction type, and is leaving further reference to examples of direct-current coal-cutter motors until the conclusion of this article.

The Stator Winding.

The exceptional length of core and small diameter of bore characteristic of the stators of coal-cutter motors render the winding process somewhat difficult, particularly with semi-closed slot construction. This construction has been preferred generally in view of the disadvantages inherent in open slot construction, namely, high magnetising ampere-turns necessary to overcome air-gap reluctance, and high-frequency rotor surface losses—a combination of factors which means that, for equivalent output with the same temperature rise, a coal-cutter motor having open slots requires not less than 25 per cent. more material and space than those necessary for a motor embodying semi-closed slot construction, while the efficiency of the former falls several per cent. below that of the latter. On the other hand, with semi-closed slots, the labour charges for winding are about 60 per cent. above those with open slots, and reliability rests to a larger extent on the human element of the winders. All British manufacturers have adopted in the past the semi-closed slot construction, but open slot construction is general in American coal-cutter motors.

The Americans have adopted cylindrical windings with their open-slot construction, in which the coils are completely formed and insulated prior to dropping in the slots. In Great Britain pull-through chain windings are the more general practice, but cylindrical windings are also used in which the coils are formed and then the conductors are dropped singly through the narrow slot openings.

Our present knowledge of appropriate calculations for predetermining high-frequency rotor losses of the nature mentioned is very incomplete. With the usual British practice of using semi-closed stator slots, this loss is generally a negligible quantity, but in America, in following the modern tendency of rating-up motors and using the smaller air-gaps permitted by the extended application of ball and roller bearings, they have had to face the fact that high-frequency rotor surface losses peculiar to open-slot construction become a serious item in motors for all purposes. For two years now some of their best known research laboratories, including that of the Westinghouse Electric and Manufacturing Company, of East Pittsburgh, have devoted much attention to the problem; and at the Midwinter Convention of the American Institute of Electrical Engineers, held at New York on February 9th to 12th last, the subject was introduced for discussion through a paper read by the research engineer of the above mentioned manufacturing company. It is interesting to note that the data presented at the convention, representing the results of the latest research work, corroborated the assertion of the author of the introductory paper that *in an ordinary American squirrel-cage motor the rotor high-frequency surface losses are of the same order of magnitude as the stator fundamental-frequency losses.* The writer has been identified with exhaustive investigation of the effect of open stator slots in coal-cutter motors, and the orders of magnitude thereby determined for the high-frequency rotor losses are remarkably similar to those recorded in America, but the investigation covered also slip-ring motors. The following average values may convey an interesting idea of the magnitudes which this peculiar loss was found to assume in coal-cutter motors.

Type of motor.	High-frequency rotor losses expressed as a percentage of the normal stator iron loss.
Squirrel-cage motor having open stator slots, semi-closed rotor slots (opening .06 in.), and uninsulated rotor bars	108 per cent.
As above, but with insulated rotor bars	90 per cent.
Slip-ring motor having open stator slots and semi-closed rotor slots (opening .06 in.)	67 per cent.
Squirrel-cage motor having semi-closed stator slots (opening 0.1), semi-closed rotor slots (opening .06), and uninsulated rotor bars	Approx. 10 per cent.

It was the problem of the coal-cutter motor which led the Diamond Coal-Cutter Company to carry out the research work in its laboratory at Wakefield which has resulted in the full realisation of the possibilities of winding in initially open slots and closing the slot openings with magnetic slot strips, a process which is arousing interest in several countries, particularly America, and which has been copied on ordinary industrial-type motors with economy. Although to the writer's knowledge the idea of magnetic-slot wedges has been in existence for at least fifteen years, the earlier productions were not satisfactory. Consisting as they did of powdered iron and a cement having electrical-insulating properties, they were utterly deficient of both magnetic permeability and the requisite mechanical properties.

The feature of satisfactory magnetic-slot strips is that the iron, instead of being in powder form, is in the form of fine strands which, while extending across the slot mouth so as to decrease the magnetic reluctance, are discontinuous along the slot so as to be substantially devoid of eddy-current loss. In one form iron strands are woven with hemp into a sheet, and the whole is rendered solid by floating with an insulating compound. The sheet so formed is then cut into widths suitable for slot strips. Alternatively iron wire of somewhat larger gauge is wound spirally upon a core of insulating material to form the closing wedge for the slots. The strips are retained in the slots by inserting them in grooves at the tops of the teeth. These magnetic strips are found to average the flux over the air gap, producing characteristics which are very similar to those of semi-closed slots. Thus they combine all the respective advantages of open- and semi-closed slots without any of their respective disadvantages. In coal-cutter motors the initially open-slot core may be made a practical construction, and such open-slot core, besides having the advantages already mentioned, may facilitate the adoption of a frame construction which permits of increased core diameter for given overall height consistent with greater security against water penetration. This may be achieved by extending the stator frame so that it overhangs the end windings—a construction which is not satisfactory with anything but former winding in initially-open slots.

The strength of these magnetic wedges has been proved in the following manner. Complete stator frames have been lifted by a bar passed through a slot on the underside of the stator core in such fashion that the entire weight has been carried on the closing wedge of one slot, and in no case has micrometical measurement revealed the slightest lifting of the wedge.

"Direct-on" Starting of Large Induction Motors.

The confined space and indifferent illumination in which coal-cutter motors have to operate make it of paramount importance that the system of operation should be of the simplest, while, as far as possible, wearing parts should be eliminated. Starting gear, which has to be carried on the coal-cutter, in particular is unanimously regarded by mining men as an evil, the only difference of opinion they seem to have on the matter being the extent to which they should submit to it. For the majority of coal-cutters, squirrel-cage motors are provided arranged for star-delta starting, and comparatively few coal-cutter motors are of the slip-ring type; but in the past the above-mentioned considerations have led engineers in several pits to short-circuit the slip-rings of slip-ring motors, and substitute "direct-on" switching for rotor-resistance starting. Fortunately there is not much in a pit to be inconvenienced by "kicks" on the line, and as no trouble resulted, they could not see why in future they could not have squirrel-cage motors with "direct-on" switching in all cases. To meet this demand squirrel-cage motors of up to 30 b.h.p. have been supplied arranged for "direct-on" switching—a practice which the writer has not found applied to motors of such large capacity in any other industry in this country. Owing to the large overload capacity for which these motors are designed, their short-circuit current is high, and

the momentary current peak with direct-on switching is of the order of six times the normal full-load current, the starting torque being about 130 per cent. of full-load torque.

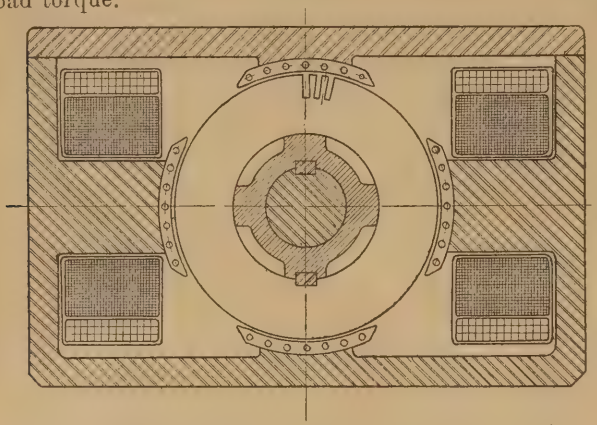


Fig. 5.—Two-pole (wound) Motor with two consequent Poles.

Examples of Direct-Current Coal-Cutter Motors.

In the production of a satisfactory direct-current coal-cutter motor, the limitation of height has necessitated the introduction, not only of armatures of great length and small diameter, but also of field forms of unusual sections and magnetic circuits. The principles of construction of the two common types of d.c. coal-cutter motors are illustrated in figs. 5 and 6 respectively; the first illustrated has two wound poles and two consequent poles; and the second illustrated has four wound poles and is also fitted with two interpoles. The latter with its very obvious advantages may be regarded as the modern standard. Cumulative compound winding of the main poles is the usual practice.

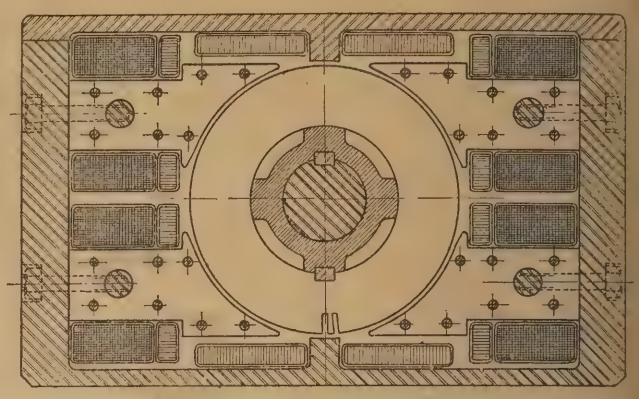


Fig. 6.—Four-pole (wound) Motor with two Interpoles.

The Definition of Capital.

By C. TURNBULL, M.I.E.E.

In discussing the financial position of municipal electrical undertakings, it is customary to take their capital expenditure as the total amount of capital expended since the undertaking came into existence, and to include all loans even when they have been paid off. Until recently this was not very objectionable, as the early loans were comparatively small and the proportion paid off was not great. The time has now come when the retention of extinguished loans is leading to absurd and misleading results. In many undertakings half the loans borrowed have been paid off, and yet in statistical calculations it is assumed that they are all outstanding! The effect on the public mind will become progressively unfavourable, as people will obtain the impression that the return on municipal capital outlay is getting smaller and smaller year by year.

Even now it is not uncommon to find critics complaining that municipal electrical undertakings provide no depreciation, while they are quite unaware of the fact that a very large part of the capital has been paid off. Actually the sinking funds are intended to extinguish the capital liabilities as quickly as their value disappears through depreciation and obsolescence, and in practice they are fully equal to this requirement.

The reasonable method of dealing with the problem would be to wipe out of the capital account all loans which have been redeemed, just as a company wipes out debentures or other loans when they are paid off. Credit should also be taken for sinking funds in detailed analysis, although for broad purposes it may be sufficient to take a loan as a liability, until it is entirely extinguished by being redeemed. Critics object to this proposal that it would lead to ridiculous results in the case of such an undertaking as the Glasgow tramways, which have practically paid off the whole of their loan. The critic states that the percentage of profit shown on the outstanding amount of loan would be absurdly great, and he therefore demands that a sum should appear in the capital account to keep the percentage of profit within reason.

The dispute, as is usual in disputes, arises from the fact that most people have no very definite conception in their minds as to what the word "capital" implies, and even experts sometimes fail to recognise that the word has two distinct meanings in common usage. The first meaning of the word is the value of the property used in a business. Thus, a millionaire is a man whose net assets are worth a million for the time being, and if the assets fall to half this value, his capital ceases to be a million. But this definition entirely fails in the case of public companies. The capital of a company may be a million, and its assets may be worth ten millions or ten pounds! There need be no relation between the value of the assets and the capital of the company, as many shareholders know well enough. For public company purposes, the capital may be defined as the liability of the concern to those who have provided the money. This definition may also be reasonable for municipal trading concerns. If it is adopted, then redeemed loans, having ceased to be liabilities, should cease to figure as capital, and the percentage of profit, &c., should be calculated only on the actual outstanding liability.

But how are we to deal with the problem of undertakings which have absurdly small capital expenditures outstanding? The answer is that these are merely the converse of other undertakings which have large capital liabilities and small profits. If one does not find it absurd to say that a concern has a capital of a million and no profit (or a loss), then it is also not absurd to say that a concern has a minute capital and a very large profit. Mathematically, we say that when dy/dx equals 0, then dx/dy equals infinity. There is no absurdity in using the "infinity" in this connection, and it is equally reasonable to say that a profit on zero capital is an infinite percentage. At the same time such cases are so rare, if not unique, that there is no reason why we should make our general returns absurd in order to make the unique case look reasonable.

One proposal is that we should value the undertakings at reasonable values, and calculate the percentage shown on them. This is really working in a circle, as the value would depend on the profits earned. Wherever an undertaking earned, say, more than 6 per cent. after paying sinking fund,, the assumed capital would be inflated to bring down the percentage to 6 per cent. If next year the profit fell off, the capital would be deflated sufficiently to bring the profit back to that figure! This method does not appear to be helpful, and one cannot but think that the method of taking the outstanding loans as the capital gives a truer method for comparison with company undertakings.

Some Graphical Methods.

Geometrical Solutions of Two Alternating-current Problems.

By PROF. WILLIAM CRAMP, D.Sc., M.I.E.E.

IN my experience it is characteristic of the English student to require some physical presentation of any numerical process with which he is dealing. Recognising this, recent elementary books, on the calculus for instance, emphasise the geometrical presentation of differentiation and integration; and the same psychological requirement doubtless accounts for the spread of graphical methods in statics, dynamics and electricity, as well as for the fact that the use of Cartesian co-ordinates now appears so early in the school curriculum. It has always seemed to me that this English proclivity is a very strong argument in favour of the introduction of graphic arithmetic into schools, and I have often urged its importance. Nor is this attitude of mind confined to the less intelligent scholars. Much of Newton's work was reared upon a geometrical foundation, and it is said that French mathematicians smiled at the necessity which Clerk Maxwell felt for mechanical models to express and to confirm his mathematical conceptions.

Whether as a generalisation this be true or whether it be a conclusion drawn from too narrow a personal experience, it is certain that English students find the

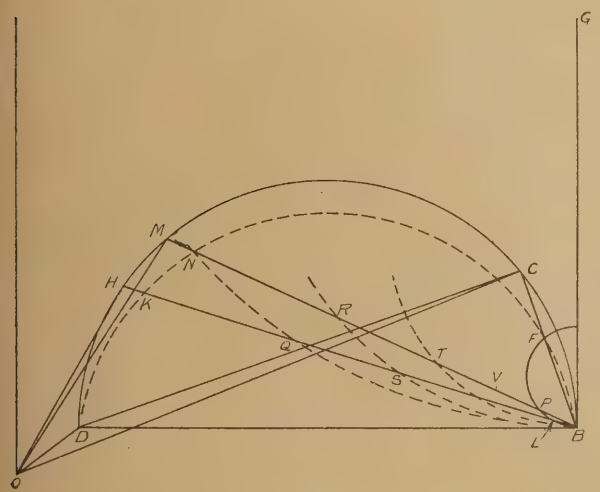


Fig. 1.

study and understanding of alternating-current phenomena much clarified by frequent reference to vector diagrams, and that comparatively few would master the simple transformer if all were compelled to approach its design and characteristics through the analytical equations alone. And this statement is even more true of the induction motor; where it certainly accounts for the vast amount of time and printing that has been expended upon various forms of the circle-diagram. Given a geometrical presentation of the subject, I find that the better English students may be trusted to develop for themselves the analytical calculations pertaining to any particular case, and that in this way they attain to a more thorough mastery of their subject and a greater self-confidence in dealing with new problems. This belief is my reason for putting forward here graphical solutions, not ordinarily appearing in text-books, of two alternating-current problems.

I. The first of these relates to the determination of the steps of the starting resistance for an ordinary polyphase slip-ring motor. In fig. 1 let OD represent the no-load current per phase of such a motor, OC the stator short-circuit current, DCB being the ordinary locus semi-circle. Then it is easy to show that very approximately to the same scale DB represents the stator applied voltage, DC represents $I_s(x_1+k^2x_2)$ and CB represents $I_s(r_1+k^2r_2)$, where k is the translation coefficient, I_s is the rotor r.m.s. current referred to the stator, and x_1, x_2, r_1, r are the stator and rotor reactances and resistances respectively. Further, the line CB may be divided at F, so that CF : FB $=r_1 : k^2r_2$; the usual arc (shown dotted) being drawn through D, F, and B.*

Now, with centre upon BG, which is perpendicular to DB, describe a semi-circle passing through F and B. Then, for any other stator current, OM, HK represents nearly the stator resistance drop, LB $\div k$, the rotor resistance drop, and KL $\div k$ represents the rotor rotational e.m.f.

Let us suppose that the full-load current of the machine is OH, and that it is desired to design a starting resistance such that the maximum current drawn from the line shall not exceed 120 per cent. of the full-load current on any stop. Mark off OM $=120$ per cent. of OH and join MB, cutting the semi-circle FLB in P. Then to the same scale that PB represents the rotor resistance per phase, NP represents the total resistance per phase to be inserted on the first stop of the rheostat so that the motor will start with the required current.

As its speed rises, M travels towards H, and finally arrives, and remains, at that point. Now, with its centre on BG, draw a semi-circle passing through N and B, and cutting KB in Q. Then KQ represents the rotational e.m.f. appropriate to the speed on this first stop, and in order to cause the current again to rise to OM, a length $=$ KQ must be subtracted from NP. Set off, therefore, NR $=$ KQ, and with its centre on BG, describe another arc passing through R and B, and cutting KL in S. Repeat the process, making, say, RT $=$ QS, &c., until an arc is arrived at that is either just within or just without the rotor resistance arc FLB. Then the total resistance to be inserted per phase in the rotor being NP, the tapping points are R, T, &c., and the sections are cut out in the order NR, RT, &c.

Some care is necessary in determining the translation coefficient. It can, of course, be obtained experimentally, and where no other data are available it is usually sufficiently near to take it as the ratio of turns of the stator to those on the rotor, due regard being paid to the systems of winding. Thus, if the ratio of turns be denoted by β and rotor and stator be wound both delta or both star, $\beta=k$ nearly. But if the stator be wound delta and the rotor star, $k=\beta/\sqrt{3}$, and so on.

In carrying out the process just outlined, difficulty will often be experienced with the large diameter of the larger circles NQ, RS, &c. On joining the points NQ and RS, the student will easily† prove that NQ and RS are parallel and that QB/NB $=$ DH/DM; so that the construction immediately simplifies to the following: Measure NB and KB and also the ratio DH/DM $=x$, say.

Then NR $=$ KB $-x$ NB,

RT $=x$ NR,

and if V be the next point along NB,

TV $=x$. RT $=x^2$NR,

and so on. Whence it follows that after the determination of the first stop on the resistance (*i.e.*, NR), the others follow in a geometrical progression having the common ratio $x=$ DH/DM. Note that the ratio is *not* OH/OM.

II. My second example concerns the grading of the P.D. to be applied to the terminals of a single-phase series a.c. motor to give even increments of current as the controller moves from tap to tap of the transformer. In fig. 2 the short-circuit characteristics of the motor are shown; OI is the full-load current and OC the corresponding terminal voltage when the motor is

*Cramp & Smith. "Vectors and Vector Diagrams," pp. 231 *et seq.*

†On second thoughts, these relationships are not so very obvious. I shall be glad to send the proof to any student who fails to deduce them.

locked. The angle COI is obtained in the usual way from the wattmeter reading, so that the product of BC and OI is the *whole* power absorbed under those conditions.

Let us assume that the motor is to start against full-load torque, but that the starting current is not to exceed the full-load current by more than 50 per cent.

Set off OI_1 and OE_1 to represent a current and voltage 50 per cent. in excess of OI and OC respectively. Draw E_1, F and CG parallel to OI. Then, when the current I_1 flows through the motor under the applied pressure E_1, the machine will start and accelerate until the current falls to I, and the pressure is the vector sum of OC and the rotational e.m.f. With centre O and radius OE_1, describe an arc cutting CG in D; OD, then, is equal to OE_1, and it is the vector sum of OC and CD. The latter is parallel to OI, and therefore in phase with the current, so that it represents approximately the required component of the rotational e.m.f. Draw DE_2 parallel to CE_1 and join OE_2. Then $E_1E_2 = CD$ and OE_2 is the vector sum of this rotational e.m.f. and OE_1; and if this P.D. be applied to the motor the current will immediately

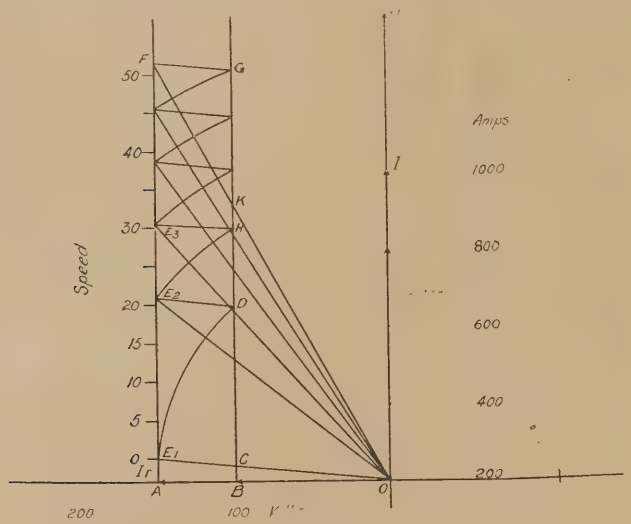


Fig. 2.

rise to I_1 again. Thus, OE_1 represents the starting P.D. to be applied to the motor, and OE_2 is the P.D. to be applied on the next stop of the controller. By swinging OE_2 up to H and drawing HE_3 parallel to DE_2, we obtain OE_3, the P.D. on the next stop; and repeating the construction we finally arrive at the maximum P.D. available, which in this case is assumed to be OF. Of course, any limiting current other than that assumed above for I_1 may be taken, the construction remaining the same. It is to be noted that, having taken the current ratio as fixed, the rest of the diagram follows from the motor characteristics, so that it may not be possible to find a line OF which exactly coincides with a given maximum P.D. It is possible, however, always to get a line on either side of a given maximum and to modify the tappings accordingly. The ratios BC/OC, BD/OD, BH/OH, &c., are proportional to the power factors reached on the corresponding tappings, and if one reading of the open-circuit armature voltage V at a speed, say, n, and for the field current I, is available, the corresponding speeds can easily be determined and placed along the line AF; for the point E_1 corresponds to zero speed, while E_2 will correspond very nearly to a speed $n_1 = CD \times n/V$, and, since the rotational e.m.f. is proportional to the speed, this fixes the scale along the line AF as indicated in the figure.

It is not essential that the speeds should be in revolutions per second or per minute. They may be in train miles per hour as calculated from the wheel diameters and gearing. As an example, suppose a single-phase series railway motor intended for, say, 300 volts and 1,000 amperes at full load. On locked test the motor requires 100 volts when the current is 1,000 amperes, the power factor being then 0.1. Then, $OI = 1{,}000$, $OC = 100$, $CB = 10$ nearly. Suppose, now, that the motor is to start against full load with a current not exceeding 1,500 amperes. Then $OI_1 = 1{,}500$, $OE_1 = 150$, and on completing the diagram and measuring the lengths OE_2, OE_3, &c., we find the tapping voltages are: 150, 190, 225, 254, 288, 310. The last, of course, is 10 volts too high, but in practice would be sufficiently near.

Suppose, now, that the machine is loaded lightly on test, and it is found that with 1,000 amperes through the armature and 150 volts across the machine, the speed corresponds to 20 miles per hour. Then, on the diagram $CD = 20$ and either CG or E_1F can be graduated in miles per hour from this single reading, the graduations being equal divisions of either line from C or E_1 as zero point. We are thus able, from fig. 2, to construct the following table:—

Tapping No.	Voltage.	Speed.	Power Factor %.
1	150	0	10
2	190	20.5	61
3	225	30.2	75
4	254	38.2	81
5	282	45	85
6	310	50	89

It will be objected that the short-circuit reading does not represent the running conditions, since the iron losses, &c., are different in the two cases. This is a valid objection, but a magnetisation curve can be taken, and if the machine can be run at a constant voltage with varying currents on test, the locked test may be avoided, and an effective resistance calculated, which, when multiplied by the full-load current, gives the point C in fig. 2. Thus, suppose we knew that with 300 volts and a current of 600 amperes, the machine ran at a speed corresponding to 40 m.p.h. with a power factor of 0.9:—

$$300 = \sqrt{(e + Ir)^2 + (Ix)^2}$$

where r and x are the effective resistance and reactance respectively of the motor, and e is the counter e.m.f. of rotation. Further,

$$\frac{e + Ir}{\sqrt{(e + Ir)^2 + (Ix)^2}} = 0{\cdot}9$$

whence

$$e + Ir = 270.$$

Now, from the magnetisation curve let the value of e corresponding to the given speed and current be 260 volts. Then $Ir = 10$, and $r = .0167$ ohm, and $BC = 16.7$.

From a series of such calculations mean values both of r and x can be obtained, and the lines OC and OE_1 drawn in accordance therewith.

From the designer's point of view it more frequently happens that between starting and full speed it is required to insert a given number of stops. This is the converse of the previous problem, and might therefore seem to be immediately soluble. Like many converse problems, however, it is not so simple as its complement, and it is well to approach it from an elementary case. Suppose that in fig. 2 the effective resistance r be assumed to be negligible in comparison with the reactance term. Then the data are the voltage, current, and power factor at full load, and the short-circuit voltage for full-load current at zero power factor. It is required to insert a given number of transformer tappings between these two such that the current increase from step to step is constant, and to determine what this increase will be.

In fig. 3 let OI represent the full-load current, OA the corresponding voltage at standstill, and OE the voltage at full load, with power factor = cos EOI. Then, on the assumptions made, EAO = 90 deg. and AE the e.m.f. of rotation at full load is known. Suppose the problem to have been solved as shown in fig. 3 for, say, three stops, so that the transformer e.m.f.'s are OB, OC, OD:—

Then $(OE)^2 = (EA)^2 + (AO)^2 = (DB)^2 + (BO)^2 = (FA)^2 + BO^2$

Therefore $(EA)^2 - (FA)^2 = (BO)^2 - (AO)^2$... ... (1)

Also $(FO)^2 = (FA)^2 + (AO)^2 = (CB)^2 + (BO)^2 = (GA)^2 + (BO)^2$

Therefore $(FA)^2 - (GA)^2 = (BO)^2 - (AO)^2$... ... (2)

Adding (1) and (2), $(EA)^2 - (GA)^2 = 2\{(BO)^2 - (AO)^2\}$ (3)

Again $(GA)^2 = (GO)^2 - (AO)^2 = (BO)^2 - (AO)^2$ ... (4)

Adding (3) and (4)

$$(EA)^2 = 3\{(BO)^2 - (AO)^2\} = 3\,(GA)^2$$

Or generally, for constant increments of starting current, the in-phase component of the given full-load

applied pressure is $\sqrt{n}$ times the component of rotational e.m.f. on the first contact, where n is the number of starting contacts required.

From this relationship the following construction is deduced:—From the given data set out OE, OI to a convenient scale to represent the applied voltage and full-load current at the given power factor. Now, to any convenient scale construct a diagram like fig. 4, OABCDE, having *n* radial lines, arranged so that OA = AB = BC = CD = DE, &c., the angles *a*, *b*, *c*, *d*, &c., being right angles. If five contacts be required, then the number of lines will be as in fig. 4. If three only, then OA, OB, and OC only are required. Adopting the latter supposition so as to complete fig. 3, we make the radius corresponding to the last contact equal to AE in fig. 3, producing it if necessary. Thus, OF (fig. 4) = AE (fig. 3). Next complete fig. 4 as shown, FG and GH being parallel to CB and BA respectively. Then AF (fig. 3) must be made = OG (fig. 4) and AG = OH. These in turn give in fig. 3 the lines OG and OF, which are the required transformer P.D.'s; OB is then found, being = OG, BD can be drawn and fig. 3 completed. To get the value of the maximum current, join AI and draw BI_1 parallel to it. Then OI_1 is the value required. The proof of the method is again left to the student, with the hint that in fig. 4 OC : OB : OA = $\sqrt{3}$: $\sqrt{2}$: 1, &c.

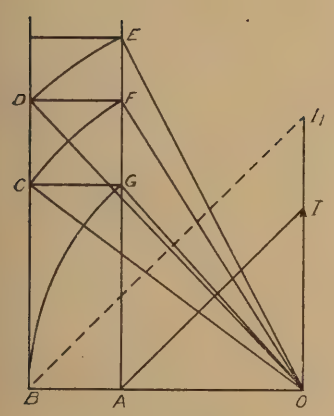


Fig. 3.

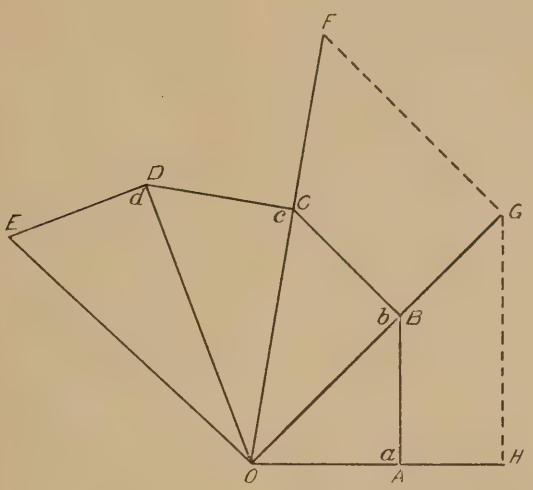


Fig. 4.

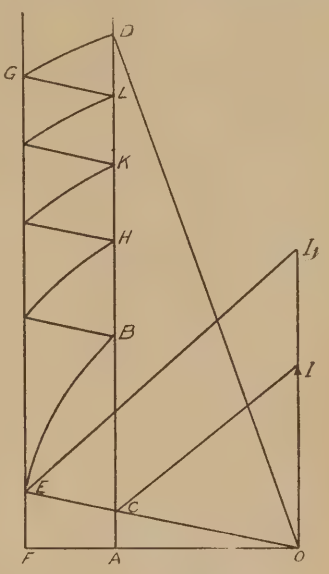


Fig. 5.

In those cases where the power factor of the motor at standstill is very low, the construction just outlined is sufficiently accurate. But it often happens that cos ϕ at standstill is considerable. The geometry then becomes far more intricate, but the following solution is very nearly accurate:—

In fig. 5 let OD be the full-load voltage corresponding to the current OI, and OC be the standstill voltage for the same current, both set out at their appropriate power factors. Draw the lines DCA and OA as usual. Let *n* be the number of contacts. Divide DC by $\sqrt{n}$ by the method of fig. 4, but instead of marking off the quotient from C, mark it off from A, as AB. With centre O and radius OB cut OC produced in E, and through E draw the perpendicular FEG. Complete the construction as for fig. 2. Then the required e.m.f.'s on the contacts (in this case five) are OB, OH, OK, OL, OD. The value of I_1 is found by the construction of fig. 4 modified as shown.

Throughout this article, on principle, any methods other than those of pure geometry have been generally avoided. But it is clear that in certain cases, as, for instance, in the last example, the division of DC by $\sqrt{5}$ could be more quickly carried out by arithmetic. Such a departure might, however, disguise one of the main objects in the development of these methods, *viz.*, that pure geometry knows nothing of the difference between commensurable and incommensurable quantities. Geometrically, it is as easy to find the square root of 5 as the square root of 4, and the result is achieved with similar accuracy in the two cases. In arithmetic the use of a conventional number system results in the multiplication table and in a process-accuracy which is in turn dependent upon the magnitudes involved in the process, being unique for certain cases, but only roughly approximate for many more. Thus, in taking the fourth root of 9 arithmetically, the first step is $\sqrt{9} = 3$, a definite result. The second is $\sqrt{3} = 1.73 + \ldots$ with an accuracy of quite a different order. True, the second step can be carried out to any desired approximation, but it still is of a different order to that of $\sqrt{9}$. By geometry the result can be achieved by the repetition of such a process as Euclid VI, 13, and each time the accuracy is dependent only upon the instruments available and the skill of the operator. To me there is something unnatural, almost grotesque, about the fitful vagaries of arithmetical coincidences: something utterly out of harmony with the rest of the universe, and obviously man-made. Indeed, if the application of geometrical method led to nothing more than meditation upon these matters, it would amply justify itself.

Novel Vehicle for the London Fire Brigade.—The latest addition to the equipment of the L.C.C. Fire Brigade is a Tilling-Stevens petrol-electric vehicle equipped as an emergency tender to deal with special conditions in fire extinguishing work and to facilitate rescue work in cases where part of a girder of a building has to be cut away. For this purpose an electric cutting plant and two electric drills are carried inside the new vehicle. Two drums of heavy cable for the cutting plant are mounted on bearings inside lockers near the rear of the vehicle so that they can be wound or unwound through apertures in the bottom; a spare drum is also carried below the rear floorboards. The connecting plug for the cable is at the extreme rear of the van, whilst the switch and resistances are at the front inside. For illuminating fire-fighting and other operations at night the machine carries three electric cluster lamps, each of 300 c.p. and two 18-in. searchlights of 10,000 c.p., which are adjustable to give a spot light or a 40 deg. flood beam. Light cables are wound on five drums mounted on spindles and furnished with brush and slip-ring connections so that current can be supplied with the drums in position. Alternatively the drums can be lifted out so that one or more lengths can be joined together up to a total length of 900 ft. All switches for the electrical equipment are mounted on a board immediately behind the driving seat, and are worked by the driver; the ends of the various cables are led to wander connections below the switchboard and can be selectively connected to six plugs according to the amperage required. The plug for the cutting plant cable is not connected to the switchboard and no fuse is included in the circuit, as the plant requires the full dynamo output of about 30 kilowatts, which can be supplied continuously. On the left of the switchboard are three automatic substitutional resistances, two for the searchlights and one for the cutting plant, which come into action when the arcs are broken. Oxy-acetylene cutting plant on a two-wheeled carrier also forms part of the equipment for use in positions which cannot be reached with the electrical plant.

The Rating of Resistances.

Constants that should always be stated.

By "ALPHA."

Rating may be termed a sub-heading of standardisation, and just as the standardisation of units is necessary for a comparison between different quantities, so is the standardisation of rating necessary for differentiating between various makers' products. The rating of such things as generators and motors is so obvious that the whole matter has been thoroughly discussed and settled, so that machines by different manufacturers may be fully compared as regards performance. The smaller pieces of electrical apparatus do not appear to be so obviously in need of standardisation for rating, although, amongst others, the standardisation of measuring instruments (B.E.S.A. 89-1919) is certainly necessary for progress in any branch of electrical engineering.

In connection with measurements, the provision of standards of resistance is of the first importance. A manufacturer will guarantee his standard resistance to be within a certain limit. He will usually specify the normal working current to be carried, in the case of a shunt or other low resistance, but for higher resistances which are intended to carry currents below that which would cause measurable heating, and consequent change of resistance, nothing is usually stated as to current.

A conductor has a definite ohmic resistance at any given temperature when measured with a certain current. An increase in the current used for measurement will cause an increase of temperature, and so an increase of resistance (unless the conductor is organic and has a negative temperature coefficient of resistance). The increase of temperature due to the passage of the measuring current is usually negligible, and is certainly below the maker's limit of inaccuracy. It is often necessary, however, to use standards at currents other than those for which they were designed, and so the need arises for a definite statement as to the maximum current that can be carried without getting beyond the maker's guaranteed inaccuracy. Further, should the current density exceed this amount, it is desirable to know the altered inaccuracy for the new conditions.

When the resistance and current are specified, two other constants are settled and can be determined. They are the power loss (I^2R) and the potential difference across the terminals. A standard resistance, then, to be completely specified requires that the four constants enumerated above, together with the temperature at which the measurement was made, should be given.

A statement of the maximum inaccuracy (commonly termed the "accuracy") completes the rating, in general. Other factors which at times are of great importance arise when the resistance is intended for alternating currents, when the above four constants are not a complete specification, the rating being altered entirely by a change of frequency. For ordinary direct-current work, such as bridge measurements, series resistances and shunts for instruments, &c., the above four constants are complete, and two of them must be noted in the standardisation report. The remaining two can then be directly calculated. With all these four constants available, the rating of one maker's product can be directly compared with that of another, although, of course, workmanship and general excellence of manufacture are obviously still beyond rating.

The case of rheostats is equally important, although the reason is different. Here the accuracy of the specified resistance is not important, but for general use it is more necessary to specify one of the other three constants at least. The "constants" for a rheostat are really far from being constant, and it is not possible to give any one rating to a rheostat, as the rating is determined by the temperature rise. The continuous rating is usually far lower than a short-period rating, the difference not being amenable to laws as the heat conductivity of all the surrounding media enters into the problem. A complete rating for a rheostat would take the form of one or more curves, the rating at continuous load being the lowest, and the rating for an "instantaneous" period "on" and a long period "off" being at the other end of the rating curve. This curve would not be a simple matter to produce, as "intermittent rating" is indeterminate. If a given rating is possible at, say, one minute "on" and three minutes "off," the same rating is possible at an infinite number of shorter and longer periods "on" and "off." If any law does connect these various intermittent ratings, then one curve will be sufficient with the help of the "law."

For rapid use it should be possible to read off on the nameplate of a rheostat the resistance, the current carried, the watts dissipated, and the voltage drop at continuous load, *i.e.*, the two quantities to be measured after such a period as enables the temperature to attain a steady value. Any two could be measured, but all four should be stated, as at times all of them are required to be known when selecting a rheostat, and so for quickness of working and absence of mistake the nameplate should include all four constants. If a manufacturer could give a definite statement as to the alteration of rating when run at all "intermittent ratings," the rheostat would be completely specified, but in the absence of this general statement a curve or curves would be necessary. A general statement, such as "50 per cent. increase of power loss permissible when 'on' and 'off' for equal periods, the 'on' periods not to exceed, say, one minute," would be useful as a general guide. For any particular intermittent rating this rating should be stated on the nameplate; then the rating would be quite definite. For general use, and not for a specific purpose, however, this is impossible again unless some definite law is found to hold as to the relationship between all possible intermittent ratings and the continuous rating.

Finally, the writer is of the opinion that the general provision of three terminals to all rheostats, and to a lesser extent resistance boxes, would extend the sphere of use of the apparatus. Of these three terminals, two would be connected to the ends of the winding and the third connected to the tapping, thus enabling the apparatus to be used as a potential rheostat as well as a series resistance, and so increasing the scope of application.

Punjab Hydro-Electric Development.—Some interesting details of the Punjab hydro-electric scheme are given in the *Indian Textile Journal*. Use is to be made of the snow-fed waters of the River Uhl, from which the water will be diverted through 2½ miles of tunnel, 9 ft. in diameter, in solid granite, and will then be dropped through a fall of 1,800 ft. to the first power station, which will be of 36,000-kW capacity, to be increased later to 70,600 kW. When the demand for power increases it is proposed to conduct the water along three miles of open duct and drop it over a second and lower fall of 1,200 ft., thus providing another 48,000 kW. The project involves railway communication to the power station. It is estimated that the scheme will take from 3½ to 4 years to complete, and it is hoped that by the summer of 1929 power will be available for 20 Punjab towns from Gurdaspur, at a cost of ¾d. per kWh. The second stage of the development will involve the supply of energy to Simla, Ambala, and Patiala in the east, Gujranwala and Sialkot in the north, and Montgomery in the west. The third stage will aim at supplying Delhi, Karnal, and possibly Rohtak in the far south of the Punjab, and Saharanpur, Meerut, and Panipat in the United Provinces. In its final form the scheme will supply 47 towns, from Rohtak in the south to Sialkat in the north, at an average cost of less than ½d. per kWh.

Manchester Mining Exhibition.—Correction.—We regret that the titles of the two blocks illustrating Ferguson, Pailin industrial switches, on page 167 of our July 31st issue, were accidentally crossed. Fig. 1, of course, is a view of the flameproof auto-transformer starter, and fig. 2 shows the 1,200-amp. circuit breaker.

Alternator Frames.

A Simple Mode of Construction.

By WILLIAM SHARP.

IT is recognised that "Necessity is the mother of invention," and some time ago, during one of our many strikes, necessity demanded that an alternator frame should be made without skilled labour. It fell to my lot to meet the demand, and consequently a frame was made which answered the purpose.

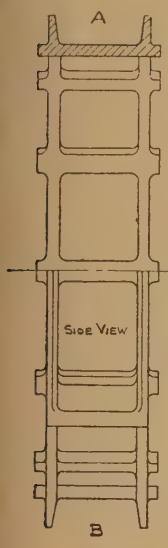


Fig. 1.

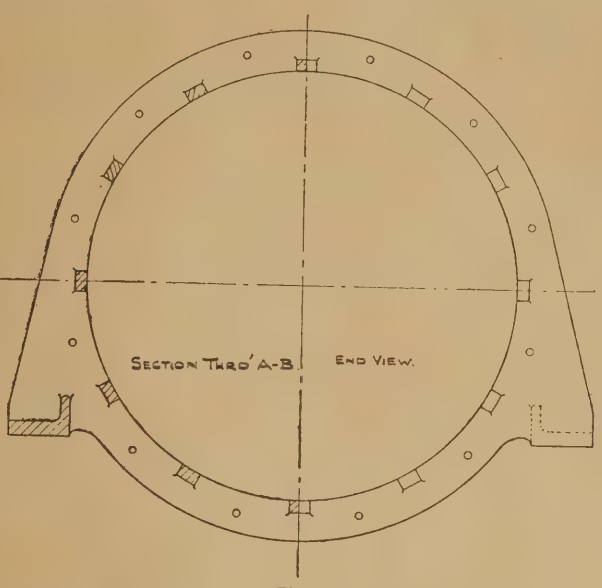


Fig. 2.

Having entered upon the scheme, I found it difficult to pass on without fully investigating its possibilities, and it is to this investigation and reconsideration that the drawings reproduced herewith owe their origin.

It will be seen (figs. 1 and 2) that the frame is of simple construction, having only two flanges held apart by fourteen ribs, two of which form the seating for the frame. The dominating features of this design are the elimination of all core boxes, and the number of sections which can be produced in two or three days, against our present-day minimum of two or three weeks for the complete unit. Should a whole pattern be made to fig. 1 it could be housed in three moulding boxes, as in fig. 4 or, alternatively, a half pattern would need four moulding boxes, as shown in fig. 5. It might be stated that the half pattern would necessitate special moulding, whereas the whole pattern could be made in jobbing moulding boxes. It is intended to make the sections in widths of about 300 mm. and to add as many sections (from the same pattern, see fig. 3) as are required for any particular machine. Each section can be registered and bolted together, and additional security will be obtained from the keys (holding the stampings to the ribs of the frame), which can be secured with screws or bolts as desired.

The clamp plates can be carried from the projecting lugs, while the terminal bracket can be attached to either the flange or the connecting ribs on the underside of the frame.

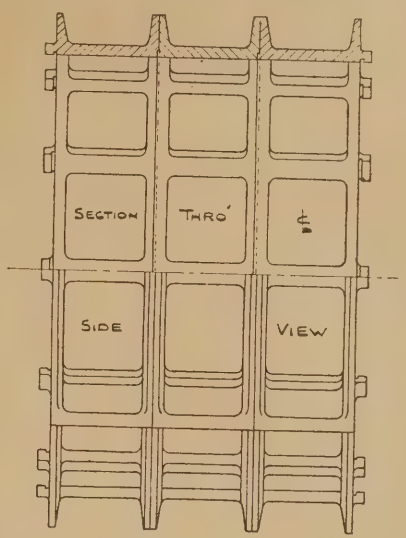


Fig. 3.

It is preferable to cover the finished article with planished steel, in order to add to its general appearance.

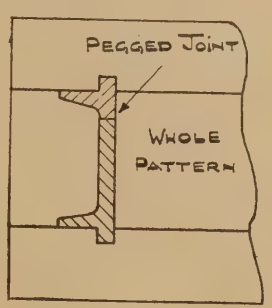


Fig. 4.

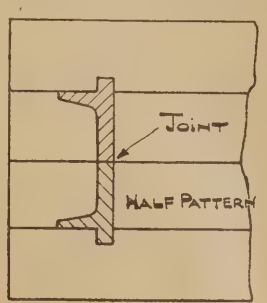


Fig. 5.

The design lends itself more especially to axially rather than radially ventilated machines, but, on the other hand, with slight modifications, this sectional scheme may be utilised for any system of ventilation.

The Generation of Electricity in Great Britain.

Statistics published by the Electricity Commissioners for the year ended March 31st, 1925.

WE have received a copy of the Electricity Commissioners' summary and analyses of the returns of fuel consumption and kWh generated made to them by authorised undertakers under the provisions of Section 27 of the Electricity (Supply) Act, 1919, and of the returns furnished by railway and tramway authorities and by certain non-statutory undertakings, for the year ended March 31st, 1925.*

Returns were received in respect of 584 generating stations, an increase of 43 on the figures for the preceding year. This increase is partly attributable to the fact that certain authorised undertakers owning more than one generating station submitted a separate return for each station, instead of a consolidated return for the undertaking as a whole as in former years. The actual number of new stations which came into operation on or after April 1st, 1924, was 23.

* Stationery Office. Price, 1s. 6d. net.

Of the 584 stations dealt with, 465 have been given places in order of results achieved (*i.e.*, based on thermal efficiency) in comparison with stations of the same group and class in their respective areas and also in Great Britain.

The remaining 119 stations are classifiable as follows:—(*a*) stations not in operation during the greater part of the year—39; (*b*) stations where the entire output was generated by waste heat, water power, &c.—48; and (*c*) stations where a large proportion of the output was generated by waste heat, water power, &c.—32.

The figures for the approximate thermal efficiency of the various stations have been calculated on the basis of average calorific values as indicated in previous returns. In arriving at the average consumption of fuel per kWh generated in the case of stations where more than one class of fuel (*e.g.*, coal and oil) was consumed, the actual fuel consumption at each station has been converted (on the basis of average calorific

values) into an equivalent tonnage of the predominating class of fuel used at the station. The figures thus obtained permit of closer comparison between individual stations, but are not directly comparable with the average values given in the previous returns. A number of instances where the returns do not state the calorific value of the fuel consumed still exist, and the Commissioners again impress upon undertakers the desirability of furnishing these particulars.

As compared with the corresponding figures for the previous year, the total output showed an increase of nearly 734 million kWh, or 11 per cent., whereas the total consumption of fuel showed an increase of 441,797 tons, or 5.8 per cent. only.

The first table is devoted to the area grouping of stations. England and Wales is divided into 20 areas (1 to 20), and Scotland 5 (S1 to S5), making with an additional one for Guernsey (21), a total of 26 area groups.

In Table 2 are classified the stations in letter groups from A to M according to the number of kWh generated during the year. Group A covers stations which generated over 200 million kWh and group M those which generated under 50,000 kWh.

The third table deals with steam stations grouped according to the kWh generated on Table 2. There were three stations which generated over 200 million kWh (group A), as in the previous year, and these showed a reduction in the average fuel consumption per kWh from 1.96 to 1.89 lb. for a total generation of 758,087,410 kWh, as compared with 715,219,124 kWh in the previous year. The Newcastle-upon-Tyne Electric Supply Co.'s station (Carville B) had both the lowest average fuel consumption and the highest thermal efficiency in this group, the consumption per kWh being 1.70 lb. and the thermal efficiency 18.78 per cent. The second group B, between 100 and 200 million kWh, is headed for both the lowest fuel consumption and the highest thermal efficiency by the Manchester Corporation (Barton) station, the average consumption being 1.51 lb. and the efficiency 19.85 per cent. The average fuel consumption for the group was 2.07 lb. for a total generation of 1,509,811,987 kWh.

The following are the details in brief of the remaining groups in this table :—

Group C (50 to 100 million kWh).—1,914,369,704 kWh, 2.41 lb.; Central Electric Supply Co., Ltd., 1.89 lb.; Rotherham Corporation (Prince of Wales station), 17.38 per cent.

Group D (25 to 50 million kWh).—1,219,706,096 kWh, 2.44 lb.; Mersey Power Co., Ltd., 1.88 lb. and 17.42 per cent.

Group E (10 to 25 million kWh).—1,047,123,268 kWh, 2.89 lb.; Accrington Corporation, 1.99 lb.; Wallasey Corporation, 14.90 per cent.

Group F (5 to 10 million kWh).—315,054,033 kWh, 3.70 lb.; Doncaster Corporation, 2.36 lb. and 12.09 per cent.

Group G (2.5 to 5 million kWh).—210,579,481 kWh, 4.03 lb.; * Finchley Urban District Council, 2.65 lb. and 12.22 per cent.

Group H (1.0 to 2.5 million kWh).—86,087,220 kWh, 5.24 lb.; * Wycombe Borough Electric Light & Power Co., Ltd., 2.89 lb. and 12.15 per cent.

Group I (0.5 to 1.0 million kWh).—15,917,850 kWh, 7.42 lb.; Melton Mowbray Electric Light Co., Ltd., 4.77 lb. and 6.50 per cent.

Group J (250,000 to 500,000 kWh).—8,391,502 kWh, 7.25 lb.; * Electric Supply Corporation, Ltd. (Exmouth), 4.48 lb. and 6.34 per cent.

Group K (100,000 to 250,000 kWh).—4,586,327 kWh, 12.60 lb.; Dawlish Electric Light & Power Co., Ltd., 5.43 lb. and 5.46 per cent.

Group L (50,000 to 100,000 kWh).—950,133 kWh, 16.20 lb.; * Ross Electric Light & Power Co., Ltd., 9.01 lb. and 3.29 per cent.

Group M (under 50,000 kWh).—91,639 kWh, 21.60 lb.; L.N.E. Railway (Silloth), 5.11 lb. and 5.26 per cent.

The foregoing stations generated a total of 7,090,756,650 kWh, as against 6,342,107,841 kWh in the year 1923-4. The total fuel consumed amounted to 8,001,687 tons, an increase of 439,696 tons.

A fourth table is compiled in a similar manner to Table 3, for gas producer stations. There are no stations above H Group (1.0 to 2.5 million kWh). This group accounts for the generation of 1,894,736 kWh and the average fuel consumption (converted to the basis of coal) is shown as 1.81 lb. The * Leek Urban District Council heads the list for both lowest consumption and highest efficiency, the figures in lb. and per cent. being 1.81 and 14.45 respectively. The details for the remaining groups are as follows :—

Group I.—4,400,004 kWh, 3.05 lb.; * Faversham Corporation, 1.98 lb. and 12.26 per cent.

Group J.—3,192,859 kWh, 2.27 lb.; Chippenham Electric Supply Co., Ltd., 1.67 lb.; * Bridgewater and District Electric Supply & Traction Co., Ltd., 13.68 per cent.

Group K.—4,359,220 kWh, 2.62 lb.; * Bude Electric Supply Co., Ltd., 1.54 lb. and 14.76 per cent.

Group L.—1,006,367 kWh, 2.86 lb.; * Ledbury Electric Supply Co., Ltd., 1.73 lb. and 12.31 per cent.

Group M.—123,660 kWh, 3.69 lb.; Mr. G. W. D. Assheton Smith and Successors (Port Dinorwic undertaking), 2.06 lb. and 10.32 per cent.

The gas producer stations account for a total generation of 14,976,846 kWh, as compared with 13,756,285 kWh in the year ended March 31st, 1924. The total fuel consumption is recorded as 17,394 tons, as against 16,161 tons, the average consumption being 2.60 lb. per kWh.

In Table 5 the statistics for oil engine stations are drawn up in the same manner. The largest generating station, Southend-on-Sea Corporation (Leigh) is alone in the Group G (2.5 to 5.0 million kWh). The total kWh generated was 2,670,510 and the respective figures for average fuel consumption (oil basis) and thermal efficiency are shown as 0.71 lb. and 26.60 per cent.

As in the preceding tables the brief details are :—

Group H.—17,049,300 kWh, 1.06 lb.; Electricity Co., of Macclesfield, Ltd., 0.68 lb. and 26.90 per cent.

Group I.—13,763,452 kWh, 0.91 lb.; East Anglian Electricity Ltd. (Felixstowe), 0.62 lb. and 29.20 per cent.

Group J.—6,464,394 kWh, 1.14 lb.; Bognor Gas, Light and Coke Co., 0.62 lb. and 28.22 per cent.

Group K.—1,798,914 kWh, 1.26 lb.; Cookham and District Electricity Corporation, Ltd., 0.73 lb.; Frinton-on-Sea and District Electric Light & Power Co., Ltd., 24.00 per cent.

Group L.—491,193 kWh, 1.13 lb.; Elgin Electric Supply Co., Ltd., 0.81 lb.; † Windsor Electrical Installation Co., Ltd., 22.45 per cent.

Group M.—301,518 kWh, 1.34 lb.; Sherborne Electric Supply Co., Ltd., 1.16 lb. and 16.30 per cent.

These stations generated a total of 42,539,281 kWh, as against 33,386,317 kWh in the previous year. The total fuel consumption is shown as 23,161 tons, an increase of 868 tons on 1923-4. The average consumption for the year was 1.01 lb. per kWh.

Statistics for stations generating by waste heat, refuse destructor, town gas and water power, are drawn up in the next table (6), under separate headings for the generation methods. The particulars of consumption and thermal efficiency are not given in this case. The table is arranged in the order of the group letters and the number of stations in each group and the kWh generated by them are given. The largest waste heat station was in Group B and the kWh generated amounted to 19,811,752. Group C held alone the largest refuse destructor station, generating 3,385,315 kWh. In the case of water power, one station heads the table in Group D with 35,019,736 kWh to its credit, and 1,134,830 kWh was generated by the largest town's gas station in Group H. The total kWh generated by the combined stations in this table was 267,102,752, a decrease from the preceding year from 292,270,829.

As in last year's summary, Table 7 shows comprehensively the best results obtained at stations of each size and class and also in each area group (Table 1) for the lowest consumption and highest efficiency. As was the case last year, Manchester (Barton) heads the list for both the lowest consumption and the highest efficiency for steam stations. It is pointed out that the figures given for fuel consumption and thermal efficiency in any one group and area do not necessarily relate to the same station, due to the variation in the calorific value of the fuel used by individual stations.

In the final table (8) particulars are given of the energy generated and the fuel consumed in all the 26 areas (Table 1). The total kWh generated in all the areas amounted to 7,415,375,529. Of this number 7,090,756,650 kWh was generated by steam stations or 95.63 per cent. The total for the previous year was 6,681,524,272.

Area 7, the London and Home Counties District, was responsible for the greatest number of kWh generated, the figure being 1,949,825,578, of which 1,936,812,565 kWh was generated by steam. The total fuel consumption for steam stations amounted to 8,001,687 tons, of which 2,173,399 tons was consumed in area 7. The largest number of kWh generated by gas producer stations in any one area was 2,513,705 in No. 8 area (West and North-West Midlands); 10,549,668 kWh was generated by oil in area 7, being the largest in the area. The greatest generation by waste heat is shown in area 16, the figure being 175,105,361. The percentages of the total kWh generated, for refuse destructor, town's gas and water power, are 0.35, 0.05, and 0.69 respectively.

* Composite stations.
† Partial bulk supply taken.

Non-Rusting Steel.—At the recent conversazione of the Royal Society, exhibits of several types of steel containing nickel and chromium and offering a high resistance to corrosion were exhibited. The specimens shown by Sir Robert Hadfield included two new alloy steels which are notable for their permanence on exposure to the atmosphere and to fresh or salt waters, differing from the ordinary non-rusting chromium steels in being independent of heat treatment. According to *Nature* the heating and cooling curves indicate a complete absence of critical points, and no change of phase is detected by microscopical examination, so that the structure remains homogeneous whatever be the heat treatment to which the steel is subjected. Riveting and brazing consequently have no effect on the capacity of the alloy for withstanding corrosion. The exhibit included turbine blades and test specimens showing the mechanical properties of the steel at atmospheric temperatures and at temperatures up to 650 deg. C, under prolonged loading, showing the absence of creep.

Reviews.

River Gauging. By M. A. Hogan, Ph.D., A.M.Inst.C.E. Pp. viii+70; figs. 24. London: H.M. Stationery Office. Price 2s. net.

This is a report on the methods and appliances suitable for use in Great Britain bearing upon measurements of river flow or of tidal and other currents, prepared by the Committee on Gauging of Rivers and Tidal Currents appointed by the Department of Scientific and Industrial Research.

The report describes the principle of construction of modern current meters and the methods of calibrating such meters, and also the design of rating stations. Many tests have been carried out by the Committee and the results are given in the report, together with curves plotted from the results. The merits of various types of meters are discussed fully and the results obtained are compared. Three typical current meters are described in an appendix, the Price electric current meter, the Amsler meter (1915 model), and the Stoppani current meter. The Price electric current meter consists of a wheel carrying buckets which rotates about a vertical axis. The upper portion of the axis passes into a contact box by which electrical contacts are made as the axis revolves and signals are produced in a telephone receiver.

The use of the ordinary current meters is found unsatisfactory for measurement in small streams and the Committee recommends and discusses the employment of weirs for this purpose. Several types of weirs are discussed and the results of tests taken with weirs are given.

Electric Welding. By L. B. Wilson. Pp. xiii+106; figs. 79. London: Sir Isaac Pitman & Sons, Ltd. Price 5s. net.

This elementary treatise on the subject contains concise descriptions of the different methods of electric welding, the equipment, and applications. A clear diagram illustrating each method renders the description easy to follow, and economic considerations in connection with the equipment and applications add an interest to the work. Arc, resistance, "Cyc-arc," and percussion welding are each dealt with exhaustively from an elementary point of view. The chapter on automatic arc welding is of particular interest; the construction and operation of an automatic arc welding machine is described and illustrated, and considerable valuable data are given for the performance. A short chapter on the Quasi-arc process contains some particularly interesting reproductions of photomicrographs of sections of joints welded by three different methods, (1) Quasi-arc, (2) electrical weld with bare wire, and (3) oxy-acetylene weld, accompanying descriptive comparisons of the methods.

The concluding chapter deals with probably the most delicate of operations in connection with electric welding, that of welding small studs on steel plates, which has been made possible by the introduction of the "Cyc-arc" automatic welding process.

The many excellent illustrations are an outstanding feature of the book and help to render it the work of value which it should prove to all students and practical men interested in the subject.

Magnets. By C. R. Underhill, Fellow A.I.E.E. Pp. xiii+468; figs. 467. London: McGraw Hill Publishing Co., Ltd. Price 20s. net.

This work is concerned mainly with the theory and design of electromagnets and with descriptive matter relating to practical applications of the subject. Permanent magnets receive but scant notice in a final chapter comprising 16 pages only. The author has attempted to develop the theory of electric and magnetic circuits whilst almost completely avoiding the use of mathematical symbols. We cannot congratulate him on his success, and have to confess that we find the theoretical portions of the book very difficult reading.

After an introductory chapter on the rudiments of electrical theory, direct-current electromagnets are classified into types and their mechanical and time characteristics are briefly investigated on elementary lines. Valuable chapters describe such practical applications as magnetic chucks and brakes, lifting magnets, contactor gear and relays. The design and operating characteristics of direct current solenoids are next treated in great detail, an abundance of test data, mainly the result of the author's own researches, being given. The treatment of the true characteristics of d.c. solenoids is somewhat obscured by the cumbersome methods of calculation described. The magnetic circuit and magnetic calculations are dealt with at length. We find on p. 287 a short demonstration based on the statement that the perimeter of a circle of 1 cm. radius is 12.5664 cm. We cannot but think that if the author had been content to express π and its multiples in the conventional symbolic fashion instead of by numbers giving various degrees of approximation, such a mistake would not have occurred, and his reasoning would have been followed more easily. The treatment of alternating current is equally confusing. On p. 344 the ratio of R.M.S. to maximum value is found by taking the square root of the mean of the maximum and minimum values of the square of the current value during half a cycle. The theory of power factor correction by static condensers is treated at some length in this chapter. The chapter on magnetic materials is unduly short, embracing only seven pages. The design and characteristics of alternating current magnetic and electromagnetic devices are treated in great detail. We are, however, rather surprised to find no account of the theory of the shaded pole magnet. The account of the a.c. induction watt-hour meter on p. 401 is merely an explanation of why the disk rotates, no attempt being made to show how proportionality of speed to watts is obtained.

The book will be of greatest use to the specialist, to whom the wealth of information regarding the characteristics of electromagnets will particularly appeal. To such readers the portions dealing with elementary theory will be somewhat redundant. The work would have been more acceptable to the general reader and to the student if the section describing modern electromagnetic apparatus had been considerably amplified. In view of the extensive and increasing use of protective and automatic gear in modern generating and distributing systems, one would expect to find copious descriptive treatment of the subject of relays in the work under consideration. Actually the space allocated to such an important matter is limited to eight pages.

The Production and Measurement of Low Pressures. By F. H. Newman, D.Sc. Pp. 192; figs. 48. London: E. Benn, Ltd., 1925. Price, 16s. net.

This monograph is written with the idea of furnishing the physicist, and engineer, with an account of the more important instruments and devices used in this branch of science. It will be found extremely valuable to those interested in the production of high vacua, together with the important discoveries that have been made due to the recent improvements in high vacuum processes. The various types of mechanical, mercury and diffusion pumps, and manometer and molecular gauges, are well described and illustrated, along with a wealth of secondary information, which all who are interested in the subject should possess. Dr. Newman is of opinion that the trend of modern scientific thought favours a more general adoption of mercury vapour diffusion pumps, and predicts their displacing all other types where rapid and efficient exhaustion is desired. In the early part of the volume, the various devices adopted for producing low pressures are summarised, the whole subject being considered in detail in the subsequent chapters. A brief sketch is given of the general principles of thermionic emission, a striking and important practical application of which is the thermionic valve now in general use in wireless telegraphy and telephony. Electrochemical processes used in the removal of gases are also described, including charcoal activation at liquid air temperatures, and its practical application in the use of charcoal in liquid air containers.

Descriptions are given of the phenomena of the disappearance of gas in the discharge tube, and in the presence of incandescent filaments and phosphorus. The modern method of exhausting incandescent lamps is based on the disappearance of gas in the presence of phosphorus. The tungsten filament is coated with an alcoholic suspension of red phosphorus and sodium silicate, the lamp quickly exhausted by the pumping system, sealed off, and a high pressure applied to the filament, the process known as "flashing," the phosphorus volatilising from the filament and removing the residual gases.

The book is devoted mainly to the practical side of the subject, and in spite of its omission of all mathematical formulæ, the author has attained a considerable amount of precision in his statements. The book will be a useful guide that will stimulate inquiry and further exploration in this attractive field.

The ground covered by the book is of considerable extent, the treatment is lucid and the volume abounds with practical information. To those who desire to study the subject, the volume will prove exceedingly useful as a handbook of trustworthy information. It is one of the most important publications of its class, is of definite practical value and no other book treats the subject with the same skill. An appendix tabulating vapour pressures, speeds of pumps, lowest pressures attained, pressure ranges for various manometers, and an index, are excellent features which deserve favourable comment.

The volume is well printed, the matter excellently arranged, and it only remains to say that Dr. Newman has accomplished a very commendable piece of work in which there are but few typographical errors.

Industrial Electricity. By William H. Timbie. Pp. xiii+735; figs. 469. London: Chapman & Hall, Ltd. Price, 17s. 6d. net. Answers to problems. Price 2s. 6d.

The title of this book does not seem a very suitable one for an elementary text book on direct-current electrical engineering. The work has, however, been written on excellent lines and will be a welcome addition to the already considerable number of elementary text-books available for the beginner. The author has started from first principles, and without the use of any but the most elementary mathematics, has covered the whole range of elementary direct current technology in a very able fashion. The student will be greatly assisted by the summaries which form the conclusion of each chapter, and by the large number of examples given for solution. The answers to these examples are not given in the book but are published separately. It is necessary to remark that the conformity to American usage in the matter of units, wire gauge sizes, and

so forth, may tend to confuse the English student. We notice this particularly in the chapter on the magnetic circuit, in which, by the use of ampere-turns per inch as the unit of magnetising force, the value of 3.19 is given for the permeability of air.

The author has taken pains to develop a clear treatment of magnetic calculations, but the derivation of the practical units which he uses from the fundamental system should have begun and not concluded this important chapter. The chapters on direct current generators and motors call for special praise, and give a very able exposition of the principles and characteristics of these machines. Another excellent chapter is that dealing with dielectrics, in which the theory of the electrostatic circuit is worked out on lines similar to those employed for the magnetic circuit, and the bearing of the theory on the distribution of stresses in insulators and cable dielectrics is clearly shown. Here again, however, the derivation of the formulæ, and of the constants, when inch units are used, might have been given for the benefit of such students as are not willing to take figures and formulæ on trust. Primary and secondary batteries and gaseous conductors are the subjects of two useful chapters. The subject of electrical instruments and measurements is covered by two chapters, one in the early part of the book dealing very satisfactorily with resistance measurements and touching briefly on the matter of fault localisation, the other, in the latter part of the book, dealing with direct current instruments and meters in which the treatment is somewhat superficial.

Subject to the limitations referred to, the work can be recommended as a sound and well-written elementary textbook, and it should be of particular use to such students and apprentices as are not able to work through a systematic course of instruction in electrical engineering, and also to electrical workers desirous of obtaining a knowledge of elementary theory. The book is excellently produced and the price is quite reasonable.

Principles Adopted for Electric Lighting in H.M. Naval Service, being the First Report of the Admiralty Electric Lighting Committee, 1924. Pp. 51; figs. 12. London: His Majesty's Stationery Office. Price, 9d. net.

It would be difficult to find a better illustration of the way in which knowledge of illuminating engineering is penetrating into all quarters than this report. Government Departments have often been accused of making obsolete recommendations, but we are bound to say that the ideas conveyed in this case are up to date. In an introduction (Section I) a summary of general principles applying to lighting in offices and factories is presented, and the application of most of these to naval practice pointed out. On modern ships of war much work must be done by artificial light, and inadequate lighting is liable to cause eyestrain; unfortunately many persons are attracted by excess of light and the visibility of naked lights, and disregard the important matter—illumination on the place of work.

Next we have a short account of the mechanism of the eye and the part played by adaptation (Section II). Miners' nystagmus is mentioned as an illustration of the results of too feeble lighting, and the drawbacks of glare are clearly pointed out. In Section III terms used in illuminating engineering are explained in simple language. The method of explaining the lumen hardly seems happy, as the illustration based on the screening of sources behind holes of varying size is liable to cause confusion with "brightness"; but the term is quite correctly defined in an appendix.

Section IV, "Recommendations," is the most important section of the work. It is impossible to review these in detail, but they cover a wide ground, and convey many practical suggestions in a condensed form. 3-5 foot-candles is regarded as a good average for most purposes, but more detailed values for different spaces on ships are given in an appendix. Great importance is attached to shading. Indeed, the recommendation that "no naked light shall be visible within an angle made by two lines from the eye, one being horizontal and the other at 40 degrees to the horizontal" is more severe than that made by the Home Office Committee in connection with factory lighting. There is sound advice on the avoidance of shallow conical reflectors, inefficient "crinkled" glass shades, limitation of portable fittings, avoidance of excessive contrasts, spacing rules, &c., and attention is drawn to several special problems on board ship, such as the lighting of gauges, hatches, &c. It is interesting to note the recommendation that gas-filled lamps should supersede arc lamps for coaling, &c., and that the blue lamps, tried for action circuits in the war, should be eliminated.

One notes with approval a final recommendation that lighting arrangements should be examined by an officer of the electrical engineering department, who should issue a certificate (with comments if necessary). Explanatory matter at the end of the book is assisted by numerous diagrams, which are clear and good. In many respects the book is a rather remarkable instance of judicious concentration. If these recommendations are generally observed a considerable improvement in the lighting of H.M. ships will be effected. This initial booklet is to be followed by separate reports dealing with the application of these principles to specific problems.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Our Advertising Competition.—We wish to advise advertisers and all who are responsible for the preparation of advertisement "copy" for the pages of the ELECTRICAL REVIEW that entries for our Competition are now being received from various directions. As there are probably some other firms among either existing or intending advertisers who still wish to enter the contest, we may state again that the prizes for £100, £50, and £25 respectively will be awarded on the finding of independent judges who will decide which series of full-, half-, and quarter-page advertisements appearing in the ELECTRICAL REVIEW during the current half-year, they consider the best. The names of the judges and full particulars of the conditions that have to be complied with are given in our advertisement supplement, page 44, this week.

Rubber Manufacturers and Restriction.—A group of British rubber manufacturers has made representations to the Government in connection with the high prices engendered by the working of the Stevenson restriction scheme. It is contended that restriction has gone too far and the result will be an acute shortage of supplies which will be taken advantage of by producers outside the British Empire.

Threatened Tramway Strike. — The threatened strike of the tramway employés of the Stalybridge Joint Tramways and Electricity Board which was to have begun at midnight on August 5th was averted, the employés having agreed to suspend the strike notice pending a mass meeting which was to be held yesterday (Thursday).

Electricity Meters Approved.—The *London Gazette* notifies the approval by the Electricity Commissioners of the following meters:—Metropolitan-Vickers "Type N" single-phase watt-hour meter, from 3 to 20 A, 100 to 600 V; the Ferranti polyphase watt-hour meter "Type C.T.," from 2.5 to 20 A, 100 to 500 V; and the Ferranti "Type C" a.c. meter for the same range of current and voltage.

A "Better Lighting" Campaign. — The Electric Lamp Manufacturers' Association is undertaking, during October and November next, an intensive national "campaign" to induce shopkeepers to pay more attention to the illumination of their premises. Apart from the distribution of booklets—including one on "Light as a Sales Force"—the Association is taking advertisement space in trade papers, and articles by illumination experts will appear in these papers during the campaign. Lectures and demonstrations will be arranged for shopkeepers' associations and chambers of commerce, and electrical retailers are asked to assist in this work.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from August 5th. In the case of foreign applications the name and address of the British representatives are also given:—

Spiroglide. No. 459,014. Class 6. Centrifugal pumps.—The British Electric Plant Co., Ltd., Alloa, Scotland.

Magnum (lettering and design). No. 451,980. Class 8. Receiving instruments, tapped coils, and coil holders, all for use in radio-telephony.—Burne-Jones & Co., Ltd., 288, Borough High Street, S.E.1.

Resonic. No. 456,002. Class 8. Instruments and apparatus for use in radio-telephony.—Thorp Roderick, Ltd., 12, Balsall Street, Bedford.

Tom Thumb, No. 458 867, and Le Petit Poucet, No. 458,868. Class 8. Radio-telephonic and telegraphic apparatus, sets and instruments, electric accumulators and batteries.—Richard Brenhley, 248, Rue de Rivoli, Paris. (S. Sokal, 1, Great James Street, Bedford Row, W.C.1.)

Cleartron, No. 459,275, and (same letters combined with design), No. 459,302. Class 8. Thermionic valves.—A. H. Carlisle, 4, Wetherby Mansions S.W.5.

Orion. No. 452,747. Class 13. Electric lamps (ordinary).—Magyar Wolframlampa-gyar Kremenezky Janos Reszvenytarsasag, VI Vaci ut 99, Budapest, Hungary. (Dicker & Pollock, 20-23, Holborn, E.C.1.)

Insuloid. No. 457,362. All goods in Class 13.—J. A. Crabtree & Co., Ltd., Lincoln Road, Walsall.

Xiattattaix (lettering and design). No. 457,428. Class 13. Electric light fittings, electric cooking installations, and electric heating appliances.—Attaix, Ltd., 36, Bernard Street, Southampton.

Local Exhibition.—HEBDEN BRIDGE.—The Electricity Committee proposes to hold an exhibition in October.

The British Industries Fair.—It is reported that the Board of Trade has asked the Government to guarantee the British Industries Fair for a period of four years. The prospects for the next Fair are considered favourable.

Art in Advertisement.—We have recently received an excellent example of publicity matter from Messrs. Cross-Courtenay, Ltd. This takes the form of a brochure, the leaves of which are samples of paper made by Messrs. Grosvenor, Chater & Co., Ltd., at the Abbey Mills, Holywell. Upon each page are printed drawings of various kinds—pen-and-pencil sketches, colour designs, &c.—and photographs. The results are very pleasing; the brochure should form a useful guide to advertisers who aim at distinction in their announcements.

Trade Announcement.—THE CURTIS MANUFACTURING CO., of Conduit Place, Paddington, W.2, has converted its business into a private limited company—the Curtis Manufacturing Co., Ltd.

Catalogues and Lists.—MR. I. ROSE, 227, Brooke Road, Upper Clapton, E.5.—A circular letter drawing attention to the "Forward" electrically-propelled carriage.

MICHELL BEARINGS, LTD., South Benwell, Newcastle-on-Tyne.—An illustrated booklet describing the "Michell" viscometer.

SIEMENS & ENGLISH ELECTRIC CO., LTD., 38-39, Upper Thames Street, E.C.4.—Illustrated price sheet of electrical appliances and accessories for August.

MESSRS. COLE, MARCHENT & MORLEY, LTD., Bradford.—Two illustrated leaflets dealing with "Colmar" metal and "Marcol" iron for casting.

THE NATIONAL CARBON CO., INC., New York City, U.S.A.—An illustrated folder advertising "Columbia" dry cells.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—Catalogue No. A.B.V. 202, dealing with three-phase induction motors. Fully illustrated. Also an August stock list of motors and dynamos.

MESSRS. R. O'BRIEN & Co., 66, Mosley Street, Manchester.—A comprehensive catalogue (109 pp.) of electric light fittings, including electroliers, bowls, standards, pendants, ship's fittings, and accessories. Fully illustrated and priced.

MESSRS. CECIL HODGES & Co., LTD., Empire Works, Dalston, E.—An illustrated pamphlet advertising standard switchboard moving-iron ammeters, milliammeters, &c.

Bankruptcy Proceedings.—G. W. TEMPEST, 40, Brazennose Street, Manchester, lately trading as the Northern Radio Co., Manchester and Leeds, also as the General Wireless Trading Co. at Leeds, radio and telephone engineer.—The first meeting of the creditors herein was held on August 5th at the Official Receiver's office, Manchester. The statement of affairs showed liabilities expected to rank for dividend of £1,632, with a deficiency of £1,079.

P. L. SYMONDS, 40, Victoria Road, Great Yarmouth, Norfolk, electrician.—The following are creditors herein:—

	£		£
Dew, Alfred J.	73	Guaranteed, Ltd.	29
Deacon, William	32	Charles White Electrical Co., Ltd.	55
Falk, Stadelmann & Co., Ltd.	63		

F. R. GRIFFITHS, Alexandra House, 36, Alexandra Road, Bedford.—At the Chelmsford Bankruptcy Court on August 5th the above debtor, against whom a receiving order was made on January 20th last on a creditor's petition, moved to rescind that order on the ground that all the debts and costs had been paid in full. The Official Receiver stated that the money had been deposited to discharge all liabilities. The order was accordingly rescinded.

W. T. ROBINSON and H. ATTERBURY, electrical engineers, trading as J. P. Beckett & Co., 134, Victoria Street, Great Grimsby.—Last day for the receipt of proofs for dividend, August 18th. Trustee, Mr. S. M. Forrester, 1, Town Hall Street, Great Grimsby.

G. W. HUMPHREY, trading as the Humphrey Electrical Co., electrical engineer, 24, Broad Quay, Bristol. Last day for the receipt of proofs for dividend, August 18th. Trustee, Mr. F. W. Darley, Official Receiver, 26, Baldwin Street, Bristol.

A. C. R. BIRKETT, electrical engineer, 22 and 24, Wheeler Gate, Nottingham.—First and final dividend of 3¾d. in the £, payable August 17th at the Official Receiver's offices, 4, Castle Place, Nottingham.

H. W. SLATER, trading as the Engineering Supplies Co., mechanical and electrical engineer, 24, Grey Street, Newcastle-on-Tyne.—Trustee, Mr. C. Woollett, Pearl Buildings, 4, Northumberland Street, Newcastle-on-Tyne, released July 8th.

THOMAS BARTON, electrical engineer, Ainsworth Street, Blackburn.—Receiving order made August 5th on a creditor's petition.

A. L. DYER, electrical engineer, 49, Whitfield Avenue, Newcastle-under-Lyme.—Receiving order made July 31st on a creditor's petition. First meeting to-day (August 14th) at the Official Receiver's office, 12, Lonsdale Street, Stoke-on-Trent.

Dissolution of Partnership.—CATLOW & BULLOUGH, radio engineers, Atherton, Lancs.—Messrs. J. Bullough and H. Catlow have dissolved partnership. Debts will be attended to by Mr. Catlow, who will carry on the business under his own name.

Company Liquidations.—E. S. Co., LTD., electrical and wireless dealers, 233, Tottenham Court Road, W.—Mr. B. A. Smith, 11, Queen Victoria Street, E.C., has issued a notice convening a meeting of creditors for to-day (Friday) at the Institute of Chartered Accountants, Moorgate Place, E.C. The company has already passed a resolution for voluntary liquidation, Mr. Smith being appointed the liquidator. A statement of affairs has been issued showing the position of the company as at June 26th last, the date of the appointment of a receiver for the debenture holders. The statement discloses first debentures of £12,397, and second debentures of £21,750, a total debenture issue of £34,147. The assets are estimated to realise £18,273, from which has to be deducted £509 for preferential claims, leaving free assets of £17,764. The assets are insufficient to meet the claims of the debenture holders by £16,382. With regard to the first debentures, the statement shows that £4,000 was issued to the guarantors of the bank loan which stands at £3,144. On that account there would be a margin which would be available for the repayment of other debentures. The claims of the unsecured creditors total £20,640, the deficiency as regarded the unsecured creditors being £37,023. The following are the principal creditors:—

	£		£
Deutsche Kabelwerke	6,000	Hart Accumulator Co., Ltd. ...	152
Anglo-Electric Co.	334	Igranic Electric Co., Ltd. ...	435
British Thomson-Houston Co., Ltd.	379	Kersons Manufacturing	222
Brown, S G., Ltd.	101	Longmore Bros.	167
Cable Accessories Co., Ltd. ...	364	Midland Electric Mfg. Co., Ltd.	168
Credenda Conduits Co., Ltd. ...	120	Metropolitan Water Board ...	113
Crabtree, J. A., & Co., Ltd. ...	395	Metropolitan-Vickers Electrical Co., Ltd.	292
Chloride Electrical Storage Co., Ltd.	193	Mullard Radio Valve Co., Ltd.	224
Cossor, A. C., Ltd.	241	McMillan & Co.	427
Davies, Kent & Stewart	114	Marconiphone Co., Ltd.	310
Edison Swan Electric Co., Ltd.	430	Radio Instruments, Ltd.	223
Siemens & English Electric Lamp Co., Ltd.	1,101	Sterling Telephone & Electric Co., Ltd.	341
Foster Engineering Co., Ltd. ...	289	Stella Conduit Co., Ltd. ...	155
General Electric Co., Ltd. ...	575	Thomas, F., & Co.	336
Graham, Alfred. & Co.	153	Vulcan Electric Co.	264
Hawkins, L. G., & Co., Ltd.	261	Wootton, H. A., & Co.	126
		Downes & Davies	104

The Sterling Telephone and Electric Co., Ltd., presented a petition for the winding-up of the company on August 7th; this is to be heard in London on October 13th.

INGLEBY & Co., LTD., electric motor manufacturers and engineers, Caledonia Works, Beeston, Leeds.—A meeting of creditors was held recently at Leeds. The chair was occupied by Mr. R. E. Starkie, 6, South Parade, Leeds, who had been appointed to act as receiver for the debenture holders and as liquidator in the voluntary liquidation of the company. An approximate statement of affairs was presented which showed ranking liabilities of £20,124, all of which was due to unsecured creditors. In addition there was a fully secured creditor for £225 who held a charge on certain land. The assets were estimated to produce £15,953. From the latter figure had to be deducted £704 for preferential claims and secured creditors, and £12,420 due on debentures, leaving net assets of £2,830, or a deficiency of £17,295 so far as the unsecured creditors were concerned. The issued capital of the company was £16,143, and as regarded the shareholders there was a deficiency of £33,438. It was reported that the business was an old-established one, but latterly had been carried on at a loss. A resolution was passed confirming the appointment of Mr. Starkie as liquidator, and a committee of inspection was elected.

CUTTING BROS., LTD., Park Works, Stamford, Lincs.—A meeting of creditors is to be held to-morrow (Saturday) to confirm the appointment of Mr. C. J. Pain, of 18, Low Pavement, Nottingham, as liquidator in the voluntary liquidation. Creditors are to send particulars of their debts, &c., to him by September 18th. Mr. Pain was appointed receiver and manager on behalf of the first mortgage debenture holders on August 11th, 1924. Since then he has carried on the business with a view to a beneficial realisation, but no satisfactory result has attended his efforts to dispose of the business privately as a going concern. In June the business was offered for sale by public tender, and three tenders of varying amount were received. The highest (£15,300) was accepted. The claims of the first debenture-holders amount to £12,000, to which must be added accrued interest for a period exceeding 18 months, the expenses of the sale, and the receiver's remuneration. There are, in addition, prior claims by the Board of Inland Revenue and other preferential creditors which it is expected will aggregate £1,056. Following the first debenture there is a second debenture for £32,000. It is doubtful whether, after discharging the various commitments referred to, there will be anything remaining for the second debenture-holders, and consequently no fund is available for a dividend to the unsecured creditors.

WALLACE (GLASGOW), LTD.—The liquidators (Messrs. A. Murdoch and J. Winning, 53, Bothwell Street, Glasgow), in paying a first dividend of 3s. 6d. in the £, state that they have disposed of the works at Paton Street, Ayr, Carmuirs, and machine-tools in the factory at Cardonald, &c. The works at Cardonald and a considerable quantity of the stock there have still to be disposed of, and the interests in Australia and Roumania have to be adjusted.

ALKLUM ELECTRICS, LTD., Waterside Works, Halifax, accumulator makers.—On behalf of petitioning creditors his Honour Judge Mossop, at Halifax County Court, on August 6th, made an order for winding up this company. There was no objection by the company.

Chase Electrical Manufacturing Co., Ltd.—Winding up voluntarily. Meeting of creditors August 18th at the office of the liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2.

Lelios Lamp Co., Ltd.—Winding up voluntarily. Liquidator, Mr. E. L. Butler, address not stated.

Deed of Arrangement.—F. Vigers and C. H. Vigers.—The trustees in this matter have issued a statement of accounts for the year ended July 20th, showing that a dividend of .8d. in the £ was paid on December 24th last on claims amounting to £126,658. It is stated that the next distribution will be made out of the profits earned in the year ended June 30th last.

Electricity at Poplar Carnival.—A carnival in aid of a fund for providing a New Year's treat for children was held in Poplar recently. The principal feature was a procession of decorated vehicles. The Poplar Electricity Department participated with two motor vehicles, each of which was



A Mobile Electrical Exhibition at Poplar.

decorated to represent the interior of a room, and bore a table upon which electrical appliances were arranged, as well as larger appliances round about, as shown in the illustration above. In this way a cooker, a fire, a geyser, kettles, fans, and other devices were displayed to exemplify the versatile nature of electricity.

French Electrical Industry.—The B.E.A.M.A. has issued, through its Electrical Publicity Bureau, a special publication (No. 2, price 2s. 6d.), dealing with the electrical industry of France. It is explained in the introduction that to give a complete idea of the part which electricity plays in the life of France emphasis has been laid upon finance, industrial electrification and electro-chemical and electro-metallurgical development as much as on the electricity supply and electrical engineering industries proper. The financial section comes first and after a general review of national finance with particular reference to the effects of inflation upon industry, attention is paid to the activities of the banks and industrial credit institutions. It is stated that finance is becoming more and more linked up with industry, and it will only be a matter of a few years before the system will be strong enough to develop outside of France and be of direct assistance to the French effort to open up foreign markets. The section on industrial electrification shows how the recovery of French industry and the reconstruction of the devastated territories has been assisted by electrical means. Some interesting figures are given relating to the use of electricity in mines and in the iron and steel industries. Electro-chemical and electro-metallurgical works are then dealt with and statistics of the capital of the principal concerns, the amount of electric power which they employ, and output are given. The report then considers the electrical industry proper commencing with a study of the production of electricity by water-power and steam. It is shown that the capital invested in hydro-electric power alone rose from 800 million fr. in 1923 to 2,800 million at the beginning of 1924. The financing for power development has been carried out not only by banks and finance companies but also by the leading electrical manufacturing firms, particularly the Cie. Générale d'Electricité and the French Thomson-Houston Co. The ramifications of the interests of these two firms are traced, showing participation in a comprehensive field. The close connections and special arrangements between other large groups are briefly mentioned. Dealing with the electrical engineering industry generally, the report states that the total amount of capital now invested in the industry is about 1,500 million fr., and that the value of production has risen from 193 million fr. in 1913 to 1,200 million fr. in 1923. The number of employés is given as 60,000. The firms engaged in the industry include five with a capital of 100 million fr. or more, and fourteen with a capital of over 30 million fr. The exports in 1924 are stated to have been 22.9 per cent. of the total output. In 1923 the value of the output per worker, in sterling, was £350, while during the same period the equivalent figure for British workers was £450. France from being at one time a market for British electrical goods, is now actively competing in European markets. The foreign electrical trade of France is analysed in the report under the main classes of goods and as to geographical distribution. After a section on railway electrification as affecting the industry, the report passes to a comparative study of wages in France and Great Britain. Broadly, it is stated that the French worker is getting almost exactly the same wage as the British worker if purchasing power alone is considered. Taking the actual figures, however, the French industrialist has now an advantage of 40 per cent. in wages alone and 25 per cent. in materials, and is able to quote prices 30 per cent. below the British prices and earn the same profits. The report is rounded off with a number of conclusions; these, in brief, are as follows: France is becoming self-sufficient electrically-speaking, and is one of our greatest potential competitors in Europe, Japan and South America. The financial participation of manufacturers in electricity supply schemes has given an impetus to electrical development. The industrial credit system is increasing in influence and is proving satisfactory. Although the French industrialist pays wages lower than those paid in Great Britain, he is protected from labour troubles by the better purchasing power of these wages. The communities of interest between groups are so close that it may be said that the French electrical trust exists in reality if not in name. Finally, however, it is pointed out that drastic deflation will have to take place if financial stability is to be restored. For this reason alone it would be dangerous to attach too much importance to those who look on the present industrial position of France as permanent. The electrical industry, however, through railway electrification and through the projected extensions of generating plant, will have a fairly sound demand for many years to come, but its expansion can only take place rapidly through development of exports, and the formation of a strong export policy may be expected.

Recovery from Fire.—Messrs. A. J. Stevens & Co. (1914), Ltd., state that thanks to the efforts of the builders, carpenters, &c., engaged in making good the damage caused by the recent fire at the firm's radio apparatus works, the position is reaching normal. The whole of the cabinet shop staff is already fully employed at the new works at Stewart Street, Wolverhampton.

Australian Tariff Inquiry.—The Australian Tariff Board recently heard an application by Australian firms for increased protection against American induction motor manufacturers who, it was alleged, charged lower prices for exported motors than for those destined for the American home market. One manufacturer said that certain firms calling themselves Australian manufacturers imported American stampings for induction motors and made them up in "Australian" motors. If these were produced in the Commonwealth the firms would have to employ 30 per cent. more hands and add about 30 per cent. to their plant. A representative of the Australian General Electric Co., Melbourne, produced invoices which, he said, proved that the export prices of the American machines were not lower than the home prices, and, indeed, were often higher.

Book Notices.—"Electrical Precipitation," by Sir Oliver Lodge, D.Sc., F.R.S. Pp. 40; figs. 7. London: Humphrey Milford (Oxford University Press). Price, 2s. 6d. net.

"17th Annual Report of the Hydro-Electric Power Commission of Ontario for the year ended October 31st, 1924." Toronto: Clarkson W. James.

"The China Year Book, 1925." Pp. xxx + 1,349. London: Simpkin, Marshall, Hamilton, Kent & Co., Ltd. Price, 42s. net.

"Alternating Currents and Transients," by F. M. Colebrook, B.Sc.(Lond.), D.I.C., A.C.G.I. Pp. x + 195; figs. 97. London: McGraw-Hill Publishing Co., Ltd. Price, 15s. net.

Social Event.—The annual sports meeting of the staff and employés of Messrs. Johnson & Phillips, Ltd., took place at Kidbrook on July 25th. There was a record attendance and the programme was a very enjoyable one. One of the events,



A Pillow Fight at Johnson & Phillips's Sports.

a pole pillow fight, is depicted in the accompanying illustration. The prizes were presented to the successful competitors by Lady Dawson.

Brazilian Electrical Imports.—Imports of electrical goods into Rio de Janeiro during May were considerably higher than the figures for the two preceding months. The United States was the principal supplier, but there were large increases in French and German imports. The latter approached the American figure, being 195 metric tons as against 219 tons from the United States.

Hydro-Electric Plant for Australia.—Definite steps are soon to be taken in connection with the Sugarloaf hydro-electric scheme which was approved by the Victorian Government in 1923. Sir John Monash, chairman of the Victorian Electricity Commission, recently announced that tenders were to be invited at an early date for the construction of the hydraulic works (including a dam a mile wide) and the supply of the necessary plant. The plans provide for two generating stations with a combined capacity of about 25,000 kW.

Australian Tariff Decisions.—Among the recent rulings by the Australian Customs authorities are the following: Control switchgear for 6,600-V, 3-phase, 50-cycle sub-stations, and 5,000-kVA, 33,000/5,000-V transformers free under the British preferential tariff, 5 per cent. under the intermediate tariff; and 10 per cent. under the general tariff.

The Electrical Imports of Siam.—In the course of a report on the commercial situation in Siam at the close of the third quarter of 1924 (Stationery Office, 1s. 6d. net), Mr. H. R. Bird, Acting Consul-General at Bangkok, gives particulars of that country's electrical imports. These show that the value of imports of electrical goods and apparatus rose from 798,215 ticals (£73,298) in 1922-23 to 1,150,507 ticals (£105,648) in 1923-24. The most noticeable feature is the rapid expansion of Germany's share in this trade. In the last report upon Siam a gain of over twice the value of the preceding twelve months was recorded; this year the gain is nearly 300 per cent., the figures being 86,655 ticals (£7,957) in 1922-23, and 328,343 ticals (£30,151) in 1923-24. This puts Germany at the head of the list, the United Kingdom, whose exports have fallen from 307,173 ticals to 286,770 ticals, being second. Denmark and the United States follow with 150,073 ticals and 117,554 ticals respectively.

An Electrical Demonstration Car.—The electrical engineer of Haslingden (Mr. Barnes Kay) has sent us a photograph, which is reproduced herewith, of a lorry which was arranged to take part in a recent demonstration held in the town. As will be seen the lorry was tastefully decorated and equipped



An Electrical Demonstration Car at Haslingden.

with examples of the principal domestic appliances—a cooker, a wash boiler, a toaster, a fire, an iron, &c., and the whole was surmounted by an effective "slogan" which must have caused the residents to stop and consider.

International Fair at Salonica.—We have received from the Greek Minister in London a brief prospectus of the First International Fair, which is to be held at Salonica from October 18th to 31st next. The fair will have a wide scope and include electric motors, generators, transformers, lighting and heating appliances, and electrical tools.

The Leipzig Fair.—The address of the London representative of the Leipzig International Industries Fair has been changed to 1, Gower Street, W.C.1. Telephone Nos.: Museum 9523 and 4; telegrams: "Amtermesse, Westcent, London."

Concessions in Russia.—The Riga correspondent of *The Times* says that the Soviet Concessions Department, which is under the management of M. Trotsky, reports that 90 concessions have been granted to foreigners, the capital invested being £2,500,000, which is to be increased to £8,000,000. Of these concessions 22 are held by German interests, 17 by British concerns, and eight by Americans, the remainder being distributed among 20 other countries. The principal class is known as "commercial," there being 26 of these; there are 17 concessions in "productive industry"; 13 mining concessions; 12 concerned with transport and communications; 6 in forestry; and 3 of a miscellaneous nature. During the last economic year the turnover of the commercial concessions amounted to about £2,000,000, but the output of all the producing concessions was below £100,000. In discussing the matter recently, M. Trotsky said that the Soviet had decided that they must "compromise and traffic with their mortal enemies, and must attract capital to put their house in order." He further said that "foreigners had better not waste time; the conditions which Soviet Russia offered would not improve, but, on the contrary, would become more unfavourable and less flexible as time went on, and those who did not close on the offers made now might find themselves left out in the cold."

German Electrical Exports.—A report by Mr. J. W. F. Thelwall, the British Commercial Secretary at Berlin, upon the foreign trade of Germany during June, states that the exports of electro-technical products decreased in value by 5.7 million Reichmarks as compared with May.

For Sale.—As the Bexley Urban District Council now purchases electricity in bulk, offers are invited for the plant at the disused generating station. (See our advertisement pages to-day.)

New French Companies. — A company has lately been formed at Wolfisheim, in the Lower Rhine area, with a capital of 1,200,000 fr. and the title La Société de la Fabrique de Matériél Electrique, Téléphonique et Industriel "M.E.T.I."

A company has recently been organised at Grenoble with a capital of 400,000 fr. and the title La Société Electribloc, to manufacture electric motor vehicles.

Irish Free State Electrical Imports.—The imports of electrical goods into the Irish Free State during April last only amounted to a value of £25,785, as compared with £44,700 in April last year. The total for the first four months of the year is returned at only £99,189, as compared with £145,593 in the corresponding period of 1924.

Austrian Patent Fees Increased.—The fees in respect of patent applications and licences in Austria have recently been increased.

French Bauxite Production.—The production of bauxite in France in 1924 is reported to have amounted to 340,000 tons, of which 202,000 tons was exported, as compared with 192,000 tons in 1923, and 167,000 tons in 1922. As the German United Aluminium Works (Lauta) now obtains bauxite from Istria and elsewhere, the French exports are sent chiefly to Switzerland and England, and to a smaller extent to Italy and the United States. Despite the efforts to restrict the exports of bauxite it is said that the French Government seems not disposed to act in this manner as it is considered that the deposits of red bauxite in the Var and the Bouches du Rhône are inexhaustible.

German Export Bounties.—Among the various premiums or rebates which the German Steel Ingot Syndicate has decided to grant to consumers of materials used in the production of manufactures for export markets, may be mentioned the grant of 25s. per ton on dynamo and transformer sheets consumed in the execution of export orders.

A German Aluminium Works Combination.—A syndicate of the aluminium rolling mills is being formed in Germany for the consolidation of the entire industry, the promotion of sales both at home and abroad, and the prevention of underselling in the future. Apart from some small mills it is stated that all the others have joined the syndicate. Negotiations with large consumers will take place on August 14th, when sale prices will be fixed. At present the basis price for sheets is 295 marks per 100 kg.

American Enterprise in Rumania. — It is reported from Bucharest that American financiers are occupying themselves with an economic-financial scheme which aims at the utilisation of the water powers from the Iron Gates of the Danube as far as the Bicaz district in the Carpathians, by bringing into use in the first place the hydraulic forces of the Neajlov and Arges basin. All the details of the scheme have been worked out by a Rumanian engineer (M. Leonida), who proposes the construction of a works capable of yielding from 140,000,000 to 150,000,000 kWh per annum. American engineers are said to have already investigated the scheme on the spot and discussed it with the Minister of Industry. Moreover, the city authorities of Bucharest definitely decided at the end of July on the formation of an electricity supply company in connection with the scheme, whose chief object will be to furnish energy to the city for industrial and other purposes, and the Americans will assist in financing the project.

United States Foreign Loans.—In a *Commerce Reports* list of foreign loans raised in the United States during the first half of the current year the following appear: The Copenhagen Telephone Co. ($2,000,000); Burmeister & Wain, Copenhagen ($2,000,000); Allgemeine Elektricitäts Gesellschaft ($10,000,000); Siemens & Halske ($8,500,000); Electric Power Corporation of Germany ($5,000,000); Price Bros. & Co., Ltd., Canada ($5,000,000); Bell Telephone Co. of Canada ($10,000,000); Montreal Tramways ($7,000,000); the Toho Electric Power Corporation, Ltd., Japan ($15,000,000); and the Ujigawa Electric Power Co., Ltd., Japan ($14,000,000).

British Electric Trucks for Peru.—*Commerce Reports* says that the Central Railway of Peru has ordered from England a number of electric platform trucks for use at the Desamparados station in Lima. This is the first time that such trucks have been used in Peru.

Proposed Railway Electrification in Venezuela.—In the course of his speech at the recent annual meeting of the La Guaira and Caracas Railway Co., Ltd., the chairman (Mr. J. A. Goudge) said that the competition of road traffic had led the board to consider the electrification of the line as the only remedy. Two experienced engineers had been asked to report and their conclusions had favoured the carrying out of the work. The company, however, would require certain assurances from the Venezuelan Government before proceeding with electrification. If these assurances were obtained and the prospects still appeared good a scheme would be presented in a few months' time.

Bulgarian Order for Germany.—Various German and Austrian firms and the Brown-Boveri Company, of Mannheim and Vienna, recently competed for the contract for the establishment of a central station in the Bulgarian town of Plevna. The lowest offer, which was submitted by the Bergmann Electricity Works Company and amounted to 16,857,762 Bulgarian leva, has been accepted.

Luxemburg Commercial Fair.—An electrical section is included in the fourth annual Commercial Fair which is being held in the city of Luxemburg from August 14th to 24th.

Copper, Lead and Rubber Prices.—Messrs. F. Smith and Co. report August 11th:—Copper (electrolytic) bars, £68 15s., £1 increase; ditto ditto sheets, no change; ditto ditto wire rods, £78 15s., £1 increase; ditto ditto h.c. wire, 9⅞d.

Messrs. James & Shakespeare report July 28th:—Copper bars (best selected), sheet and rod, £92, £1 increase; English pig lead, £38 10s., 5s. increase.

Messrs. E. Till & Co. report July 28th:—India-rubber, Para fine, 3s. 8d., 5½d. decrease.

Annual Holidays.—The works and offices of the Airedale Electrical and Manufacturing Co., Ltd., Bradford, will be closed from to-night (Friday) until the morning of Monday, August 24th.

Lighting and Power Notes.

Airedale.—CONFERENCE OF LOCAL AUTHORITIES.—At a recent meeting of the Skipton Urban District Council a report was given of the proceedings at the private conference of various local authorities of Airedale and the north-western area of the West Riding (Aire and Calder) Electricity District, convened by Keighley Corporation, on the subject of possibilities of co-ordinated effort in electricity supply. The delegates reported that the conference on July 23rd passed the following resolutions: (1) "That in the opinion of this conference it is desirable that the supply and distribution of electricity in this area should be developed under the supervision and control of the local authorities and that with this object in view a committee be formed to promote co-ordination and co-operation among the local authorities concerned"; and (2) "That the committee be constituted of representatives of the councils of Barnoldswick, Denholme, Earby, Ilkley, Keighley Borough, Silsden, Skipton Urban and Skipton Rural." It was also agreed that the next meeting of the committee should be at Skipton.

Audenshaw. — STREET LIGHTING. — The Urban District Council has appointed a committee to report as to the electric lighting of main roads.

Bangor.—CONTRIBUTION TO B.E.D.A.—There was some discussion at last week's meeting of the Bangor City Council on a recommendation to contribute £13 to the British Electrical Development Association. The main point of objection was that it was a manufacturers' movement, and the Bangor electricity works being in a flourishing condition, did not need advertisement. The recommendation was confirmed on its being explained that the department had benefited considerably from assistance rendered by the E.D.A.

Blackpool.—LOANS.—The Corporation has received sanction to a loan of £6,116 for a new traction feeder between the electricity works and Marton. Application is being made for sanction to borrow £12,000 for the purchase of a 2,000-kW turbo-generator for the electricity undertaking.

Bridlington.—LOAN.—The Town Council has received sanction to a loan of £5,398 for mains.

Chelmsford.—ELECTRICITY SUPPLY.—At a recent meeting of the Town Council the Electricity Committee reported that it had discussed with Mr. A. Hugh Seabrook, M.I.E.E., his preliminary report upon the condition of the electricity undertaking, its financial standing, the question of its acquisition by the Council and alternative suggestions of dealing with it if taken over. After full consideration it was resolved that the managing director of the Electric Supply Corporation, Ltd., be approached with a view to a conference being arranged for the discussion of the whole matter on a purely informal basis.

Continental.—CZECHO-SLOVAKIA.—Work is about to commence on the construction of a large new hydro-electric station to utilise the water power of the river Vetzva, a tributary of the Moldau, near Prague. Three turbo-generator sets capable of producing 130 million kWh per year are to be installed.

AUSTRIA.—It is announced that as a result of the financial support of the Swiss Bank for Electrical Undertakings, of Zurich, the Stern and Hafferl Electricitatswerke Gesellschaft, of Gmunden, is now making good progress with the establishment of a new 9,000-h.p. hydro-electric power station at Ranna and a 9,000-h.p. steam-operated station at Timelkam in the Wolfsegger coal mining district of Lower Austria. When these are completed the company will have thirteen electricity stations under its control with a total turbine capacity of 60,000 h.p. and an annual output of approximately 200 million kWh.

Among the schemes for the establishment of hydro-electric plants recently submitted to the Hydrographic Central Office of the Austrian Government is one for 10,780 h.p. on the Weerbach for the municipal authorities of Hall (Tyrol), and one of 2,000 h.p. on the river Mur at Niklasdorf, Styria, for the Brigl-Bergmeister Cellulose and Paper Works Co.

ITALY.—The Italian Government has decided again to grant subsidies to central stations in course of construction in order to give a fresh impetus to the establishment of new undertakings, the carrying out of which seems to have slackened during the past two years. According to the scheme, the amount of the subsidies, based on the number and power of the projected works, will reach from 30,000,000 to 35,000,000 lire. The most important central stations which will benefit from the subsidies are that of the Adamello Company on the San-Croce torrent and that of the Moncenisio at Calcinera, which will be of 100,000 h.p.

FRANCE.—*Le Journal* learns from Madrid that the work of electrifying the Spanish section of the international line Ripolle-Puigcerda-Aix has just commenced and that the resumption of work on the French side is announced as imminent. At the Tour de Carol, at an altitude of 1,231 metres and a distance of 39½ kilometres from Aix, a large international station is to be built at an estimated cost of 10,000,000 fr. The Spanish trains will run as far as this station, while the French trains will stop at Puigcerda.—*Reuter's Trade Service* (Paris).

Dalkeith.—PURCHASE OF UNDERTAKING.—The Town Council has agreed to make a final offer of £18,000 to the Electric Supply Corporation, Ltd., for the purchase of the Dalkeith electricity undertaking, and if the offer is not accepted to let the matter go to arbitration. The company stated that the undertaking was approximately valued at £22,000, but it was willing to accept £19,000.

Eastbourne.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to a loan of £6,689 for mains and equipment.

Gisborough. — ELECTRICITY SUPPLY. — The Urban District Council is to proceed with the electricity scheme which recently received Government sanction, and a contract has been placed with the Craven Electrical Construction Co. for laying the cable and for the construction of the transformer station and equipment. The Council will receive a bulk supply of electricity from the Cleveland and Durham Power Company.

Glasgow.—DALMARNOCK STATION PROGRESS.—Satisfactory progress is being made at the Dalmarnock power station, and it is expected that at least one of the Parsons turbo-alternators will be in commission in time for the winter load.

Hastings.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer: Mr. R. F. Ferguson) for the year ended March 31st last shows a total income of £63,228, as compared with £55,543 in the preceding year. Working expenses increased slightly from £28,134 to £30,912, and the gross profit was £32,316, as against £27,409, to which was added a sum of £347 received as aid in connection with unemployment relief schemes, making a total of £32,663. After providing for capital charges there remained a net surplus of £8,626, as compared with £12,045 in 1923-24. A sum of £2,000 was contributed to the borough fund. The capital expenditure during the year amounted to £126,469, and included £49,991 for machinery, £25,966 for buildings, and £17,758 for mains. The electrical energy sold increased from 2,292,993 to 2,790,418 kWh, and the maximum supply demanded from 1,730 to 1,895 kW.

Hereford.—ELECTRICITY EXTENSIONS.—The Town Council is applying for sanction to a loan of £4,000 to meet the cost of extending the mains from Glewstone to Ross, a distance of about four miles. The Council is to supply electricity in bulk to the Ross Electric Light and Power Co., Ltd., on the following terms:—The company to guarantee a minimum annual bill equal to 20 per cent. for three years on the expenditure incurred by the Council; the company to pay for the cost of the line; the price to be paid for electricity to be £6 per kW, plus 0.6d. per kWh, with a coal clause. The Council has also decided to apply for a loan of £843 to meet the cost of laying a cable to supply electricity to 56 Council houses.

Irish Free State.—DUNGARVAN (CO. WATERFORD).—At a recent meeting of the Urban District Council, the Dungarvan Electric Light Co.'s tender for lighting the streets of the town for 12 months at £4 per lamp was accepted.

Keighley.—INAUGURATION OF EXTENSIONS.—The Right Hon. Philip Snowden, M.P., will formally open an extension at the Corporation electricity works on September 19th.

Lancaster.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer, Mr. G. C. Milnes) for the year ended March 31st last, record a total revenue of £26,035, and working expenditure of £20,826, leaving a gross profit of £5,209. The figures for 1923-24 were: Income, £25,066; working expenses, £16,404; gross profit, £8,662. To the gross profit was added bank interest and contributions to loan charges making a total of £9,036. After providing for capital charges there was a balance of £1,365, of which £1,000 was contributed to the borough fund and the remainder transferred to reserve. The sales of electrical energy increased from 1,354,365 to 1,498,234 kWh. The maximum load on the generating station was 1,526 kW.

Leyton.—ELECTRICITY IN BULK.—The Electricity Committee has recommended to the Urban District Council that agreements be entered into with the County of London Electric Supply Co., Ltd., and the Walthamstow Urban District Council for a bulk supply of electricity of approximately 2,000 kW and 5,000,000 kWh from each authority, and that application be made for sanction to a loan of £25,000 for the installation

of the necessary converting plant to carry the scheme into effect.

Manchester.—STREET LIGHTING.—The Electricity Committee is seeking sanction for a loan of £25,000 for the extension of street lighting.

LOAN.—The Finance Committee has approved a recommendation of the Electricity Committee that application be made for sanction to a loan of £420,000 for h.p. trunk mains, transformer stations, distributing stations, and a feeder and ordinary mains.

Merstham.—ELECTRICITY SUPPLY.—At a meeting of the local Council on August 4th, a representative of the County of London Electric Supply Co., Ltd., which is applying for an order to supply electricity within the district, attended and gave particulars of the company's proposals. He stated that the company was prepared to extend the mains through Merstham directly the Order was granted, and the price of electricity would probably be 7d. per kWh for lighting, and 3d. per kWh for power (maximum). The Council decided to support the application.

Nelson.—ELECTRICITY IN BULK.—The Town Council, on August 5th, approved a resolution quoting terms to Burnley for a bulk supply of electricity.

Northern Ireland.—ARMAGH.—The Urban District Council has asked Mr. P. Spalding, manager and engineer of Dundalk electricity works, to prepare a scheme of electric lighting for the city, the estimated cost being £10,000.

RATHFRILAND (Co. DOWN).—A ratepayers committee has asked the Rural District Council to grant facilities for the installation of electric lighting in the town.

Price Reductions. — Reductions in the charges for electricity have been made or recommended in the following districts:—

LEYTON.—Lighting: Flat rate from 6½d. to 5½d. per kWh.
MAIDENHEAD.—Lighting: 6½d. per kWh.

Retford.—NEW POWER STATION.—The Town Council has decided to proceed with the construction of a new generating station and has appointed the present gas and water engineer, Mr. J. R. Bradshaw, as electrical engineer at an increased salary.

Special Orders. — The following Orders have been submitted by the Electricity Commissioners to the Minister of Transport for confirmation: Wolverhampton Electricity (Extension) Special Order, 1925, for the supply by the Corporation in parts of the rural districts of Cannock and Seisdon; Preston Corporation Electricity (Extension) Special Order, for the supply by the Corporation in part of the rural district of Preston.

Applications for Special Orders have been made by the following authorities: Bedford Corporation, for the supply of electricity in the urban district of Ampthill and parts of the rural districts of Ampthill and Biggleswade; St. Helens Corporation, in the parish of Windle and part of the parish of Eccleston.

Torquay.—LOANS.—The Town Council has applied to the Electricity Commissioners for sanction to the following loans: £1,100 for transformers; £1,700 for an e.h.p. main to Abbots Kerswell; £850 for transformers and e.h.p. switchgear at substations; £165 for oil-purifying and testing plant.

Watford.—EXTENSION OF SUPPLY.—The Town Council has decided, subject to the sanction of the Electricity Commissioners and the Unemployment Grants Committee, to carry out an extension of its electricity supply to Bovingdon at an estimated cost of £11,169.

Wolverhampton.—ELECTRICITY EXTENSIONS.—The Corporation Electricity Committee proposes to make a number of important extensions which include an expenditure of £26,000 for extending the supply to Codsall, Brewood and Coven, subject to a grant in aid, £56,956 on the Low Hill Housing estate where the Town Council proposes to erect 3,600 houses ultimately, and £19,000 on additional converter plant at the power station.

Tramway and Railway Notes.

Continental.—FRANCE.—According to the *Electric Railway and Tramway Journal*, a series of torrential thunderstorms broke over Paris on the night of July 22nd. The electric generating station at Gennevilliers, on the edge of the city, was put out of action, and the electric power by which the trains are taken from the Gare d'Orsay, the terminus of the Orleans Co.'s main line, was cut off. The station had to be closed, and intending passengers had to go by cab to Austerlitz Station, where steam locomotion is employed.

The electric tramway system in the town of Saint Quentin has recently re-inaugurated. During the war the company's power station was destroyed and the directors decided not to rebuild it but to obtain the necessary energy from the local municipal central station. The current is three-phase a.c., and to convert it to d.c. a sub-station with Brown-Boveri mercury rectifiers has been equipped by the Compagnie Electro-Mécanique, of Paris.

BELGIUM.—Good progress has been made with the work of electrification of railways in the province of Antwerp, and the provincial government is to commence the preparation of supplementary plans which were only to be started when the main project had been accomplished. It is anticipated that the plans will be ready during the autumn.

ITALY.—A new electric railway has recently been completed and opened for traffic between Rome and Ostia. The line works on the 2,600-V, d.c. system, the necessary energy being supplied by the municipal central station at Acilia, where three transformers have been installed by the Italian Brown-Boveri Co.

SWITZERLAND.—The Swiss Federal Railway authorities have voted a credit of £163,320 towards the cost of electrification of the line between Rothkreutz, Rupperswil and Brugg, a distance of nearly thirty-four miles, and one of £478,160 for the electrical equipment of the Plezieux-Berne line, a distance of 47½ miles.

Croydon.—ROUTE ABANDONED.—The Corporation is to abandon the tramway track in Oakfield Road.

TRACK RENEWALS.—The Wellesley Road route is to be reconstructed at a cost of £13,437.

Darlington.—RAILLESS CARS.—The reconstruction of the Corporation tramway overhead equipment for the operation of railless-cars has now commenced, the work being carried out by Messrs. Clough, Smith & Co., Ltd., and it is hoped to have the complete system in operation by the end of the year.

Doncaster.—RAILLESS CARS.—The Town Council is to promote a Bill for the running of railless cars between the town and Bentley.

Dover.—RAILLESS CARS.—The Town Council has decided not to promote a Bill for the adoption of a system of railless cars on the route from the Lord Warden to New Bridge, but to continue with the present system.

Halifax.—LOAN.—The Tramways and Electricity Committee is applying for sanction to a loan of £11,520 for the proposed double tramway track along Barum Top.

Irish Free State.—DUBLIN AND LUCAN ELECTRIC RAILWAY.—The Dublin City Administrative Commissioners recently reconsidered their decision as to allowing an extended lease of 40 years to the Dublin United (Electric) Tramway Co. on an agreement to take over the Dublin and Lucan Electric Railway, which closed down some months ago, and ensure a continuous service from Lucan throughout the centre of the city, and intimated acceptance of the company's offer subject to certain conditions. The company now states that it is unable to accept some of the conditions laid down by the Commissioners, and negotiations have reached a deadlock.

Leicester.—NEW ROUTE.—The Tramways Committee has recommended to the Town Council that a single tramway track be constructed along Coleman Road between Uppingham Road and Green Lane Road, at an estimated cost of £12,500.

Preston.—TRAMWAY IMPROVEMENTS.—The Tramways Committee is to confer with the Streets Committee on the question of the proposed doubling of the tramway track from Cannon Street to Corporation Street.

Thornaby-on-Tees. — TIME EXTENSION. — The Minister of Transport has extended the period stipulated for the completion of the Corporation's tramway, authorised in 1919, from August 15th, 1925, to August 15th, 1926.

Walthamstow.—FARES.—The local Council is to reduce the tramway fares between Stratford Broadway and Chingford to 1½d. for the whole journey with corresponding reductions in the intermediate, children's and workmen's fares. The Council's decision is due to the recent reductions in omnibus fares on the route by the private companies, the new fare comparing with 2½d. now charged by the companies.

Wolverhampton.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (general manager, Mr. C. Owen Silvers) for the year ended March 31st last, record a total revenue of £99,094, as compared with £102,449 in the preceding year. Working expenses amounted to £64,606, as against £73,189, leaving a gross profit of £34,488 (£29,260), to which was added bank interest and a contribution towards capital charges in respect of a through running agreement from the Wolverhampton & District Electric Tramways, Ltd., making a total of £35,492. After providing for capital charges there was a net surplus of £14,837, as compared with £9,143 in 1923-24. The number of passengers carried fell from 14,870,878 to 14,494,020, and the car mileage from 1,213,548 to 1,070,514.

The railless-car system showed a total revenue of £18,018, and working expenditure of £11,892, leaving a gross profit of £6,126. The previous year's figures were: Income, £6,239; working expenses, £4,140; gross profit, £2,099. After deducting interest and other charges there was a net surplus of £3,196. The number of passengers carried increased from 874,802 to 2,541,808, and the car miles run from 93,406 to 252,767.

There was also a net profit from the omnibus service of £7,648, making a total surplus on the three systems of £25,682.

During the year the Bushbury tramway route was converted to the railless-car system and extended from Bushbury to Fordhouses.

Telegraph and Telephone Notes.

Cable Rates.—Press Rate Reduced.—The Pacific Cable Board, on August 1st, reduced the rate for Press messages exchanged between Canada (except Vancouver City) on the one hand, and Australia and New Zealand on the other hand, from 5d. per word to 4d. per word, and further reduced the rate from August 10th to 3¾d. per word. The Press rate for traffic between Vancouver City and Australia or New Zealand has been reduced from 3¼d. per word to 2¾d. per word.

Irish Free State.—Taxi "Fare Alarm."—Dublin is experimenting with a new adaptation of the public telephone kiosk which has the triple object of increasing telephone revenue by means of *inward* public calls; providing the general public with means of calling taxi-cabs and thus reducing traffic congestion by making the cab rank more profitable for taxi-owners than "cruising" for fares. When a bell rings opposite Trinity College the nearest taxi-cab driver on the stand answers the call at a kiosk specially installed for incoming calls, and the next taxi-cab awaits the succeeding call.

Italy.—New Cable.—It is announced that the new direct telegraph cable between Rome and Buenos Aires, *via* Madeira and St. Vincent, will be inaugurated for business on October 12th next.

Long-Distance Telephony. — London - Germany. — Four weeks' experiments in an endeavour to establish telephone communication between Frankfurt-am-Main (Germany) and London were successful on August 7th, when excellent communication was obtained *via* Cologne and Amsterdam.

The Telephone Service.—Liverpool Development.—The Liverpool and District Postal Telegraph and Telephone Advisory Committee has under consideration a report foreshadowing the conversion of the Liverpool system from manual to automatic operation; the work is expected to be entered upon in five years' time. The new portion of the exchange in South John Street is approaching completion and will accommodate additional subscribers' junction switchboards, a new and more commodious school for the training of telephonists, and a modern observation room with up-to-date local and trunk service observation equipment.

Radio Notes.

Australia.—Licence Revenue.—Information regarding the number of broadcast licences in the Commonwealth was given in the House of Representatives recently by the Postmaster-General (Mr. Gibson), who said that on May 30th 61,518 licences had been granted in the Commonwealth; of these 33,964 were in New South Wales. The total amount of licence fees collected throughout the Commonwealth was £113,658, and the amounts paid to the various broadcasting companies were:—Farmer & Co., Ltd., Sydney (2FC), £34,628; Broadcasters, Sydney, Ltd. (2BL), £12,018; Broadcasting Co. of Australia, Melbourne (3LO), £14,444; Associated Radio Co., Ltd., Melbourne (3AR), £4,089; Westralian Farmers, Ltd., Perth (6WF), £4,220.

Dealers' Licences.—Some time ago, at the Camberwell Court, a Mr. A. L. Rowell, was proceeded against on information charging him with being a person to whom a dealer's licence had not been granted, pursuant to the wireless telegraph regulations; he, contrary to the said regulations, manufactured certain equipment for use as broadcast receivers, to wit, four-valve receiving sets. Mr. Wade contended that there was no case to answer. According to a Melbourne message, five separate judgments in the Full Court of High Court, consisting of the Chief Justice (Sir Adrian Knox), Mr. Justice Isaacs, Mr. Justice Higgins, Mr. Justice Rich, and Mr. Justice Starke, upheld the contention of Mr. Wade that the regulations governing the issue of licences for the manufacture of wireless equipment are *ultra vires*.

New Zealand.—Deadlock.—Some 18 months ago the Government announced a project for providing the Dominion with a broadcasting service, but so far very little definite progress has been made and, according to the *Electrical Engineer*, there would have been no development had it not been for certain traders who recognised that they would sell no apparatus were there nothing for people to listen to. An attempt was made by private interests to put a stop to even such services as were being given, on the grounds of infringement of patents, but the Government intervened on behalf of the broadcasters, and allowed them to carry on under its protection. The Government has decided on a definite minimum standard of service, but the subsidy paid to the broadcasters out of licence fees has not been adequate for the maintenance of that service; the broadcasters, however, have carried on. The scheme which the Government had under consideration provided for the licensing of four main stations operated by one privately financed company. A syndicate was formed 14 months ago in order to float the company and arrive at an agreement with the Government. It was not till March, 1925, however, that regulations were gazetted, and even then they were of such a nature that no company could undertake services with a prospect of success. After some trouble the Government was prevailed on to amend the regulations, but, although the syndicate is ready to form the company and has submitted all its requirements to the Government, the agreement is still awaiting finalisation. In the meantime the licence fees for listeners have been raised from 5s. to 30s. in order to pay for the improved service. The delay is quite unjustifiable and it seems remarkable that it should take 18 months to draw up satisfactory regulations and come to an agreement with one company.

Poland.—New Stations.—The Polish Government is desirous of developing radio broadcasting; the *Daily Mail* reports that new stations are to be built at Krakow, Lwow, Poznani, and Warsaw.

The B.B. Co.—Advisory Committee.—A committee of I has been appointed "to advise as to the proper scope of broadcasting services and the management, control, and finance thereof, after the expiry of the existing licence on December 31st, 1926, and to indicate what changes in the law, if any, are desirable in the interests of broadcasting." The Committee will probably meet in November next. Further details will be found in our "Parliamentary News."

Anniversary.—Monday night last, August 10th, was the 1,000th night on which the British Broadcasting Co., Ltd., has provided its listeners with a programme, and Capt. P. P. Eckersley, chief engineer of the company, was chosen to speak in celebration of the occasion.

United States.—A Mobile Transmitter.—The American listener, it seems, will in future not be content with less than two good sets, one for his home and another always ready to take away at short notice. According to the *Evening News* one firm has fitted up a large motor-boat as a transmitting station for the benefit of campers and cottagers round the shores of the Great Lakes. A party of artistes is carried on board and concerts are given every day and more or less all day to holiday-makers. The boat is using Detroit as its base until the winter, when it will go to Florida.

Wavelength Tests.—The Schenectady station (WGY) of the General Electric Co., is now broadcasting a its items on the following wave-lengths simultaneously namely, 38, 109, 379.5, and 1,660 metres. The scheme was started for research purposes and the power used on each of the four wave-lengths will be varied from time to time, while the aerials will also be transferred for different purposes in turn. Listeners will thus be able to judge under which conditions they obtain best reception.

"Wireless on Tap." — War Seal-mansions, Walham Green, which were established for the accommodation of disabled ex-Service officers and men and their dependents, have been equipped throughout with wireless receiving apparatus. The mansions contain 138 flats, and each has now a set of four pairs of ear-phones. Listeners have only to plug in their individual line to the main supply line to receive the broadcast programmes, each flat being separately served from a central receiving set. The service is thus "laid on" on the same principle as water and light, says *The Times*, but there is no charge for it.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—Melbourne.—State Electricity Commission. September 21st. 250-kVA, 22,000-V transformers and spares.

September 15th. Postmaster-General's Department. (Sched. C.36). Telegraph equipment. Tender forms from High Commissioner, London.

September 29th. Postmaster-General's Department. Telephone protective apparatus.*

October 20th. Switchboard cable. Sched. C.39, jumper wire Sched. C.40, bells and buzzers.*

New South Wales.—New South Wales Railways. October 7th. One 20,000-kW turbo-alternator for White Bay power house.

November 11th. New South Wales Railways and Tramways 5-ton 3-motor electric overhead travelling crane, 56 ft. 2 in. for iron and steel foundry, Eveleigh workshops.—*Tenders.*

September 23rd. Four feed-water meters for White Bay power house.

Newcastle.—September 22nd. Caledonian Collieries, Ltd. Ward-Leonard electric winding engine for Aberdare central colliery, complete with balancer, exciter, and the necessary switchgear. (July 31st.)

October 15th. City Council. 2,000-kW or, alternatively, 1,500-kW turbo-alternator, complete with condensing plant. *Tenders.*

Dundee.—August 19th. Town Council. Electric lighting for Lawton housing scheme (200 houses) and Stirling Park scheme (20 houses).

Egypt.—Cairo.—September 9th. Ministry of Education. One 50-h.p. Diesel engine, generator, electric motors and machine tools for the Mansurah Trades School.*

Ministry of the Interior. Supply and installation of an electric power station and distributing system for the town of Minieh.

Edinburgh.—September 14th. Royal Infirmary. Supply of X-ray and electro-medical equipment for the new Radiological Department. (See this issue.)

Fleetwood.—August 24th. Urban District Council. eeder cable and pillar. (August 7th.)

Greetland (near Halifax).—August 15th. Electric light- ıg and ventilating at Greetland Liberal Club. (Particulars om Secretary.)

Ilford.—August 18th. Urban District Council. 660-V aper-insulated cable.

Leeds.—August 25th. Property Committee. Electric ghting work required for public wash-houses and slipper baths Stocks Hill.

Kettering.—August 28th. Electricity Works. One cool- ıg tower and tank circulating water pipe. (July 31st.)

London.—METROPOLITAN ASYLUMS BOARD.—August 26th. ıstallation of additional electric lighting at North-Eastern ever Hospital, Tottenham. (July 31st.)

ACTON.—August 28th. Borough Council. Overhead wiring the Council's Isolation Hospital, Wales Farm Road, Acton. ugust 7th.)

Manchester.—August 20th. Electricity Department. ıpply and erection of constructional steelwork at Burnage sub- ation.

New Zealand.—WELLINGTON.—September 22nd. Post and elegraph Department. Bituminous tape.*

September 29th. Public Works Department. 560 galvanised eel transmission line towers, complete with cross-arms, round stubs, and accessories. (A.X. 2,250.)*

MARLBOROUGH.—Electric Power Board. September 22nd. wo 750-h.p. turbines, with generators, switchboard, &c., for Vaihopai River development.—*Tenders.*

Rochdale.—September 9th. Paving and Sewering Commit- e. Motors and electrical gear, together with the necessary iring in connection with the electrification of sludge pressing achinery at Roch Mills sewage disposal works. (See this sue.)

South Africa.—JOHANNESBURG.—October 13th. Electricity upply Commission of South Africa. Equipment and build- ıgs for an electric power station at Durban. (July 31st.)

October 1st. Railways and Harbours. Four 4-ton electri- lly-driven portable jib cranes, complete. (AX.2299.)

BULAWAYO.—September 29th. Municipal Council. Plant for ıe extension of the electricity works.*

Stockport.—September 5th. Board of Guardians. Con- ersion of lift at Stepping Hill Hospital from hydraulic to ectric power. Particulars from the Steward at the hospital.

*Further particulars can be obtained at the Department of verseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—MELBOURNE.—City Council. Accepted :—
Four 500-kVA, 3-phase transformers (£1,748).—Weymouths, Ltd.
Meters.—Lascelles, Parrington, Ltd. (£1,450); Measurement, Ltd. (£357); W. G. Watson & Co., Ltd. (£940); Landis & Gyr, Ltd. (£650); Noyes Bros. (Melb.) Pty., Ltd. (£26).

Melbourne Tramways Board. Accepted :—
Conversion of the cable tramways on the St. Kilda Road and elsewhere to electricity (£144,800).—Foundation Co. of London.—*Reuter's Trade Service* (Melbourne).

Victorian Railways. Accepted :—
Cabin transformers, 10 kVA.—E. M. F. Electric Co., Ltd.

Victorian Electricity Commission. Accepted :—
V.i.r. control cable (£1,708).—British Insulated & Helsby Cables, Ltd.
—*TENDERS.*

SYDNEY.—Works Committee. Accepted :—
Electric derrick crane (£425).—Hodkinson & Co.

Electricity Supply Committee. Accepted :—
Maximum demand indicators (£6,363).—Edison Swan Electric Co., Ltd.

NEW SOUTH WALES.—Postmaster-General's Department. Ac- pted :—
Accumulator plates and separators (£2,678).—T. K. Steanes & Son.

COMMONWEALTH.—Department of Works and Railways. ccepted :—
Erection of electric goods elevator at G.P.O., Sydney (£2,436).—Standard-Waygood, Ltd.

Postmaster-General's Department. Accepted :—
Creed telegraph apparatus (£3,705).—Amalgamated Wireless (Australia), Ltd.
46 magneto floor-pattern switchboards (£4,214).—Western Electric Co. (Aust.), Ltd.
Telephone repeater equipment (£2,821).—Western Electric (Aust.), Ltd.

WESTERN AUSTRALIA.—Government Tender Board. Accepted :
Two 3-phase transformers (£247 each).—Metropolitan-Vickers Electrical Co., Ltd.

Bath.—Town Council. Accepted:—
One h.p. truck-type switchboard (£1,041).—Ferguson, Pailin, Ltd.

Burton-on-Trent.—Electricity Committee. Accepted:—
Erection of sub-station at Swadlincote (£1,170).—George Hodges & Son.
Erection of sub-station at Overseal (£488).—Richard Kershaw & Sons.

Carlisle.—Electricity Committee. Accepted:—
Erection of new buildings in connection with the electricity works (£18,238).—Durham & Vevers.

Chelmsford.—Town Council. Accepted :—
Rewiring the Public Library Museum (£172).—Christy Bros. & Co., Ltd.

Darlington.—Corporation. Accepted:—
Extension of the trolley omnibus system on the Haughton Road, Eastbourne, Cockerton, and Harrow Hill routes.—Clough, Smith and Co., Ltd.

Hull.—GERMAN TENDER REJECTED.—The Corporation Telephone Committee recently decided to accept a German tender for bronze wire and cable, but at last week's meeting the Corporation reversed this decision in favour of British goods.

Irish Free State.—DUBLIN.—Electricity and Public Lighting Department. Recommended :—
Arc lamp carbons.—Beacon Carbons, Ltd.; E. A. Langrish & Co.

Lamp Contracts.—Government of Northern Ireland.
Gasfilled lamps.—The Edison Swan Electric Co., Ltd.
Aberdeen Line.
Part supply of lamps until December 31st, 1925.—The General Electric Co., Ltd.

Leek.—Urban District Council. Accepted:—
One 600-b.h.p. gas engine for the electricity works (£7,765).—National Gas Engine Co., Ltd.

London.—GENERAL POST OFFICE. Accepted :—
Conversion of telephones in the Southport area to automatic working (Strowger system) :—Southport (3,700 lines), Birkdale (1,600 lines), Churchtown (1,000 lines), and Ainsdale (800 lines).—Automatic Telephone Manufacturing Co., Ltd.

Manchester.—Town Hall Committee. Accepted:—
Switchboard for the Town Hall.—Metropolitan-Vickers Electrical Co., Ltd.

Tramways Committee. Accepted :—
Copper trolley wire.—R. Johnson & Nephew, Ltd.
Tramway rail bands.—T. Bolton & Sons, Ltd.; and Forest Electric Co., Ltd.
Permanent-way portable turnout.—Hadfields, Ltd.
Special track work.—Edgar Allen & Co., Ltd.; and the Titan Trackwork Co., Ltd.
Span wire brackets.—B. O. Barton & Son.
Centre pole brackets.—Naylor Bros., Golborne.

Electricity Committee. Accepted :—
Composition and plastic magnesia.—Sutcliffe Bros. & Bryce, Ltd.
Crucibles.—Morgan Crucible Co., Ltd.
Dynamo and copper tape brushes.—F. W. Potter & Co.
Fuse boxes.—Callender's Cable & Construction Co., Ltd.; Macintosh Cable Co., Ltd.; Siemens Bros. & Co., Ltd.; Sykes & Dyson, Ltd.
Cables.—W. T. Glover & Co., Ltd.; Pirelli-General Cable Works, Ltd.; Callender's Cable & Construction Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Western Electric Co., Ltd.; British Insulated & Helsby Cables, Ltd.; Hackbridge Cable Co., Ltd.; Siemens Bros. & Co., Ltd.; Connollys (Blackley), Ltd.; Macintosh Cable Co., Ltd.
Meters.—Ferranti, Ltd.; Chamberlain & Hookham, Ltd.; Measurement, Ltd.; Edison Swan Electric Co., Ltd.; Aron Electricity Meter, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.
Potential and current transformers.—Ferranti, Ltd.
Auto-transformers and auto-balancers.—General Electric Co., Ltd.; Johnson & Phillips, Ltd.
Trifurcating boxes.—British Insulated & Helsby Cables, Ltd.; Johnson and Phillips, Ltd.; Siemens Bros. & Co., Ltd.; Sykes & Dyson, Ltd.
Time switches.—Venner Time Switches, Ltd.
Electric kettles.—Premier Electric Heaters Ltd.
Portable centrifugal oil purifier.—De Laval Chadburn Co., Ltd.
Distant reading water gauges, &c., for Barton boilers.—Kelvin, Bottomley & Baird, Ltd.; J. Hopkinson & Co., Ltd.; Babcock & Wilcox, Ltd.

Oldham.—Electricity Committee. Accepted:—
Cable.—Union Cable Co., Ltd.

South Africa.—CAPE TOWN.—Electricity Committee. Recommended :—
Metering equipment (£321).—Bailey Meter Co. of U.S.A.
Switchgear (£250).—English Electric Co., Ltd.
Erection of sub-station at Salt River (£1,998).—C. R. Haywood & Co.

Accepted :—
Cables (£360).—W. T. Glover & Co.
Switchgear (£437).—A. Reyrolle & Co., Ltd.

Stoke.—We are asked to state that the contract for wiring at the central power house was placed with Messrs. Hawley and Ingram, of Stoke-on-Trent, at £1,068, not as stated in our issue of July 31st.

Notes.

A Lead-Hardening Process.—It is reported from Chicago that engineers of the Western Electric Co. have discovered a process for hardening and tempering lead.

Institution of Electrical Engineers.—The Council has awarded the following scholarships to students for 1925-26 :—
A David Hughes scholarship of the value of £50 to Mr. G. N Peel, B.Sc. (Armstrong College, Newcastle-on-Tyne).
Salomons scholarships of the value of £50 each to Mr. R. O. Carter (City & Guilds (Engineering) College), and Mr. H. S. Leman (East London College).

Wind Power Plant in Austria.—What is described as the first large wind-operated electric lighting and power plant in Austria has recently been completed at Asparn-an-der-Zaya, in the Mistelbach district. The wind turbine, which has a diameter of 32 ft., is mounted on a 65-ft. tower and by means of a dynamo and battery of accumulators is supplying current to the three hundred inhabitants of the village. It is stated that during the first four months of operation the wind turbine never stopped, and it has enabled from 5 to 45 h.p. to be developed.

A Large Hydro-Electric Installation.—Some interesting details are given in *Power* of the installation of the hydro-electric plant of the Alabama Power Co. on the Tallapoosa River, Ala. The installation will total 135,000 h.p., consisting of three sets of 45,000 h.p. each. These are claimed to be the largest in the Southern States, and with the exception of those at the Niagara Falls, the largest in the United States. All the generators are being supplied by the American G.E.C., two of the waterwheels by the Allis-Chalmers Manufacturing Co., and the third by the Wm. Cramp & Sons' Ship and Engine Building Co. The generators are rated at 37,500 kVA, 88 per cent. power factor, 120 r.p.m., 12,000 V, three-phase, 60 cycles. They are carried on vertical shafts, fitted with spring thrust bearings, and directly connected to exciters. A storage reservoir will form the greatest lake in the world, having a capacity of 530,000 million gals. The Roosevelt Dam Reservoir, at present one of the largest artificial lakes, holds 420,000 million gals.

An International Electricity Producers' and Distributors' Association.—The *Journée Industrielle* of Paris reports that an Association of French, Belgian, and Italian electricity producers and distributors has been formed with Signor Ponte, of the Italian Association of Electricity Producers as first president and M. G. Martz, of the corresponding French Association, as secretary. The object of the new body is to collate information and statistics relating to the production and distribution of electricity in the different countries with a view to the unification of methods. An international congress is to be held every two years, the first of which is to be held in Paris in 1926. It is hoped that other countries will join the new Association in order to render it a truly international body.

Ignition of Firedamp.—There is an intimate connection between the subject matter of two papers recently published by the Safety in Mines Research Board (H.M. Stationery Office, 6d. each), and they should be read in conjunction. The first, on "The Ignition of Firedamp" (No. 8) by Messrs. H. F. Coward and R. V. Wheeler, constitutes a concise and practical summary of the objectives of research on the ignition of firedamp with reference to the requirements of the coal-mining industry, and the results so far attained. The objectives are (1) to ascertain the conditions under which firedamp will ignite, in order that means may be taken to avoid the occurrence of such conditions in the pit, and (2) to ascertain which are the most readily ignited mixtures of firedamp and air, in order that these mixtures may be used when determining the liability of colliery equipment, such as flame and electric lamps, electrical apparatus generally, and explosives, to ignite firedamp. Phases of the subject, such as ignition by heated surfaces and wires (including incandescent filaments of electric lamps), frictional sparks, flames, and electric sparks are discussed. It is shown that a mixture of firedamp and air can be ignited without the application of flame, merely by raising it to a certain temperature either directly by the application of heat, or, indirectly, by submitting the mixtures to adiabatic compression (that is, compression without loss of heat to the containing walls before the process is complete). The fact that a firedamp-air mixture can be ignited by pressure alone may have an important bearing on the possibility of the ignition of pockets of gas in crevices by the pressure produced when a shot is fired, even though the flame of the explosive is entirely suppressed.

When an inflammable mixture of firedamp and air is raised to, and maintained at, a temperature higher than the "ignition temperature" it ignites—but not immediately; there is a certain interval, termed the "lag on ignition," the length of which depends upon the temperature and upon the composition of the mixture. This lag, which is dealt with in the second paper (No. 9) by Messrs. C. A. Naylor and R. V. Wheeler, is not peculiar to firedamp, but is more marked with it than with some other inflammable gases, such as hydrogen, for example. Lag on ignition has an important bearing on safety in coal mines. It accounts for the fact that it is very difficult, if not impossible, to cause an external ignition of firedamp by the gauze of a miner's flame safety lamp heated by firedamp burning within it; and it provides grounds for the hope that it may be possible to compound explosives, the flames from which (being of exceedingly short duration) could not ignite firedamp despite their high temperature.

In a third paper (No. 10), firedamp explosions within closed vessels and the effects of turbulence are dealt with by Messrs. G. B. Maxwell and R. V. Wheeler. Inasmuch as mining electrical machinery, such as motors, may sometimes comprise enclosures in which rapidly revolving parts induce turbulence, it is important to determine the extent to which such turbulence modifies the character of an explosion of firedamp and air that may occur within the casing, since the speed at which flame spreads through an inflammable mixture is demonstrably dependent on the degree of mechanical agitation imparted to the mixture. The effect of turbulence on the development of firedamp explosions in closed vessels has been studied in relation to (*a*) the maximum pressures produced, and (*b*) the time taken to attain the maximum pressure. It is shown that, whereas considerably enhanced pressures can be obtained from weak mixtures of methane and air when they are turbulent, the most explosive mixtures (containing between 9 and 10 per cent. of methane) are not much affected even by extreme turbulence. The maximum pressure obtainable from any quiescent mixture of methane and air, initially at atmospheric pressure, when exploded in a closed vessel is about 105 to 110 lb. per sq. in. The effect of turbulence is to increase this maximum pressure by about 4 per cent. On the other hand, with both weak and strong mixtures the effect of turbulence is greatly to increase the rapidity with which the maximum pressure is attained. Neither the slight increase in maximum pressure from turbulent mixtures, nor the greatly increased rapidity of development of pressure, affects the safety of "flange protection" devices for flame-proof mining electrical apparatus.

Railway Collision Report.—We have received a copy of the report made to the Minister of Transport into the cause of the collision which occurred on May 22nd, in the tunnel at the south end of Snow Hill Station, Birmingham, on the Great Western Railway. The collision was brought about by the signalman wrongly assuming that the train in front, in the tunnel, was proceeding in the normal manner, when it was actually standing at the up starting signal in the tunnel, owing to this signal having been prematurely brought to danger by the track circuit in advance of it which had failed, and allowing the second train to follow up in the rear. The depression bars functioned properly, but lack of faith in these on the part of the signalman due to the fact that they had previously failed several times, and to his not being aware of the track signal failure, led him to assume also that they had failed. The failure of the track circuit was attributed to the batteries being run down due to intermittent failure of insulation brought about by two of the long transverse tie bolts touching the fang bolts on the circuit. Similar battery troubles had occurred previously. The following are among the recommendations made: That all running movements be controlled by the home signals; that a "limit of shunt" indicator be substituted for the existing "starting" signal in the tunnel; and the provision of back locks, and, if necessary, front locks on the home signal levers.

Appointments Vacant.—Test assistants, for the Ignition and Electrical Department of the Royal Aircraft Establishment; electrical assistant required for the Straits Settlements (commencing salary about £40 per month); meter tester, repairer and inspector for Middleton (Lancs.) Corporation; superintendent to take charge of the generating works of the Sunderland Corporation; the salary offered is £650 per annum. Sunderland Corporation; the salary offered is £650 per annum; lecturer in the department of electrical engineering at Bradford Technical College. (See our advertisement pages to-day.)

Fatalities.—An August 6th, a middle-aged man threw himself upon a live electric rail at Twickenham station on the South-Western section of the Southern Railway, and was immediately killed.

On the previous day a young girl was killed by electric shock on the line between Wandsworth and Earlsfield.

Harry Light (46), while repairing the roof of a house at Sebastopol, Monmouth, on August 5th, came into contact with a "live" wire and received a fatal shock.

Observations on Ferromagnetism. — We learn from *Engineering* that as a result of experiments by Messrs. L. R. Ingersoll and S. S. de Vinney, of the University of Wisconsin reported in the *Physical Review*, it has been found that thin films of nickel appear to be non-magnetic until rendered crystalline by heating. A film of nickel was deposited on a cover-glass by spattering a nickel disk in a hydrogen bulb. The deposit, though bright metallic and hard, was originally amorphous, and in that state non-magnetic and incapable of producing magnetic rotation of the plane of polarisation. After heating to 400 deg. C. in a hydrogen atmosphere the film was distinctly magnetic and also crystalline; films thicker than 120 $\mu\mu$ may be magnetic to start with and thick non-magnetic films are not obtained. From these and other observations, as well as on coloidal iron, Ingersoll concludes that ferromagnetism is not an atomic property, but connected with crystalline structure. The removal of hydrogen by heating might also account for the appearance of magnetism. Some films were spattered over with gold; they developed blisters apparently of escaping hydrogen, during the heating, which also diminished the electric resistance of the film, sometimes to a fifth of its value. The spattered nickel might first be in the oxidised condition and be reduced by the heat treatment with hydrogen, but Ingersoll considers this unlikely because heating in a Bunsen flame also rendered the film magnetic, though the flame might oxidise the nickel.

Rugby Radio-telegraph Station.—With reference to our recent description of the Post Office radio-telegraph station at Rugby, we are informed that the Mullard Radio Valve Co. Ltd., in conjunction with Philips' Glowlampworks, Ltd., of Eindhoven, Holland, has supplied thermionic valves for the station.

Electricity in Time-keeping.—Annual Report of the Astronomer Royal for Scotland.—The record of the work done at Edinburgh Observatory during the past year under Prof. R. A. Sampson, F.R.S., Astronomer-Royal for Scotland, has a very important bearing upon the accurate measurement of time, a subject to which special attention has been devoted at Edinburgh. Since 1918 Prof. Sampson has contributed a series of papers to the Royal Society of Edinburgh and the Royal Astronomical Society on time-keeping; he employs an oscillograph and a kinematograph film with continuous motion by means of which each vibration of a pendulum can be recorded, and with the aid of a reading microscope the record can be measured to the thousandth of a second. In his labor

tory were installed the following standard clocks: Riefler No. 258, said to be the best ever made of that type; Leroy No. 1,230, similar to those used at the Paris Observatory, which control the time signals from the Eiffel Tower; and Shortt No. 0, the original "free pendulum" clock of the Synchronome Co. The performances of all three were automatically recorded on the same strip, and he reports that "the daily comparison demonstrated a decided superiority in the rate of clock Shortt; indeed, the other two were hardly able to serve as a check upon it. Therefore, with a view to carrying time work to the limit that the appliances will allow, a second model of the clock (Shortt No. 4) was installed in January, in one of the vacant clock cells in the basement. The connections for temperature control are the same as in the other cells. The original clock of these series (Shortt No. 0), which was erected here for trial by Mr. Shortt in 1923, and which has shown such remarkable going, has been generously presented to the Observatory by the Synchronome Co., Ltd., in association with whom Mr. Shortt had prepared his model. Briefly, it may be said that the only discernible faults in the going of Shortt No. 0 are a small temperature coefficient showing when an accident disturbs the temperature control of the cell, and a minute leak in the case, which has not been located."

All time determinations are based upon transit observations, but the latter are far less reliable than modern clocks, being about 100 times as rough as the clock observations, so that the clocks have to be rated from a long series of daily transit observations. This process has been greatly facilitated by the use of wireless telegraphy and the "time vernier," which enables observatories to compare their times with precision. Hitherto there has been an appreciable discrepancy between them, which, though apparently trifling, has given astronomers much embarrassment, and Prof. Sampson has been seeking the cause of the error. He now states that "owing to improvements in the clock and chronograph system in this observatory, and in receiving apparatus for wireless telegraphy signals from other observatories, it has proved possible to bring this investigation to an issue. It has been found that during the whole of 1924 the whole of the large erratic or systematic errors are removed if the level error, determined as usual by the mercury bath, is rejected, and the observations are reduced instead by an azimuth error derived from one of the collimators, in combination with the usual observations of polar stars. The implications of this result are of high interest and importance to astronomers and will be pursued."

Proposed Street Lighting Practice.—A table is published in the *Electrical World* showing the recommendations made by the Street and Highway Lighting Committee in its report to the N.E.L.A. at San Francisco. The streets are classified according to the lighting requirements and to the populations of the cities, &c. For cities of 100,000 population and over, the principal business streets are recommended to have illumination of 15,000 to 50,000 lumens, each source placed 18-25 ft. high, with spacings of 100-150 ft. The following are brief details of some of the remaining recommendations: Cities of 100,000 population: Primary thoroughfares, 10,000-15,000 lumens, 15-20 ft. high, 100-150 ft. spacing; secondary thoroughfares, 4,000-10,000 lumens, 15-20 ft., 100-150 ft.; residential streets, 2,500-4,000 lumens, 13-20 ft., 125-200 ft. Cities of 30,000 to 100,000 population: Principal business streets, 10,000-30,000 lumens, 15-20 ft., 80-125 ft.; main thoroughfares, 6,000-15,000 lumens, 15-20 ft., 100/150 ft.; secondary thoroughfares, 4,000-10,000 lumens, 15-20 ft., 100-150 ft.; residential streets, 2,500-4,000 lumens, 13-20 ft., 125-200 ft. Cities of 5,000 to 30,000 population: Business streets, 6,000-15,000 lumens, 14-18 ft., 80-125 ft.; main thoroughfares, 4,000-10,000 lumens, 15-20 ft., 100-200 ft.; residential streets, 2,500-4,000 lumens, 13-20 ft., 150-250 ft. Cities up to 5,000 population: Business streets, 4,000-10,000 lumens, 13-16 ft., 80-110 ft.; thoroughfares, 2,500-6,000 lumens, 15-20 ft., 100-200 ft.; residential streets, 2,500 lumens, 13-20 ft., 150-300 ft. Highways: Light pavement, 2,500-4,000 lumens, 25-35 ft., 300-400 ft.; dark pavement, &c., 2,500-4,000 lumens, 25-35 ft., 200-300 ft.

Educational.—Loughborough College.—We have received a copy of the calendar for 1925-26 of Loughborough College—the only institution of its kind in this country, the equipment being such that engineering students receive both theoretical and practical training concurrently; the course covers a period of five years, during half of which the student is engaged in productive work in the workshops, passing through every department of the works. The shops are equipped with up-to-date machinery, the scope of which is well shown by numerous photographic illustrations and lists of tools in the calendar. The Department of Electrical Engineering, under Dr. J. F. Driver, is well equipped with machines and apparatus for experimental work, and includes the college generating station. Residential accommodation is provided.

The New Gallery Kinema Lighting Installation.—Some features of this recent London installation are of interest. The lighting of the attractive main entrance is produced through the medium of six floodlight projectors equipped with 100-W gasfilled lamps, which are fitted in line at the back of the frame supporting the illuminated facia sign. In addition, two flood projectors are fitted just inside the entrance, one on each side. The main entrance hall is covered by an illuminated dome, which has a large number of white lamps, concealed from view, fitted round the lower portion.

It is in the auditorium that the charm of coloured and decorative lighting is most pronounced. The dome is illuminated by a large number of colour-sprayed lamps. Each colour is arranged on a separate circuit and connected to a dimmer. By the operation of the dimmers exceedingly pleasing effects can be produced. On the side walls of the kinema a number of lighting units take the form of old-time wooden ships with sails; both ships and sails are gilded. The bow of each ship contains an entirely concealed lamp from which the light is projected from the inside on to the sail, whence it is reflected into the auditorium. Over the circle is a special type of mirrored cornice reflector, in which coloured light is employed with excellent results. The illumination of the proscenium arch is another special feature. A number of floodlight projectors, equipped with 200-W lamps and colour screens, flood the arch with coloured illumination which is very effective. For the stage lighting a special footlight system of compartmental design is in use; the compartments, each accommodating a colour-sprayed lamp, extend to 30 ft. and are designed so that maximum horizontal and vertical flooding is obtained. Above the screen a number of horizon floods fitted with colour filters are installed. The circuits are connected to dimmers so that direct



Interior of the New Gallery Kinema.

colours, or any combination of colours, can be projected upon the screen.

The general lighting scheme for the kinema was prepared and carried out by Mr. E. C. Nicholls, chief engineer of the Provincial Cinematograph Theatres, who is to be congratulated upon the excellent results obtained; the electrical equipment is chiefly of the G.E.C. design and make.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Mr. S. F. Ricketts, vice-president and sales manager of the Western Elevator & Motor Co., Ltd., Winnipeg, is in this country on a holiday and business trip. He is an old Finsbury College student, and left England in 1903 for China, where he built the big power house in Canton, and later built up a large machinery department for Shewan & Tomes in Hong Kong. After spending eight years in China, he has since resided in Canada, and has been connected with several large engineering schemes. Firms which are desirous of doing engineering trade in Canada are invited to communicate with him at 83, Grove Road, Windsor.

The *Electrical Engineer of Australia and New Zealand* reports that Mr. H. A. Curtis has been appointed chief engineer and general manager of the Hydro-Electric Department of Tasmania. Mr. Curtis, who is a native of New Zealand, has been with the department since 1915, and upon the retirement of Mr. J. H. Butters last year he became acting chief of the department.

The Electricity Committee of Luton Town Council has recommended that the salary of the electrical engineer be increased from £1,000 to £1,200 per annum as from August 1st, and that of his chief clerk, Mr. R. Harding, from £275 to £300 per annum, from the same date.

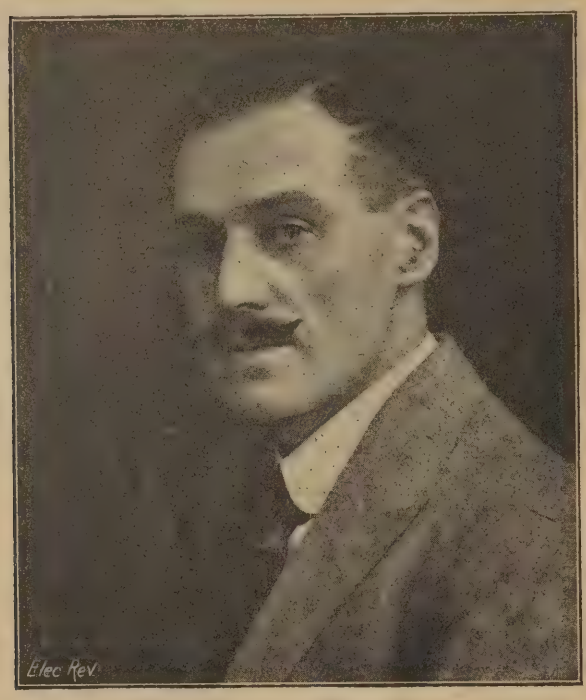
Messrs. Mavor & Coulson announce that Mr. Geoffrey M. Gullick, who has been general manager of their Mining Department for between four and five years, has now been appointed a director of the company.

On Saturday last, according to the financial Press, Sir Glyn West, the chairman of the Armstrong Whitworth Co., left for America by the *Aquitania*. The company has been developing hydro-electric power in Newfoundland and has constructed paper mills at Corner Brook, and Sir Glyn is attending

the official opening of these mills by the Governor on August 24th.

Hastings Town Council, in view of the additional work in connection with the new generating station, has made a grant of £500 to the Borough Electrical Engineer, and has increased his salary from £850 to £1,000 per annum, as from August 1st. The salary of the Deputy Borough Electrical Engineer has been increased to £600, and he has been granted an honorarium of £250.

We reproduce herewith a portrait of Mr. William Weekes, who is shortly succeeding Mr. C. Newton Russell as borough electrical engineer at Shoreditch, on probation for a period of twelve months. After completing his academical training in 1889, Mr. Weekes had four years of practical training with Messrs. W. T. Goolden & Co., electrical engineers, London. In 1893 he became electrical engineer in charge of traction contracts, &c., for Messrs. Easton, Anderson and Goolden, Erith. Shortly afterwards he secured a post in the Blackpool Corporation Tramways Department as assistant engineer having general supervision of the power station and electrical plant. Mr. Weekes went to Shoreditch in 1897 as shift engineer in charge of the Coronet Street generating station, remaining there until 1900, when he went to South Africa with the Imperial Yeomanry as an armourer.



Mr. W. Weekes,
who is to succeed Mr. C. Newton Russell as Borough Electrical Engineer at Shoreditch.

While in South Africa he assisted in the supervision of the locomotive repair shop of the Beira-Salisbury Railway. Returning to Shoreditch, he became shift engineer in charge of the Whiston Street power station, and in 1907 was appointed chief assistant electrical engineer and mains superintendent. Mr. Weekes served for a time with the County of London Yeomanry during the war. He has been an Associate Member of the Institution of Electrical Engineers since 1912.

The Hereford City Council has granted an honorarium of £100 to the City Electrical Engineer.

Mr. H. S. Persey, of Fulham, London, was last week appointed resident electrical engineer to the Ulverston (Furness District of North Lancashire) Urban District Council. There were 187 applicants for the post. Supply is expected to be available in the district by the end of September.

Mr. T. Thorne Baker has been elected a Fellow of the Institute of Physics.

Mr. T. W. Ellis, consulting engineer, of Westminster, is leaving for the United States immediately on special business and hopes to return in October.

Obituary.—Mr. E. A. Cannell.—We regret to learn that Mr. Ernest Edward Cannell, who has been associated with our contemporary *Electricity* for more than 26 years, passed away on the 9th inst. in his 51st year. He will be much missed by a wide circle of friends in the electrical world.

Mr. C. Wooller.—The death has taken place from injuries received through being knocked down by a motor-car of Mr. Charles Wooller, of Mitcham, a shift charge engineer at the electricity works of the Beckenham Urban Council. He was 35 years of age.

Wills.—The late Mr. John Bilbie, of Bilbie, Hobson and Co., gas engine makers, left £6,487 gross and £6,285 net personalty.

Mr. J. Archdale (James Archdale & Co., machine tool makers, Birmingham) left £28,896 gross and £20,678 net personalty.

New Companies Registered.

Larne Electric Light and Power Co., Ltd. (N.1,263).—Private company. Registered in Belfast on July 28th. Capital, £5,000 in £1 shares. Objects: To take over the Larne Electric Light Co., at Larne. The subscribers (each with one share) are:—W. Crawford, 85, Main Street, Larne, merchant; W. H. Brandon, 7, Donegall Square West, Belfast, chartered accountant. W. Crawford is the first director. Secretary: William J. Allen. Solicitors: L. Estrange and Brett, Chichester Street, Belfast. Registered office: 79, Scottish Provident Buildings, 7, Donegall Square West, Belfast.

Mullard Wireless Service Co., Ltd. (207,669). — Private company. Registered August 4th. Capital, £10,000 in £1 shares (5,000 "A" and 5,000 "B"). Objects: To acquire, maintain, use, and supply telephones, telegraphs, and machines and valves, apparatus and appliances for use in connection with the transmission of signals, sounds and other communication, &c. The subscribers (each with one share) are:—S. R. Mullard, 27, Crane Drive, Surbiton, electrical engineer; H. J. Owens, 8, Milner Road, Kingston-on-Thames, secretary. S. R. Mullard signs as director. Half of the directors are to be appointed by the "A" shareholders and half by the "B" shareholders. No person connected with any person, firm or corporation engaged in the manufacture of radio valves or incandescent electric lamps or similar products other than the company or the Mullard Radio Valve Co., Ltd., or the N. V. Philips Gloeilampenfabricken, of Holland, shall be eligible for appointment as director of the company, except with the consent of all the directors. Remuneration, £50 each per annum. Solicitors: Godfrey, Wirr and Co., 85, Gracechurch Street, E.C.3. Registered office: Orient House, New Broad Street, E.C.

The Greater London Power Co., Ltd. (204,674).—Registered as a public company on August 4th, with a nominal capital of £100 in £1 shares. The objects are:—To carry on the business of an electric light and power supply company in all its branches. The subscribers (each with one share) are:—W. J. Rowles, 18, Austin Friars, E.C.2, solicitor; R. J. L. Scott, 18, Austin Friars, E.C.2, solicitor; A. G. Austice, 18, Austin Friars, E.C.2, articled clerk; P. J. Bellis, 18, Austin Friars, E.C.2, clerk; A. C. Dowsing, 4, Larden Road, Acton, W., accountant; A. K. Sterne, 18, Austin Friars, E.C.2, clerk; W. F. Marlow, 18, Austin Friars, E.C.2, solicitor's clerk. Minimum cash subscription, £7. The first directors are not named. Registered without articles of association. Solicitors: Slaughter and May, 18, Austin Friars, E.C.

Energo Products, Ltd. (207,621).—Private company. Registered July 31st. Capital, £3,000 in 2,000 cumulative 10 per cent. participating preference shares of £1 and 20,000 ordinary shares of 1s. Objects: To acquire the registered design and trade mark "Energo" as applied to electrical transformers from A. L. Vandervelde, and to carry on the business of manufacturers of, and dealers in electrical, telephonic and wireless goods and apparatus, brass and other metal parts for all purposes, goods appliances and sundries, insulated wire and cables and all forms of wire and cable, castings, electric light, general electrical and wireless engineers, &c. The directors are:—A. L. Vandervelde, 1, St. James Street, E.C.1, engineer; V. B. M. Mallentjer, 57, Scarsdale Villas, W.8, merchant (joint managing directors for life, with a minimum remuneration of £360 each per annum). Qualification, 250 shares.

Thermo Path Company, Ltd. (207,639).—Private company. Registered July 31st. Capital, £1,260 in 1,200 10 per cent. preference shares of £1 and 1,200 ordinary shares of 1s. Objects: To acquire certain processes and full information as to the processes for manufacturing and the right to manufacture and deal in certain dielectrics suitable for the manufacture of electrical heating apparatus and other electrical applications, and to adopt an agreement with A. Van der Moersch. The subscribers (each with one preference share) are:—C. Evans, 172, High Street, Acton, W.3, draper; A. F. A. Ashfield, The Warrens, Woodlands, Kemsing, Kent, cigar importer; A. W. Poore, of 59, Eardley Crescent, S.W.5, is managing director. Qualification of directors, 100 shares. Remuneration, £26 5s. each per annum. Solicitors: Woodbridge & Sons, 7, New Square, Lincoln's Inn, W.C.2.

Electroflo Meters Co., Ltd. (207,682).—Private company. Registered August 4th. Capital, £21,000 in £10 shares. Objects: To acquire the trade marks "Electroflo," No. 434,026 and 444,505, to acquire the business of the Electro Flow Meters Co. carried on by B. Dunglinson, A. Bursill, and J. W. Healy at Abbey Road, Park Royal, N.W.10, and carry on the business of electrical, gas, hydraulic, and general engineers, jig and tool and scientific instrument makers, &c. The directors are: B. Dunglinson, 9, Gunterstone Road, Kensington, W.14, engineer (managing director); A. Bursill, 25, Spencer Road, Chiswick, W.4, engineer; W. J. Healy, 143, Sutton Court, Chiswick, W.4, engineer. Qualification, £10. Remuneration as fixed by the company. Solicitor: A. R. Lord, 48, Bedford Row, W.C.1. Registered office: Abbey Road, Park Royal, N.W.10.

Official Returns of Electrical Companies.

Newcastle-upon-Tyne Electric Supply Co., Ltd.—Acknowledgment of further indebtedness dated July 17th, 1925 (supplemental to trust deeds dated October 16th, 1913, and December 9th, 1921), to secure further debenture stock for £170,000, ranking, *pari passu*, with £1,376,000 like debenture stock secured by trust deed and previous acknowledgments of indebtedness charged on property comprised in the original deed and supplement; charge dated March 4th, 1925. Trustees: Law Debenture Corporation, Ltd.

Cheddar Electric Supply Co., Ltd.—Debenture dated July 24th, 1925, to secure £2,500, charged on the company's undertaking and property, present and future, including uncalled capital, but excluding freehold hereditaments and premises. Holders: Lloyds Bank, Ltd.

North Somerset Electric Supply Co., Ltd.—Mortgage dated July 15th, 1925, collaterally securing £40,000 primarily secured by debentures dated October 30th, 1922, and February 23rd, 1925, charged on various properties in Somerset. Holders: Solicitors for H.M. Treasury.

Haworth & Williams, Ltd.—Particulars filed of £300 debentures authorised July 8th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount now being issued.

Specialities (Liverpool), Ltd.—C. M. Dolby, of 51, North John Street, Liverpool, was appointed receiver and manager (1) on July 22nd, 1925, under powers contained in debenture dated September 28th, 1922; and (2) on July 23rd, 1925, under powers contained in charge dated January 26th, 1924.

Cooper & Smith, Ltd.—A. F. Lovell, of 5, South Street, Finsbury, E.C.2, was appointed receiver on July 28th, 1925, under powers contained in a first debenture dated March 2nd, 1922.

Scintillating Sign Co., Ltd.—A. H. Partridge, of 3, Warwick Court, Gray's Inn, W.C., was appointed receiver and/or manager by order of Court dated July 17th, 1925.

Colombo Electric Tramways and Lighting Co., Ltd. (72,864).—Capital, £150,000 in £10 shares. Return dated June 2nd, 1925. 13,084 shares taken up. £840 paid. £130,000 considered as paid. Mortgages and charges, £120,000 5 per cent. debenture stock.

West African Telegraph Co., Ltd. (21,626).—Capital, £400,000 in £10 shares. Return dated June 24th, 1925. 23,109 shares. £231,090 paid. Mortgages and charges, nil.

Astro Electric, Ltd.—F. Wilcock, C.A., of 1, Great Winchester Street, E.C.2, was appointed receiver and manager on July 23rd, 1925, under powers contained in debentures dated November 8th, 1923, in place of R. R. Jones, of 15, Elm Grove, Wimbledon, who has ceased to act in those capacities.

Premier Accumulator Co. (1921), Ltd. (178,158).—Capital, £40,000 in £1 shares. Return dated July 6th, 1925. All shares taken up. £18,749 paid (£1 on 11,249 and 15s. on 10,000). 18,751 shares credited as fully paid. Mortgages and charges, nil.

Lancashire Dynamo and Motor Co., Ltd. (61,447).—Capital, £250,000 in £1 shares (200,000 ordinary and 50,000 preference). Return dated April 22nd, 1925. 174,120 ordinary and 48,800 preference taken up. £222,920 paid. Mortgages and charges, £75,000.

Hart Accumulator Co., Ltd. (60,059).—Capital, £200,000 in £1 shares (180,000 ordinary and 20,000 preference). Return dated June 3rd, 1925. 156,708 ordinary and 19,523 preference taken up. £38,411 paid up on 31,352 ordinary and 7,059 preference. £137,820 considered as paid on the remainder. Mortgages and charges, nil.

Bromley (Kent) Electric Light and Power Co., Ltd. (54,127).—Capital, £100,000 in £1 shares. Return dated April 20th, 1925. 90,000 shares taken up. £75,000 paid. £15,000 considered as paid. Mortgages and charges, £63,726.

Metallic Seamless Tube Co., Ltd. (47,966).—Capital, £65,333 6s. 8d. in 20,000 preference shares of 13s. 4d. and 260,000 ordinary shares of 4s. Return dated May 29th, 1925. 15,245 preference and 260,000 ordinary taken up. £36,163 6s. 8d. paid on 15,254 preference and 130,000 ordinary. £26,000 considered as paid on 130,000 ordinary. Mortgages and charges, nil.

Anglo-Portuguese Telephone Co., Ltd. (24,545).—Capital, £500,000 £1 shares. Return dated June 1st, 1925. 400,000 shares taken up. £301,046 paid. £98,954 considered as paid. Mortgages and charges, £66,280.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Enfield Cable Works, Ltd.

Lord Verulam presided at the annual meeting on August 7th, and in moving the adoption of the report (*vide* our last issue, p. 227), said that the balance sheet more than came up to the forecast which he made a year ago as to the prospects of the company. They had to remember that the period with which the report dealt had been a normal one so far as the labour and political situations were concerned, and, further, that there had been a considerable volume of orders in the country for the goods which they manufactured. They had had a fair share of those orders, and the results were reflected in the balance sheet. Referring to the investments in subsidiary companies, the chairman said that they held the whole of the capital of £5,000, with the exception of £6, in the Enfield Cable Works (Australasia), Ltd. They had formed that company to work their Australian agency, and although orders in that country had to be taken at very cut figures, the company had succeeded in making a profit of just over £2,500. That profit was kept in Australia for financial reasons. The business done in that country was entirely in the products of their factory at home, and therefore there was a small profit made on the Australian business in England. The other subsidiary company was the Enfield Rolling Mills, Ltd., which they had formed with a capital of £27,775. The mill had been erected, and the directors were satisfied that it was going to be a profitable investment. It was the only plant of its kind in the South of England, and they had no fear that there would not be plenty of work for the mill to do. It was of advantage to them to have the company for many reasons. One reason was that they would be able to buy copper in bar form instead of rods, and, further, it enabled them to obtain any odd-sized wire or copper strip at any time. The profit for the year, after charging directors' fees, depreciation, &c., amounted to £104,000 odd. The dividend on the preference shares and the interim dividend on the ordinary shares absorbed just over £25,000. They proposed to increase the reserve, which now stood at £5,151, to the round figure of £20,000, and to declare a final dividend of 15 per cent. on the ordinary shares, making 20 per cent. for the year. That would leave £34,079 to be carried forward, against £14,892 brought into the account. Sir T. O. Callender seconded the motion, which was adopted.

Kalgoorlie Electric Tramways, Ltd.

The annual meeting was held in London recently, under the chairmanship of Mr. A. H. P. Stoneham. In presenting the report and accounts, which were reviewed in our issue of July 31st (p. 189), the chairman said that the net profit for the past year had declined from £7,445 to £5,148, owing mainly to the reduction of the population of Kalgoorlie and the competition of motor-omnibuses. Since 1905 the population had fallen from 33,000 to 18,000 owing to the gradual decline of the mining industry of the district. A Royal Commission had inquired into the position of the industry, and it was found that costs could be reduced and the tonnage increased, enabling the field to be worked at a profit for some years. It was recommended that a gold bonus should be paid to the Western Australian mines; this, it was considered, would increase the number of employed by 50 per cent. in two years. With regard to the motor-bus competition, the chairman said that representations by the company had resulted in restricting the 'buses to certain routes.

Mr. W. H. Stanley, director in Western Australia, said that private enterprise was not encouraged in Australia; wages were high, and so was the cost of material. The depreciation of the system had also had to be taken into account; they would have to look forward to attending to that matter if conditions enabled them to keep on. The report and accounts were adopted.

Manila Electric Corporation.—The *Financial Times* reports that the Associated Gas and Electric Co. is offering valuable subscription rights to all stockholders and security holders having the right to become stockholders by conversion. The offer will apply to the "A" stock, now being exchanged for the Manila Electric Corporation stock, and also to the Associated Co.'s 6½ per cent. Manila Electric "B" debentures, issued previously in exchange for Manila Electric stock. In May last, under a scheme of reorganisation of capital, stockholders of the Manila Electric Corporation were offered 6½ per cent. debenture obligations of the Associated Gas and Electric in exchange for their holdings. The latter concern acquired two-thirds of the Manila stock, and in July last offered to exchange "A" stock for the remainder of the Manila capital stock.

Stock Exchange Notices.—The undermentioned have been ordered to be officially quoted:—

Calcutta Electric Supply Corporation.—133 ordinary shares of £1 each, fully paid, Nos. 1,216,573 to 1,216,710.

Fife Tramway, Light and Power Co.—500,000 ordinary shares of £1 each, fully paid, Nos. 1 to 500,000, and 500,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 500,000.

Siemens Bros. & Co.—45,000 10 per cent. cumulative preference shares of £1 each, fully paid, Nos. 360,001 to 405,000.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Shropshire, Worcestershire, and Staffordshire Electric Power.—39,315 "A" ordinary shares of £1 each, fully paid, Nos. 810,001 to 849,315; 307,863 "B" ordinary shares of £1 each, fully paid, Nos. 1 to 300,000 and 600,001 to 607,863.

Anglo-Argentine Tramways Co., Ltd.—The Special Committee appointed by the Municipal Executive to study the proposals of the Anglo-Argentine Tramways Company and of Messrs. Dodero and Benigni for new underground railways reported on August 10th, advising the acceptance of the Anglo-Argentine Company's project. The Committee admitted the justice of the increased tramway fares so as to provide quotas for the pension fund, salary increases, and a fair return on capital.—*The Times.*

Tyneside Tramways and Tramroads Co.—The report for the half-year to June 30th last shows a surplus of £1,963, and the addition of £751 brought forward makes £2,714. The balance available, after providing for interest, &c., is £830, which is being carried forward. The directors regret that they are unable to recommend a dividend for the half-year; the traffic receipts show a decrease of £1,456, as compared with the first half of 1924. The decline is attributed to the depressed state of trade in the district.

Waste Heat and Gas Electrical Generating Stations, Ltd.—An interim dividend of 1½ per cent. on the issued share capital of the company has been declared in respect of the half-year ended July 31st.

Chatham and District Light Railways Co.—An interim dividend at the rate of 5 per cent. per annum has been declared on the ordinary shares, as in 1924.

Mansfield and District Tramways, Ltd.—A dividend at the rate of 6 per cent. per annum has been declared on the ordinary shares in respect of the past half year, as in 1924.

Cork Electric Tramways and Lighting Co., Ltd.—An interim dividend of 3 per cent., less tax, has been declared on the ordinary shares, as in 1924.

Clyde Valley Electrical Power Co.—An interim dividend of 3 per cent. (actual), less tax, has been declared on the ordinary shares in respect of the half-year to June 30th.

East African Power and Lighting Co., Ltd.—A dividend at the rate of 3 per cent. per annum is announced for the past year.

Lanarkshire Tramways Co.—The directors state that they are unable to declare an interim dividend.

Fuller's United Electric Works, Ltd.—At the resumed meeting on Monday last, the scheme for the creation of a prior lien debenture for £75,000 in favour of the company's bank, and increasing the interest on existing stock was approved.

Tyneside Electrical Development Co., Ltd.—An interim dividend of 3 per cent. has been declared on the preferred ordinary shares for the half-year ended July 31st.

Stocks and Shares.

MONDAY EVENING.

THE principal financial excitement of last week the Bank of England furnished by reducing its rate to 4½ per cent. as against the previous 5 per cent. The step came as a complete surprise. It was only three or four weeks ago that people in the Stock Exchange talked of the possibility of a rise in the

Bank Rate. For it to come down to 4½ per cent was so unexpected that its import was scarcely grasped at first. Very quickly, however, investment stocks responded to the change in the position, and, with the rises in British Government securities, there followed a general hardening of gilt-edged stocks in other sections. Investment securities of all kinds are better. The new County of London Electric preference, for instance, strengthened to 1s. 1½d. premium. Most of the quotations in our price-lists show little variation. There is, nevertheless, more change in them than actually appears, in that it has become less easy to buy stock than it was even a week ago.

The effect of the arrangement made by the Government in connection with the coal crisis, after being sharply criticised in the Stock Exchange, was subsequently deemed to be as satisfactory as could have been expected in the circumstances, and the settlement of the trouble, though considered to be more or less temporary, led to revival of confidence and of quotations. The usual August holiday feeling is noticeable in Stock Exchange markets, although there is still a good deal of business going on in various directions.

A sharp fall in the price of rubber to about 3s. 4d. per lb. caused a general shake-out amongst rubber share values, while at the same time it brought about a corresponding improvement in the share prices of Henleys, Callenders, Siemens, and various others in companies connected with the industries which use rubber in large quantities.

Towards the end of last week there were published the returns of the Electricity Commissioners for the year ended March 31st last, showing that the use of electricity is extending rapidly. The Chancellor of the Exchequer stated the other night in the House of Commons that the surplus to the credit of the Road Fund may be employed temporarily in assisting electrical schemes, and this seems to be a very commonsensible method of dealing with money which is appropriately due to public utility works. The Electrical Distribution of Yorkshire is expected to issue fresh capital in the near future, and the price of the ordinary shares, which was standing about 30s. before the statement appeared, has risen to 35s. Shares changed hands to-day, Monday, at 35s. 6d.

In connection with the further employment of electricity, it is particularly interesting to note that the Ministry of Transport, according to an answer given in Parliament last week, continues to press on the coal-mining companies the desirability of electrification. A member asked if the electrification of railways was delayed by any question affecting the supply of current, and the Government's answer was that this is a matter of opinion. The chairman of the La Guaira & Caracas Railway mentioned at the recent meeting that it is proposed to electrify this railway in Venezuela, but that the board had not received certain assurances which they required from the Government of Venezuela, and without which they did not care to proceed with the change-over in the system. That they would receive these assurances, the chairman remarked, he had every reason to hope.

Westminster ordinary eased off to 44s. 6d. Charing Cross strengthened to 47s. 6d. and St. James's at 13⅞ are 5s. higher. Beyond these changes, there are no alterations of consequence in the list of electricity supply shares, and business has been quiet. The City of London announces an interim dividend of 1s. per share, payable on September 26th. This is the same rate as that declared a year ago.

Callenders are better at 3 1/16. Henleys rose to the same price, and several other advances occurred in consequence of the reaction in the price of raw rubber. Babcock & Wilcox stand out with a substantial recovery, being 3s. 3d. up at 52s., thanks to the settlement of the coal dispute. Siemens hardened to 27s. 6d. Enfield Cable ordinary shares are firm at 65s. 6d., the preference remaining at 25s.

Metropolitan Consolidated at 70 and Districts at 44½ are 10s. up and down respectively. The market in Home Railway stocks is better, material recoveries having occurred in the prices of the steam companies' stocks. The public, however, are shy of touching Home Railways, and a great part of the improvement is due to a marking-up process, rather than to any increase of actual investment on the part of the public.

The cable market is uninteresting. Advances have occurred in Anglo-American preferred, Eastern extensions and Globe preference, while United River Plate Telephones at 7⅞ are ⅜ higher. The wireless group has scarcely moved. A little investment demand has arisen for Marconi 5½ per cent. debenture on the basis of 103. Amongst miscellaneous shares, Victoria Falls ordinary are better at 46s. Rangoon Electric preference have gone back to 4⅝.

Mexican issues remain heavy, not to say depressed. Mexican Light & Power Firsts shed 2 points to 61½. The rise in Brazilian Tractions was checked by a little profit-taking, and the price stands ½ lower at 60. British Columbia deferred strengthened a trifle; other issues in this section have not moved. The iron and steel market is better all round. Babcock & Wilcox, as already stated, stand out with the principal rise. Rubber shares are weaker by reason of the fall in the price of the raw material. This cold douched the recent fever-heat of optimism, and brought about a considerable reaction in values.

Share List of Electrical Companies.

	Nom.	Dividend. 1923.	Dividend. 1924.	Price Aug. 10, 1925.	Rise or fall.	Yield p.c
Home Electricity Companies						
Bournemouth and Poole	£1	13	14	2⅝	—	5 0 10
Brompton Ordinary	1	10	10	1⅝	—	*5 14 3
Charing Cross Ordinary	1	14½	15	47/6	+9d.	6 11 10
do. do. 4½ Pref.	1	4½	14½	17/6	—	5 2 10
Chelsea	1	12	12	1⅝	—	6 8 0
City of London	1	15	15	45/9	—	5 11 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	30/-	—	5 3 3
County of London	1	15	15	52/6	—	5 14 3
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	20/6	—	6 1 7
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	33/3	—	6 0 4
Kensington Ordinary	5	14	15	12¾	—	5 17 8
Lancs. Light and Power	1	7½	7½	25/6	—	5 17 8
London Electric	1	10	10	33/-	—	6 1 2
do. do. 6% Pref.	5	6	6	5⅛	—	5 7 10
Metropolitan	1	10	11	38/3	—	5 15 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	23/3	—	5 4 4
Newcastle-on-Tyne Ordinary	1	6	7	22/6	—	6 4 5
do. 5% Pref.	1	5	5	18/3	—	5 9 7
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	13¾xd	+ ¼	6 10 10
South London	1	15	15	2 1/16	—	6 3 1
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref.	1	6	6	20/-	—	6 0 0
Westminster Ordinary	1	15	15	44/6	—6d.	6 14 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/6	—	7 13 10
Yorkshire Elec.	1	8	8	29/-	-6d.	5 10 6
Home Rails.						
Central London Ord. Assented	Stock	4	4	68	—	5 17 8
Metropolitan	,,	4	5	70	+ ½	7 2 10
do. District	,,	3½	3½	44½	— ½	7 17 4
Underground Electric Ordinary	10	Nil	Nil	2½	—	Nil
do. do. "A"	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds		6	6	98	—	*6 2 8
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	103½	—	5 15 11
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	3	6	2 1/16	—	2 18 5
Chili Telephone	5	6	5	5⅜	—	*4 13 0
Cuba Sub. Ord.	10	5	5	6⅜	—	7 8 9
Eastern Extension	10	10	10	17½	+ ⅛	*5 15 11
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 15 11
Globe Tel. and T. Ord.	10	10	10	17⅜	—	*5 15 1
do. do. Pref.	10	6	6	11	+ ⅛	5 9 1
Great Northern Tel.	10	22	22	31	—	7 1 11
Indo-European	25	7	8½	41½	—	*5 2 6
Marconi	1	10	10	1⅜	—	7 5 0
Marconi Marine	1	10	7½	18/9	—	8 0 0
Oriental Telephone Ord.	1	12	12	2⅜	—	*5 12 11
United R. Plate Tel.	5	8	8	7⅛	+ ¼	5 5 5
Western Telegraph	10	10	10	16½	—	*6 3 1
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3⅛	—	8 16 0
do. do. 2nd Pref.	5	6	6	2 1/16	—	10 4 4
do. do. 5% Deb.	Stock	5	7	71½	—	6 15 9
British Electric Traction Ord.	,,	6	6	112	—	5 7 1
do. do. 6% Pref.	,,	6	6	104	—	5 15 5
Brazil Traction	100	4	4	60	— ½	6 13 4
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	88½	—	5 11 9
do. do. Preferred	,,	96/-	96/-	83½	—	*5 15 0
do. do. Deferred	,,	129/5	129/5	103	+1	*6 6 0
do. do. Deb.	,,	4½	4½	76½	—	5 11 1
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8 6
Mexico Trams, 5% Bonds	—	5	5	62½	—	8 0 0
Mexican Light Common	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	58	—	Nil
do. 1st Bonds	—	5	5	61½	—2	8 2 5
Yorkshire (West Riding)	1	5	—	17/6	—	5 14 3
Manufacturing Companies.						
Babcock & Wilcox	1	12	12	52/-	+3/3	*4 12 4
British Aluminium Ord.	1	5	10	30/9	—	6 12 0
British Elec. Transformer Pref.	1	Nil	7	17/6	—	... ...
British Insulated Ord.	1	15	15	3 1/16	—	4 18 0
Brush Ord.	1	10	10	1	—	10 0 0
Callenders	1	15	15	3 1/16	+ 1/16	4 17 10
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 6
Crompton Ord.	1	Nil	Nil	⅜	—	... ...
Edison-Swan	4	10	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	80½	—	6 4 8
Electric Construction	1	10	10	30/6	—	6 11 2
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	17 9	—	5 12 8
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23 6	—	5 10 8
do. Ord.	1	5	7½	24/-	—	6 5 0
Henley	1	15	16	3 1/16	+ ⅛	5 4 4
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	19/6	—	*5 2 6
Johnson & Phillips	1	10	10	2½	—	4 9 3
Met Vickers, Ord.	1	8	8	22/-	-1/3	7 5 0
do. Pref.	2	8	8	2⅜	—	6 14 5
Siemens Ord.	1	—	7½	1⅜	+1/9	5 9 5
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

London's Electricity Supply.

Three New Measures, Inaugurating a New Era.

The House of Lords on July 29th approved the London nd Home Counties Electricity District Order, 1925, nd on July 31st the London Electricity Bills, Nos. 1 nd 2, received the Royal Assent.

The three measures which have thus become law re inter-related, and between them open up possibilities f considerable improvement in electricity supply in the ondon district. Their passing marks the end of a pro-racted and difficult series of negotiations and discus-ions which commenced in 1920, as soon as the Electri-ity Commissioners appointed under the Electricity Supply) Act, 1919, were able to get to work.

The two London Acts are similar in effect, but a little ifferent in machinery, because the two groups, the Four Companies" of No. 1 Act and the "Ten Com-anies" of No. 2 Act, preferred different methods of co-peration. The most vital provisions of both Acts re:—

(1) The tenure of the companies in respect of their reas of supply in the County of London is extended om August, 1931, until the end of 1971.

(2) The statutory prohibition of amalgamation or ssociation between the London companies is repealed, nd some definite arrangements of that character are nfirmed and enjoined upon the two groups respectively.

The "Four Companies" of the No. 1 Act are the ity of London, County of London, South London, and outh Metropolitan.

The "Ten Companies" of the No. 2 Act are the haring Cross, Brompton and Kensington, Chelsea, ondon Electric, Metropolitan, Kensington and Knights-ridge, Notting Hill, St. James' and Pall Mall, West-minster, and Central Companies.

The extension of tenure will have the immensely im-ortant effect of permitting the London companies to end money in extension and development with the rtainty of ample time for the capital to fructify. The rospect of compulsory purchase in 1931 on terms which nvolved a material sacrifice of capital value, and the ture returns on unexhausted works, have discouraged uch expenditure.

This is specially important with regard to distribution xpenditure, but it is not negligible with regard to the xtension of generating resources, particularly where is involves the scrapping of existing stations.

The London companies, relieved of the prospect of ss of capital on purchase at a near date, will now have rong incentives to exercise enterprise where they have r some years been obliged to proceed with caution. ery shortly, it may be hoped, no parts of their areas ill be without distributing mains, and the lack of sh in some quarters with regard to domestic supplies r cooking, &c., will give place to active propaganda.

The London companies have had to give something r this. The consent of the London County Council—the holder of the purchase powers—was necessary, so at body was in a position to make terms. These rms are set out in agreements between the L.C.C. and e two groups, scheduled to, confirmed and made bind-g by the two Acts. One of the terms is that the divi-nds on the ordinary capital of the Companies are to be gulated by a sliding scale relating the dividend rates the prices charged.

Until 1931 (later in the case of two companies for ecial reasons) the standard rate of dividend is to be per cent.; after 1931, 7 per cent. The building-up reserves is strictly limited. "Standard prices" are be fixed for each company, and in any year in which company's receipts aggregate less than would have been oduced by actual sales at those prices, the company ay—if it has the necessary funds—distribute as addi-nal ordinary dividend one-sixth of that difference. the company's costs are reduced as compared with those of the year taken for the standard price calculation, it must have given its consumers six-sevenths of the savings by prices below the standards in order to be able to distribute one-seventh as an addition to the standard dividend.

Standard prices will be fixed by taking the costs and charges of the last elapsed year (possibly either 1924 or 1923), adding a calculated sinking fund instalment, and the standard dividend, making some minor adjustment for return on investments and other matters; dividing the total by the number of units sold, and splitting the average into four standard prices for railway and traction, bulk supplies, street lighting, and private consumers. The true value of the ordinary capital is to be arrived at by setting off the available reserves against the depreciation of existing assets; and any balance of "free reserves" may be capitalised and rank for dividends at a reduced rate.

Standard prices may be revised every three years, and must be for 1932.

The prices charged in the year of reference will not enter into the calculation. The companies will not be under an obligation to charge the standard prices; they will have an incentive to charge less, as described; they may charge more, but cannot retain as profit or reserve any net revenue beyond the permitted dividends and reserves.

For several years the London Companies have paid good dividends, and have put large sums to reserve. This was justified by the expectation of loss of capital at purchase. The necessity for these large reserves now disappears, as the sinking fund entering into the standard price calculation is to make good the difference between cost and the purchase prices to be paid in 1971. Prices should consequently be reduced by the difference as soon as the sliding scale becomes effective.

The Commissioners have to fix the date from which it will operate. If, for example, they fix January 1st, 1926, the first application of the sliding scale and the consequent regulation of dividends will be to the accounts for the year ending December 31st, 1926.

The second important provision, permitting and enjoining the co-operation of the companies in each group, takes the form in Act No. 1 of an agreement between the "Four Companies" either to amalgamate or to make arrangements satisfactory to the Commissioners for the centralisation of their generating resources, which means interlinking and unified control of the generating stations.

The stations belonging to this group include Barking (County Company), Bankside (City Company), and Blackwall Point (South Metropolitan Company). These are all Thames-side stations well placed for economical working. Barking, with 100,000 kW of plant and site room for perhaps six times as much, and Bankside, with 55,000 kW and room for considerable extension, will be the mainstay of the group. Loughborough Junction (South London) and City Road (County) will probably become distributing sub-stations very shortly. Wandsworth (County) and Blackwall Point may remain as peak load stations for a time; both are hampered by site area as regards large extensions. These stations are interlinked, or will be so, by 33,000-volt transmission mains, laid or being laid.

The ten companies have undertaken to lease their generating stations and transmission lines to the London Electricity Joint Committee, Ltd., incorporated by the No. 2 Act, which is empowered to operate the stations, to build new ones, and lay transmission mains. The new company will generate for the whole of the constituent companies, which will be the distributors. It will be financed by them and supply them at cost, including capital charges, &c.

Probably Bow Road (Charing Cross), Deptford (London Electric), Willesden (Metropolitan), and Grove Road (Central) will form the mainstay of the group. But Deptford is largely pledged to the Southern Railway, and to 25 cycles; Willesden is largely pledged to the outer areas of the Metropolitan Company, and Grove Road is restricted by site and water supply. Bow Road can be extended.

The engineers informed the House of Commons Committee that it was intended to build a large Thamesside station as soon as the Bill passed. Until that is ready, several of the smaller stations must be kept at work; but with unified control, the existing stations are capable of working at low costs.

The London and Home Counties Electricity District Order, 1925, constitutes a district nearly identical with the area delimited by the Commissioners in their first announcement of 1920. It extends from St. Albans to Dorking, from Windsor to Gravesend, has an area of about 1,860 square miles, and a population (1921 Census) of about 8¼ millions. At the very last stage—approval by Parliament—the Watford Corporation's supply area was cut out, which makes an ugly dent in the north-western quadrant of the boundary.

The Order establishes a Joint Electricity Authority of 33 appointed and elected members, who may co-opt and pay a chairman. The members are thus apportioned: Municipal undertakers, 14; companies, 5; L.C.C., 6; City Corporation and Middlesex County Council, one each; other county councils, 2; workers in the industry, 2; the Railway Companies' Association, 2. This gives authorised undertakers, 19; local authorities, including undertakers, 24; clear majorities on either line of division.

The Authority may raise £10,000,000 for capital works, generating stations, transmission lines, acquisition of undertakings, &c., subject to the approval of the Commissioners.

It may supply in bulk to authorised generators generally, but only with the consent of the four power companies in some portions of their areas. It has to consider, elaborate and report to the Commissioners upon a technical scheme set out in the Order which classifies the existing generating stations for extension, limited extension, and shutting down, and proposes some interlinking mains. The London Companies are pledged by the agreements scheduled to the Acts to carry out their own parts of the scheme after approval by the Commissioners; and to dispose of any surplus generating capacity as the Joint Authority may direct. The scheme provides for the standardisation of frequency and transmission voltages.

The Authority has to submit to the Commissioners plans for supply in any areas which have none and require it, within a limited period. The North Metropolitan Power Company has to do this for its own area.

The Joint Authority may—by agreement—take over and operate the generating stations or the whole undertakings of any authorised undertakers; but it has no compulsory power to control generation, or to acquire any undertakings excepting those of the London companies, as provided by the two Acts.

It will have to be notified of any applications to the Commissioners for consents to the extension of stations &c., required by the Electricity (Supply) Acts, and can make representations thereon. It can also address representations to the Commissioners on matters affecting the efficiency of supply in the district or the necessity for alterations, improvements and extensions.

The Authority may appoint and pay the necessary officials, and may appoint certain committees, including a Technical Advisory Committee, which need not be composed of its own members.

It may promote or oppose Bills in Parliament.

It will have no call upon the rates or taxes. Its administrative expenses must be met by contributions to be levied ratably upon the sales of the authorised undertakers represented; and its supply costs by its sales. Its annual estimates must be submitted to the Commissioners for approval; and any proposals for capital expenditure are also subject to the Commissioners' approval and consent.

The powers of the Joint Authority are largely permissive, and the benefit of its activities will depend upon the extent to which the authorised undertakers agree to carry out its plans.

The Commissioners indicated that they would have preferred to give the Authority more power, but the Order embodies the greatest common measure of agreement which emerged from five years of negotiations and discussions. The Commissioners can give the Authority directions under the 1919 Act; they can make amending Orders, and the Authority can promote Bills; so that if local patriotism hinders development, further powers may be asked for.

It will help greatly to have a deliberative body before which local interests will assume their proper proportions, and the general interests of supply over the whole district will take the first place. It may be that in such an atmosphere, consents will be given which would make mandatory powers superfluous; time will show, and time may allay local feelings.

The three measures at least make possible an early approach to a cheaper and more abundant supply of electrical energy to one-fifth of the population of Great Britain. It is to be devoutly hoped that the possibilities will be realised.

Russian Electrical Notes.

Soviet Electrical Industry. — *Reuter's Trade Service* (Moscow) says that according to a report of the "Glavelektro" on the programme of the electro-technical industry during the year 1925-26, production is to be increased by 72 per cent. compared with 1924-25, the value of the gross output rising by 51 per cent. The number of workers will be increased by 43 per cent. and of salaried officials by 22 per cent. It is hoped to increase the individual output on an average from 15 to 33 per cent. and wages are to be raised from 1 to 13 per cent.

The Electrical Manufacturing Industry.—The General Electrical Commission has included in the working plan for next year (1925-26) schemes for the specialisation of the manufacturing works for increasing their productivity. In the case of the former Vek works at Kharkoff, it is proposed to specialise in the construction of motors and fittings; in generators and large transformers at the Electroforce works in Leningrad; in tramway and railway motors, train lighting, and railway train equipment at the Dynamo works; and in transformers at the Volt works. By this means it is calculated that the production can be increased by from 20,000,000 roubles to 38,000,000 roubles per annum. In the case of the erection of entirely new works, the programme provides for the construction of one works for the production of standard machines at a cost of 5,000,000 roubles and one for small motors at an estimated outlay of 3,500,000 roubles. Moreover, the scheme contemplates the erection of four works for the manufacture of measuring instruments and meters, insulating materials, installation materials, and porcelain. The production of measuring instruments and meters at existing works will be concentrated in the near future in the shops of the former Kasints works in Leningrad and that of automatic telephones at the former Ericsson works.

The Electrification Conference.—As a result of the recent general conference which was held in Moscow over several days, resolutions were adopted emphasising the necessity for the preparation of a plan for the re-equipment of the existing manufacturing works and the erection of new works, this plan to be completed next September so as to render it possible for the expenditure to be included in the Budget estimates for 1925-26. In the meantime the trusts are recommended to undertake bulk production to meet the growing demand as far as possible; it is suggested that the imports should cover the difference between the maximum demand and the actual productive possibilities of the native works; that the import duties on raw materials and semi-finished products should be reduced; and that the trusts should be authorised to arrange with foreign firms for the sending of goods on consignment for the satisfaction of the needs of customers. At the same time the conference instructed the General Electrical Commission to make an investigation with a view to bringing about a general revision of sale prices.

Peat Fuel Stations.—The first 10,000-kW set at the Nischni Novgorod station in Balakhn, which is eventually to have a capacity of 80,000 kilowatts, is to be put in service shortly, and the second generator of the same power is intended to be started soon after. The station is to employ peat as fuel, and six of the proposed ten boilers are in position. The expenditure on the station for the plant of 20,000 kW has been about 8,000,000 roubles, including 2,000,000 roubles for the purchase of foreign equipment. As a result of the rapid growth in the consumption of energy in Leningrad, the Electric Planning Commission has decided that it is necessary to increase the capacity of the peat fuel station of Leningrad by 40,000 kW in the next few years.

Cable Manufacturing.—The Central Electrical Trust has made application to the higher authorities for a loan of 1,500,000 roubles for the purpose of concentrating its two cable works and two lamp factories, which, under existing conditions, are unable fully to meet the demand, at the premises of the former Provodnik works in Moscow. It is proposed to install new machinery for the manufacture of armoured cables. It is reckoned that the alterations and extensions would be completed in the summer of next year, and that the value of the annual output, which now does not exceed 16,000,000 roubles, would then be increased to 45,000,000 roubles.

A Large Generator from France.—The Azneft (Baku Oil Trust) has been authorised to purchase a 17,500-kW turbo-generator for the Belgorod station in Baku, this being the largest of its kind in Russia. The set has been ordered from a French firm.

Electricity Supply in the Moscow Region.—A plan for the electricity supply system for the region of Moscow for the next five years has been considered by the Electric Planning Commission. The scheme provides for an increase in the supply of energy from 320 million kWh in 1924-25 to 430 millions in 1925-26, 540 millions in 1926-27, and 1,000 millions in 1930-31. In order to meet this estimated growth in the consumption, it is considered necessary for the capacity of the stations in Moscow and region to be increased from 102,000 to 300,000 kW by means of the installation of new generators at the works of the Electric Transmission (Peredach), the raising of the capacity of the Schatur station to 48,000 kW, the augmentation of the output at the industrial stations which feed into the general network, &c. It is calculated that by 1927-28 it will be possible to reduce the costs of production by from 35 to 40 per cent.

Electrification of the Crimea.—The Electric Planning Commission has prepared a scheme for the electrification of the region of the Crimea. It provides for the construction of a hydro-electric station on the River Chernoi of a capacity of 9,000 kW for supplying, among other towns, Sebastopol, Simferopol, and Yalta, but owing to the inequalities in the level of the river it is considered necessary to establish a steam power reserve station of 2,850 kW. The expenditure on the hydro-electric works and the transmission lines is estimated at 4,100,000 roubles, of which the sum of 2,800,000 roubles has to be provided in 1925-26.

Electricity in White Russia.—The Electrical Planning Commission has under consideration a plan for the electrification of White Russia, which provides for the construction of three regional stations for the supply of Minsk, Vitebs, and Polots. The expenditure on these works is computed at 16,000,000 roubles, while a number of smaller local stations are also in contemplation.

Moscow Radio Exhibition.—It is proposed to continue until September 15th the exhibition of radio apparatus that was recently opened in Moscow, the extension being connected with the delay in the receipt of exhibits from abroad. Foreign firms have been permitted to import 12 sets of apparatus of small size, six sets of medium size, and three sets of large size free of duty for the purpose of the exhibition. Five German firms were expected to participate, as well as a big American company.

The Shteroff Regional Station.—It is expected that the Shteroff regional station in the south of Russia will be completed and put into operation by the end of the current year. As a result of the receipt of further applications from industrial and other prospective customers, the General Electrical Commission has brought forward the question of acquiring a further set of not less than 16,000-kW capacity for this station.

Large Radio Station.—The Weak Current Trust has received an order to construct a radio station in Leningrad with an effective radius of 1,320 miles, all the equipment to be made at the Kosints works. The trust has also on hand orders for telegraph stations for Kazan and Voronesh.

Progress in the Ukraine.—A conference was held at Kharkoff in the third week in July to consider the question of electricity supply in the towns in the Ukraine. According to reports presented at the meeting, the capacity of the generating stations in this republic at the end of the current year will amount to 180,000 kW, permitting of a large reduction in the time costs as compared with the present time. As to the projected Dnieper works, it was mentioned that it would probably be necessary to add from one to two generating sets to the six which are already in contemplation, and that the works would yield a profit of 16,000,000 roubles in the first year of its activity.

India's Electrical Imports.

Principal Sources of Supply.

Full details of India's import trade in 1923-24 in electrical goods, showing the principal countries of supply, have recently been issued. From these the following particulars have been extracted. The corresponding figures for 1922-23 have been added for purposes of comparison and a note of increases or decreases given. The value of the rupee in the years in question varied approximately between 1s. 3½d. and 1s. 5d.

	1922-23 Rs.	1923-24 Rs.	Inc. or dec. Rs.
Control and switchgear.—			
Total	1,777,000	3,618,000	+1,841,000
From United Kingdom ...	1,425,000	3,046,000	+1,621,000
,, United States	343,000	236,000	− 107,000
Generators, alternators and dynamos.—			
Total	3,980,000	3,920,000	− 60,000
From United Kingdom ...	3,402,000	2,953,000	− 449,000
,, United States	323,000	845,000	+ 522,000
,, Switzerland	196,000	4,000	− 192,000
,, Germany	28,000	35,000	+ 7,000
,, Italy	10,000	23,000	+ 13,000
Motors.—			
Total	8,160,000	7,226,000	− 934,000
From United Kingdom ...	6,062,000	4,631,000	−1,431,000
,, United States	1,112,000	1,754,000	+ 642,000
,, Sweden	143,000	449,000	+ 306,000
,, Germany	311,000	209,000	− 102,000
,, Switzerland	380,000	17,000	− 363,000
,, Italy	34,000	41,000	+ 7,000
Transformers.—			
Total	2,099,000	1,539,000	− 560,000
From United Kingdom ...	1,208,000	958,000	− 250,000
,, United States	804,000	542,000	− 262,000
,, Germany	72,000	8,000	− 64,000
,, Italy	13,000	11,000	− 2,000
Turbo-generating sets.—			
Total	1,423,000	1,111,000	− 312,000
From United Kingdom ...	1,393,000	800,000	− 593,000
,, Denmark	—	245,000	+ 245,000
,, United States	28,000	66,000	+ 38,000
Other electrical machinery.—			
Total	8,553,000	4,844,000	−3,709,000
From United Kingdom ...	6,451,000	3,985,000	−2,466,000
,, United States	1,198,000	655,000	− 543,000
,, Switzerland	308,000	17,000	− 291,000
,, Germany	209,000	49,000	− 160,000
,, France	151,000	6,000	− 145,000
,, Italy	196,000	35,000	− 161,000
,, Belgium	16,000	14,000	− 2,000
Electric fans and parts.—			
Total	3,114,000	2,915,000	− 199,000
From United Kingdom ...	1,394,000	1,733,000	+ 339,000
,, Italy	952,000	466,000	− 486,000
,, United States	587,000	345,000	− 242,000
,, Germany	159,000	325,000	+ 166,000
Wires and cables, rubber insulated.—			
Total	2,853,000	2,716,000	− 137,000
From United Kingdom ...	2,423,000	2,450,000	+ 27,000
,, United States	58,000	99,000	+ 41,000
,, Germany	58,000	32,000	− 26,000
Ditto, other insulations.—			
Total	3,845,000	2,228,000	−1,617,000
From United Kingdom ...	3,540,000	1,828,000	−1,712,000
,, United States	195,000	200,000	+ 5,000
,, Germany	75,000	69,000	− 6,000
,, Holland	—	80,000	+ 80,000
,, Switzerland	5,000	26,000	+ 21,000
Telegraph and telephone wires and cables.—			
Total	163,000	896,000	+ 733,000
From United Kingdom ...	161,000	892,000	+ 731,000
Telegraph and telephone instruments and apparatus.—			
Total	474,000	3,240,000	+2,766,000
From United Kingdom ...	363,000	3,197,000	+2,834,000
,, United States	99,000	20,000	− 79,000
Electric glow lamps.—			
Total	1,802,000	1,486,000	− 316,000
From United Kingdom ...	800,000	577,000	− 223,000
,, Holland	454,000	582,000	+ 128,000
,, Germany	400,000	209,000	− 191,000
,, Austria	26,000	39,000	+ 13,000
,, United States	30,000	24,000	− 6,000
Batteries.—			
Total	235,000	624,000	+ 389,000
From United Kingdom ...	92,000	370,000	+ 278,000
,, United States	110,000	203,000	+ 93,000
,, Germany	32,000	45,000	+ 13,000

	1922-23 Rs.	1923-24 Rs.	Inc. or dec. Rs.
Electric carbons.—			
Total	47,000	64,000	+ 17,000
From United Kingdom ...	40,000	58,000	+ 18,000
Accumulators.—			
Total	370,000	265,000	− 105,000
From United Kingdom ...	283,000	214,000	− 69,000
,, United States	83,000	38,000	− 45,000
Electric condensers (all from United Kingdom).—			
Total	—	2,000	+ 2,000
Electric bell apparatus.—			
Total	7,000	4,500	− 2,500
From United Kingdom ...	1,600	2,600	+ 1,000
,, Germany	4,000	1,800	− 2,200
Electric lighting accessories and fittings.—			
Total	1,113,000	902,000	− 211,000
From United Kingdom ...	836,000	695,000	− 141,000
,, Germany	146,000	144,000	− 2,000
,, United States	44,000	31,000	− 13,000
Meters.—			
Total	630,000	524,000	− 106,000
From United Kingdom ...	503,000	375,000	− 128,000
,, Sweden	68,000	82,000	+ 14,000
,, Switzerland	21,000	37,000	+ 16,000
,, United States	28,000	24,000	− 4,000
Electro-medical apparatus.—			
Total	35,000	105,000	+ 70,000
From United Kingdom ...	21,000	72,000	+ 51,000
,, United States	10,000	13,000	+ 3,000
Switchboards (other than telegraph and telephone).—			
Total	668,000	719,000	+ 51,000
From United Kingdom ...	564,000	488,000	− 76,000
,, United States	77,000	205,000	+ 128,000
Electrical goods and apparatus not enumerated.—			
Total	4,756,000	4,038,000	− 718,000
From United Kingdom ...	3,296,000	2,934,000	− 362,000
,, Germany	751,000	475,000	− 276,000
,, United States	308,000	397,000	+ 89,000
,, Japan	220,000	108,000	− 112,000

Canadian Notes.

[By Our Special Correspondent.]

A decision of great importance to those interested in hydro-electric power development in Canada has recently been made by the Dominion Government. Application was made some time ago by certain private interests for permission to develop power at Carillon Falls on the Ottawa river. It was stated that some 400,000 h.p. was available for development at this and certain other sites in the vicinity. The primary object of the promoters was to export hydro-electric power to the United States, and, according to various newspaper reports, it was intended that Canada should be allowed 100,000 h.p. to supply the needs of Ontario and Quebec.

Several advocates of this scheme made statements purporting to show that Canada would not be able to absorb 100,000 h.p. for very many years. Both Ontario and Quebec provinces made vigorous protests against the proposal to export power in this way, for it was sought to change the existing law (which provides that electricity shall only be exported under leases valid for one year renewable annually at the discretion of the Government) to permit of a long-term lease being obtained. It is noteworthy that the privately-owned power interests in Quebec were in full agreement with the Hydro-Electric Power Commission of Ontario regarding the matter of the exportation of power from Canada, for both were able to show definitely that not only would 100,000 h.p. be utilised in Canada very quickly, but even the whole 400,000 h.p. involved would be required in the near future. The Dominion Government has decided that the present system of yearly licences shall continue, and, further, that hereafter no licence for export of power beyond that already granted shall be issued except with the concurrence of the provinces in which it is proposed to develop such power and of any adjacent provinces interested therein. According to the *Electrical News* (Toronto), the Member of Parliament who moved the finally accepted amendment to the motion on this matter in the Canadian House of Commons stated that:— "For every 1,000 developed horse-power, the investment at the point of development was $250,000, and at the point of application $1,616,000; the number of employés at the point of development was 8.6, and at the point of application 376.4." If such figures be even approximately correct it would clearly be the uttermost folly for Canada to export, for long periods, power which she will herself need at an early date. How early this date may be can be gauged from the fact that the load on the systems of the Hydro-Electric Power Commission of Ontario is increasing at the rate of 60,000 h.p. per year at the present time, and there is every indication that the rate of increase will itself go on growing for a good many years to come. Similar conditions obtain in Quebec.

Another matter of interest at present is the fact that the Dominion Government a few months ago placed a tax on all electricity exported from Canada of .03 cent. per kWh. On the 650,000,000 or more kWh exported annually by Ontario and Quebec the tax represents nearly $200,000 per annum. This would affect Ontario more seriously than Quebec, since the former province exports almost twice as much energy as the latter. Furthermore, since, by Provincial Government regulation, electrical energy must be sold by the Hydro-Electric Power Commission at cost, and since that body supplies about 85 per cent. of the energy exported from Ontario the only way of paying this tax would be for the Commission to raise the rates at which it sells electricity to its customers—the municipalities—in Ontario. The Commission cannot absorb the tax in profits since no profits are made, and it cannot pass on the tax to its customers in the United States because the supply is given under contracts which were made years ago by the private companies whose properties the Commission has since acquired. Up to date the Commission has paid no tax, though three monthly payments are now due—it is believed that the Provincial Government of Ontario is seeking to have the imposition of this tax removed in the case of the energy exported by the Commission.

A Vertical Alternator for New Zealand.

It is interesting to learn of the installation of a comparatively large vertical alternator in New Zealand, particularly as the machine is of British manufacture. This machine, a 1,750 kVA, 3-phase, 3,000/3,300 volt, 50-period, vertical alternator for water-wheel drive, has been supplied recently to the Tauranga Borough Council, for the McLaren Falls power house, by the Brush Electrical Engineering Co., Ltd.

The alternator, which runs at a speed of 375 r.p.m., is directly coupled to a water turbine, and is designed to withstand an overspeed of 80 per cent.

The stator, illustrated in fig. 1, consists of a massive iron casting of the box girder type, bolted to a cast-iron skirting which in turn is bolted to the foundations. The stator core is built up of laminations of annealed low carbon steel of a quality such that losses due to hysteresis and eddy-currents are a minimum. In the stamping of the laminations the utmost care has been taken, so that with the core finally assembled the slots present a clean and smooth appearance and there is no necessity for filing or machining. The laminations are insulated from one another by a thin coat of insulating varnish, and are clamped solidly between two end plates which are firmly keyed in position. No bolts pass through the core. The stator has open slots and the coils are completely formed and insulated before insertion. Those portions of the coils which are embedded in the slots are contained in seamless micanite tubes, this being done by means of a specially heated press ensuring that the tubes are solid, and hardwood wedges are inserted over the windings to retain them in the slots. The end turns of each phase are reinforced with additional mica insulation as protection against surges. The coils have been impregnated, dried under vacuum, and treated with liquefied compound under pressure.

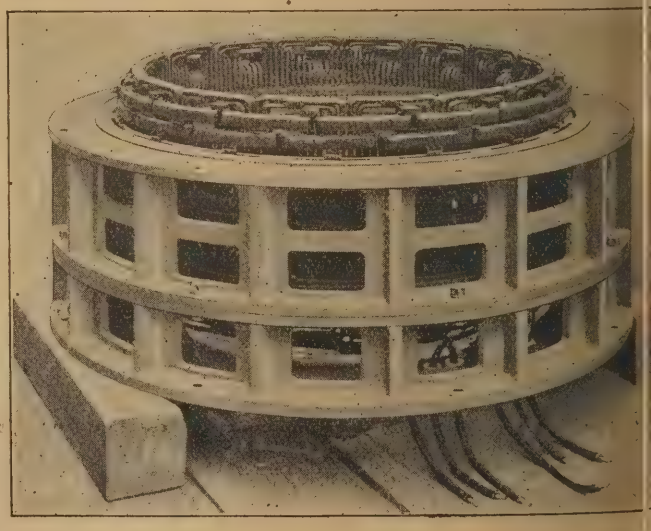


Fig. 1.—Stator of Vertical Turbo-Alternator.

Fig. 2 is a view of the rotor and flywheel. T

ıub, which is constructed of cast steel, is firmly keyed to the haft, turned and accurately ground from a mild steel forging of high tensile strength. It is dovetailed on its periphery or the reception of the poles. Each pole, which is held rigidly n position by means of two tapered wedges of mild steel inerted in opposition to each other, carries a separate field coil f high conductivity soft drawn copper strip. The turns are round on edge and the complete coil is subjected to hydraulic ressure to remove any irregularities in the copper and o ensure a tight and compact coil. The coils are thus ractically indestructible, and are so wound that the onnections between adjacent coils are all at the ottom.

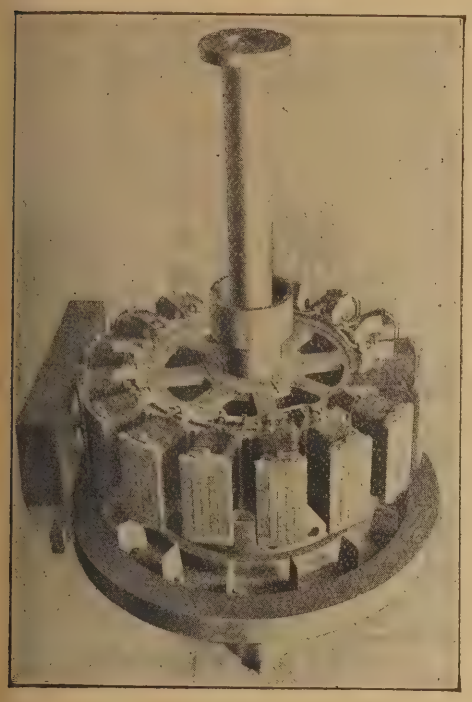


Fig. 2.—Rotor of Vertical Turbo-Alternator.

A chamber below the alternator provides cooling air for vention through ducts in the foundation. Fan blades fitted the rotor hub and also on the machine side of the flywheel, aw air through the rotor and stator, the air being expelled rough holes in the outer periphery of the stator frame and d casings.

A water-cooled Michell thrust bearing at the top of the alternator carries the whole weight, 28 tons of the alternator rotor and turbine runner. It is also designed to take up the unbalanced hydraulic thrust. Two water-cooled guide bearings are also provided, one being incorporated in the thrust bearing and the other immediately below the alternator rotor,

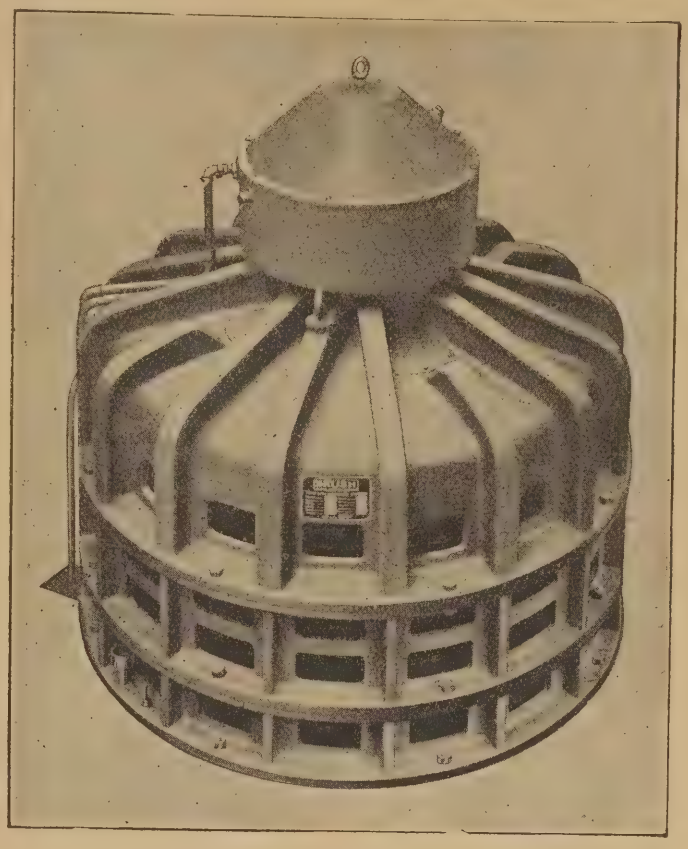


Fig. 3.—External View of Vertical Alternator.

the casing for the latter being carried by the skirting. The phosphor bronze slip rings are easily accessible, being placed immediately below the thrust bearing. Brush holders of the radial plunger type are used, access to them being provided by doors in the top end casing. Fig. 3 shows an external view of the vertical alternator.

The Situation in Czecho-Slovakia.

R. A. A. Adams, the Commercial Secretary to the British gation, Prague, has forwarded to the Department of Overs Trade a report * upon the industrial and economic situaon in Czecho-Slovakia, dated March, 1925.

In the introductory chapter, Mr. Adams says that in 1924 ogress was more clearly visible, and was evidenced by the eater ease and confidence shown in business transactions ring the year. A few more years like the last two, coupled th energetic Government action in reducing expenditure, will the country out of financial danger.

The principal industries of Czecho-Slovakia showed conuous improvement in 1924. In general the manufacturers getting to that point of organisation and efficiency which ll enable them to compete with the products of other ntries both in the geographical area of their old markets d in others. As in general only some 20 per cent. of indusal products is consumed in the country itself, the effort to d export markets turns not only upon costs and quality, but o to a considerable extent upon credit facilities and delivery, well as the technique of salesmanship; to these matters a eat deal of attention is being given. It has been stated thoritatively that many industries during 1924 forced up oduction to reduce overhead charges, necessitating unreerative sales in export markets. Thus, although exports ched a higher level, profits were less than might have been pected.

Import Trade.

The expansion of the market for British goods in Czechovakia is hampered by the system of import restrictions and h duties. There are, however, distinct potentialities which likely to develop, especially if the import restrictions should be abolished. Although the demand is likely to be principally for raw and semi-manufactured materials, there is also a demand for finished articles of good quality. Among the goods considered by various Prague business men as likely to command a sale, particular mention is made of electrical machinery. In this direction both Switzerland and Germany are serious competitors. During 1923 arrangements were made by several British firms to have their products manufactured under licence in Czecho-Slovakia, and it is likely that this system will be further extended to get behind the import restrictions and Customs duties. The more important of such arrangements cover steam wagons, electric motors, aircraft, automatic telephones, and radio apparatus. It is stated that power schemes and the electrification of railways provide possible opportunities for British trade. An appendix shows that during 1924 Great Britain exported 7,866 kg. of electrical machinery, valued at 757,041 Czech crowns (about £4,700), to Czecho-Slovakia; at the same time imports of electrical machinery from that country into the United Kingdom amounted to 37,250 kg., valued at 1,797,147 crowns (approximately £11,200).

Reference is made above to railway electrification, and it is stated in another part of the report that tenders have been made for an electric power station, 16 electric locomotives, and other materials in connection with an extensive scheme which has been decided upon by the Government. It was hoped to start working on the suburban lines in the vicinity of Prague early in the spring.

Methods of Business.

The methods of transacting business in Czecho-Slovakia vary greatly with different trades. Firms wishing to market a specialty product very often adopt the form of agency representation either in Prague or working from a central agency

* Stationery Office. 1s. 6d. net.

in Vienna. The geographical dispersion of customers and the best points of location for either agency or branch representation vary considerably from trade to trade, and firms sending out a representative to look over the market might ask him to call at the office of the Commercial Secretary, when the purchasing potentialities of the various districts could be discussed before any decision was taken.

Competition is particularly acute in the country. Although Germany has the advantage of proximity to the market, local manufacturers put up extensive competition at level prices. Generally speaking, British goods are of a better quality, and despite hindrances there is a demand which could be catered for by progressive firms. Owing to the high rate of interest in Czecho-Slovakia long credits are desirable if these can be arranged. A warning is given regarding import restrictions; firms are advised to ascertain whether customers in the country are able to secure the necessary licences without delay to avoid loss and difficulty.

Slovakia and the Ruthene Territory.

A separate report upon the above provinces is contributed by Mr. R. T. Smallbones, the British Consul at Bratislava. In the course of this it is stated that there are six electric light and power companies in the district for western, central, north-western, southern, and eastern Slovakia, and for the Ruthene territory. They generate electricity with coal and oil fuel. Though plans for utilising water power have been elaborated, the companies have, with one exception, devoted their attention to building overhead lines and increasing the number of consumers. Only the Central Company has built a water-power station, at Ulanka, near Banska Bystrica, which during 1924 was nearing completion. It is the aim of these companies to keep the price of electricity as near as possible to the cost of production, and they are therefore not accumulating reserves to engage costly capital expenditure. Money for this will have to be raised in some other manner. The Central Company was founded with a capital of 8,000,000 kronen, of which the Government subscribed 2,000,000 kronen. The towns interested in the scheme found 90 per cent. of the remaining 6,000,000 kronen. Subsequently the capital had to be raised to 12,000,000 kronen.

The Blackstone Spring Injection Oil Engine.

This engine, which is made by Messrs. Blackstone & Co., Ltd., Stamford, works at a moderate pressure on crude or residual oils, but differs from the ordinary crude oil engine in that the fuel is injected into the cylinder by mechanical means only and at a considerably lower pressure than injection by compressed air. The makers claim that the result of this mechanical injection is a prolonged and more perfect combustion of fuel, producing a flat-topped indicator diagram, and this claim certainly appears to be substantiated by the results obtained from tests carried out on two "Blackstone" spring injection engines by Mr. J. L. Chaloner, consulting engineer.

The fuel-injection arrangements are shown in fig. 1; the essential details of the devices are a low-pressure fuel-measuring pump, a high-pressure fuel-injection pump, and a spring-loaded fuel-injection valve. The fuel is first pumped into the fuel chamber by the low-pressure fuel-measuring pump

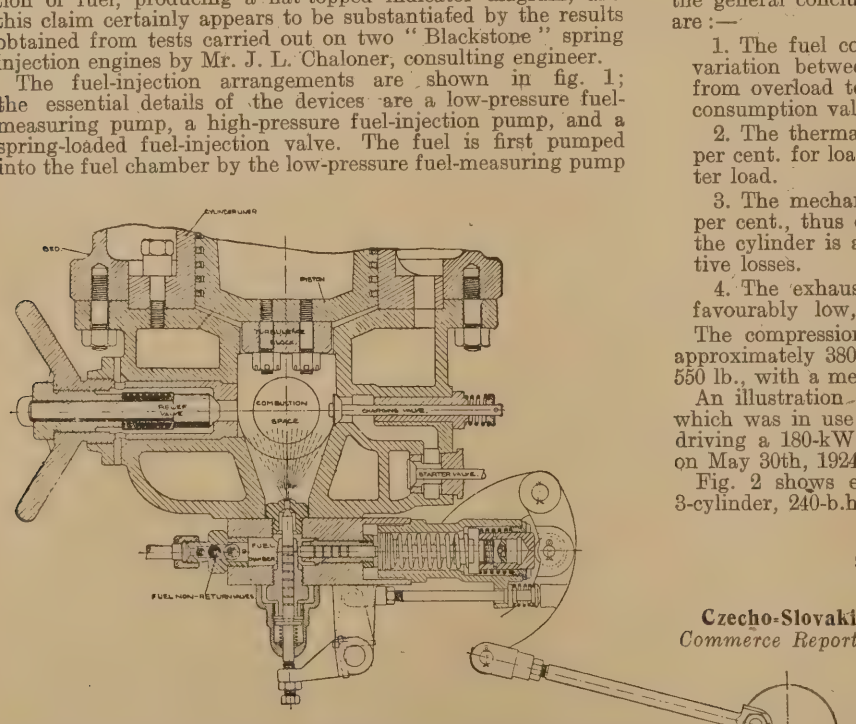


Fig. 1.—Section of Fuel Injection Arrangements in the Blackstone Engine.

and displaces the plunger of the high-pressure pump. The length of the stroke of the measuring pump, which has a separate plunger for each cylinder, is controlled by the governor and is proportional to the load. The fuel is then transferred, under the influence of the high-pressure pump, to the annular space around the fuel valve. The h.p. pump plunger consists of two members with a spiral spring between them; the spring is compressed by a lever which presses upon its outer member, the inner member being held by abutting upon the fuel, which is retained by the spraying valve and the non-return ball-valves at the outlet of the low-pressure pump.

The fuel or spraying valve is held on its seat by a spring and a lever, which controls both the opening period and the total lift of the valve. When the lever is lifted, the high-pressure or injection pump spring pressure overcomes that of the fuel valve spring, the spring is lifted, and the fuel is admitted into the cylinder.

This mechanical injection ensures that the fuel is always injected at the same point during the stroke and under the same pressure irrespective of the speed of the engine. The fuel spray velocity is constant and the period and quantity of spray is proportionate to the load on the engine. The h.p. section of the injection system is confined to the spray-box machined from a solid steel block, and there is no length of fuel-oil piping under high-pressure, either momentarily or permanently.

The engine is started up from compressed-air containers which are charged automatically from the engine cylinder

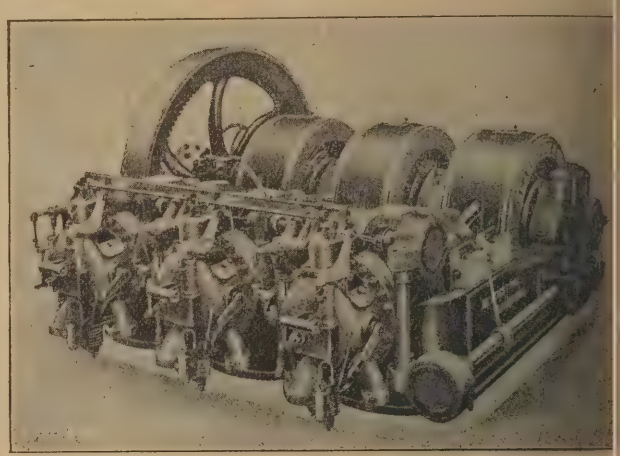


Fig. 2.—Exterior View of Engine.

whilst the engine is at work. Engines of 100 b.h.p. and below can be started by hand without compression, by means of a special patented device consisting of a removable plug to which is attached a smouldering rag. This will fire the first few charges and get up sufficient speed to enable the full compression to be overcome when the ignition becomes normal.

The results of the tests referred to are most interesting and the general conclusions arrived at by the consulting engineer are:—

1. The fuel consumption is favourably low and the total variation between consumption figures for loads ranging from overload to half load is less than 5½ per cent. on the consumption value for full-load conditions.

2. The thermal efficiency (on a basis of b.h.p.) is over 3[illegible] per cent. for loads varying between full load and three-quarter load.

3. The mechanical efficiency at full load is as high as [illegible] per cent., thus only 15 per cent. of the developed power in the cylinder is absorbed in frictional and other non-productive losses.

4. The exhaust temperatures for the different loads are favourably low, indicating a high combustion efficiency.

The compression pressure of the Blackstone S.1 engine is approximately 380 lb., and the initial pressure on full load is 550 lb., with a mean indicated pressure of 100 lb. per sq. in.

An illustration of a 300-b.h.p. twin S.1 Blackstone engine which was in use at the British Empire Exhibition last year, driving a 180-kW,. d.c. generator, appeared in these columns on May 30th, 1924.

Fig. 2 shows externally the injection arrangements on a 3-cylinder, 240-b.h.p. Blackstone engine.

Czecho-Slovakian Hydro-Electric Scheme.—According to *Commerce Reports*, a scheme for the production of electricity from the Dyje River (Moravia) has been drawn up. It is proposed to dam the river and erect four stations which will have an annual output of 100 million kWh. The dam is to have a height of 55 metres and a width of 40.5 metres. It will be erected at Vranov, and the cost of the dam and the station at that town will be 102 million crowns (about £600,000). The funds will be provided jointly by the National and provincial Governments, and the Western Moravian Electricity Co., Brun.

The First International Congress of Radiology.

Exhibition of X-Ray and Electro-Medical Apparatus.

(*Concluded from page* 230.)

Newton & Wright Exhibits.

The electro-medical devices displayed by Messrs. Newton and Wright, Ltd., included the Snook interrupterless transformer plant, the main points of which are the solid mounting of the motor, the large margin of safety in the oil-insulated transformer, the rectifier which breaks the circuit in two places at each reversal, and the silent running of the entire mechanism. The universal couch and fluoroscopic stand are both alike in smoothness and rigidity of movement; also they are claimed to comply entirely with the recommendations of the X-ray Protection Committee as regards protection. The fluoroscopic stand is shown in fig. 8. "The "Holway" Potter-Bucky diaphragm is of new design and combines smooth and easy control of the rate of movement as a means of cutting off secondary radiation. The unique feature of the X-ray sterescope shown in fig. 9 lies in the fact that the adjustments are embodied in the mirror fittings with their very convenient access, rather than in adjustments of the photographic plates. The "Hercules" X-ray tube is robust and is exhausted with argon gas, thereby producing a vacuum of great stability.

The "Metalix" X-ray Tube.

One of the novelties in X-ray apparatus has already been referred to (see page 192, July 31st issue). It is the new metal tube that has been developed in several types for various purposes by Messrs. Philips Lamps, Ltd., of Holland.

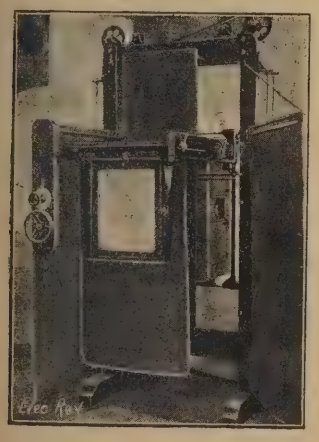


Fig. 8.—Fluoroscopic Stand.

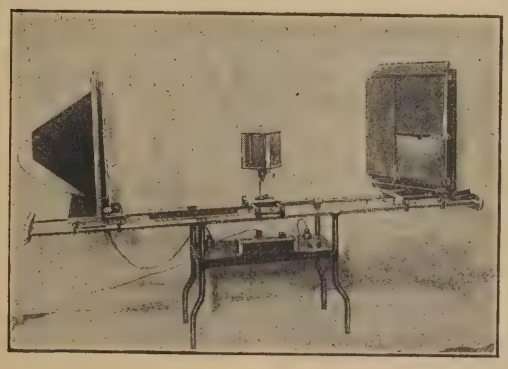


Fig. 9.—X-ray Stereoscope.

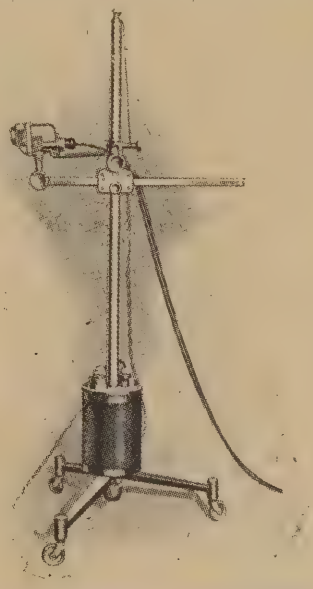


Fig. 10.—The D.C. Kromayer Lamp.

Two patterns of the new tube are illustrated in fig. 11, and it may be remarked that the use of a protecting bowl round it is quite superfluous, as the lead sheet of the tube is the only necessary protection; the beam is automatically centred to the window and a simple clip only is needed to fix the tube to its support. The special construction of the anti-cathode enables the new tube to be more heavily loaded than glass ones and the focus can be fixed with great precision. The metal middle-part of types D and E can be connected to earth; when using a suitable transformer the same can be done with the cathode parts of types A, B, and C, and in both cases, the X-rays being produced in a chamber consisting of metal only, the patient can touch the radiating part of the tube without any danger. Therefore, the tube can be operated quite near the patient, so that much smaller currents are sufficient for obtaining good results in diagnostic and superficial therapy work, owing to the fact that the intensity is inversely proportional to the distance. The "Metalix" tube has a diameter of about 2½ inches, while it is clear that it must be much less fragile than glass tubes.

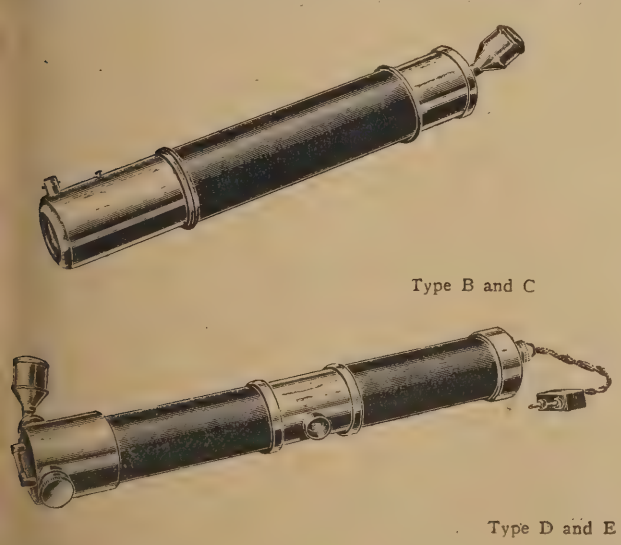


Fig. 11.—Philips "Metalix" X-ray Tubes.

"Hanovia" Lamps.

The subject of actino-therapy) is of special interest in view of the public attention that is being directed just now to the treatment of many diseases, *e.g.*, tuberculosis of bones and rickets, by ultra-violet rays or artificial sunlight.

Therapeutic results of value seem to have been obtained and in this connection the British Hanovia Quartz Lamp Co., Ltd., displayed lamps of several types. The Kromayer lamp is used for treating local areas under compression and for orificial conditions where the rays are required to be focused on particular points. A d.c. model is illustrated in fig. 10; the burner grip enables the lamp to be tilted for starting the arc and the burner is a ∩-shaped tube of the evacuated mercury-anode type with an evacuated quartz jacket and it is water-cooled. Ultra-violet irradiation is claimed to be a roborant in almost every case and an adjuvant to nearly every other method of treatment, particularly during convalescence; it produces a skin reaction which accelerates and increases the healing effects of other medicaments and modes of procedure, and it is said that over 60,000 "Hanovia" quartz lamps are in use.

Schall Apparatus.

Amongst the exhibits of Messrs. Schall & Son, Ltd., the radium balance of Dr. Russ was noticed. In this instrument a constant source of alpha radiation ionises the air in a small chamber; the radium tube to be tested is allowed to influence the air in a second chamber, and the two chambers are connected in series with a steady e.m.f. In one of the chambers is a gold leaf electroscope which is subject to deflection, the amount of deflection being a measure of the difference in degree of ionisation in the two chambers, and in this way the radium tube to be examined can be balanced against the constant source of alpha radiation. The instrument is useful for hospitals and other institutions using radium, in which it is necessary to have a rapid method of checking the radium tubes before issuing them and after receiving them back. The X-ray radium balance shown in fig. 12 is built on the same principles as the balance described above, but it is so dimensioned that X-rays are balanced against a constant source of alpha radiation. In this way is obtained a measure of the intensity of an X-ray beam, expressed in terms of radium, an advantage in X-ray therapy because the biological effect of radium rays has perhaps been more thoroughly investigated, and is certainly capable of somewhat more accurate dosage than is X-radiation at the present time.

The application of X-ray diagnosis to dentistry is becoming more and more frequent, and the apparatus illustrated in fig. 13 has been designed to meet the needs of the dentist in as economical a way as possible. It consists of a static transformer which converts the alternating main supply to a pressure of about 65,000 volts, which then passes through a Coolidge X-ray tube, the whole apparatus being a complete

and practical unit. The rules formulated by the Röntgen Society, in conjunction with the National Physical Laboratory, for the protection of operators and patients, have given a considerable stimulus to the construction of accessory apparatus and fig. 14 shows a modern tube stand to which there is added a box, so designed that it wholly encloses a gas or Coolidge X-ray tube; being surrounded with protection equivalent to 2.3 mm. of sheet lead, the weight of such a box is of course considerable, and the necessity of making it comparatively

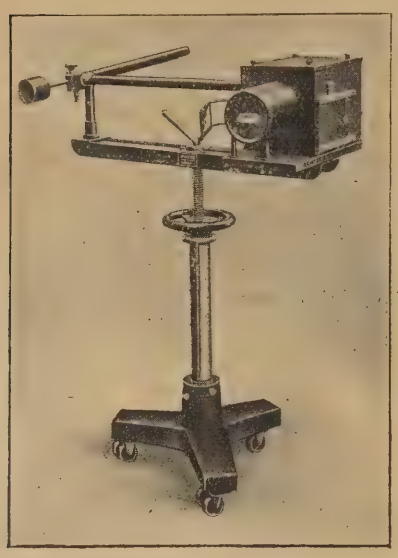


Fig. 12.—X-ray Radium Balance.

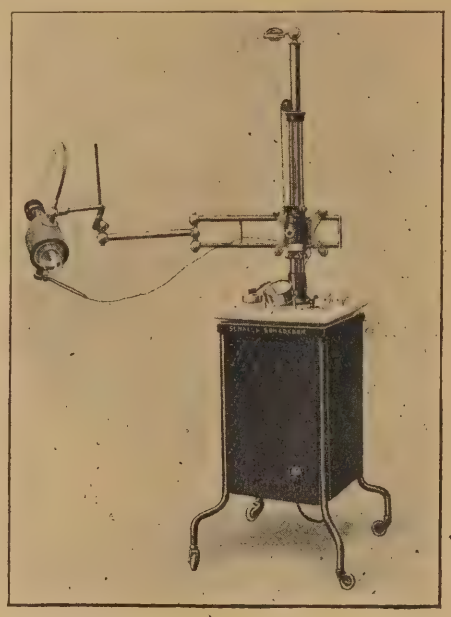


Fig. 13.—Dental X-ray Outfit.

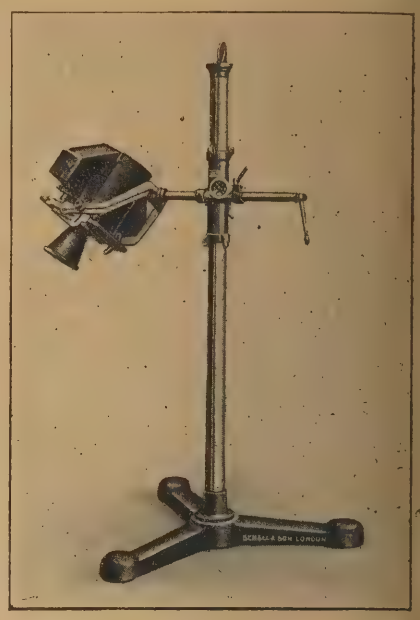


Fig. 14.—X-ray Tube Stand with Heavy Protective Box.

easily movable in all directions has given rise to the extensive use of ball bearings throughout the stand and careful mechanical work.

"X-Rays" Products.

One of the items on the stand of X-Rays, Ltd., which attracted considerable attention was the "Metalix" tube, which is of novel construction and should revolutionise the existing heavy form of apparatus with heavy protection and the consequent solid construction. The protection afforded by the "Metalix" tube itself complies with the requirements of

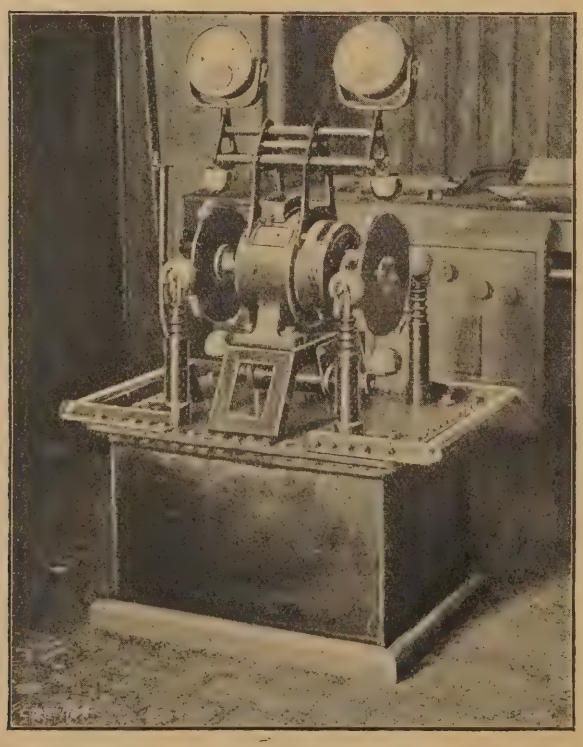


Fig. 15.—New Double-rectification Transformer.

the X-ray and Radium Protection Committee. It is an advance also on the Coolidge tube, as greater current can be obtained from it for the same size of active surface on the anti-cathode. Messrs. X-Rays, Ltd., have been appointed agents for the sale of this tube. The company also showed a new type of transformer with double rectification. Depicted in fig. 15, this equipment is designed to give an output of 50 milliamperes at a voltage of about 80,000, r.m.s. The method of double rectification employed with coronaless spheres and collectors means that the equipment is of small dimensions when taking the output into consideration. Other material exhibited included the usual couch and screening stand giving protection to comply with the N.P.L. standard.

Dean Apparatus.

The piece of apparatus on the stand of Messrs. A. E. Dean and Co. which drew most attention was the constant potential plant capable of delivering 10 milliamperes at 200,000 volts and the company believes it is the only manufacturer of such apparatus in Great Britain. The firm's Potter-Bucky table for diagnostic work is provided with a moving grid which absorbs all secondary radiation from the body, and is also fitted with mechanism which provides against the possibility of the X-ray tube being used out of centre with the plate. The company showed, in addition, a range of mercury-vapour lamps for administering artificial sunlight treatment.

Other Exhibitors.

Other exhibitors included the following firms: Patterson Screen Co., U.S.A. (fluoroscopic screens); Electricitäts-gesellshaft "Sanitas," Germany (X-ray apparatus and accessories); C. H. F. Muller, Germany (X-ray tubes); Victor X-ray Corporation, U.S.A. (X-ray apparatus); Chas. Zimmerman & Co. (Photographic), Ltd. (X-ray films, plates, &c.); Radium Belge (Union Miniere du Haut Katanga); Kodak, Ltd. (films and accessories); C. A. F. Kahlbaum Chemische Fabrik, Germany (fluorescent and intensifying screens, preparations for opaque meals, &c.); Acme-International X-Ray Co., U.S.A. (X-ray apparatus); Cuthbert Andrews (X-ray tubes); Tintometer, Ltd. (a radiometer for the measurement of X-ray dosage); W. S. Rothband & Co. (X-ray protective clothing); Radiguet and Massiot, France (X-ray apparatus); Holborn Surgical Instrument Co., Ltd. (electro-medical requisites); Chas. Zimmerman & Co. (Chemicals), Ltd. (radium and "radiogen"); Dr. Seeman, Germany (a spectrograph for the qualitative measurement of the wave-length of soft and hard rays); and G. C. Aimer (X-ray tubes and ultra-violet apparatus).

New Steam Stations in U.S.A.—A few details of the 30,000-kW steam station of the Pennsylvania Water & Power Co. at Holtwood, Pa., are given in the *Electrical World*. The station was built to supplement the Holtwood hydro-electric development, and will enable the company to handle its load more easily and eliminate any necessity of purchasing power. The initial installation consists of two 15,000-kW units with provision made for an ultimate installation of 150,000 kW if required. It will feed into the same sub-station that handles power generated by the hydro-electric plant, and its energy will be transmitted over the company's existing 110,000-V lines. The initial cost was about $4,500,000, including equipment which will be adequate for future additions.

Particulars are also given of a new 60,000-h.p. steam plant which is to be built in Louisiana and run by a new company to be formed and known as the Central Louisiana Light and Power Co. The station, which is to be built on the Mermentan River, near Crowley, La., will generate energy for transmission over Southern Louisiana and sale to existing companies or for distribution over systems to be acquired by the company. The plant will cost about $10,000,000.

Selected Radio-Telephone Apparatus.

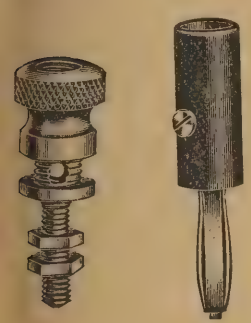
Recent Developments and Improvements.

"Excel" Tags.

We have received samples of the above-named terminal tags, which are made by the S.H. Collett Manufacturing Co. in a number of types, to meet a variety of requirements. They are obtainable in bright and tinned brass, tinned copper, and nickel finishes; being no larger or heavier than is necessary, they take up little room.

A New Tripart Terminal.

The new tripart terminal illustrated in fig. 1, a specimen of which has been sent us by Messrs. Ward & Goldstone, Ltd., should prove to be distinctly useful to the home constructor. The terminal serves three purposes: it will take the standard wander plug and consequently act as a plug base; it will accommodate the standard size of fork terminal, and also the usual pin terminal as fitted on telephone cords, while the advantage of having a plug-in terminal will be appreciated.



Figs. 1 & 2.—New Tripart Terminal and Wander Plug.

In fig. 2 is shown a new wander-plug attachment, the particular feature of which is that it is provided with phosphor-bronze springs to ensure good contact. These plugs are made with black and red insulating tops for distinction and are manufactured throughout at the firm's Pendleton works.

The B.T.-H. Portable Receiver.

Outdoor recreation is the great summer competitor of "wireless," but there is no reason why proper radio apparatus should not be just as capable of providing entertainment out of doors as in the house. The British Thomson-Houston Co.'s new portable receiver uses three B.5 valves with a total consumption of 0.18 watt. The filaments are heated by a l.p. dry battery fitted into the case of the receiver, which is thus completely self-contained. A circuit on the super-heterodyne principle is employed to reduce the frequency of the incoming carrier wave, amplify the current at the reduced frequency, and then rectify it to obtain audio frequency. The process of frequency reduction is carried out by means of an oscillating valve, the frequency of which can be approximated to that of the incoming frequency, the two being then combined and rectified to give a third frequency equal to the difference between the two primary ones, which improves amplification and selectivity. For coupling the oscillating valve and aerial circuits to combine the two frequencies, the company has adopted a circuit, covered by patent No. 197,405, which makes possible reactoaction in the aerial circuit, and so increases the received current. For use on wave-lengths below the B.B.C. range, plug-in coils will lower the oscillator frequency to a suitable figure, and the fact that the frame aerial is contained within the case of the receiver makes the set directional. It is contained in a leather cloth-covered or mahogany case, fig. 3, and the companion amplifier and loud-speaker, similarly encased, employs two B.6 power valves, taking a total of 0.24 ampere at 3 volts and operated from dry batteries. The two sets can be easily carried by one person.

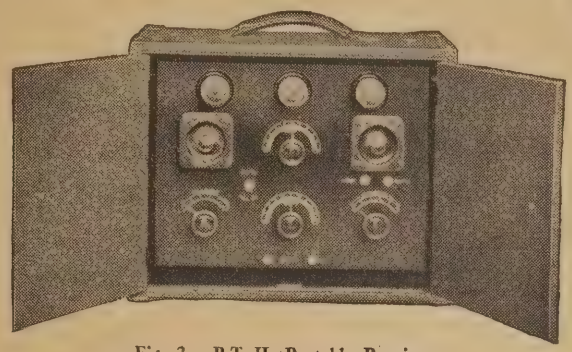


Fig. 3.—B.T.-H. Portable Receiver.

"Radio Conduit."

A new speciality has been placed on the market by Messrs. Autoveyors, Ltd., which they have called "radio conduit." It is well known that electric currents which are subject to high-frequency oscillation, function only on the skin of conductors; the use of solid wire incurs a "dead-end" energy absorbing effect, while multi-strand wire induces an alternate magnetic impedance to every cycle. Radio conduit is therefore been introduced as a h.f. conductor which is claimed to present the following advantages: it has the minimum h.f. resistance; a maximum conducting surface with a minimum of capacitive metal; eliminates lateral surging, cross magnetic induction, and energy absorption. It is composed of copper tube, the internal and external surfaces of which are burnished to provide highly-polished conducting surfaces, and is now available in a diameter equivalent to 16 S.w.g., but we understand that it will be marketed in due course in diameters equivalent to all standard wire gauges used in radio work. The conduit is sold in packets of six tinned 24-in. lengths.

Choke Amplifiers.

Messrs. A. J. Stevens & Co. (1914), Ltd., have sent us samples of their newly-designed choke amplifiers, which are finished in dull egg-shell black with nickel-plated fittings.

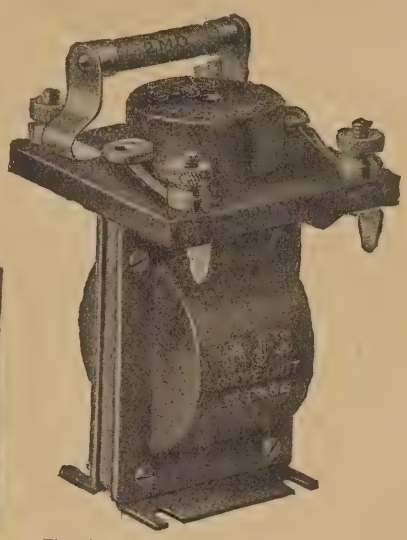


Fig. 4.—Choke Amplifier, 1st Stage.

They are obtainable in three types: the choke only; the first stage unit, as illustrated in fig. 4, which comprises a choke, combined by-pass and grid condenser, and a grid-leak; and the second-stage unit, which is similar, but has no by-pass condenser and a different value of grid-leak. The units only need the addition of a valve holder, resistor, and the necessary connections to complete a low-frequency amplifier; their use is claimed to reduce atmospheric disturbance and assist sensitivity, combined with consistent amplification, and they are supplied with diagrams and working instructions.

A Combined Rheostat and Grid Leak.

Designed to simplify control, a combined filament rheostat and variable grid leak has been placed on the market by the Igranic Electric Co., Ltd. It is suitable for use in practically all kinds of receiving sets and is particularly valuable for short-

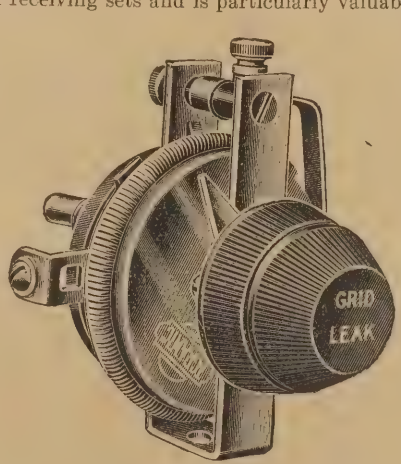


Fig. 5.—A Combined Rheostat and Grid Leak.

wave reception, enabling the wiring of a receiver to be considerably reduced, thus minimising stray capacity losses and the attendant decreased efficiency which may be occasioned by the use of long and closely-spaced parallel leads, especially in h.f. circuits. In addition, economy in panel space is effected and simplified control is obtained by the use of this dual-purpose instrument, while the advantage of a grid leak of the variable type is obvious. Fig. 5 shows that the control knobs of both units are close together, and the variable leak is mounted at the rear of the rheostat, with the result that it is effectively shielded by the rheostat frame which is at earth potential, and consequently hand-capacity effects are reduced. It may be had with a filament resistance of 4, 6, 8, or 10 ohms as required, in conjunction with a grid leak which is variable between 0 and 5 megohms.

Electrical Notes from New Zealand.

(From Our Special Correspondent.)

There is a scheme afoot to harness the famous Bowen Falls in the Fjordland of the South Island not far from Milford Sound and Mitre Peak, for the purpose of generating power for the extraction of manurial nitrates from the atmosphere. The Bowen Falls Nitrates Company, Ltd., has been formed with a view to commencing operations, but the Government has withheld the issue of the necessary licence on account of the public resentment against the scheme which involves the destruction of a well-known scenic spot. Bowen Falls is situated on Milford Sound alongside deep water, and is well placed with regard to the Australian ports. There is an available flow at the Falls of 700 cusecs, and an available head of approximately 600 ft. The estimated power on a 50 per cent. load factor is 35,000 h.p., or 25,000 kW. The site is ideal for the erection of plant, and the scheme is easily the most suitable for the purposes of the company proposing to exploit it.

The matter of commencing operations at Lake Waikaremoana has been held up pending an agreement between the Government and the Poverty Bay Power Board. As a result of negotiations just concluded the Government will immediately proceed with the construction work at the lake. The scheme provides for a final power supply of 60,000 kW at an estimated cost of £2,600,000. At the present time the Public Works gang on the site has erected a small plant of two 350-kW Pelton-wheel units utilising a head of 680 ft. The power is transmitted about twenty miles to the town of Wairoa where it is used in driving flax mills and freezing works machinery, as well as for lighting, heating and general power purposes in the town of Wairoa itself. It is intended that these two units shall be used to excite the main 60,000-kW set to be installed in the major plan.

Up to the present the city of Christchurch, N.Z., has been supplied from the 12,000-kW plant installed by the Government Hydro Electric Department at Lake Coleridge. The recent wintry weather, however, was responsible for such a heavy overload that new works are being undertaken with a view to increasing the capacity to 36,000 kW. There is some agitation for an additional stand-by plant, preferably on the Waimakariri project, to relieve the demand on Lake Coleridge at peak hours, and in view of the number of breakdowns and other interruptions, there is some prospect of additional works being put in hand.

Experiments are being made with a trackless tram operating over the Thorndon-Kaiwarra section of the Main Hutt Road. The car is a solid-tired motor-bodied vehicle working on the overhead trolley system. So far the results have been entirely satisfactory, and the council contemplates extending the service.

The Railway Department has been making experiments with a new type of rail coach with a view to countering the motor-'bus competition over the Lambton-Lower Hutt and Thorndon-Johnsonville suburban routes. To date about ten different types of vehicle have been tried but without any satisfactory results.

The failure of the tramways to satisfy the need for quick and comfortable locomotion, has led to the private inauguration of several motor-'bus services in Wellington. The City Council is somewhat perturbed in view of the difficult situation that has arisen in Auckland where the 'buses have made the trams unprofitable, and contemplates placing 'buses on the road in competition with the private companies.

Parliamentary News.

[By Our Special Parliamentary Reporters.]

Municipal Installation Powers.—We mentioned in our last issue that the Burnley Bill, which contained a clause empowering the Corporation to sell electrical fittings and wire consumers' houses, had been read a third time in the House of Lords in spite of opposition to this clause. The Burnley Bill was one of three containing clauses of this nature; the other two were promoted by the Bath and Barrow Corporations, and they were considered together by a House of Lords Committee recently.

Sir Lynden Macassey, K.C., for the Bath Corporation, pointed out to the Committee the difficulties which confronted municipal electrical undertakers in developing the use of electricity in working-class dwellings, owing to the inability of the occupiers to pay for the wiring of their houses in a lump sum. Consequently, the undertakers were not in a position to lay mains in streets containing these houses, because they would prove unremunerative. If, however, an arrangement could be provided whereby the owners or occupiers of houses, instead of having to pay in one sum the first cost of wiring their houses and laying down the service lines, could pay by a system of deferred payments, they would, as evidence in other towns showed, go in for wiring. Then the Corporation could get enough consumers in a street to make it worth its while to lay the necessary mains. Many electrical contractors were not in a position to wire houses and supply fittings on the deferred payment system. When the three Bills were before the House of Commons no petitions were deposited by the electrical contractors. The clauses now objected to were passed by the Local Legislation Committee of the House of Commons. It was not the practice of electrical contractors to supply fittings and carry out wiring on the hire purchase or deferred payment system, and he contended that, if the Corporation wanted to do that business, it was not competing unfairly with the contractors, as was alleged. There would be no obligation on the part of any consumer to go to the Corporation as against a private contractor.

Mr. F. W. Purse (Borough Electrical Engineer, West Ham) said that the West Ham Corporation had obtained powers in 1898 to sell fittings and carry out wiring, and the experience was that the deferred payment system had encouraged working-class consumers to use electricity. The Corporation was in competition with the contractors, and he urged that the possession of these powers by the Corporation would help contractors, in that more mains could be laid, and fresh fields of business opened up to contractors.

Mr. Walter Barrett (a member of the Bath City Council and an electrical contractor) was in favour of the Corporation obtaining powers to do wiring, because he was confident that in his business as an electrical contractor he would benefit thereby. He believed that practically the whole of the electrical contractors in Bath would also benefit from it. Very often he lost business because the Corporation had not a main in the area in which he was asked to wire a house.

Mr. J. W. Spark (Borough Electrical Engineer, West Hartlepool, who is about to take up the position of City Electrical Engineer at Bath) said he had had nearly seven years experience at Devonport of operating the powers now sought by the Bath Corporation, and had found those powers to be of considerable value. The result was an increase in the number of consumers, and an increase in the operations of the electrical contractors.

The Hon. Evan Charteris, K.C. (Counsel for the Burnley Corporation) said that Burnley had been seriously hampered in the development of its electrical undertaking by the absence of the powers now sought. If they were obtained there was no doubt that the undertaking would go ahead and develop.

Mr. J. E. Starkie (Borough Electrical Engineer, Burnley) gave evidence to the same effect.

The case for the granting of selling and wiring powers for the Barrow-in-Furness Corporation was then put by J. Villiers Bayly (Counsel for the Corporation), who was supported by Mr. H. R. Burnett (Borough Electrical Engineer).

Mr. L. G. Tate (Secretary of the Electrical Contractors' Association) said there were sufficient contractors in Bath to carry out the electrical work there. One of the main objects of the Association was to prevent competition with municipal trading. It was unfair for the Corporations to open up this trading business, because they were trading with the ratepayers' money; it was immaterial to them whether they made a loss or a profit, and experience had shown that where Corporations were exercising those powers the private traders could not carry on their business. The best canvassers for the Corporation business were contractors, who were trying to get business for themselves. Witness then dealt at length with the history of legislation in this connection, and said that while it was true that, up to 1904, about 70 or 80 Corporations had obtained selling powers without opposition, since 1904 the Association had successfully prevented the grant of these powers to municipal undertakings. In the course of cross-examination Mr. Tate said he was not against municipal trading, so far as it could be utilised by all the ratepayers, but where one ratepayer was going to benefit to the disadvantage or loss of another ratepayer, municipal trading was wrong.

There were contractors present from the three towns concerned who were prepared to give evidence. Mr. Drucqu[illegible] who appeared for the opposers, said the evidence showed that the contractors in those three towns were strong enough to carry out the wiring work and the sale of fittings. He submitted that the Committee should reject the clauses sought to be inserted in the three Bills. The onus was entirely upon the corporations concerned, because, from 1902 or 1904 down to the present day, both in private and public legislation, the House of Lords had set its face against the particular powers asked for in these Bills. The policy of the Electricity Commissioners was not to grant any other powers apart from those laid down in the 1919 Act unless special cause were shown. If the Committee granted these powers to the three corporations now applying for them, it would have no reason for refusing them to any corporation that applied for them in the future.

Mr. Villiers Bayly (on behalf of the Corporations of Bath and Barrow) said that the Electricity (Supply) Act, 1919, did not provide that special cause had to be shown for the granting of these powers. All it said was that corporations should not sell unless expressly authorised by special Act.

Mr. Charteris asked the Committee not to be influenced by the fact that since 1919 these powers had not been granted. The matter was before the Committee for judicial decision. The Electricity Commissioners were in doubt on the matter and had appointed an advisory committee to consider the point.

The Chairman announced the Committee's unanimous decision in favour of the granting of the powers asked for.

Bills Passed.—The following Bills were read a third time and passed on August 4th:—In the House of Lords: The T[illegible]

graph (Money) and the Darlington Corporation (Transport, &c.) Bills. In the House of Commons: The Uckfield Gas and Electricity Bill.

Railway Electrification. — On August 5th, Mr. HANNON asked the Minister of Transport whether he could make any statement on the progress which had been achieved in the past six months in the development of railway electrification with the object of reducing unemployment; whether he had received a series of reports, prepared by experts, all of which tended to prove that the increase of railway transport facilities through electrification would be economically advantageous to the railways themselves and a great convenience to the travelling public, while providing large orders for the electrical industry which was now suffering seriously from foreign competition; and whether he was aware that the schemes of electrification which were regarded as absolutely necessary would, if provided with, provide employment for upwards of 20,000 skilled artisans during the next few years.

Colonel W. ASHLEY said he was aware that the views referred to were widely held by qualified persons. So far as the general question of railway electrification was concerned he would refer to the reply to a question on the subject asked on June 30th and to the remarks he made when the Ministry of Transport Bill was under discussion on May 21st, since which date electrical working had been started on several sections of the Southern Railway.

Replying to further questions, Colonel ASHLEY said that the Ministry was continuing to impress on the companies that electrification was desirable, and he hoped that when the Government proposals with regard to electrification became law they might increase the supply and distribution of electricity, and thereby improve the chances of electrification for the companies.

Electricity Commissioners.—On August 5th, Sir F. HALL asked what was the expenditure involved in the transfer of the Electricity Commissioners to Savoy Court from Gwydyr House, and the use of the last-named premises for the Air Force; and why it was not possible at a time when national economy was vital to avoid this change.

Mr. LOCKER-LAMPSON said that the total expenditure involved was estimated at £7,820. The removal was necessary in the interests of more effective co-ordination between the Air Ministry on the one hand and the other Service departments and the Committee of Imperial Defence on the other.

Severn Power Scheme.—On August 5th, the Duchess of ATHOLL informed Col. Woodcock that the Committee appointed to inquire into the feasibility of the Severn tidal-power scheme had submitted a report which was now receiving the consideration of the Government. The amount expended on the inquiry up to date was £2,562. Should the Government decide to proceed with the inquiry, it was estimated that the total cost would be from £70,000 to £90,000.

The Broadcasting Inquiry.—On August 7th, Sir W. MITCHELL-THOMSON, the Postmaster-General, informed Sir F. Meyer that the terms of reference to the Broadcasting Committee of inquiry would be: "To advise as to the proper scope of the broadcasting service and as to the management, control and finance thereof after the expiry of the existing licence on December 31st, 1926." The Committee would indicate what changes in the law, if any, were desirable, in the interests of the broadcasting service. The Committee would be constituted as follows: Lord Crawford (chairman), Lord Eyleigh, Lord Blanesborough, Mr. Macpherson, M.P., Mr. W. Graham, M.P., Sir Thomas Royden, Dame Meriel Talbot, Sir Henry Hadow, Capt. Fraser, M.P., Mr. Rudyard Kipling, Mr. W. E. Weston, G.P.O. (secretary). It was expected that the Committee would commence its sittings during November.

Royal Assent. — On August 7th, the Royal Assent was given, by Commission, to the following Acts: Telegraph (Money), Wireless Telegraphy (Explanation), Burnley Corporation, London, Midland and Scottish Railway, Uckfield Gas and Electricity, Mersey Tunnel, and London County Council (General Powers).

Adjournment.—Parliament adjourned on August 7th until November 16th.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

A Proposed Institute of Radio Engineers.

With reference to the statement issued by the Institution of Electrical Engineers regarding the qualifications necessary for a wireless engineer to become a member of the Institution, there are one or two points which appear to have been omitted.

In the first place, it does not state that an application must be accompanied by the signatures of three corporate members as proposers and three corporate or associate members as supporters, all of whom must endorse the application from personal knowledge of the applicant. As the prospective candidate for admittance to the Wireless Section will not, in the majority of cases, have been connected with electrical power engineering, his chance of being intimately acquainted with members of the Institution is very remote. Furthermore, the majority of the members of the Wireless Section are resident in and around London, which does not give the provincial applicant much chance of making their acquaintance. This condition must be published by the I.E.E. owing to the fact that the Council is powerless to act unless these signatures are obtained by the applicant.

Secondly, no explanation is given as to how one may discriminate between the wireless engineer and the electrical engineer (there must be a difference, otherwise why have a Wireless Section?) Again, does the Institution realise that by accepting a wireless engineer with no power engineering experience it is proclaiming him a chartered electrical engineer, and in doing so is rather slighting the truly professional electrical man?

Thirdly, the letters M.I.E.E. and A.M.I.E.E. denote professional electrical standing, and give no indication that the member is in any way connected with wireless, a point which is more important than anything else. True, he may add the words (Wireless Section), but this conveys nothing definite.

Fourthly, the I.E.E. does not govern the professions of radiology and electro-chemistry, which professions utilise electricity in a much smaller proportion than do wireless engineers. The I.E.E. could sponsor wireless as it appeared in 1914, but now that wireless is almost as important an industry as electrical engineering, it should be governed by its own body.

In view of the above conditions there still appears to be room for a separate Institute, and I am asked to state that the organisation of the proposed new society will still be carried forward with a view to providing the wireless engineer with a definite professional standing as distinct from the electrical engineer. Proceedings will be issued dealing only with wireless subjects, thus providing 100 per cent. wireless instead of the minimum percentage as at present published in the Proceedings of the I.E.E. The first meeting of the proposed society will take place during the early part of September, at which date the articles of association will be drawn up and presented in the usual way.

Y. W. P. Evans,
Hon. Sec. (temp.) proposed Radio Institute.

Manchester, *August 7th*, 1925.

Is There an Age Limit?

With reference to Major Porter's letter in the REVIEW of August 7th, I do not think he is justified in his remarks, and I must take exception to his inferences from my letter in your issue of July 24th on the above subject. He is correct in stating that I did not serve with the forces during the war, but, like many more engineers, I offered my services on the outbreak of hostilities to the Army, Navy, and Transport authorities, but was not accepted. Fortunately, I was able to render war services at home in one of the largest coal, iron, steel and munition works in the country, and during the war and post-war periods I put in the most strenuous years of my life, holidays and amusements were cut out entirely, it was a case of working night and day under very severe conditions. I think your readers, even the regular Army and Navy men, will agree that their civilian friends who were engaged in engineering and munitions work had not exactly a picnic while the war was on, and they appreciate what their pals at home did for them in the munitions line.

I can assure Major Porter that I should be the last man to forget the debt I owe to the men like himself who were privileged to fight for our country, but as to "making profit out of their patriotism," he is entirely wrong in his assumption, and owes me an apology for making such a statement.

Your correspondent "M.I.E.E." writes a very sporting letter in the same issue, but I can only advise him to cheer up, as when the present troublous times are over a man of his experience and calibre is sure to find a suitable outlet for his abilities. I wish him luck.

Too Young at Forty.

August 7th, 1925.

Wireless and the Solar Eclipse.

After reading Dr. R. L. Smith-Rose's rejoinder (page 730) to my article on the above subject, I at once sent you a reply to his observations. This has not so far appeared in the ELECTRICAL REVIEW, so I assume that you may have deemed it too lengthy, or considered that the interest had passed. As, however, I should not like it to be thought that I accept Dr. Smith-Rose's views, I should be grateful if you would kindly accord me a brief space in your "Correspondence" columns to enable me to say that I am quite unconvinced by his arguments, which seem rather general in character and evasive of the fundamental conditions which I referred to in my article.

Taking his main points briefly, I should like to say that I did not consider it necessary to enlarge on the effects due to the altitude of the sun, as I felt that the disclosures of Senatore Marconi were too recent to be absent from the minds of any students of the subject.

Dr. Smith-Rose said that it was doubtful if any of the "most prominent wireless experts" would have been prepared to prophesy as I did. As to this, I venture to suggest that the title does not necessarily imply a knowledge of astronomy. As, however, he said that full details of the eclipse were previously known, I can only feel additional surprise at the enthusiasm which was shown.

His remark that the signal intensity was greater on the day of the eclipse than on the preceding or succeeding days is not disputed, but attention is again called to the differences between the two last-mentioned days and to certain curious points in the records which I mentioned in my article.

Dr. Smith-Rose attached importance to the fact that all stations taking part in the tests (some of them 400 miles apart) produced curves of a characteristic shape, but such coincidences might easily have arisen from some atmospheric conditions over the Atlantic quite unconnected with the eclipse, particularly when it is remembered that the signals converged from one point on the American side. My reasons for thinking that the eclipse could not possibly bring about the effects noticed were fully stated in my article, and I see no reason for changing my views.

He made special reference to a rapid fall of signal intensity coinciding with the passage of totality across the great circle, but I fail to see how this helps the eclipse theory—on the contrary, it strikes me as damaging to the same in view of the general experience that obscuration or reduction of solar rays tends to increase signal strength.

Arthur E. Cotterell.

Beckenham, *July 28th*, 1925.

Non-Metallic Switch Covers.

It is interesting to see the notice given in your issue of the 7th instant under "New Electrical Devices," pointing out the development of a switch with a shockproof cover which obviates the necessity for earthing the switch cover.

We have for the past four years, at least, been making non-hygroscopic fireproof covers for all switches and switch-plugs, and our products are made throughout, in this country, and from "all British" materials.

Tok Switches, Ltd.
J. M. G. Rees, *Director.*

London, *August 8th*, 1925.

Legal.

Baron Abinger and Another v. Lochaber Power Co.

Judgment has been issued in the Court of Session, Edinburgh, in an action by Baron Abinger of Abinger and another against the Lochaber Power Co. Pursuers are the trustees acting under the trust disposition and settlement of the fourth Baron Abinger, and as such trustees are proprietors of the estate of Inverlochy, Inverness-shire. They sued the defenders, who are incorporated by Act of Parliament, for implement of an agreement dated March 30th, 1925, under which the defenders agreed to purchase nearly the whole of the estate, except the castle, policy, and fishings, for £82,500. The substantial question involved in the case was whether, in the circumstances, the pursuers had power to sell the subjects. Lord Constable sustained defenders' plea to the effect that the pursuers were not in a position to tender to them a good title to the subjects, and dismissed the action.

British Insulated & Helsby Cables, Ltd., v. Atherton (Inspector of Taxes).

When the Law Lords re-assemble on October 22nd the case British Insulated & Helsby Cables, Ltd., *v.* Atherton (Inspector of Taxes) will be heard. It raises some interesting points in connection with deductions from profits set apart towards a pension fund for employés in their relation to income tax. The original case and a subsequent appeal were reported in our issues of July 4th, 1924 (p. 44), and November 14th, 1924 (p. 760).

Bufton v. Kidderminster and District Lighting and Traction Co., Ltd.

At the Kidderminster County Court recently, before Judge Ingham, George Bufton (14), sued the defendant company (a subsidiary of the Shropshire, Worcestershire, and Staffordshire Electric Power Company), claiming £70 for damages, &c., arising from an accident caused by the explosion of a pavement fuse box last December. It was stated that the plaintiff stepped on the surface cover of the fuse box, when there was an explosion, the cover being blown off. The boy had to be rescued from the testing chamber, having sustained personal injuries, which incapacitated him from his employment for eight weeks.

The defendants claimed that the charge of negligence had not been established, stating that gas might have percolated through from other sources, a gas supply having previously been laid at the place where the fuse box had been placed.

Mr. Eaden, for the plaintiff, argued that the extent of liability of the company went beyond the initial operation of laying the system, and for this he relied on the words "by reason of and in consequence," which were in an Act under which the company operated.

The jury found that the accident was not caused by the manner in which the defendants constructed the boxes and ducts and that they were not guilty of negligence in the construction of the boxes. Judgment was accordingly entered for defendants.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

26,032. "Multiplex telegraphy and radio-telegraphy." Marrec, Ltd., and Y. Marrec. April 14th, 1924. (236,654.)

1924.

6,651. "Electrical resistances." A. Dilger and Dubilier Condenser Co. Ltd. March 15th, 1924. (Cognate application 12,143/24.) (236,975.)

6,716. "Electric interrupters for the automatic transmission of wireless or other telegraphic code signals." C. E. Perry and Evershed & Vignoles, Ltd. March 15th, 1924. (236,977.)

6,744. "System of transmitting views, portraits, and scenes by telegraph or wireless telegraphy." J. L. Baird and W. E. L. Day. March 17th, 1924. (236,978.)

6,800. "Apparatus for use in electrical signalling." J. B. Bolitho. March 17th, 1924. (236,979.)

9,011. "Telephone receivers, loud speakers, and like instruments." W. Preece. April 9th, 1924. (236,986.)

9,297. "Electric discharge devices." P. D. Tyers. April 12th, 1924. (236,992.)

9,319. "Low-frequency amplifiers for wireless signals." S. W. Bligh and E. L. Crowe. April 12th, 1924. (236,993.)

9,405. "Inductance coil mountings." W. Rogers and C. W. Wingrove. April 14th, 1924. (236,996.)

9,560. "Wireless valves." Edison Swan Electric Co., Ltd., and T. W. Price. April 15th, 1924. (237,002.)

9,796. "Protective arrangements for electrical systems." W. J. Brown and Metropolitan-Vickers Electrical Co., Ltd. April 17th, 1924. (237,016.)

9,852. "Head-attachment gear for telephone receivers." British Thomson-Houston Co., Ltd., and A. Easthope. April 17th, 1924. (237,017.)

10,064. "Knobs and dials for variometers, condensers, and other electric instruments." G. Barber and T. Hough. April 23rd, 1924. (237,023.)

10,259. "Radiotelephonic and other signalling systems." G. W. Hale and Radio Engineering Co., Ltd. April 25th, 1924. (237,025.)

10,575. "Control of wireless apparatus." Igranic Electric Co., Ltd., and A. H. Curtis. April 29th, 1924. (237,033.)

10,619. "Indicator for marking the different tuning-in positions of the various wireless broadcasting stations." H. V. Flinn. April 30th, 1924. (237,035.)

10,665. "Electromagnetic instruments of movable iron type." A. Martin and E. R. Furderer. April 30th, 1924. (Cognate application 16,874/24.) (237,036.)

10,707. "Electric wave reception." F. Schneider. April 30th, 1924. (237,038.)

11,077. "Controls for wireless receiving sets." Gramophone Co., Ltd., and B. E. G. Mittell. May 5th, 1924. (Addition to 280,176.) (237,042.)

11,519. "Servo-motors." S. Gowan and Metropolitan-Vickers Electric Co., Ltd. May 9th, 1924. (237,049.)

12,131. "Two-way coil holders." J. F. Ingenhoes. May 16th, 1924. (237,051.)

12,352. "Thermionic valves or electron discharge tubes." Mullard Radio Valve Co., Ltd., and S. R. Mullard. May 20th, 1924. (237,053.)

12,649. "High-frequency signalling systems." Western Electric Co., Ltd. June 21st, 1923. (217,891.)

14,295. "Crystal rectifiers for wireless apparatus and the like." W. Harris and M. Masel. June 13th, 1924. (237,064.)

14,584. "Electric fuses." W. McGeoch and C. Andrews. June 17th, 1924. (237,067.)

15,816. "Electric switches." J. Lucas, Ltd., and W. H. Egginton. July 1st, 1924. (237,080.)

16,827. "Electric switches." H. Cheshire and V. Summer-Hayes. July 14th, 1924. (237,092.)

18,795. "Separator for electric storage batteries." De Loye et Touzet. August 13th, 1923. (220,621.)

18,843. "Control of electric winding equipment or the like." British Thomson-Houston Co., Ltd. August 8th, 1923. (220,322.)

19,498. "Stands for self-heated tools and like devices, heated electrically or otherwise." British Thomson-Houston Co., Ltd. August 16th, 1923. (220,654.)

21,290. "Signalling over telephone and like transmission lines." Western Electric Co., Ltd. (Western Electric Co. Inc.). September 9th, 1924. (237,12

23,091. "Power-transmission mechanism." Metropolitan-Vickers Electric Co., Ltd. October 1st, 1923. (222,863.)

23,982. "Starting electromotor for internal-combustion engines." R. Bosch Akt. Ges. November 9th, 1923. (224,513.)

24,771. "Anchor bolt for tramway-track rails." J. Henderson. October 18th, 1924. (237,137.)

25,565. "Electrical insulators." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd. (A. Nyman). October 27th, 1924. (237,142.)

27,549. "Electron-emitting electrodes and method of making the same." British Thomson-Houston Co., Ltd. December 18th, 1923. (Addition to 201,900.) (226,509.)

27,552. "Magnetic separators." P. C. Rushen (F. Krupp Grusenwerk Akt. Ges.). November 18th, 1924. (237,150.)

30,219. "Variable condensers for wireless telephony." A. G. Trigg, C. O'Callaghan and H. F. Pattinson. December 16th, 1924. (237,159.)

30,709. "Automatic arc-welding control systems." British Thomson-Houston Co., Ltd. December 22nd, 1923. (226,570.)

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Self-Depreciation—and the Penalty.

SOMETIMES American visitors, observing at close quarters our attitude towards our industrial and other problems, venture the friendly criticism that we are prone to be self-critical and self-depreciatory, while they, on their side, living in a land overflowing with milk and money, are inclined to be over-confident and self-congratulatory.

Occasionally when we are inclined to brush depressing signs aside and adopt a thorough-going optimism, we are warned by some of our own critics of the folly of shutting our eyes to the incontrovertible facts, or hiding our heads in the sand.

Both kinds of criticism are useful if they lead to absence of panic, sane thinking, and reasonable action. But in addition to these two views, there is another to which we need to pay greater heed under certain circumstances; we refer to the observations of the Britisher abroad. Our business men who are operating in colonial and foreign markets on our behalf are able to judge at close quarters the effect of our self-criticism and depression upon the minds of other people. These business men are face to face with actual trading difficulties, and if British spokesmen and newspapers represent us as industrially on the down grade, overdoing it so as to indicate that unless this or that happens we shall soon be at the end of things, those difficulties will grow worse.

The *Journal* of the British Chamber of Commerce in the United States has uttered a protest against "Too much cabled pessimism." Englishmen in the States find that too much stress is being laid on unfavourable industrial conditions in Great Britain. Whether the Press reports that they have in mind be true or false, whether justifiable or otherwise regarded in the light of the facts, the publication of our troubles does not assist them in their efforts to secure business. The potential purchaser, however much allowance he may be disposed to make for our natural inclination toward self-criticism and depression, is likely to take us at our own valuation and perhaps at even less than that. The *Journal* makes the definite statement that too much cabled pessimism is doing England harm rather than good in the U.S.A., and it adds: "the quicker this is realised the easier will be the task that the business interests of England are fulfilling so nobly."

Let us quote how British business men in New York regard the old country, for it may do us all good to see ourselves as they see us:—

"Admitting that official trade returns show that manufacturing output might be better, and that the trade totals of exports are below par, England is still doing a lot of business with the world. She has not lost her trade to competitors, as one might infer from reading the dispatches published in metropolitan papers, and emanating in part from official sources. She has not lost her supremacy in shipbuilding, even though the wording of the latest Lloyds' reports might be so construed. The business instinct which has placed England in her present proud position still lives. She faces the situation calmly—at least, her business men do—and they are not to be moved or alarmed by hysterical conjectures, theories, or prognostications that, for Great Britain, the sun has set. Far from it, they are looking for the sunrise of better times to come and with indomitable courage and perseverance will carry on. The war has been ended only about six years, yet England has restored the pound sterling to gold parity. She is paying her heavy debt to America, and the position of her banks, business houses, manufacturing plants and shipping enterprises is warrant not only that all is well, but that all will be well."

As we have stated on several occasions, the data that have had to be published here for the information of the community, including industrial workers, on high costs of production, are used against us by our competitors abroad, the effect being to create an impression that, on price, we are out of the running. We are not questioning the wisdom of letting the truth be known among our own people, for it is only when the facts are fully understood that real co-operation among all classes is likely to be secured. But we need not in the gloom forget all the bright spots. The electrical industry, at any rate, has ample justification for optimism in most of its sections.

It is a pity that so much is made of an occasional lost contract, while far too little is made of our manufacturers' successes. We are always pleased to publish particulars of British achievements for the information of potential purchasers in other lands. The more publicity that is given to what our works are doing the more likely is there to be a return flow of inquiries and orders from the oversea markets.

Pulverised Coke for Electricity Generation.

At the annual dinner of the Mersey and North Wales (Liverpool) Centre of the I.E.E., last February, Sir Max Muspratt referred to the importance of a cheap supply of electricity to the chemical industry, to enable it to meet the competition of countries that had water-power at command, and expressed approval of a suggestion that had been made —that coal should first be used for the production of gas, and that afterwards the resulting coke should be pulverised and burnt in boilers, thus making the best use of the coal. He suggested that problems of this kind should be worked out by co-operative action on the part of the representative institutions. Mr. W. B. Woodhouse, president of the I.E.E., said that the views expressed by Sir Max corresponded with those of the most advanced electrical engineers, and that with suitable plant it would be possible to supply electrical energy to the chemical industry at prices comparable with those resulting from the use of water power.

A point which we would emphasise in this connection is that, whilst the cost of fuel has comparatively little influence on the cost of electricity for short-hour loads, such as our public electricity supply stations have to deal with—the load factor rarely exceeding 30 per cent. —it is of first importance in relation to an industrial load, such as that of many electrochemical operations, with a load factor of 90, or even 100 per cent. Water power is cheap for long-hour loads, but not necessarily cheap for loads of short duration, because in the former case the heavy capital charges are distributed over a larger area, whilst the running costs are small. Thus, as Sir Max Muspratt pointed out, for electrochemical processes, in order to compete with water-power cheap fuel is essential, to keep down the running costs.

Sir Max's suggestion that pulverised coke should be used for this purpose is hardly capable of realisation, so far as it applies to ordinary gas coke, for this material is difficult to pulverise, and besides consuming far more power in the process than coal, is very abrasive, rapidly wearing out the pulverising plant. But an announcement in the daily Press last week puts the matter in a new light. A process for the low-temperature carbonisation of coal, it appears, has been developed and successfully tested on a commercial scale, in which the coal is pulverised before carbonisation, resulting in the formation of powdered coke. In an interview with a representative of the *Morning Post* the inventor, Mr. McEwen, stated that by the recovery of the by-products —oils and tars, &c.—from the carbonisation process, as well as of the gas, and the use of the powdered semi-coke for generating electric power, it was hoped to reduce the cost of power by half. An installation capable of carbonising 200 tons of fuel a day, he said, had been ordered by the Milwaukee Electric Railway & Light Co. to work on these lines.

Further information will be awaited with interest. Obviously, such a process would be capable of utilising coal to the best advantage, in the light of our present knowledge: fuel oil, motor spirit, tar, and gas would be derived from the coal, before the residue was burnt under boilers, and though the highest thermal efficiency as yet attainable in steam practice is only 20 per cent., still the reproach that all the valuable by-products of coal were wastefully consumed in the furnace would be removed and an important commercial economy would be effected.

Electricity Supply in South Africa.

In his valedictory address to the South African Institution of Engineers, Mr. T. G. Otley explained the circumstances under which the Witbank power station was put in hand by the Electricity Supply Commission of South Africa; the scheme had been criticised on the ground that the Victoria Falls and Transvaal Power Co., Ltd., was to obtain a bulk supply from the new station at cost price. Under the Electricity Act, said Mr. Otley, the Commission was bound to supply all consumers at cost, and in order to reduce that cost to the minimum, it was essential to enrol the Power Company as a bulk consumer; unless the Commission could supply electricity as cheaply as private enterprise could do it, the Control Board could not authorise the Commission to erect the station, and the load in the Witbank district, apart from the Power Company's demand, was not sufficient to justify the erection of a generating station. The Power Company could have extended one of its existing power stations, or built a new one elsewhere, in which case the Government scheme would have fallen through.

However, the company desired to co-operate with the Commission, and agreed to take from the new power station all output that was not required by the Commission for its own consumers, thus enabling the plant to be operated on the most economical basis, at the maximum load factor. This would appear likely to react upon the Company's other power stations, but the terms of the agreement provide for sharing the benefits equitably between the two parties. The arrangement will enable the Commission eventually to supply energy to the railways at a much lower rate than would be possible if a separate station for traction had to be erected.

The case is unique within our experience, and admirably illustrates our contention that increased output per unit of capital outlay is the essence of cheapness. Merely installing the most economical plant cannot result in cheapness of supply. In this instance arrangements have been made before-hand to ensure that the essential condition shall be fulfilled.

Boiler Practice on the Rand.

In the same address, which is abstracted elsewhere in this issue, the retiring president brought out some interesting facts relating to the four steam stations of the Power Company, in which 102 boilers are installed. Twenty-four of these boilers have been steaming at a load factor of between 70 and 80 per cent. for 17 years, representing, in comparison with average British conditions, a working period of 30 or 35 years;

yet they are to-day "virtually as good as when installed," and they are steaming at higher efficiencies than at any previous time in the history of the Company. The other boilers have worked for 13 or 14 years at the same load factor, and every boiler on the system is considerably exceeding the makers' rating, though they are burning coal of far lower calorific value than they were originally rated on. The high output is obtained by applying forced draught over a short length of the grate at the front end, and running the grates 12 or 14 per cent. faster than the speeds they were designed for. It was found advisable to use a separate fan for each grate, and by means of these the output can be increased by 15 or 20 per cent. when necessary. The induced draught is also to be increased, and it is hoped to raise the output by about 40 per cent. above normal rating.

Mr. Otley is a believer in large boilers; he sees no good reason why more than one boiler should be required to feed one turbine—even of 50,000 kW—except that it would take some time to heat up a spare boiler in case of need. Hence he urges that the boiler should be made as reliable as the turbine, and points out that in the experience of the Rand Power Companies the great majority of boiler stoppages are due to the mechanical parts—the grates, gear-boxes, &c.—and not to the boilers themselves; it is up to manufacturers, he says, to make these parts, which are simple compared with turbines and generators, at least as reliable, and to station staffs to maintain them immune from involuntary stoppage. The result of installing such large boilers would be reduced capital cost, simpler piping, &c., and—especially in the Transvaal, where coal is extremely cheap—simplicity of design should be the watchword. High thermal efficiency can be bought at too great a price for installation and maintenance.

Gas on Trains.

The terrible accident which took place at Amiens on Thursday last week affords further evidence of the danger of carrying gas on railway trains. According to the *Morning Post*, "the only carriages which took fire were the fifth and sixth, which were the only ones on the train fitted with gas tanks." As we have observed on previous occasions, the horrors of a railway collision are ghastly enough without adding to them the mental agony of awaiting the approach of the flames and the physical tortures of a lingering death by fire.

Long ago the French Government realised that such risks must be removed, and issued a decree that before January 1st, 1923, gas lighting on express trains should be abolished; on suburban trains electricity was to be the sole lighting agency by the beginning of 1924, and in the course of that year all other trains must be lighted with electricity (Electrical Review, October 28th, 1921, p. 555). Similar action had been contemplated in 1914, but was delayed by the war. Apparently the decree had not been fully carried out, though only two of the 21 coaches involved in the Amiens disaster were equipped with gas lighting. It has been officially stated that all the regular express trains are lighted with electricity, and only on holiday trains are gas-lighted coaches still in use.

There is no need for gas on trains at all. Electricity can not only provide illumination and ventilation, but can also perform all the cooking operations required on restaurant cars. The decree above-mentioned was the immediate result of the frightful disaster in the Batignolles tunnel; are we to wait for a similar holocaust in this country, before our Government will intervene and abolish gas on trains?

The Cost of the Electricity Commission.

In the *Gas World* of August 15th, editorial criticism is levelled at the Electricity Commission on the ground that this body, "ostensibly established for the purpose of co-ordinating the electric supply of the kingdom," is pursuing competitive methods, of which the evidence is a circular letter with regard to the Advisory Committee on Domestic Supplies and Methods of Charge, addressed by the Commissioners to all authorised electricity undertakers. We are not concerned to defend the Commission against the charge of exceeding its authority, though we fully believe that it is acting in accordance with the spirit of its constitution; but we wish to point out that incidentally it is said to be "financed at the taxpayers' expense," and the statement is made that "The taxpayers' money is being used for promoting the well-being of one industry." This is a mistaken impression. It is true that the Exchequer advanced funds in 1919 to enable the Commissioners to make a start, but that loan has now been wholly repaid, and the Electricity Commissioners' expenses are borne entirely by the electricity supply industry, the excess of expenses over receipts being apportioned among the authorised undertakers of the country *pro rata* to their output. Last year the amount so apportioned was £75,000. The matter was fully covered in the Acts of 1919 and 1922, and we feel sure that our fair-minded contemporary, on having its attention drawn to the error, will rectify it.

On Exaggeration.

Overstatement is a weapon often employed by propagandists. It startles the reader or the listener and fixes his thought upon a subject when possibly the truth and nothing but the truth told in moderation might leave him uninterested. "Stunts" on occasion justify themselves in the result, but the public tires of stunts, and once bitten becomes twice shy. Ordinary mortals clothe themselves in protective armouring, proof against exaggeration, and become critical and sceptical. Now, slogans are excellent in their way, and they serve their purpose for a time, but new ones should be ready to take their place before they are worn out. Electricity has had its slogans, and we could do with some arresting ones now, but they need not express exaggerated claims. Electricity is able to do so much and to do it all so well that exaggeration is quite unnecessary. The merits of electrical service—when it is given proper trial—are self-demonstrative. The purpose of the slogan or the propaganda claim is to impress the minds of those who do not *know*, but who need to be brought to fixity of thought regarding electricity and compelled to interest themselves in it. Therefore, publicity must be efficiently employed, forcefully but fairly stating its merits. Some criticism may be offered of those who have advocated it as a panacea for all industrial ills at a time when hundreds and thousands of men have been earnestly searching for a way out of most serious situations. Its advocacy as the householder's way of solving domestic problems requires discretion too, because, say what we will, in large numbers of homes there is not money to spare for electrical installation and supply at present costs. Convenience is worth much to many, but it cannot be paid for by all. Even with the "All-in" rate of the Electric House, the bill is not small compared to previous bills for lighting and heating—it is in convenience and cleanliness and labour-saving that electricity scores, and these are things which must be paid for. The consumer who is led on to the mains under false impressions as to cost is not going to be a help in the long run—he may even be a hindrance if he spreads abroad an anti-electrical experience. Overstatement or optimism is a very pronounced weakness with some who have the drawing-up of electrical company prospectuses, but Nemesis relentlessly dogs the steps of such, and extravagant promises have to be paid for by somebody. We have known extravagant statements to be issued to the Press by manufacturers' publicity departments—a most short-sighted practice to adopt. Self-respecting editors do not admit such into their pages, and the unavoidable result may be an inclination so to deal with over-statements as to make them briefer than they would otherwise be. Another class of over-statement that occurs to the mind is excessive praise of men; if it be laid on with a trowel it often fails in its intention, for it raises a smile but is not treated seriously by listeners. It does little harm, however, for most of us are wonderfully clever at discovering the depth of sincerity of such utterances.

Water Power in New Zealand.

The Government Hydro-electric Scheme at Mangahao.

(From a Special Correspondent.)

From its wealth of physical features New Zealand is able to derive a potential water-power supply of about 36 kW per square mile, and is second only to Switzerland in this respect. Resources examined by public works engineers indicate that from sources of over 1,000 kW capacity the country can produce a grand aggregate of over five million kW, and power from minor sources is estimated to amount to another two million kW. At the present time there are not more than thirty schemes



Fig. 1.—The Mangahao Dam.

in operation throughout the country, the great majority of these being small local schemes developing at most a few hundred horse-power. There are, however, several Government schemes already in operation, and these provide the great bulk of the 100,000 kW developed in the country at the present time.

Government schemes in contemplation include the harnessing of the Arapuni Rapids on the Waikato River, developing 120,000 kW at a cost of five and a half million pounds. The Waikaremoana Lake project is now being commenced, and involves the development of 60,000 kW at an estimated cost of two and a half million pounds. Other schemes for the future include the utilisation of Lake Te Anau to develop over a million and a half horse-power—this will be one of the largest works in the world.

One of the completed Government schemes is the Lake Coleridge development on the Rakaia River for the purpose of supplying the city of Christchurch and other towns on the Canterbury Plains with electricity for lighting and power. The present plant utilises the waters of the lake by taking them through a tunnel a mile and a quarter long, giving a head of 480 ft. The capacity of the plant is 15,000 kW, consisting of four 1,500-kW and three 3,000-kW sets. Power is generated at 6,600 V, three-phase, and transmitted about 60 miles at 66,000 V to a main sub-station on the outskirts of Christchurch. The primary distribution is at a pressure of 11,000 volts, at which it is sold to the local retailers. Secondary distribution is at 3,300 and 400 volts. Work is proceeding upon the extension of the capacity to 36,000 kW.

The largest Government scheme is the newly-finished Mangahao station at Shannon designed to cater for the city of Wellington and the provincial towns. The construction of this project presented some difficult and unusual features, and the work was constantly interfered with by a regular succession of heavy floods, which time and time again nullified the accumulated efforts of the large body of men employed. The principal works at Mangahao are two large storage dams at Mangahao and Tokomaru, 186 chains of concrete tunnelling, a surge chamber 75 ft. deep, pipe lines and power house, and transmission lines and nine sub-stations.

The construction of the dam at Mangahao (fig. 1) was the most difficult job in the contract. It was originally intended to erect an arched concrete dam containing about 9,000 cubic yards, but owing to vagaries in the rock it was decided to build it partly as a core-walled earth-filled dam, and partly as a gravity section overtopped concrete dam. The concrete core wall is carried down into the country rock for a distance of several feet. The gravity section portion contains two automatic tilting gates, which are so constructed as to retain the water at a constant level against floods. The passages in which the gates operate are each 64 ft. wide and 10 ft. deep, and the gates operate on pivots placed just less than half way up their sides. These gates are balanced in such a way that, when the level of the dam rises above normal, water enters a siphon and flows into a chamber behind the lower portion of the gate. The balance of the gate is then disturbed and it tilts slightly forward and permits water to run over the dam face. The amount of water entering the chamber determines the tilt which can be as much as right angles to normal, and this represents a sudden rise of three inches in the level of the dam. When the level of the water again falls to two inches below the normal level of the dam, air is drawn into the siphon, whose action is then interrupted, the water in the chamber drains away and the gate resumes its normal position. The installation of this device obviated the necessity of raising the level of the Mangahao and Tokomaru dams another 10 ft. The tunnels joining Mangahao dam with Tokomaru dam, and the latter with the surge chamber, are controlled by motor-operated gates, which enable either dam to be emptied without affecting the level in the other. The surge chamber (fig. 2), which is situated at the lower end of the second tunnel, is shaped like a volcanic crater, and is 87 ft. in diameter at the top, 75 ft. deep, and 19 ft. in diameter at the bottom. From the surge chamber a 72-in. pipe line in duplicate



Fig. 2.—The Surge Chamber at Mangahao.

emerges, passes successively into 66-in. and 60-in. pipes, and then breaks into four 41-in. and finally 36-in. pipes on entering the power house.

The power house (fig. 3) is a substantial concrete building, 215 ft. long and 84 ft. wide. In the basement of the building are the main pipe and valves, bus pipe, turbine and generator pits. The main floor contains the turbines and generators on one side, the reactances and l.p. switchgear in the centre, and the

transformers on the other. Above the l.p. switchgear is the switchboard gallery, with the offices alongside.

The main pipes, bus pipes, and valves are so arranged that any pipe or turbine may be isolated without interfering with any of the others. The generator room contains three 8,000-h.p. and two 4,000-h.p. Pelton wheels, driving respectively 6,000-kVA and 3,000-kVA alternators. All the machines can be excited by two independent 250-kW d.c. generators. Governing is by needle valve and deflector operated by oil pressure and driven off the main generator shaft.

In the transformer room are two banks of three 4,000-kVA single-phase transformers and one in reserve, capable of raising the pressure from 11,000 to 110,000 V*. The various Power Boards will receive the current at 11,000 volts from the sub-stations and transmit it at their own pressure to their clients. The Wellington City Council has arranged to take over 12,000 kW from the Mangahao undertaking. The City Council's own plant at Evans Bay will continue to operate for the purpose of relieving the Mangahao supply at peak hours. A typical transmission line pole is shown in fig. 4.

Mangahao is the largest Government station in existence at the present time, developing 24,000 kW, and has cost approximately £1,600,000. Further works consist of an additional storage dam behind the Mangahao dam, and the erection of several sub-stations, together with the duplication of the main transmission lines, finally linking up with the Arapuni and Waikaremoana schemes.

We are indebted to the Publicity Department of the New Zealand Government for the illustrations in this article.

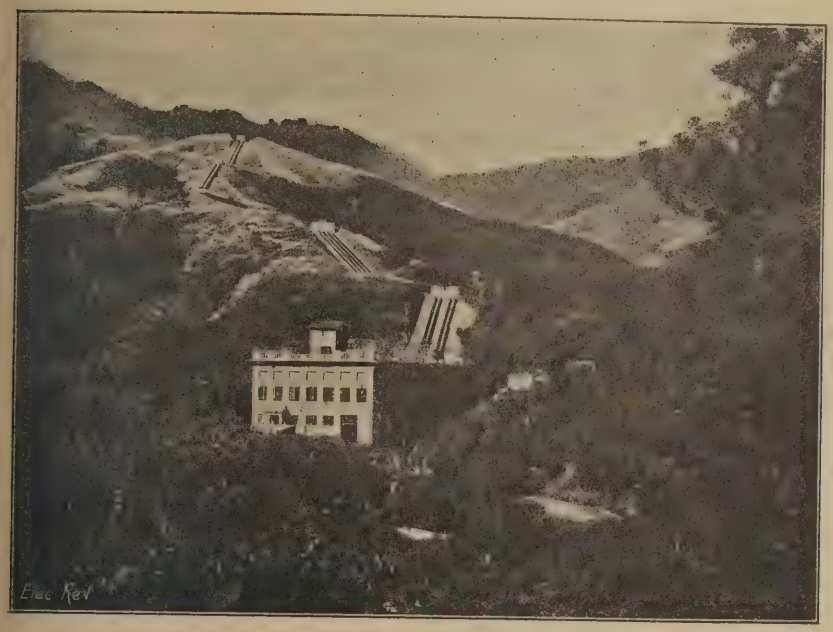


Fig. 3.—View of the Power House and Pipe Lines.

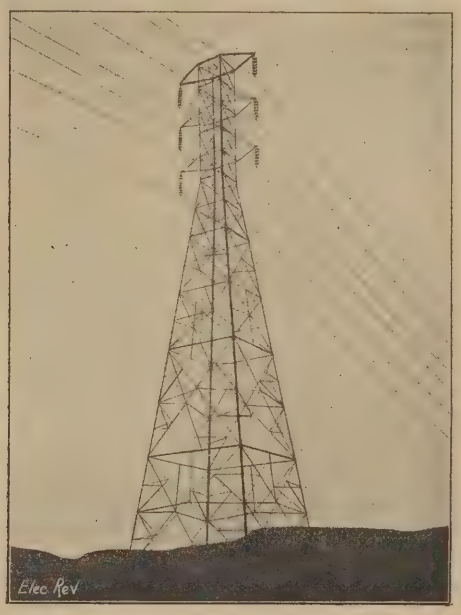


Fig. 4.—A Typical Transmission-line Pole.

Induction Heating by Low-Frequency Currents.

The Use of the Induction Furnace for Melting Non-ferrous Metals.

By G. E. TAYLOR, A.M.I.Mech.E., A.M.I.E.E.

The heating and melting of metals by means of induced electrical currents is perhaps the nearest approach to the ideal method of heating that science has yet made possible, for the heat is generated in the material itself. Thus, the necessary containers or crucibles are at a lower temperature than the charge, and a maximum heat efficiency is obtained.

The first to recognise the great possibilities of this form of heating was de Ferranti, who took out a patent in this country in 1887. The same year Edwin Colby, of Newark, N.J., took out patents in the United States, and some time later he constructed an induction furnace which consisted of a single ring of molten metal, forming the secondary, placed round an iron core, the primary being placed outside the secondary.

Kjellin, and subsequently Frick and Rodenhauser, were responsible for the design of the induction furnaces in European works, which were successful for limited metallurgical applications in the steel trade, but this development has almost ceased in recent years on account of the better metallurgical conditions obtained in the arc furnace, which is superior for refining purposes. The necessity of using extra-low frequencies, such as 5 to 15 cycles per second, was also an important factor in preventing the development of induction heating as applied to the steel trade, owing to the capital expenditure necessitated by the installation and maintenance of special generators which were not suitable for other purposes.

The application of induction heating to the non-ferrous metals has given a new impetus to this type of furnace, and as this is usually performed in small units, the furnaces now used can be designed to give good power factors when working at normal commercial frequencies.

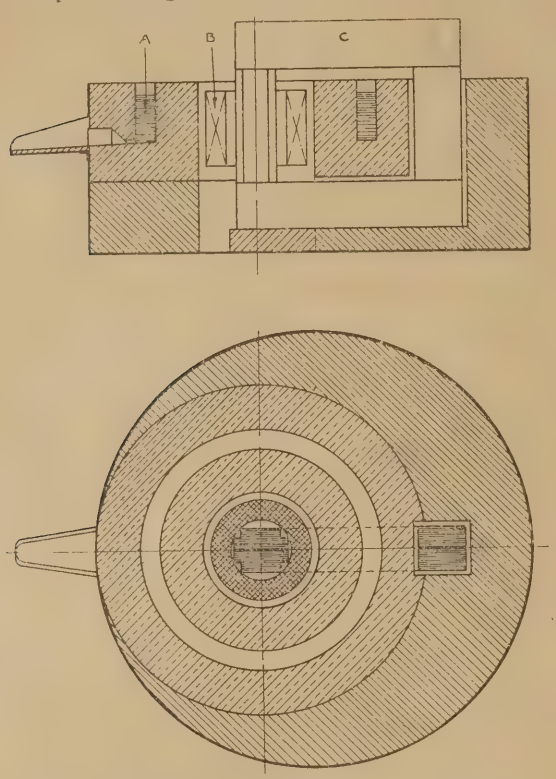
The principle of the low- and normal-frequency induction furnace is that of the static transformer, that is, it has primary and secondary circuits which are magnetically interlinked by a core of iron, the power supplied to the primary being transferred to the secondary by means of a fluctuating magnetic field and there turned into heat; as a transformer, it is extremely efficient, for whereas the heat generated in the secondary of a transformer is a form of loss, in the induction furnace it is utilised.

Its design also closely resembles that of a transformer. This is illustrated in fig. 1, which is a usual method of construction.

* See Elec. Rev., October 20th, 1922; p. 557.

The metal (A) is contained in a horizontal ring, placed concentrically with an iron core (C) of transformer iron, on which is placed the transformer winding (B).

It will be seen from the sketch below that whereas in the transformer the primary and secondary windings are close together, in the induction furnace a very large space of necessity exists, filled with refractory lining, thus forming a large leakage area for the magnetic field and giving a correspondingly poor power factor. This space varies greatly with the temperature of the metal to be melted and the size of the furnace, but in the most favourable circumstances it is comparatively great, and also, as the secondary channel has to take the complete charge, the cross section of this channel is



(A) Molten metal; (B) Primary coil; (C) Iron core.

Fig. 1.—Low-Frequency Induction Furnace for Melting Steel: Vertical and Horizontal Sections.

large, if its diameter is to remain within practical limits; thus again we get adverse conditions for maintaining a high power factor.

Many methods have been adopted by different inventors to reduce the magnetic leakage, and to a certain extent the power factor has been improved.

In starting up an induction furnace it is necessary to pour into the secondary channel sufficient molten metal to form an electrical circuit of a cross section large enough to take the current required to heat the charge. After this has attained the desired temperature, cold scrap is added in small quantities until the complete charge is molten. After pouring the metal, a sufficient quantity is left in the channel to form the necessary circuit for the next charge.

With the open-channel type of furnace, the cross section of the bath varies according to the weight of metal charged; its resistance will likewise vary, so that with constant voltage the current flowing in the channel will be smaller at the commencement than after the complete charge is molten.

For example, if a furnace, when charged to half its capacity, takes a load of 143 kW at a power factor of 88 per cent. with 10 volts across the secondary channel, we shall have the following electrical conditions:—
kW 143; p.f. 88 per cent.; volts 10; amperes 16,200; ohmic resistance 0.000544; reactive resistance 0.000292 ohm.

When the full charge has been added, the ohmic resistance will be halved; the reactance will be as before, and the power factor will be cos ϕ, where tan $\phi = .000292/.000272$. Then cos $\phi = 0.68$. The impedance is now .0004 ohm.

The current flowing will be, assuming the voltage to be constant $10/.0004 = 25{,}000$ A, and the power taken will be $10 \times 2{,}500 \times 0.68 = 170$ kW.

From the above it can be seen that the power factor varies considerably according to the state of the charge in the furnace. The rate of heating also varies—that is to say, although the charge has been doubled, the kilowatts have only increased by about 20 per cent. However, if a means of voltage regulation is adopted, the power may be increased to a certain degree, depending upon the current density of the bath.

Owing to the phenomenon known as "pinch" effect, there are well-defined limits beyond which the current cannot be increased. Therefore the maximum electrical power of the furnace equipment cannot be used throughout the whole charge, unless a large proportion of the molten metal be left in the bath; consequently the load factor will be low.

When large furnaces of the simple ring secondary type are used, it is necessary to reduce the frequency, the usual practice being to install machines of the motor-generator type so that three-phase currents may be taken from the line, and a single-phase current of the required frequency delivered to the furnace. As the motor is usually of the synchronous type, it is used to advance the power factor.

The Rochling-Rodenhauser furnace deviates from the usual method of construction and makes use of polyphase currents. This is perhaps one of the greatest improvements in the induction steel furnace. Its arrangement is such that it may be connected to standard supply circuits without having an unduly low power factor.

Dr. Carl Hering noticed that when current was passing through a molten conductor contained in an open trough, deep depressions of the liquid metal took place on the current reaching a certain density. This effect is known as the "pinch" effect, and has considerable bearing on the design of modern induction furnaces.

It is well known that parallel conductors carrying current in the same direction attract each other. The molten liquid contained in the secondary of an induction furnace may be looked upon as an indefinite number of parallel paths, through which the current is flowing. Each of these paths will tend to move towards the axis of the conductor, and should the current density be raised beyond a certain point, the force will become great enough to interrupt the circuit momentarily. Hence there are limits to the current density which may be allowed in the molten secondary.

The force due to what is known as "motor" effect also has a very important bearing on induction furnace design, especially in the case of the Ajax-Wyatt furnace for melting non-ferrous metals, which is described later.

Most of the earlier induction furnaces were developed for the melting of high-resistance metals, such as steel, &c., very little attention having been paid to the melting of non-ferrous metals and alloys, such as copper and brass. Experiments, however, were carried out some years ago on the melting of non-ferrous metals by an induction furnace of the open-channel type, but without much success. The poor results of this type of furnace for non-ferrous metals and alloys were principally due to the low power factor and "pinch" effect.

Owing to the higher resistance of steel, the current density required to melt at a practical rate may be adjusted so that the "pinch" effect does not reach a sufficient magnitude to break the secondary, but in the case of low-resistance metals the current density for practical melting in a horizontal ring furnace may be so great that the "pinch" effect will break the molten metal circuit. The power factor of the secondary channel will also be lower than that of steel, and the resistance may be so variable that the furnace will become impracticable.

It is, however, in the melting of non-ferrous metals and alloys of the copper-zinc type that the characteristics of the induction furnace are much more favourable than those of the arc furnace. In melting steel and ferrous alloys, unless very pure expensive scrap is used, it is necessary to refine the molten metal. To do

this, it is important that the slag should be hotter than the molten steel, so that the chemical actions for the removal of impurities may take place. In the arc furnace these required conditions exist, whereas with the induction furnace, as the slag is a poor conductor of electricity, it is extremely difficult to generate sufficient heat in it to hold it at the required temperature.

On the other hand, when melting copper-zinc alloys, owing to the low volatilisation point of zinc, it is important that no part of the bath shall be heated to an excessive temperature. In the arc furnace this condition is not easily obtained, but with induction heating the temperature can readily be kept within the desired limits.

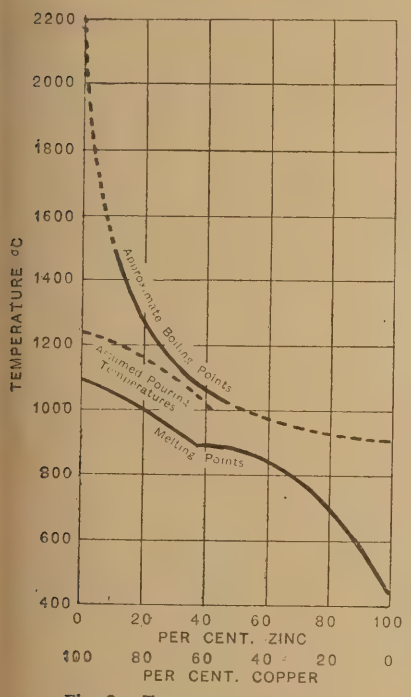


Fig. 2.—Temperature Curves for Copper-Zinc Alloys.

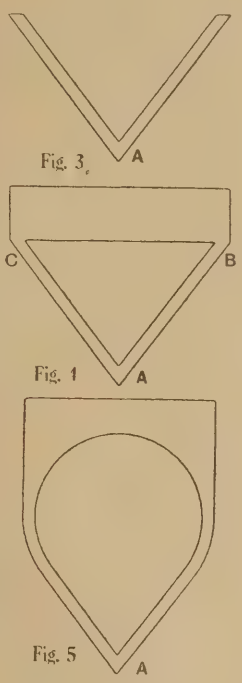


Fig. 3. Fig. 1 Fig. 5

Figs. 3, 4 and 5.

The above three curves, fig. 2, were prepared by Mr. H. W. Gillett, of the U.S. Bureau of Mines. The upper curve shows the temperature at which zinc volatilises in the various copper-zinc alloys; the lower curve is that of their melting point, and the centre curve the temperature at which they are usually poured.

In the case of the important commercial alloys, namely, those containing from 30 to 40 per cent. of zinc, very little difference exists between the temperature required for successful pouring and that at which the zinc in these alloys volatilises. Therefore, the control of heat and the temperature at which the heat is applied to the metal are of the utmost importance.

It is obvious then that for these alloys the open horizontal-channel induction furnace is limited in its application, owing to the low power factor, the varying input, and "pinch" effect, and the arc furnace is unsuitable, owing to its heavy zinc losses.

To overcome the various difficulties, C. P. Schneider constructed and described the original closed-channel type of furnace, in which the ends of the channel terminate in a bath of molten metal placed above them, which maintains pressure in the channel. The circulation of the metal in the secondary channel was not sufficiently great to prevent the metal becoming overheated, and the furnace therefore was not practical.

James Wyatt, when carrying out experiments in the development of the electrode "pinch"-effect furnaces invented by Dr. Carl Hering, noticed that a peculiar action was taking place in the molten metal. Experiments were carried out to find its cause, and from the data gained the type of closed-channel furnace known as the Ajax Wyatt was developed.

From the experiments undertaken by Wyatt, it was found that on passing current through a molten metal conductor contained in a rigid channel, a strong repelling action took place wherever a well-defined angle was formed, this action tending to bank up the metal against the side of the channel. When an acute angle was formed, as shown in fig. 3, a strong action took place which tended to bank the metal at A and caused a flow of metal away from that point.

If we join the two ends of the conductor in a bath of metal as shown in fig. 4, banking will take place at A as before, but the flow of metal away from this point will be retarded owing to a similar effect, although of less magnitude, taking place at B and C.

If we require the metal to have a maximum rate of flow along the sides adjacent to A, we must round off the corners at B and C, as shown in fig. 5.

From these experiments it was clear that wherever a sharply defined angle was formed, a certain magnetic effect was taking place on the molten metal. Also, where such a force is exerted, it tends to eject molten metal from the channel, and the corners at the point where the ends of the channels meet the bath must be rounded off to obtain a maximum rate of flow.

The present type of Ajax-Wyatt furnace has been designed to utilise the force due to "motor," "pinch," and "Joule" effects to the best advantage.

(To be continued.)

Cheaper Power.

Suggested Combination of Gas and Electricity Production.

By W. D. WYLDE.

The present-day advocacy by the powers that be of the super type of super-power station as a means of producing a plentiful supply of cheap electrical power, will no doubt to the layman appear to be the stepping stone to real and rapid progress towards putting our staple industries on their feet, and towards the conservation of the nation's fuel resources. The fact remains, however, that the most up-to-date plant in existence as a commercial proposition at the present time, utilising steam as the working medium for power production, only makes use of 25 per cent. of the heat value of the raw coal consumed; and what is more, this figure is only obtained and maintained by the adoption of the most modern types of fuel economisers, ceaseless vigilance, and scientific methods of plant operation applied continuously. In the absence of these aids, the figure would fall to 15 per cent., which may be taken as that obtaining in the majority of modernised municipal and power companies' power stations at the present time. It does not require a great deal of calculation to show that, assuming that the super-station with the higher efficiency supplies energy to large consumers at 0.75d. per unit, by adopting methods of power production resulting in a 40 per cent. coal utilisation efficiency the price of energy to the same consumer would be a maximum of 0.5d. per unit, taking it for granted that the power supplier would be content with the same profit margin as before.

To enable the higher efficiency of coal consumption to be attained, it is absolutely essential that the efficient methods of coal treatment developed by the gas industry be combined with the modern methods of utilising at maximum efficiency the heat at its disposal evolved by the electricity supply industry, and as a means to this end amalgamation of the two industries is suggested. The reason for the foregoing suggestion

will be seen when the valuable elements that make up the conglomeration that goes by the name of coal are taken into consideration.

Coal is well known to contain in varying quantities volatile hydrocarbons—valuable substances which by the distillation process are recoverable in crude forms, the degree of further refinement being decided by the market values of heavy and light fuel oils ruling at the time. The residual solid matter in the form of a baked carbonaceous mass is a useful commodity for the domestic fire, steam boiler firing, and other industrial heating requirements.

The main deciding factor is, of course, the value of the hydrocarbons in question: whether their value in by-product form exceeds the value of the heat produced by burning them immediately they are liberated from the raw coal, which is the case when utilising raw coal in the boiler furnace.

It may be useful to examine briefly the cause and effect of splitting up the coal disintegration period into two distinct, although interdependent, processes for the ultimate realisation of the aims in view, which are included under the title of conservation of the potential assets of coal. The cause is simply the fact that at the present time this country is dependent for 80 per cent. of its oil fuel needs on supplies from abroad, the 20 per cent. produced at home being from the high-temperature carbonisation process of existing gas works and coke ovens—maximum gas yield per ton of coal carbonised taking precedence with the former, and maximum coke yield per ton of coal with the latter.

Also included in the cause are existing economic demands, which make compulsory the utilisation to the full of the potentialities of the nation's most valuable natural asset, which the present-day method of consuming raw coal industrially and domestically does not do. By the universal adoption of the gas industry's most modern methods of coal treatment, an augmented supply of fuel oils would be available, with the beneficial result of reducing the dependency of this country on supplies from abroad.

There are other by-products, such as alcohol (which, incidentally, mixed with the by-product benzol, produces a motor fuel bordering on perfection); ammoniacal liquors, for fertiliser production; creosote oil, for disinfectant and wood-preserving purposes; and pitch, for road-making—to mention only a few of the products of commercial value that are recovered.

There is also smokeless fuel, the residue remaining from the aforementioned process, available to meet household and industrial requirements and to promote smoke abatement.

Coupled with the foregoing products there is a large volume of gas of relatively high heat value, an outlet for which is easily found, *viz.*, boiler firing for electrical power production and the augmentation of existing town's requirements, in the event of gas making further headway as a heating agent for household purposes.

The total effect realised by the removal of the coal distillates, as part and parcel of power production, is the conservation of the valuable chemical ingredients which in the ordinary way would either be partly destroyed and their heat value diminished, or wasted entirely in soot production and atmospheric pollution. The former is the result of boiler firing with raw coal, the latter the result of using coal in its mined state for domestic purposes.

In stating the reasons for the advocacy of a gas and electricity supply combine, it is not intended to convey the impression that such a combination would cause the original power production efficiency to increase by leaps and bounds. The inherent properties of steam as a power-producing medium with present-day boiler pressures and methods of steam utilisation unfortunately do not allow more than, say, 5 per cent. increase in the maximum efficiency to be obtained by up-to-date plant. There would, however, be an increase of at least 20 per cent. in the overall efficiency of the coal utilisation—in other words, 20 per cent. of the initial heat value would be recovered in the form of tarry vapours, and gas, with their subsequent use to the best advantage, chemically and thermally, resulting in a saving of the equivalent of 4 cwt. of raw coal for every ton originally consumed in its mined state in the boiler furnace. The foregoing simply means that the self-contained process of smokeless fuel, by-product, and electrical power production, enables a 20 per cent. increase in the overall efficiency of coal consumption to be effected. The economic advantages of the joint operation of the two industries under consideration may be itemised as follows:—

(*a*) Conservation of potential heat in liquid form.
(*b*) Recovery of the chemical constituents of coal.
(*c*) Introduction of semi-coked fuel for universal use.
(*d*) Incandescent coke used for boiler firing.
(*e*) Surplus gas available for boiler firing.
(*f*) Utilisation of waste heat from coal-treatment plant.

The economy derived from (*a*) will be appreciated when it is realised that the consumption of raw coal for domestic purposes results in the deliberate waste of 25 per cent. of the potential heat value of the coal, in the form of tarry vapours passing away to the atmosphere unburnt.

Applied to power plant, the economy is less pronounced, being about 10 per cent. for the older types of boiler-firing equipment, and from 3 to 5 per cent. with modern boiler-house practice.

Referring to (*b*), the economy accrues from the recovery of the alcohol and benzol compounds, which in the ordinary way of burning coal in its mined state give off only a fraction of their real heat value previous to their being classified as waste gases.

The beneficial asset (*c*) is the saving of the raw coal's material value by the low-temperature carbonisation process, coupled with smoke abatement and decreased expenditure on household soot removal. These results in turn would benefit humanity by the healthier atmospheric conditions that would prevail in our large industrial centres when their existing smoke screens were removed. In the case of (*d*) the economy is the result of utilising the carbonised coal forthwith for boiler-firing purposes, for electricity supply, without its being quenched, thus cutting out the heat loss incurred by slaking the product previous to its being stored or transported.

Item (*e*) plays a prominent part in the realisation of economy due to the surplus gas being used for steam production with a corresponding decrease in the consumption of solid fuel used in conjunction with the gas for boiler firing.

The last, but not least, item (*f*) materially assists in the maintenance of maximum efficiency by making use of heat which, although it has done the work primarily intended, is still capable of being exploited as a means of obtaining further economy in preference to the slipshod practice of allowing it to go to waste. In the light of the foregoing, the conclusion may be safely arrived at, that compliance with the demands of progress necessitates the abolition of the present-day methods of coal destruction and the substitution of methods whereby the maximum economy of conversion from coal into oil and power may be attained, and the elimination of waste may become a reality.

As a means to this end, the changing-over of gas works and coke ovens from the present high-temperature process of gasifying coal to the more progressive process of low-temperature carbonisation is suggested, which is simply the lowering of the temperature to which the coal under treatment is subjected, and the necessary increase in the capacity of the distillation and by-product recovery plant for dealing with the increased tar-oil recovery. This, in conjunction with the utilisation of the surplus gas for power production, a ready market for the smokeless fuel at a price comparing favourably with that of raw coal, and the reclamation of the most valuable fractions of the crude oil, should at any rate be the forerunner of the rightful demand of industry at the present time, *i.e.*, cheaper power.

On Finding the Right Man and Keeping Him.

Some Suggestions regarding Procedure.

By W. ROLAND NEEDHAM.

Much has been written urging the advisability of finding men suitable employment; and certainly one can scarcely over-emphasise the importance of that training which fits men the better to succeed in their life work. Less has been written in the different, though not necessarily opposed, sense of stressing how necessary it is that the right man be either found or *grown* for a particular job. The latter is, of course, one of the commonest quests undertaken in commercial and industrial life. Every Press advertisement for a man to occupy a certain position is a case in point. Scarcely 10 per cent. of those appointed through these media, however, really *fill* the positions they occupy. Many, indeed, may be likened to circular pegs which fail even to touch the square holes they are placed in. They are misfits who make no real contact at all.

In this matter of seeking the man for the job, even given the most wisely conceived, carefully engineered recruiting scheme possible, more often than not the results would be below rather than above what would probably be considered a reasonable mean; and as things are, it is not at all surprising that in the majority of cases the end desired is but very indifferently realised. It would indeed be strange were it otherwise, having regard to the haphazard means employed.

It frequently happens that the advertisement column of a newspaper or technical journal provides a man with his only avenue of approach to betterment in position. Whether he deserves such advancement or not is here beside the point. As a plain matter of fact this facility offers him his chance, and many a man eagerly accepts the opportunity.

But how about finding the right man for the job? It is very questionable whether, in the majority of cases, he will be captured in this way. How is an employer to be guided? What standards of comparison will he establish? What criteria will he adopt? Can he hope by a series of carefully chosen questions to test a candidate's qualifications rigorously enough? Shall he trust to his skill in cross-examination, or to his more or less instinctive appraisal or distrust of a man's general deportment and calibre? Are the candidate's credentials, or is the ostensible range of his experience, to decide matters? Some uncertainty there needs must be. This may not be obviated. The aim should be, however, to reduce the element of risk to a minimum. The present writer is strongly of opinion that the ordinary Press advertisement medium, and the customary procedure attendant thereupon, do not tend to liquidate this uncertainty. It may be worth while to consider a little more fully what are some of the points at issue.

Many a specious fellow has boundless assurance. If he have just sufficient knowledge and acumen to enable him to dissemble and cloak his limitations, he can by sheer nerve and bluff deceive even the shrewdest observer *for a time*. It is upon more intimate knowledge, and up against the real issues which test a man's worth, that the material is found to be under specification.

A good testimonial is not always the thing it purports to be. It is by no means a thing unknown for an amiable employer to present a man, whom secretly he is relieved to release, with notable credentials. He presumably works on the easy-going principle that if an employé is not good enough to be retained, he need not be penalised on that account. Thus a good-natured gesture is made, and "the poor fellow is given the best reference possible." Despite the fact that more and more the practice is growing whereby a testimonial is made to be a plain, unvarnished record of services rendered, the older variety is by no means dead.

Then as to the range of a candidate's experience, the employer should nicely discriminate and seek the golden mean. Between the radicalism of the rolling stone and the conservatism of the stick-in-the-mud, there is well-nigh infinite variety of gradation. Range of experience may be as necessary as depth. Into the equation must enter the psychological and the temperamental factors as well. An energetic, forceful applicant will insist upon scope and elbow room. His nervous energy must find outlet. In parenthesis, be it said, the employer who on other grounds is favourably disposed towards such a candidate will seek to provide at least air space wherein such a man may breathe freely. If, on the other hand, the job demands that a man shall apply himself closely, that intensive detail work be required, then a more studious type of worker should be sought. Where the difficulty really arises is, however, just in the matter of the employer's judgment upon the miscellanea he has to inspect. He has to remember that a fine presence is not a necessary concomitant of a well-balanced, liberally equipped, and tactful personality. It is not all men who have journeyed far who really know much of the countries they have traversed. Many men understand Nature, are intimate with its lore, hear its voices, who have seldom wandered from one particular stretch of moorland or countryside. Nature's treasures are no secrets to the lovers of Nature. And so, on paper, a man may be able to reel off a most formidable itinerary of service, but in fact he may be a most ignorant person. Ostentation without substance, froth without body, swank wedded to incompetence—these things are of those which happen, and even keen judges of character do well to remember this. A solitary interview may not be sufficient; in fact, it is seldom sufficient. Actual working conditions provide the only valid test.

As a necessary corollary to the foregoing, a very modest, unassuming paper record may really have reference to sterling work and most valuable experience. The range may be limited, and looked at from that *partial* standpoint only, the data must be extremely incomplete. The ground, restricted though it be, may at the same time be well broken up, thoroughly reclaimed, and intensively cultivated. The employer should on no account overlook this possibility. Here again, however, from a merely paper programme, and from first impressions of an applicant's demeanour, how can he hope to form other than a haphazard opinion? Sometimes your best qualified man suffers from temporary nervousness. If this be at all apparent, what construction is the alert interviewer to put upon it? Is it necessarily a sign of weakness? On the other hand, is boundless assurance a sure mark of competence? It is well to emphasise how onerous, not to say thankless, is the task which devolves upon those who are called upon to make these important decisions. The data should be as complete as is humanly possible; but where the ordinary advertising methods are in vogue, are the desired conditions realised? Can they be realised under such auspices! Is there any other method available by which the gaps may be bridged, or at least reduced? The present writer believes that in many instances more facts might be educed, fuller knowledge gained, and thus material be at hand by means of which a sounder judgment is possible. The present article concludes, it is hoped, on a constructive note. The suggestions are not to be regarded as original. The deductions which may be drawn from them, however, should help matters forward quite appreciably.

Excellent results can be, and in fact often are, obtained when employers grow their own men. So long as it is realised that no one expedient, however good, can be relied upon to meet every case, no one key release every lock, the principle is sound. No horticulturist seeks to raise every kind of plant from antecedents he happens to possess at one particular time. New strains

must on occasion be introduced, lest such variations as eventually appear be too limited in range and depth. These limitations, be it remembered, are emphasised as time goes on, both depth and range of operation decreasing. Similarly it is vitally necessary at times to recruit the human material, to infuse fresh blood into the organism. Stipulating this proviso, it is suggested that the proven men on the spot are, in the majority of cases, more promising material upon which to draw, than is the stranger who must of necessity be selected in a hurried and somewhat fortuitous manner. Better men may, of course, apply for a given post than any to be found on the existing staff. It is highly problematical, however, whether any one of these better men will be the successful candidate. More likely than not the choice will fall upon one less equal to the task than several at the time in the particular firm's employ. This kind of thing happens times without number. Wise and far-sighted policy will insist that the intelligence department of a concern be wide awake and functioning. Thus, whether John Brown himself know it or not, if he show promise for doing better things than the very good things his restricted conditions permit, then John Brown should most certainly be ear-marked for the larger position which one day shall fall vacant. If John Brown is not so docketed, his employer richly deserves to lose him. Unquestionably by accepting a more lucrative and responsible position with a competitive firm, Brown inflicts upon his former employers a double loss. They lose directly, in that valuable service is withheld from them, indirectly because it is transferred to a leading competitor. The latter loss may quite easily be as serious as the former.

It is a veritable truism that nothing so crushes initiative as constant, unvarying repression. This repression need not be of the virulent aggressive type. Indeed, the most dangerous form it can assume is when it results from sheer inertness. Let men once conceive the idea that promotion is only possible with *another company*, and the best men will leave. Such as remain are seldom better than second rate, and even good men lose their zest and zeal and, so doing, lapse into mediocrity. Wideawakeness, initiative, the ability to visualise requirements and satisfy them—these are things to encourage; and encouraged, they pay extremely well.

Where it is necessary to seek afield for new talent, it is well to cut the risks as much as possible. If it is a really responsible post which has to be filled, it is excellent policy to hasten slowly. It takes time to make a good search. Not one interview only, but a serious collecting of facts, and a painstaking verification of them are often well worth while. The writer has known of enlightened engineers who have thought well ahead of events. They have arranged special interviews for the sole purpose of getting into touch with promising men. Then, when in later months the position has actually become vacant, relevant facts have been at hand and have been pressed into use. Responsible engineers can, if they will, acquire a surprising grip of salient facts. To do this, they must keep eyes wide open, and they should especially cultivate the scout sense. This is at once a gift and an acquisition.

Messrs. Benjamin Bent & Co., Ltd., requiring an assistant works manager, advertise locally and in the leading technical journals. Out of some 80 applicants, interviews are arranged with eight. Seven duly appear, and eventually, without undue difficulty, the running falls to two. The one with the better paper record, unfortunately for himself, exhibits some slight signs of nervousness. Benjamin Bent, being all out for *presence*, offers the post to the more feasible candidate, who, whatever else he lacks, has confidence enough. Six months later Mr. Bent offers the post to Mr. Nervous Man. He, having formed unfavourable opinions of Mr. Bent, refuses. Next, another of the seven has his chance. He, a really capable man, accepts provisionally. His own people, however, are loath to release him, and make him a firm counter-offer, which, after due consideration, he accepts. Then, and not till then, does Benjamin Bent get down to facts. He noses round, and finds that his assistant chief draughtsman has had an exceptionally good record, has effected marked economies, not only in office and routine work, but in certain workshop processes also. Further, he discovers that foremen moulder, pattern maker, machinist, and storekeeper value his advice and opinion very highly. In the end Mr. Assistant Chief Draughtsman becomes Mr. Assistant Works Manager, and eventually works manager, and secures at the same time a place on the board of directors.

The foregoing is a purely hypothetical example. It is also a parable.

The Motor Repair Shop.

Some Notes and Instances.

The following notes have been based on experiences gained in the running of a motor repair shop by the Walker Electrical Service, Edinburgh.

The main generator supplying a large tweed mill, a 460-volt, 100-kW, 4-pole machine with 4 nine-brush spindles, developed heavy sparking at the commutator. The trouble was entirely due to badly carbonised

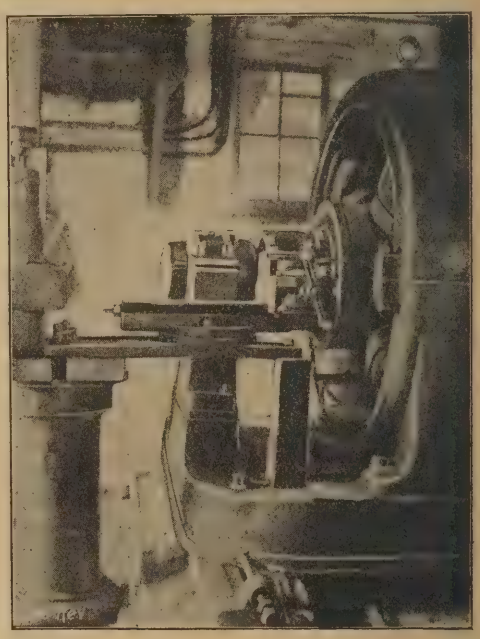


Fig. 1.—Method of Turning a Commutator.

intersegment micas, and also the breaking down to earth of the front mica vee ring. The front ring was removed, and the cast-iron vee was taken back to the repair shop to have a new mica ring fitted, it being thought inadvisable to attempt to make such a mica ring on site. The vee was 15 in. in diameter and 4 in. wide. As some of the micas were very badly burned down between the segments, the micas were scraped out and the spaces filled up with commutator cement. Some of the micas were actually burned down a distance of $\frac{1}{2}$ in. or so below the surface. A drop test was taken all round before filling in the cement to ensure that no "shorts" would be locked in with the cement. After reassembling the commutator, final tests for "earths" and "shorts" were made, when arrangements were made for the truing up of the commutator. A temporary cutting device was built up around the commutator, and the generator was driven by means of a motor fed from a small stand-by set.

Fig. 1 shows the method of turning the commutator. More time was spent on the rigging-up of the turning gear and the turning of the commutator than on the actual electrical repairs. After seven weeks' running without trouble, heavy sparking again developed. This time the complete armature was withdrawn and removed to the repair shop, and the commutator was rebuilt with

new micas, and after seven months' service the generator is giving entire satisfaction. The rebuilding of the commutator was not put in hand to begin with because, owing to pressure of work, the quickest repair possible was necessary.

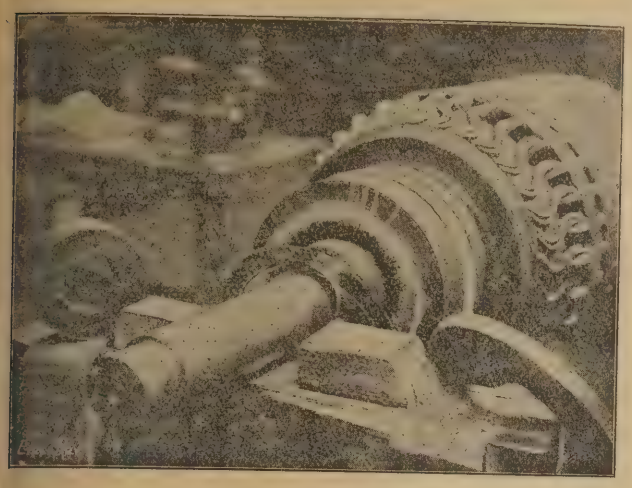


Fig. 2.—A Faulty Commutator.

Another instance of commutator trouble shutting down a main set in another mill has recently occupied the attention of the repair squad. A low-voltage set having a commutator 24 in. in diameter with 306 bars developed a number of badly carbonised "shorts" between commutator segments, and it was decided to replace the faulty mica; 24 mica segments were replaced, but as the work was in progress it was found that others were also showing signs of going, and it was agreed that the commutator should be removed and rebuilt. The commutator hub was duly removed, together with all the bars, to the repair shop. After dismantling the commutator the total number of faulty mica segments was found to be 64. This suggests that when a few of the mica segments become faulty, the others follow closely, and it is only a matter of time until they all give out.

Fig. 2 shows another case of an armature going to earth at the front mica vee ring, the beginning of the trouble in this case being a few bad joints in commutator lugs causing pitting of the mica which had then become carbonised.

Many complaints are received of motors throwing oil all over the commutators and brush gears. In two recent cases the commutators and brush gears were in a filthy condition, and on removing the end plates, it was found that the brushes were not properly designed as regards the cutting of the gutters. An oil gutter was cut along the whole length of bush and allowed oil to travel right to the end of the bush to the collar and then on to the brush gear and commutator. The gutters should terminate in a circular gutter about $\frac{1}{8}$ in. from the end, and a hole should be drilled through the bush to meet the circular gutter and allow the oil to drain into the oil well. In the case in question, two grub screw holes were drilled close together right through to the shaft. This, of course, was gross carelessness; the holes should not have been drilled completely through the bush.

Modern Steam Practice.

Recent Developments in the Transvaal Power Stations.

We abstract from the valedictory address of the retiring president of the South African Institution of Engineers, Mr. T. G. Otley, which he read before the annual general meeting of the Institution on June 17th, and of which a report is published in the *Journal* of the Institution, some very interesting details concerning recent developments in the power stations of the Victoria Falls and Transvaal Power Co., Ltd., and also some observations of the author relating to modern steam practice generally in South Africa. He said, *inter alia*:—

Early in 1925 it was realised that a crisis might very easily arise towards the end of the present year and, although the Witbank power station, designed and being built by the Victoria Falls and Transvaal Power Co., Ltd., is scheduled to commence supply at about the end of the year, yet the board of the company took the heroic measure of ordering a new 12,500-kW machine in February for the Rosherville station, to be delivered in June and July, and to be running about the end of August. It is not for me to say whether it was really obligatory on the company to provide any such temporary relief, seeing that the delay to the Witbank scheme was not of its seeking, but the fact remains that the power company shouldered the burden in a generous spirit in order to safeguard the interests of the mining industry and other consumers.

Although additional turbine plant is on order and will have to be steamed, no additional boiler plant has been or will be installed in the existing station. There are 102 boilers installed in the four steam power stations—40 at Rosherville, 24 at Simmerpan, 20 at Vereeniging, and 18 at Brakpan; the numbers steamed over the peak each day are 36, 21, 17, and 16 respectively.

The boilers that are not steaming cannot be considered as immediate spare and available to meet the load, because of cleaning, inspection, &c. Now, 24 of our boilers have been steaming for about 17 years at a load factor of between 70 and 80 per cent., so that, measured by average British conditions, they have steamed the equivalent of 30-35 years' normal life, and to-day they are virtually as good as when installed, and indeed are steaming at higher efficiencies than at any time in the history of the company. The other boilers range from 3 to 14 years of life at the same power factor, and again the efficiency has been maintained, but the most striking thing, from an engineering point of view, is the fact that every boiler steaming on the system is doing very considerably more than the makers' rating; and the makers' guarantees of evaporation were given when burning Witbank district coal of an average calorific value of about 11,600 B.th.u. per lb., whereas to-day we are burning about a million tons per annum of what may be termed low-grade coal of a calorific value varying between 9,600 and 10,000 B.th.u. per lb.

Innumerable trials and experiments were made, and we ultimately concentrated on what we term selective draught. This consists of applying forced draught over a short area towards the front of the chain grate, which not only increases very considerably the furnace temperature and CO_2, but interposes a barrier of pressure between the curtain and the rest of the combustion space of the furnace, so that for about 12-18 in. at the front of the grate next to the curtain there is what virtually amounts to balanced draught. The higher furnace temperature also tends to accelerate ignition, and the majority of our chain grates now run 12 to 14 per cent. faster than the speeds for which they were designed by the makers, and low-volatile and low-value coals can be burnt very efficiently and at a high rate per sq. ft. of grate area. The first experiments were made with air taken from the blast pipes to the Prat ejector nozzles, but it was quickly realised that separate fans for each stoker grate would be justified. The Schlotter blower fan was brought to our notice, and these high-speed and efficient little fans worked in very well indeed for the scheme we had in mind, and at the present time we have about 150 of these running, which enable us to increase the steam capacity of the plant by anything from 15 to 20 per cent., and in certain cases by 30 per cent. more than we were doing before. In certain cases we are also increasing the induced draught and output by applying 150-h.p. motor fans to each of a number of boilers and, by so doing, we hope to increase their steam capacity by about 40 per cent. more than the normal rating. The money has been well spent, and the boiler efficiency is higher to-day than at any time in the history of the company; we have also met the increasing loads without increasing the capacity of the boiler plant, and we anticipate no difficulty in steaming the full capacity of the new machine that is being installed at the Rosherville station.

The principles involved in the "Loffler" system, in which the whole of the transfer of heat from fuel to steam takes place in the feed heater and in the superheater, so that the boiler is not exposed to fire or to the products of combustion, is being applied on a commercial scale, and the results will be awaited with the greatest possible interest. The two most interesting features are the generation of low-pressure steam by high-temperature steam, and the very high temperatures to which steam is superheated, *viz.*, up to 930 deg. F., and sometimes to 1,110 deg. F. One must not assume that one can work for long periods at such high temperatures, as the characteristics of steel and alloys of steel are not sufficiently well known to justify confidence in working plant at these temperatures. One of the most interesting expositions of the

effect of temperature on the strengths of steels is that given in a paper presented by Professors A. L. Mellanby and W. Kerr before the North-East Coast Institution of Engineers in February last (Electrical Review, March 6, p. 383). They point out that in actual working practice the question is not of how violent may be the death of the material, but rather its length of life under the conditions of actual working.

Modern power stations are becoming complex and expensive affairs. In addition to the ordinary bleeding of the turbine to heat the condensate, steam is being returned to special boilers and re-heated; in other words, the steam is being superheated between stages to increase the average temperature through the machine. It is obvious that this ought not to be done unless it shows a financial return on the additional capital involved, but it is not unlikely that, instead of the steam being returned to special boilers, it will be passed through simple heaters utilising the high-pressure and high-temperature steam, or part of it, to re-heat the lower pressure steam on the counter-current principle, the efficiency of transfer being very high, and on the face of things it would appear that the capital cost will be very considerably less.

Naturally, a point must arise where this must end, as it becomes increasingly difficult to obtain the ultimate 1 or 2 per cent., and the cost of doing so is becoming prohibitive. The metallurgist and the steel manufacturer have played a big part in the progress that has been made, and units of 40,000 to 50,000 kW in one cylinder are in service, and there are prospects that units of 100,000 kW, or even more, may be designed.

The size of boiler units has also increased in an even more remarkable manner, but no serious or difficult engineering problems have been involved, as the output of the boiler depends only upon the extension of its heating surface.

Why should it not be practicable to have boiler units of 500,000 lb. capacity, three boilers steaming and one in reserve for a power station of three running turbines, plus one spare? Until quite recently a boiler of 70,000 lb. evaporation per hour was considered a large unit, and there are relatively few boilers in the world to-day of a capacity greater than 100,000 lb. evaporation per hour, but there is no good reason why one boiler per turbine should not be adopted, except, perhaps, that a boiler which is out of commission and cold requires a longer time to get up steam than is required to run up a turbine and its auxiliaries on to load, and should anything happen to a steaming boiler the load would be curtailed.

It is well known among engineers connected with the power industry that capital costs are the biggest factor in production on a large scale, and that the steam generating plant of a power station involves the highest capital cost and also the highest maintenance, but with the advent of large boiler units the capital cost per kWh of production will be enormously reduced not only on account of the boilers, but of the steam pipe arrangements, smaller and simpler buildings, coal bunkers and auxiliaries, and, in passing, I would remark that in the present power-station design the cost of steam, feed-water, and other pipes is becoming a very large factor. In my opinion too much money is, in many cases, being spent on refinements to obtain a high thermal efficiency.

A Novel Air-Break Switch.

Operation in Severe Weather.

According to the *Electrical World*, the Railway and Industrial Engineering Co., of Greensburg, Pa., has recently made a 220-kV air-break switch for use on overhead transmission lines. A rotating tubular blade is used, which is claimed to embody

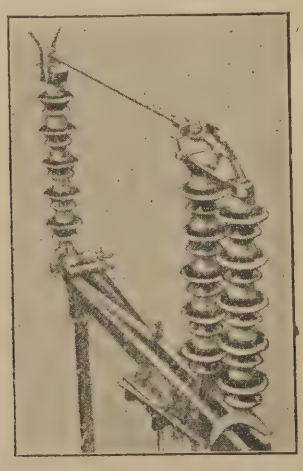


Fig. 1.—Model of Rotating Switch, Showing Constructional Details.

the essentials necessary to produce a reliable mechanism to meet severe weather conditions. An illustration of a model of this switch showing the details of construction is reproduced in fig. 1. The contact end of the blade is provided with a hollow flat end or "beaver-tail" of aluminium bronze 4 in. wide, 1¼ in. thick, and about 5 in. long, with a shank pressed into and riveted to the end of the tubular copper blade 2 in. in outside diameter. In the closed position of the switch this "beaver-tail" is jammed between the tubular copper jaws with a total contact pressure of 400 lb.

Fig. 2 shows the switch in the closed position; at open position the switch blade is perpendicular.

In opening the switch the blade is first rotated through an angle of 60 deg., thereby releasing the contact pressure and breaking out the ice before the blade is called upon to lift. This rotation of the blade is positive, being produced by the first 30 deg. rotation of the rotating insulator at the back end of the switch, the blade being subsequently opened to 7½ deg.

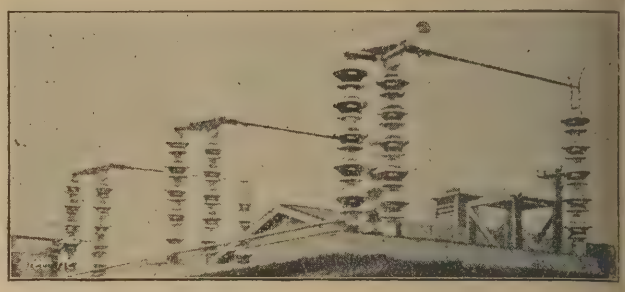


Fig. 2.—Rotating Switches with Blades in Closed Position.

beyond centre by the final 60 deg. rotation of the insulator. The advantage of releasing all pressure at the jaw is very evident when it is realised that the blade is 10 ft. 8 in. between the hinge and the centre of the jaw. If the usual jaw friction and ice locking had to be contended with, the strains on the insulators would be excessive.

The design of the jaw contact is distinctly novel and has been the subject of some speculation. It was thought that the line contact produced would cause excessive heating and wear, but tests have shown that this contact will carry from 800 to 1,000 A without exceeding a temperature rise of 30 deg. C. Wear is compensated by facing the 1¼-in. outside diameter tubular copper jaws with cast aluminium-bronze shoes having 1¼-in. faces.

All the essential mechanical parts of the switch above the insulators are of high-tensile aluminium-bronze, having also a high elongation and great resistance to shock. The blade has a double reinforcing of seamless steel, the first extending approximately 80 per cent. of the length from the hinge end and the second being within it.

In a recent test to determine the mechanical fitness of the switch for duty on 220-kV systems, it was operated continuously for 24 hours, the controls to the motor contactors being equipped with a special relay which started the switch in the opposite direction a few seconds after an operation was completed. During this period a cycle counter attached to the switch indicated 3,186 complete openings and closings and a d.c. Wh meter for the 1-h.p. motor showed a consumption of 13.5 kWh, 4.17 Wh per cycle of operation.

The prevailing temperature during the test averaged about 12 deg C. below zero. Before starting the test the switch was sprayed to form artificial sleet to a thickness of ¼ to ½ in. Before the completion of the test the motor mechanism and the auxiliary switch were sprayed from a hose nozzle and the cases were found to be tight. No part of the switch or mechanism failed, with the exception of the flexible leads to the rotating blade. The blade contacts showed a maximum wear of 0.005 in. without lubrication, and on the aluminium-bronze shoes on the tubular jaws only a slight depression was produced.

Norwegian Water Power.—A committee of French engineers made an inspection of Norwegian waterfalls and hydro-electric works in the last week in July and subsequently gave to the Oslo newspapers an account of the impressions which they had formed. In the opinion of the engineers the Norwegian water powers possess extraordinarily large possibilities of being regulated; they are capable of being utilised all the year round, whereas in France it is only possible to rely upon four months' working, at the end of which steam power has to be used. If, therefore, the Norwegian industries adopt the most modern methods it is considered that the country will have unique industrial possibilities. A beginning has already been made at the Rjukan works, where the Haber ammonia process is being introduced. At Odda it is proposed to transform the process at the cyanamide works where, among other things, liquid air is to be produced according to the Claude process. As to the future of the aluminium industry, the French engineers are reported to have stated that Norway must be considered to occupy an important position in this respect, but the prices are so high that aluminium is not used in the big industries as much as is desirable. It was added that the French import duties stand in the way of the export of manufactured of aluminium from Norway.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Lead Market Report.—Messrs. James Forster & Co. reported on August 15th: "Closing prices yesterday were £37 12s. 6d. for August and £36 6s. 3d. for November, a fall on the week of 6s. 3d. a ton for forward, with August unchanged. The expected set-back, after a continuous advance since July 27th of nearly £3 a ton, came at the beginning of this week, but a firm tone set in again and there was a recovery. The close is firm at £37 12s. 6d. for August, £37 2s. 6d. for September, £36 12s. 6d. for October, and £36 6s. 3d. for November. According to the Board of Trade returns the imports of lead during July into the U.K. created a record, no less than 27,367 tons being imported. The balance of imports over exports, *i.e.*, 25,551 tons, went straight into consumption and yet at the end of July a shortage developed, which indicates what a tremendous consumption is taking place. This month arrivals are considerably less, only about 9,000 tons being imported up to the 13th inst., and the position is getting more acute every day. Although the current price of lead is certainly very high, everything points to a further advance in values, until either consumption is checked, or production is increased to such an extent as to satisfy the world's demand and leave a surplus."

Shannon Contract Signed.—The contract between the Irish Free State Government and the Siemens-Schuckertwerke for the carrying out of the Shannon hydro-electric scheme was signed last week. A correspondent of *The Times* reports that it is intended to commence the work next month, the first stage being the construction of a canal from O'Brien's Bridge to Ardnacrusha, which is to be the head race of the power station. It is said that the contract is valued at 2½ millions sterling, but does not provide for the distribution works for which a further contract will be necessary at a later date. There is still uncertainty as to the methods which will be adopted to raise the necessary funds.

It is expected that the work will occupy three years and in the meantime the Government is to undertake an intensive educational campaign to acquaint prospective consumers with the advantages of electricity—especially in agricultural applications.

The Birmingham Building Trades Exhibition.—The Birmingham Electric Supply Department informs us that it has taken space for an exhibit of electrical appliances of all kinds at the Building and Allied Trades Exhibition which is to be held at Bingley Hall, Birmingham, from September 7th to 19th. Moreover, in conjunction with local electrical manufacturers and contractors, four lectures by well-known experts, with practical demonstrations, have been arranged. The lectures will be given by Messrs. J. W. Beauchamp and V. W. Dale, of the British Electrical Development Association, and Messrs. W. E. Bush, W. J. Jones, and R. C. Hawkins, of the E.L.M.A. Lighting Service Bureau. At the same exhibition the Yorkshire Copper Works, Ltd., will show copper tubes for hot and cold water systems.

Delagoa Bay Strike.—The employés of the Delagoa Bay Development Corporation, which provides the town's tramway, lighting, and water services, struck work last week, causing much inconvenience. The trouble was due to grievances in connection with currency. It was expected that the Government would intervene.—*Reuter* (Lourenço Marques).

Boiler Contracts. — The Stirling Boiler Co., Ltd., is at present erecting two 40,000-lb. boilers at the Bedford Corporation's electricity works. Other orders recently secured include a 30,000-lb. unit for the Kettering municipal electricity undertaking, two 50,000-lb. units for the Northampton Electric Light & Power Co., Ltd., and a 45,000-lb. boiler for the Hammersmith Borough Council.

"Exide" Battery Service.—The Chloride Electrical Storage Co., Ltd., has issued to its "Exide" service agents a chart which shows, among other things, the appropriate batteries for all makes of automobiles.

Italy's Foreign Electrical Trade.—A report upon the foreign trade of Italy during the first quarter of the current year shows that the value of electrical imports was more than double that of exports. The actual figures were: Imports 11,180 quintals, valued at 25,245,770 lire (as against 17,984,200 lire in January-March, 1924), and exports 7,407 quintals, valued at 11,103,239 lire (as against 10,743,540 lire). The principal item in both divisions was generators and motors, the exports at 6,501,738 lire being slightly higher than the imports. Electric meters to the value of 4,799,148 lire were imported; the value of imported radio apparatus is shown as 4,147,993 lire; and telegraph and telephone apparatus as 1,872,113 lire. The second largest item in the export list was magnetos, valued at 887,561 lire. In an analysis of the sources of imported electrical goods, Germany occupies the first place as in the previous year. France wrested the second place from Hungary, while Great Britain remained in the sixth position. The strong position of Germany in this market can be judged from the fact that her exports to Italy represented about 60 per cent. of the total, while the French share (the second highest) was only about 11 per cent.

Chinese Notes. — The *Chinese Economic Bulletin* reports that the Chapei Water & Electric Supply Co., Shanghai, has increased its capital by $680,000 to $2,000,000, for the erection of a new water plant.

A group of local capitalists in Kaoyu (Kiangsu province) has decided to install a telephone service in the city. A sum of $6,000 has been raised to meet preliminary expenses.

The employment of automatic telephones in China has made great headway both for public and private purposes. The largest automatic exchange is that operated by the South Manchurian Railway Co. at Dairen. This exchange, which was provided by the Automatic Telephone Mfg. Co., Ltd., is equipped for 4,800 lines, but is capable of extension to 10,000 lines. There is also a 3,000-line exchange at Harbin, and it is expected that Tientsin will be provided with automatic telephones at an early date. Although most of the work has been done by the British it is said that a small number of German automatic telephones have been installed at Tsinan.

Trade Announcements. — A firm styled the STONEHOUSE RADIO SUPPLIES has opened a radio shop at 54, Union Street, Stonehouse, Plymouth.

A new electrical department has been opened by the CLECKHEATON ENGINEERING & MOTOR CO., LTD., of Bradford Road, Cleckheaton.

Owing to the increase in their export business in the London area, MESSRS. JOHNSON & PHILLIPS, LTD., have transferred their London Export Sales Branch, under Mr. J. Horne, from their main London offices at 12, Union Court, Old Broad Street, to new and more extensive accommodation at 23-24 Wormwood Chambers, Wormwood Street, E.C.2. The telephone numbers remain the same, *i.e.*, Central 2207 and 178.

The business of the "Cantie" Switch Co., Ltd., has been purchased by BROOKHIRST SWITCHGEAR, LTD., but will continue to be carried on under the present name and from the same address—Leighton Street, Nottingham. It is being arranged that the branch offices and agents of Brookhirst Switchgear, Ltd., shall represent the "Cantie" Company.

The address of Mr. ARTHUR H. SPEARING is now 3 & 4, Clement's Inn, W.C.2. Telegrams: "Spearartha, Estrand, London"; telephone: Holborn 3136-38.

Messrs. F. W. BERK & Co., LTD., are removing, on August 24th, to larger premises at 106, Fenchurch Street, E.C.3. The firm's telephone numbers and telegraph address will remain as before.

Our Foreign Trade.—JULY FIGURES.—The Board of Trade returns for July show the following values of electrical imports and exports:—

	July, 1925. £	Inc. or dec. £	7 months, 1925. £
Imports.—			
Electrical goods and apparatus	291,087	+ 353	+ 727,566
Machinery	1,106,139	+173,004	+ 968,156
(Electrical machinery) ...	93,401	+ 13,128	+ 12,146
Exports.—			
Electrical goods and apparatus	863,952	+ 18,730	+1,456,983
Machinery	3,910,612	+ 30,904	+2,801,797
(Electrical machinery) ...	435,799	− 4,152	+ 492,681
Re-exports.—			
Electrical goods and apparatus	22,785	+ 8,117	+ 63,722
Machinery	148,257	+ 32,145	+ 139,541
(Electrical machinery) ...	4,886	+ 66	− 20,559

Receiver Appointed.—EGO ENGINEERING CO., LTD., Regent Street, W.—Mr. Wm. Osborne, of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C.2, informs us that he was appointed receiver on August 5th on behalf of the debenture holder in this matter. The debenture issue amounts to £800, plus interest, and, judging from the report of the directors of the company as to the value of the assets, he does not anticipate that there will be a sufficient sum realised even to meet the debenture holder's claim.

The Stinnes Concern.—According to the latest German estimates the liabilities of the Stinnes undertakings amount to no less than £9,000,000. Negotiations are proceeding for the sale of the trust's properties, including newspapers and mines. With regard to the latter it is reported that the Rhenish Westphalian Electricity Works is contemplating the purchase of the Mathias Stinnes coal mines.

French Radio Apparatus Tariff.—According to a recent decision of the French Customs authorities radio apparatus is to be classed as "Electrotechnical apparatus" for the purpose of import duty (No. 524 *bis* in the tariff list).

Patent Application.—The Automatic Telephone Manufacturing Co., Ltd., has applied for an extension of the periods of patents Nos. 1,298, 1,418, 1,420, 1,422, 7,876 and 7,877, all of 1910. The application will be heard by Mr. Justice Tomlin on October 13th in London.

Russia's Credit Requirements.—The Manchester correspondent of the *Financial Times* says that the Russian delegation which recently visited the city in connection with the projected purchase of textile machinery to the value of £5,000,000, insisted that orders could only be placed if the manufacturers were willing to allow long-term credits.

British-Dutch Valve Agreement.—An agreement has been entered into by the Mullard Radio Valve Co., Ltd., and Phillips Glowlampworks, Ltd., of Holland, whereby the former company gains the use of all the Phillips valve patents, machinery designs, and technical knowledge, with a view to manufacturing the Dutch firm's valves in this country. Messrs. Phillips have agreed to cease importing valves into Great Britain and Ireland, a matter of some magnitude as they have been by far the largest suppliers of foreign valves.

Bankruptcy Proceedings.—J. S. Yeomans, 11, Hill View Terrace, Chapel Allerton, Leeds, electrician.—The receiving order herein was made recently on debtor's own petition. The statement of affairs showed liabilities of £213, against assets of £17. The first meeting of the creditors was held on July 27th, at the Official Receiver's Office, 24, Bond Street, Leeds, when the case, being a summary one, was left in the hands of the Official Receiver as trustee. The following are creditors:—

	£		£
Churton, T. H.	33	Metcalf, —	22
Crowther, N.	23	North Electrical Co.	37
Electric Lamp Factors	23		

V. G. Baines, electrician, 2, West Street, Wellingborough.—Last day for receipt of proofs for dividend, August 25th. Trustee, Mr. D. Helliar, Official Receiver, The Parade, Northampton.

J. Isherwood, wireless and photographic dealer, 91, Lee Lane, Horwich.—Last day for receipt of proofs for dividend, August 29th. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

J. S. McLeod (trading as McLeod Bros., at Bolton, and, with a partner, as McCload Bros., at Horwich), radio and electrical engineer, 189, Blackburn Road, Bolton.—Last day for receipt of proofs for dividend, August 31st. Trustee, Mr. A. T. Eaves, C.A., 47, Mosley Street, Manchester.

H. Fildes, electrical engineer's superintendent, 108, Monton Road, Eccles.—Last day for receipt of proofs for dividend, August 29th. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

J. F. Lyons, electrical engineer, 25, Palmerston Street, and Front Street, Consett, Durham.—First and final dividend of 1s. 8¼d. in the £, payable August 27th, at the Official Receiver's office, Pearl Buildings, 4, Northumberland Street, Newcastle-upon-Tyne.

G. W. Tempest, 12, Sandhurst Road, Stockport, trading as the Northern Radio Co. and the General Wireless Trading Co., at Manchester, radio and telephone engineer.—Trustee, Mr. A. Yearsley, 27, Brazennose Street, Manchester, appointed August 11th.

W. R. J. White, electrical agent, 29, Great Pulteney Street, W.1.—Trustee, Mr. D. Williams, Official Receiver, Carey Street, W.C., released July 27th.

J. Benson, lately carrying on business as an electrical engineer at 2a, Wade Street, Leeds.—Receiving order made August 7th on debtor's own petition.

Roberts & Co., electrical engineers, 61, Old Town Street, Plymouth, and at East Looe, Cornwall.—Receiving order made August 10th on a creditor's petition.

Company Liquidations.—Roderick Electric Supplies Co., Ltd., Theobald's Road, W.C., and St. Mary Street, Swansea.—The creditors interested herein were called together recently at the offices of Mr. W. H. Cork, 19, Eastcheap, E.C., who occupied the chair, and reported that he had been appointed to act as the liquidator in the voluntary liquidation of the company. The statement of affairs presented showed liabilities of £1,669, of which £1,468 was due to the trade. The assets were estimated to realise £372, from which had to be deducted £179 for preferential claims, leaving net assets of £193, or a deficiency of £1,476. The company was incorporated as a private limited liability concern in July, 1923, to take over a business which was established by Mr. W. A. Roderick in 1914. The company had a nominal capital of £2,500, and there had been issued 2,272 ordinary shares of £1 each, and 1,000 deferred shares of 1s. each. The vendor was issued fully paid shares as the consideration for the assets. When the company was formed there were liabilities of £1,690, and assets valued at £3,010. A balance sheet was prepared in June, 1924, which showed liabilities to the trade of £2,302, while £137 was owing to the bank. The trading for the period showed a loss of £679, the turnover being £8,112. The deficiency as regarded the shareholders was £3,797, and that figure was accounted for by the depreciation written off the assets in the statement of affairs and the losses on the trading. It was estimated that since July, 1924, there had been a loss of £1,114. Mr. Cork stated that he had continued trading since his appointment as liquidator. He had advertised the businesses for sale, and there was a possibility of something being achieved in that direction, although no definite offers had yet been received. Failing a sale within a reasonable time the business would have to be closed down. Mr. W. A. Roderick said that the large loss had been brought about by the absolute stagnation of business. He thought that the business could be made a success, as there were good contracts which it was anticipated the company would receive. Mr. Cork said that he did not think there was very much in the contracts from the point of view of profits to be earned. The creditors might have been called together some time ago, but apart from that there was nothing to complain about. The books had been well kept. It was resolved to confirm the voluntary liquidation of the company, with Mr. Cork as liquidator, whilst an advisory committee of three of the principal creditors was also appointed. The following are among the creditors:—

	£		£
Cable Accessories Co., Ltd. ...	123	Kodak, Ltd.	77
Credenda Conduits Co., Ltd. ...	68	Morgan Bros.	96
Dorman & Smith, Ltd.	27	Napier-Kimber, Ltd.	40
S. Dawson & Co.	53	Russ, John	29
Dwyer, P. L.	30	Sloan Electrical Co.	34
Edison Swan Electric Co., Ltd.	45	Swansea Corporation	44
Electric Lamp Factors	28	Siemens & English Electric Lamp	
Aster Engineering Co.	39	Co., Ltd.	71
General Electric Co., Ltd. ...	162	Wesley Evans, J.	105
Hay, G. R.	20	West End Electric Co.	20
Jackson Electric Stove Co., Ltd.	29		

E.S. Co., Ltd., electrical and wireless dealers, 233, Tottenham Court Road, W.—A meeting of the creditors of the above was held on August 14th. The chair was occupied by Mr. B. A. Smith, receiver for the debenture holders and liquidator in the voluntary liquidation of the company. A statement of affairs had previously been circulated which showed net assets of £17,764. There were first and second debentures for £34,147. The deficiency as regarded the debenture holders was £16,382, and as regarded the creditors £37,023. The chairman stated that he was appointed as receiver for the debenture holders on June 26th last, and on July 27th the company went into voluntary liquidation. The company had been carrying on business for a good many years, it having been registered in February, 1915. It took over a going concern, but the original shares issued had changed hands. With regard to the recent trading of the company, during the half-year to June, 1921, there was a loss of about £11,000, largely due to a writing down of the stock. During the two following years there were considerable losses, but during the six months to December, 1923, there was a profit of £400, apart from debenture interest. During the half-year to June, 1924, there was a trading loss of £700, and in the next six months there was a small profit. That profit, however, was turned into a loss of £123 by the writing off of bad debts incurred in the previous half-year. There was every reason to hope that by reducing the expenses the company could carry on successfully. During the current year, however, the sales had fallen off considerably. Two creditors issued writs against the company and that precipitated the appointment of a receiver. At that time there were some hopes of a re-organisation of the company taking place, but when the accounts were prepared it was thought that any such venture was hopeless. The issued capital of the company was £5,600, of which £4,703 was issued for cash. As far as he knew £898 worth of shares were issued for a consideration other than cash. He believed those shares were allotted to the vendor in respect of the goodwill of the business taken over. In reply to a question, the chairman said that there was no limitation to the company's borrowing powers.

Mr. Houstoun said the position was that in 1921 the company lost £11,000, and shortly afterwards it was insolvent. He inquired when the second debentures were issued, and what the consideration was. The chairman replied that the first debentures and interest were for £12,397, whilst the second debentures and interest totalled £21,749. All of the debentures were issued for cash. The second debentures were issued in July, 1922. There might have been a debit balance on the profit and loss account when the second debentures were issued. Rather more than £21,000 in fresh money had been paid into the company since that date. All the money obtained was used in the ordinary course of trading.

Mr. Kinnaird, of Messrs. Stanley Evans & Co., the solicitors to the company, pointed out that if the liquidation had taken place at the end of last year the debenture holders would have received 20s. in the £. The company, however, continued, the liabilities to the trade had been reduced by £15,000, and the second debenture holders, including the two directors, could not expect to receive 10s. in the £.

The chairman stated that he was carrying on the business and disposing of the stock at market prices.

Mr. Houstoun mentioned that a petition had been presented for the compulsory liquidation of the company. He proposed a resolution to the effect that the voluntary liquidation should not be confirmed, and this was carried.

Western Engineering Co., Ltd., electrical and mechanical engineers, Liverpool. In voluntary liquidation. The following are creditors:—

	£		£
Downes & Davies	85	Johnson, Clapham & Morris,	
Ellis, W.	47	Ltd.	100
General Electric Co., Ltd. ...	930	Murray, J. A.	18[illegible]
W. T. Henley's Telegraph		Perrin, Hughes & Co., Ltd. ...	30
Works Co., Ltd.	20	Rowe Bros. & Co., Ltd.	3[illegible]
		Smith & Cookson	132

Robins Wholesale Electrical & Wireless Co., Ltd.—Winding up voluntarily. Meeting of creditors held August 19th at the offices of the liquidator, Mr. S. E. Clutterbuck, 31, Queen Street, Cardiff.

Western Wireless Telephones, Ltd.—Winding up voluntarily. Meeting, August 26th, at the office of the liquidator, Mr. W. J. Birch Kempton, 20, North John Street, Liverpool. Particulars of claims were to be sent in by August 19th.

RADIECO, LTD.—A meeting is called for September 11th at the offices of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C.2, to hear an account of the winding-up from the liquidators, Messrs. C. L. Thornton Duff and W. A. J. Osborne

MOSELEY INSTALLATIONS, LTD.—Winding up voluntarily. Liquidator, Mr. C. E. Cowney, 55, Temple Row, Birmingham. A meeting of creditors was to be held on Wednesday last.

THE WATERLOO WIRELESS CO., LTD.—A meeting of members is called for September 16th at A22, Queen Insurance Buildings, 10, Dale Street, Liverpool, to hear an account of the winding up from the liquidator, Mr. R. R. Bailey.

ASSOCIATED ELECTRIC TRADERS, LTD.—Mr. G. D. Pepys, Official Receiver and liquidator of this company, 33, Carey Street, W.C.2, states that the liabilities amount to £5,720, and the estimated assets to £200. It is proposed to pay a first and final dividend, and proofs of debts must reach the liquidator by September 2nd.

Dissolutions of Partnership.—DAFFERN & EDWARDS, electrical heating and sanitary engineers, &c., 10, High Town, Hereford:—Messrs. W. F. Edwards and H. J. Darlow have dissolved partnership. Debts will be attended to and the business carried on by Mr. Edwards.

RALPH NANCE, electrical and consulting engineers, &c., 5, Stuart Street, Bute Docks, Cardiff.—Messrs. R. V. and H. C. Nance have dissolved partnership. Mr. R. V. Nance will attend to debts.

THE NORMAN BAYNTON CO., sellers of electric lamps and accessories, 26, Rathbone Place, Oxford Street, W.—Messrs. C. N. Bradnock and L. S. B. Williams have dissolved partnership. The business will be continued by Mr. Bradnock.

RILEY, RUSSELL & CO., wireless dealers, John Street, Bradford.—Messrs. A. H. Riley and S. A. Russell have dissolved partnership. Mr. Riley will attend to debts.

Private Arrangements.—WILLIAM EDWARDS, trading as Edwards, Sons & Co., electrical and radio dealer, 492, Prescot Road, Old Swan, and 20, Prescot Road, Fairfield, Liverpool.—A meeting of the creditors of the above was held recently, at the offices of Mr. P. S. Booth, accountant and auditor, Liverpool, when a representative of Messrs. Baxendale Bros., Ltd., occupied the chair. A statement of affairs was submitted, which disclosed liabilities of £1,224, of which £1,108 was due to the trade, and there were cash creditors for £117. In addition, there were fully secured creditors for £571, who held security valued at £879, leaving a surplus of £298. The net assets were £1,547, leaving a surplus of £323. It was decided to confirm the deed of assignment already executed in favour of Mr. Booth, while a committee of inspection was also appointed, consisting of the representatives of Messrs. Baxendale Bros., Ltd., Rowe Bros. & Co., Ltd., the General Electric Co., Ltd., Pulford Bros., and Mr. John Airey. The following are creditors :—

	£		£
Baxendale Bros., Ltd.	220	Liverpool Corporation	26
Claremont, Johnson & Co., Ltd.	43	Levy, H., & Son	24
General Electric Co., Ltd. ...	78	Marshall, O. P., & Co., Ltd. ...	31
Holloway, Ltd.	20	Pulford Bros., Ltd.	100
Hamilton & Co., Ltd.	50	Roberts & Co.	20
Longford Insulating Co., Ltd. ...	35	Rowe Bros. & Co., Ltd.	85

Book Notices.—"Electrical Precipitation." By Sir Oliver Lodge, D.Sc., F.R.S. Pp. v+40; figs. 7. London: Humphrey Milford. Price 2s. 6d. net.—This work is a publication in book form of a lecture delivered by the author before the Institute of Physics at the Institution of Electrical Engineers' building, in October last. In the lecture, which was abstracted in the ELECTRICAL REVIEW of November 7th, 1924, the author puts forward a plea for the electrical control of the atmosphere, by assisting natural precipitation artificially. The book is arranged in three parts—natural precipitation, artificial precipitation, and the combination of the two. An appendix is also included, containing some most interesting and useful practical notes on commercial precipitation of dust and fumes.

"The Elimination of Interference from Radio Receiving Apparatus." Air Ministry Publication 1,136. Pp. 8. London: H.M. Stationery Office. Price 2d. net.—With a view to obtaining the best conditions for radio reception, the principles of some of the methods of avoiding interference have been set out, and a summary of 16 possible methods of obtaining relief is given.

"Primer of Costing," by R. J. H. Ryall. Pp. x + 115. London: Sir I. Pitman & Sons, Ltd. Price 5s. net.

"Mercury Arc Rectifiers and Mercury-Vapour Lamps," by J. A. Fleming, M.A., D.Sc., F.R.S. Pp. viii + 100; figs. 44. London: Sir I. Pitman & Sons, Ltd. Price 6s. net.

Catalogues and Lists.—IGRANIC ELECTRIC CO., LTD., 147, Queen Victoria Street, E.C.4.—Pamphlets advertising "Igranic" concert coils and giving reduced prices of honeycomb duolateral coils. Also a chart showing the coils required for the reception of transmissions from British and European stations.

THE HENKERBAK SYNDICATE, LTD., The Hague, Holland.—A pamphlet describing the "Henkerbak" electrical water-heating apparatus.

TOK SWITCHES, LTD., Granville House, Arundel Street, W.C.2.—A blotter bearing a calendar for August advertising "Tok" switches.

MESSRS. FALK, STADELMANN & CO., LTD., 83-87, Farringdon Road, E.C.1.—A three-fold showcard illustrating, in colour, "Efesca" radio components, including headphones, and the "Puravox" loud-speaker.

ELECTRICAL DEVICES, LTD., 18-20, Collingwood Street, Newcastle-on-Tyne.—A comprehensive trade price list of radio apparatus, including complete sets, components, and accessories.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Catalogue Section W (2) containing illustrated details of the "Magnet" wiring system. Fully priced.

ENGINEERING SUPPLIES, LTD., 235a, Blackfriars Road, S.E.1.—An illustrated and priced catalogue of radio components, including geared coil holders, condensers, transformers, filament resistances, &c.

MESSRS. COLEY & SWINNERTON, LTD., St. John's Square, Wolverhampton.—Two illustrated and priced pamphlets dealing with electric cookers.

THE MIDLAND ELECTRIC MANUFACTURING CO., LTD., Barford Street, Birmingham.—An illustrated and priced folder containing details of "Memrex" ironclad switches designed to comply with the I.E.E. regulations for medium-pressure switchgear.

MR. GEORGE ELLISON, Perry Barr, Birmingham.—List No. 161, containing illustrations, details, and dimensions of totally-enclosed, unit type draw-out switchgear for large capacities.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 12th :—

Lightning. No. 459,726. Class 1.—A chemical solution for use in batteries and accumulators. Louis Frederick Ducker, 55, Worple Road, Wimbledon, S.W.19.

Tunion. No. 450,180. Class 8.—Instruments and apparatus for use in wireless telephony. George Turncock, trading as G. Turncock, 41, High Street, Aston, Birmingham.

Astra. No. 448,286. Class 8.—Instruments, apparatus, and contrivances for use in wireless telephony and telegraphy. Charles Teverill Freeman and Frank U. Weldon, trading in co-partnership, 124, Victoria Street, London, S.W.1.

Bess (lettering and design). No. 459,632. Class 8.—Electric batteries and accumulators. William Henry Osborn, trading as the Brighton Electric Supply Stores, 38, Gloucester Road, Brighton.

Radiolys (lettering and design). Class 18. Component parts for wireless receiving sets. Lionel Sidney Alexander, trading as the Wholesale Wireless Co., 103, Farringdon Road, London, E.C.1.

Annual Holidays.—The Gorton and Dukinfield depôts of the Stores Department of the London & North-Eastern Railway will be closed from August 29th to September 14th inclusive. Birkby's works, Liversedge, Yorks., will be closed from Saturday, August 29th, to Sunday, September 7th, inclusive.

Local Exhibitions.—NOTTINGHAM.—An electrical exhibition is to be held in the Drill Hall, Nottingham, from October 8th to 17th next. The arrangements are in the hands of the Electrical Contractors' Association, and the exhibition is receiving the support of the Nottingham Corporation Electricity Committee, the local branch of the E.C.A., and the largest manufacturers in the electrical industry. The exhibition will cover cooking, lighting, heating, power and welding, and its period will coincide with the opening of the Corporation's new power station. The display is being organised by Mr. W. A. Gillott, A.M.I.E.E., and full particulars can be obtained from the secretary of the local branch of the E.C.A., Mr. C. Thompson, Armitage Chambers, Victoria Street, Nottingham.

WAKEFIELD.—The city electrical engineer has been asked to prepare a scheme for an electrical exhibition during the autumn.

YORK.—The Electricity Committee has agreed to take space at the forthcoming Industrial Trades Exhibition, which is to be held in September next, for showing electrical appliances.

MEXBOROUGH.—The Urban Council arranged an electrical exhibition recently, which was opened by Mr. T. Chambers, chairman of the Electricity Committee, and proved very attractive. Well-known firms, as well as the local electrical firms, were the principal exhibitors.

A South Wales Exhibition.—An engineering exhibition organised by the South Wales Institute of Engineers was held at Swansea from August 6th to 15th. A number of leading manufacturers displayed electrical, mining, and metallurgical appliances. The Engineering Department of the University College had an interesting display.

Swiss Import Duties Removed.—It is reported from Zurich that the Swiss Government has recently withdrawn the import restrictions on electric irons and cooking stoves, insulated wires and cables, and incandescent lamps.

Canadian Radio Exhibition.—The Senior Trade Commissioner in Canada (Mr. F. W. Field) reports that the Canadian Exhibition Co., 204, King Street East, Toronto, is holding a radio exhibition at the Windsor Hotel, Montreal, from October 12th to 17th. It is understood that a few exhibit spaces are still available. A copy of the application card for space giving the rules and regulations of the exhibition is available for inspection by interested British firms on application to the Department of Overseas Trade (Room 52), 35, Old Queen Street, S.W.1.

The Moscow Radio Exhibition.—We reported in our last issue that the period of the Radio Exhibition which is being held in Moscow had been extended to September 15th. The Department of Overseas Trade now informs us that a further extension, to November 15th, will be made should the interest shown by foreign firms justify it. Foreign firms may import up to October 1st free of duty any kind of radio material, irrespective of all previous prohibition and are free to sell it after the close of the exhibition. Small articles of any one type may be imported up to the number of twelve, medium sized articles up to six, and large articles up to three. It is understood that amateur receiving sets, for instance, may be imported up to the number of twelve of every different type. The Commercial Secretary at Moscow is of opinion that this is a favourable opportunity for United Kingdom radio firms to introduce their wares to Russia. Although import on a large scale is not likely to be allowed after the exhibition, it is probable that licences will be issued for the import of specific articles, and the merits of exhibits will decide the destiny of such orders as may be placed abroad. Intending exhibitors should communicate with the Soviet Union Trade Delegation, 49, Moorgate Street, E.C.2, as soon as possible, for the duration of the exhibition depends to some extent upon the number of entrants.

The Australian Radio Market.—A correspondent of *The Times Trade and Engineering Supplement* points out that while, in 1923, Great Britain exported radio apparatus to the value of £35,100 to Australia, the United States exported £46,000 worth, and in 1924, due to the abolition of restrictions, the value of American apparatus imported rose to £210,500. The Australian market is big and comparatively undeveloped, and the prospects are favourable, particularly as the Federal Government proposes to reduce the fee for receiving licences. There are at present broadcasting stations in Sydney, Melbourne, and Perth, while a fourth is to be opened in Brisbane.

Radio Patents in Austria.—A warning has lately been issued by the Siemens & Halske Co., of Vienna, against infringement of the "Telefunken" patents in Austria, which are claimed to cover reaction couplings, metal-sealed transformers, amplifying valves for loud-speaker reception, frame aerials, and high- and low-frequency amplifiers.

New Canadian Companies.—Among the recently-formed Canadian companies are the following: The Lighting Company of Ontario, Ltd., capital $25,000, for the manufacture of electrical machinery and appliances; the Chute-à-Caron Power Co., Ltd., to develop the power of the Chute-à-Caron Falls, Quebec; and the Portneuf Power Co., capital $1,000,000, which is to re-build a destroyed dam and supply power in the Portneuf, Quebec, district.

New Belgian Company.—La Compagnie Continentale "Trialmo" is the name of a new company which has lately been formed in Brussels with a capital of 200,000 fr., to manufacture radio apparatus.

New French Company.—A new company has lately been formed in Paris (4, Rue Cambronn) with a capital of 1,700,000 fr. and the title La Société d'Exploitation de la Téléphone Picart et Lebas, to acquire and work the Picart-Lebas telephone patents.

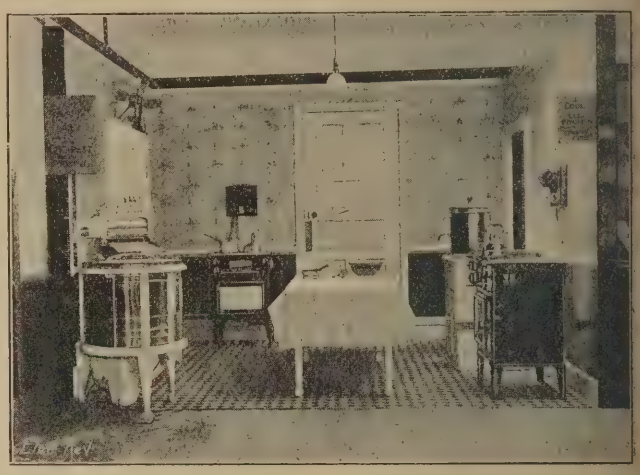
New Indian Companies.—Among the new companies recently formed in connection with electricity supply in India, are the Barisal Electric Industries Co., organised at Barisal, Bengal, with a capital of 500,000 rupees, and the Mangalore Electric Supply Co., at South Kanara, Madras, capital 750,000 rupees.

New Czecho-Slovakian Company.—The "Transforma" Moravian-Slovakian Electrical Construction Co. is the name of a new concern which has lately been formed at Olomoric.

A Report upon Turkey.—Col. H. Woods, O.B.E., the British Commercial Secretary at Constantinople, has recently furnished a report upon the economic and commercial conditions in Turkey (Stationery Office, 1s. 6d.), to the Department of Overseas Trade. There is little of direct electrical interest in the report, but it is stated that the position, generally, is improving and it is thought that the gradual restoration of mutual confidence between Turkey and Europe, once fairly secured, and a consequent improvement in economic legislation would promise a return to more normal conditions. The Director-General of the Customs Administration has announced that he intends to grant every possible facility to trade. In the statistics of foreign trade electrical goods are not shown separately, but under the general heading of "Machinery" it is seen that the imports for the first six months of 1924 were valued at £T2,039,064, as compared with £T1,336,478 for the whole of 1923; the exports were £T54,651, for the first half of 1924 and £T130,863 in 1923. In both the import and export lists Italy occupies the first place, and Great Britain the second. It is pointed out that although Turkey may be a small market she is now one of the few European countries which is obliged to import practically all her manufactured articles, and with a period of peace in which to develop her agricultural and mineral resources, the potential purchasing power of the country should enormously increase. Although the bulk of transactions are for cash with order or against documents, favourable credits are often extended to well-established local firms. The credit given by English and French importers is usually from 30 to 60 days, or 90 days in exceptional cases. German firms have recently commenced to grant credit, but United States firms have so far withheld them. Among the few developments which the report mentions are the construction of a powerful radio station at Angora and the refitting of the Osmanie station near Constantinople, for which tenders have been invited, and the installation of a telephone exchange at Angora, the order having been placed with a Swedish firm. An attempt has been made to introduce broadcasting into Turkey; at present receivers are subject to a Ministry of National Defence permit.

Unemployment.—The number of persons registered as wholly unemployed on August 4th was 1,260,400—an increase of 62,770 on the week, and 180,160 more than in August, 1924. The total included 817,622 men and 194,307 women, the remainder being juveniles.

New Ilford Showrooms.—The Ilford Urban District Council Electricity Supply Department (engineer, Mr. A. H. Shaw) has recently opened new showrooms at Goodmayes. One feature of the new premises is a well arranged kitchen, a view of which appears in the accompanying illustration. Here



The Ilford Council's All-Electric Kitchen.

it will be observed are two patterns of cooker, a combined washing machine and wringer, a water heater, a kettle and a number of other small appliances. The card to the left of the picture indicates that Ilford has a very favourable rate for electric cooking.

The Tokio Underground Railway.—The Tokio correspondent of the Federation of British Industries reports that the Japanese Government has refused to sanction borrowing abroad in connection with the Tokio underground railway scheme, but firms interested in the supply of equipment, &c., should keep in touch with the situation.

American Capital in Italy.—It is reported from Milan that the Banca Commerciale Italiana has sold to the New York banking firm of Blair and Company a large parcel of shares in the Società Idro-Elettrica Piemonte, the American firm in this way getting a first footing in Italy. The Italian company is a trust for the financing of water power development in Upper Italy, which a year ago had a share capital of 120 millions of lire, but has since increased this to 600 millions. It appears that the trust sought to acquire the undertaking of the Negri company of Genoa, in which the Milan Edison company has an interest, but the latter is said to have succeeded in preventing the completion of the transaction, although the shareholders in the Negri company were victorious from a monetary point of view, as they disposed of their shares at high prices to the companies competing for the majority of the shares.

Social Events.—On July 25th the employés of Messrs. A. H. Hunt, Ltd., were the guests of the managing director of the company on a trip to Brighton. The weather was excellent and lunch and tea were provided at the Pavilion, Brighton. There were present at the lunch Messrs. C. H. and A. H. Hunt, F. J. Chamberlain (general manager), and E. A. Baggaley (works manager). On the previous day the company's annual travellers' conference was held at Croydon.

The annual gala and sports of the Chloride Electrical Storage Co., Ltd., were held at Clifton Junction on August 8th. A number of interesting side-shows were arranged.

American Company's Foreign Subsidiary Sold.—An *Exchange Telegraph* message from New York says that the Western Electric Co., which has maintained many foreign branches, and is interested in some factories, particularly in Japan and China, has announced the sale of its foreign subsidiary to the International Telephone and Telegraph Co. The Western Electric had partial ownership of plants in London, Paris, Vienna, Budapest, Barcelona, Milan, Tokio, and Peking. The purchasing company will make improvements, including the extension of its system to the principal cities of Mexico.

German Commerce and Industry in July.—The Commercial Secretary at Berlin (Mr. J. W. F. Thelwall) has forwarded to the Department of Overseas Trade a review, based on the reports of the Prussian Chambers of Commerce, of the commercial and industrial situation in Germany during July. He says that there was no improvement in the general economic situation; on the contrary, the sales crisis became more acute, and affected still further branches of economic life. The reasons for the increasing sale difficulties are to be sought chiefly in the great shortage of capital, with the result that more and more delay takes place in the settlement of accounts. Further, the home market is in many cases influenced by the still deferred final settlement of the tax and Customs legislation. The position of the iron industry became more unfavourable. Scarcely any inland or foreign orders were to be had, and prices everywhere declined further. In view of the unfavourable market situation, the Raw Steel Association decided to restrict the production of raw steel for July by 25 per cent. of the participation figure. Foreign trade was very slack. Under the pressure of French and Belgian competition, export prices receded further, and for German conditions reached an intolerably low level. In the electrotechnical industry a decline in orders, in part considerable, was recorded. This applied specially to foreign orders, as the powers of competition of German firms diminished further. The renewed advance in the price of raw and half-finished products, together with the increase in wages and salaries provided for by an arbitration award, will adversely affect business also in August.

For Sale.—The London and North-Eastern Railway invites offers for the purchase of plant at the power house, Immingham Dock, Lincolnshire. (See our advertisement pages to-day.)

CORRECTION.—We regret that an error occurred in the Hull Corporation's advertisement regarding the disposal of a steam turbo-alternator, which appeared in our last issue (Supplement, p. 26). The phrase "5,500 S.V.T." should have read "550 deg. S.V.T."

Turkish Import Duty Remitted.—The Turkish Government has ordered the exemption from Customs duties of certain medical apparatus, &c. Among them are X-ray equipment and accessories (including dynamos and motors).

Tasmanian Water Power Contract.—It is reported that the Armstrong, Whitworth Pty., Ltd., has received a contract for the extension of the Great Lake hydro-electric scheme, which will increase the capacity from 63,000 to 75,000 h.p., at a cost of £114,000.

Guatemalan Street Railway Concession.—The municipal authorities of the City of Guatemala have intimated their willingness to consider new offers for a street-railway concession.

Lighting and Power Notes.

Accrington.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer, Mr. A. W. Clegg) for the year ended March 31st last, show a total income of £76,179, and working expenditure of £39,404: the gross profit was thus £36,774. The previous year's figures were: Income, £74,372; working expenses, £37,863; gross profit, £36,509. To the gross profit was added £155, dividend on war loan, making a total of £36,930. Of this amount, interest and sinking fund charges absorbed £23,263, leaving a net surplus of £13,667 (£12,839), which was carried to appropriation account. A contribution of £2,000 was made to the borough fund. The capital expenditure during the year, which included £19,052 for machinery and £13,643 for mains, amounted to £33,690. The sales of electrical energy increased from 12,192,870 kWh to 13,901,583 kWh, and the average price per kWh obtained fell from 1.459d. to 1,310d. The maximum supply demanded rose from 7,000 to 7,400 kW.

Australia.—VICTORIA.—The Victorian Electricity Commission is considering plans for providing further generating plant to deal with the increasing demand. Preparations are being made for developing hydro-electric power from the Goulburn and its tributaries in the Sugarloaf district. This scheme involves laying down seven small hydro-electric stations. It is estimated that by 1928 the demand will be such that still further power will be required. The Commission is considering three alternatives: Developing the Kiewa hydro-electric scheme in north-eastern Victoria, extending the Yallourn scheme, and extending the Newport power house.—*Electrical Engineer of Australia and New Zealand.*

Blean.—OPPOSITION TO ORDER WITHDRAWN.—With reference to the application of Messrs. Hunt & Sons, of Herne Bay, for an order to supply electricity in the district, the Rural District Council has now consented to withdraw its objection on receiving a satisfactory undertaking that the charges for electricity will not be more than those quoted at the recent inquiry.

Brazil.—ELECTRICAL DEVELOPMENT.—The Government of the State of Rio de Janeiro has signed a contract with the Rio de Janeiro Tramway, Light and Power Co., authorising the supply of electricity to the towns of Campos, Macahe and Sao Joao da Barra.—*Reuter's Trade Service* (Rio de Janeiro).

Continental. — FRANCE. — In order to meet increasing demands the Société Nantaise d'Eclairage et de Force par d'Electricité has recently commenced the erection of a new transmission line between Nantes and Cholet. The line, although designed to work at 120,000 V, will at first be worked at 60,000 V. A feature of the line is that it will cross the river Loire by a single span of 984 ft., and be supported on masts about 310 ft. in height.

STYRIA.—Work has commenced on the construction of two large hydro-electric stations between Bruck-an-der-Mur and Mixnitz, which is expected to occupy three or four years.

SWITZERLAND.—The Nordost-Schweizerischen Kraftwerke, in conjunction with the Motor Columbus Gesellschaft of Baden, has plans in hand for a new hydro-electric station at Niederschworstadt.

SPAIN.—*Commerce Reports* states that the Hydroelectrica Espanola, which furnishes Madrid with power, reports the production of energy during the year 1924 at 220,000,000 kWh, a considerable increase over the output during 1923. At the end of the year the new installation at the falls of the Jucar River was put into commission; its capacity is 3,200 kW. The new turbo-generator in the central power house of Madrid was completed in October, increasing the total capacity of the company's plants in Madrid to 22,600 kW.

Dartford.—ELECTRICITY SUPPLY.—The West Kent Electric Co., Ltd., has informed the Rural District Council that it is carrying out extensive works in connection with the laying of mains for the supply of electricity to Stone and Swanscombe at an expenditure of over £250,000, and the works are due for completion by the end of 1925. The company added that it was opposing the application for additional powers put forward by Gravesend and Dartford Town Councils, and asked for the Council's support. The Council has decided to oppose the application and to be represented at the inquiry.

Dewsbury.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £2,685 for the supply of electricity in the Shaw Cross and Leeds Road areas, and £1,000 for mains for supply to Thornhill Lees.

East Ham.—YEAR'S WORKING.—The report on the working of the Borough Council's electricity undertaking (engineer, Mr. W. R. Elliott) for the year ended March 31st last, records a total revenue of £87,574, as compared with £81,527 in the preceding year. Working expenses were £61,968, as against £53,509, leaving a gross profit of £25,606 (£28,018); to this was added £8,601, brought forward, and bank interest of £183, making a total of £34,389, which was distributed as follows:—Interest on loans, £4,281; income tax, £3,154; contributions to sinking fund, £5,367; loan repayment, £2,976; contributions to capital expenditure, £9,196; rate relief, £7,918; depreciation and renewals fund, £683; balance carried forward, £815. The capital expenditure during the year amounted to £32,388, the bulk of which was expended on machinery and cables. The sales of electrical energy increased from 5,966,439 to 6,697,884 kWh, and the maximum supply demanded from 3,135 to 3,444 kW. The average price per kWh obtained fell from 3.19d. to 3.028d. During the year two new 1,000-kW motor converters were installed and one of the original 225-kW horizontal steam sets was displaced.

Edinburgh.—EXTENSION OF ELECTRICITY WORKS.—The Town Council has approved the recommendation of the Electricity Committee to extend Portobello power station to meet the increased amount of electricity which will be required in the winter of 1927. The report prepared by Mr. Edwin Seddon, engineer and manager, shows that the building extensions, required to provide for two 25,000-kW sets, are estimated to cost £200,000; one 25,000-kW set, complete with condensing plant, £100,000; pumping plant and cooling water pipework, £10,000; four boilers, complete with mechanical stokers, steel chimneys, &c., £90,000; coal and ash plant, £12,000. The total estimated cost is £434,500, and it was reported at the last Council meeting that the Electricity Commissioners were prepared to sanction the borrowing of £465,120 for the purposes of the electricity undertaking.

PURCHASE OF COOKERS.—On the recommendation of the Electricity Committee, the Town Council has agreed to purchase 100 electric cookers.

Holmfirth.—PURCHASE OF DOMESTIC APPLIANCES.—The Urban District Council is applying for sanction to borrow £1,000 for the purchase of electrical domestic appliances to be let out on hire.

Irish Free State.—CLONMEL (CO. TIPPERARY).—It is expected that the Corporation's electricity scheme will be completed and a supply available at the end of the present month.

SKIBBEREEN (CO. CORK).—At a recent meeting of the Urban District Council it was decided to write to the Skibbereen Electric Lighting Co. to arrange a conference with the Urban Council on the question of an electricity supply for the town.

Ilford.—LOAN.—The Electricity Committee is applying for sanction to borrow £6,700 for the erection and equipment of a sub-station at Gants Hill.

Japan.—TOKIO.—According to *Eastern Engineering*, the city authorities are planning an improved lighting system as a part of the reconstruction programme for Tokio. According to this plan, it is proposed to light 635 miles of thoroughfares with 40,000 lamp standards at a cost of y.2,000,000. The maintenance is estimated at y.600,000 per annum. The main streets will be lighted by 500-watt lamps and the less-frequented thoroughfares by 400- and 300-watt lamps.

London.—Joint Electricity Authority.—The Minister of Labour has given notice that after August 29th he will designate to the Electricity Commissioners, in accordance with the London and Home Counties Electricity District Order, 1925, the employés' organisations having members in the employment of authorised undertakers in the district, in order that the organisations so designated may choose two representatives of persons employed in connection with the supply of electricity in the district to be members of the Joint Authority. Any employés' organisation which is desirous of being considered under the Order should make application to the Minister not later than August 29th on the form provided for the purpose, copies of which may be obtained from the Secretary, Ministry of Labour, Montagu House, Whitehall, London, S.W.1.

Morocco.—Electrical Development.—Considerable development in electrical distribution is taking place in Morocco. The Société de l'Energie du Maroc is now operating three steam turbo-generators at its Roches Noires station in Casablanca. The station is now supplying current at 5,500 V to the Société Marocaine de Distribution, and the company has also erected a 60,000-V transmission line between Casablanca and Rabat. A similar line is being established from the first-named town to Kourrigha, while others are projected between Sidi-el-Aidi and Sidi-Machoil and between Rabat and Kenitra. It is also proposed to extend the electricity supply to the Setfat and Fedhala districts.

Northern Ireland.—Aughnacloy (Co. Tyrone).—The Town Council has considered an offer of Messrs. Curran, Belfast, to introduce electricity for public lighting and has decided to ask for details of the proposed scheme.

North-West Riding Area.—Arising out of newspaper notices of the recent conference of various local authorities in the north-western area of the West Riding (Aire and Calder) Electricity District, convened by the Keighley Corporation, to consider possibilities of joint action for the supply of electricity in the area, the Oxenhope District Council, last week, received a letter from the Yorkshire Electric Power Co., drawing attention to that company's developments in the area and offering proposals jointly with its associated company, the Electrical Distribution of Yorkshire, Ltd. After a lengthy discussion in private, the Council postponed consideration of the matter for a month, with instructions to the Clerk to ascertain from Keighley Corporation in the meantime what its intentions were with regard to Ovenhope.

Oswestry.—Electricity Supply.—The Town Council recently approved a recommendation that the North Wales Power Co. be given authority to erect in the borough a transmission line for a supply of electricity from Ruabon, providing the company satisfied the Council that it would be impracticable to lay the line underground.

Peterborough.—Electricity Extensions.—The Corporation proposes to carry out extensions at the city electricity generating station at a cost of £99,200.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Mirfield.—Lighting: From 6d. to 5½d. per kWh. Power, heating and cooking: First 1,000 kWh per quarter from 2½d. to 2d. per kWh; beyond that amount, 1½d.

Dewsbury.—Lighting: Sliding scale, varying from 5d. per kWh for the first 250 kWh per half-year to 4¼d. for over 1,250 kWh; maximum demand system, from 7½d. and 4d. per kWh to 7d. and 3½d. per kWh. Power: Maximum demand system, from 3½d. and ¾d. per kWh to 3¼d. and ⅝d. per kWh.

Maidenhead.—Power: From 2½d. to 2d. per kWh.

Tunbridge Wells.—Lighting: From 5½d. to 4½d. per kWh. Power, heating and cooking: From 1½d. to 1d. per kWh. New alternative domestic rate of 18s. per annum for each living room and hall, and 6s. per annum for other rooms, plus ¾d. per kWh for electricity consumed. Extended shop-window lighting with time switch, 1d. per kWh, plus 5s. per quarter for time switch hire.

Rochdale.—Proposed Change-over.—The Corporation has given notice of its intention to apply for consent to change its system of electricity supply from 3-wire d.c. 440 and 220 V to 4-wire a.c., 3-phase, 50 periods, 440 V between phases and 230 V between phase and neutral.

Sheffield.—Mains Extensions.—The Electric Supply Committee has approved extensions of mains for general distribution purposes, at an estimated cost of £24,961, and extensions and works at a cost of £21,667.

South Africa. — Queenstown. — According to the *South African Power Engineer*, the consulting engineer to the Municipal Council, Mr. A. E. Val Davis, has submitted a scheme for the erection of a new power station to take the place of the existing station which is not now capable of dealing with the increasing demand. It is recommended that the new station should contain two new 250-kW steam alternators, and in addition the two 75-kW sets at present in use at the existing station. Two new water-tube boilers, fitted with mechanical stokers, are also proposed. The cost of the proposed extensions is estimated at £29,330, and the remaining value of the present undertaking at £24,862.

Silsden (Yorks.).—Application for Order.—The Urban District Council is applying for an Electricity Order in respect of its area.

Stretford.—New Sub-Stations.—The Electricity Committee is to erect a new sub-station in the neighbourhood of Skerton Road, Old Trafford, to cope with the increasing demand for power in that area, at an estimated cost of £4,000, and a new sub-station in the vicinity of the junction of Warwick and King's Roads to supply the Council's new housing schemes at Gorse Hill, &c., at an estimated cost, including distribution cables and services for the housing scheme, of £5,000.

Tonbridge. — Electricity Order. — The Urban District Council has agreed, subject to obtaining a bulk supply of electricity from Tunbridge Wells, to apply for Fringe Orders to supply electricity to the parishes of Leigh and Hildenborough.

Uruguay.—Hydro-electric Development.—The possibility of developing the hydro-electric resources of the Rio Negro has again received the attention of the National Administrative Council, and it is probable that engineering companies of the world will be requested to submit estimates of charges for making a complete study of the hydro-electric resources of the river and for preparing definite plans and cost figures.—*Commerce Reports.*

Warwickshire.—Electricity Supply.—The *Birmingham Post* states that it is officially announced that the application of the Barford Electric Supply Co., Ltd., for an Order to supply electricity to a number of villages in South Warwickshire has been refused by the Electricity Commissioners. Statutory powers have been given to the Leamington and Warwick Electrical Co., which was the competing applicant.

Whitehaven.—Loans.—The Town Council has applied for sanction to loans amounting to £7,790, made up as follows:—Mains extensions, Arrowthwaite housing site, £3,790; meters, £1,500; services, £2,500.

Tramway and Railway Notes.

Continental.—Bulgaria.—The first electric railway in Bulgaria has recently been completed and put in operation between Sofia and Kniajevo.

East Ham. — Year's Working. — The accounts of the Borough Council's tramway undertaking (manager, Mr. W. R. Elliott) for the year ended March 31st last, show that the total revenue was £81,292, as compared with £78,316 in 1923-24. Operating costs increased from £89,969 to £96,061, leaving a gross deficit of £14,769 (£11,653). After meeting capital charges and special expenditure out of revenue, there was a net deficit of £42,889, as compared with a deficit of £35,673 in the preceding year. The capital expenditure during the year, which included £12,691 for permanent way, amounted to £14,814. The number of passengers carried increased from 15,342,953 to 15,987,284, and the car miles run from 1,483,256 to 1,568,102. The revenue per car mile fell from 12.46d. to 12.33d.

London.—New Oxford Circus Station.—The new booking hall below the street level at Oxford Circus station was opened to the traffic of both the Bakerloo and Central London lines on August 16th. Eight passimeters have been installed.

Manchester.—New Route.—The Corporation is to construct three miles of tramway track along Kingsway.

Rochdale.—Loan.—In connection with the Town Council's share of the purchase price of the Middleton tramways and the cost of linking up with the local system at Sudden, application is being made for sanction to the borrowing of £11,150.

South Africa.—Railway Electrification.—In connection with the electrification of the Natal main line, the position at the end of May, 1925, was as follows:—Four of the five 12,000-kW turbo-generators in the engine room of Colenso power station were in commission, and the erection of generator No. 5 was nearing completion. Five of the eight boilers were in commission, four of the five circulating-water pumps were in operation, and No. 2 station transformer had been placed in service. With the exception of connections to the transformers at Lidgetton, Cedara, and Pietermaritzburg, all work on outdoor sub-stations had been completed, and the connecting of cables in the sub-stations at Nottingham Road, Lidgetton, Cedara, and Pietermaritzburg was proceeding. All work, including the affixing of anti-climbing devices to the towers, had been completed in connection with the erection of the 88,000-V transmission lines between Pietermaritzburg and Glencoe. The erection of 72 electric locomotive units at Pietermaritzburg had been completed, and a further five were in course of erection.—*South African Railways and Harbours Magazine.*

South Shields.—Year's Working.—The report of the general manager and engineer of the Corporation tramway undertaking for the year ended March 31st last records a total income of £86,513, as compared with £82,903 in the preceding year. Working expenses were lower by £562 at £69,456, leaving a gross surplus of £17,056 (£12,884). After providing for capital charges a balance of £1,679 remained. There was, however, a deficit of £3,942 on the motor-omnibus system, the net result for the whole of the undertaking being a deficit of £2,262. The number of passengers carried increased from 18,125,830 to 18,668,095 ('buses 527,195), and the car miles run from 1,214,451 to 1,230,260 ('buses 97,794). The average traffic revenue per car mile increased from 16.08d. to 17.393d.

The Southern Railway Electrification.—III.*

High- and Low-Pressure Cable Systems and Sub-Station Equipment.

THE inauguration of various sections of the extended suburban lines electrification scheme of the Southern Railway marks a new phase in passenger transport facilities south of the River Thames. The first section embraces that portion of the former L.B. & S.C. Railway from Balham to Coulsdon North, and from Selhurst and Norwood Junction to Sutton, a total single track of 82 miles.

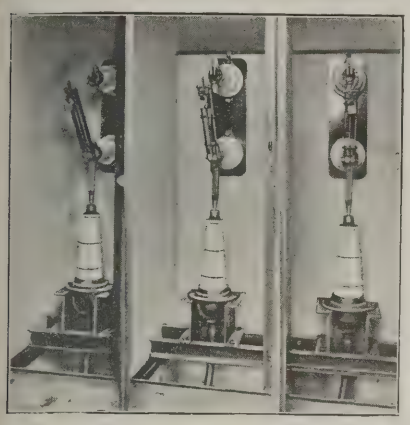


Fig. 1.—J. & P. 33,000-V Isolating Switches.



Fig. 2.—Cable Troughing along Line; 33,000 V.

Sutton and Coulsdon Extension.—Electricity is delivered by the London Electric Supply Co. at New Cross Gate at 6,700 volts, 25 cycles, single-phase, and is there stepped up to 64,000 volts by two 5,000-kVA transformers, with the centre point earthed. The power is thence transmitted by two single-phase circuits composed of four single-core, 33,000-volt, 0.25 sq. in., lead-covered cables which pass through an isolating cabin at Sydenham, containing cable potheads and isolating switches only, as shown in fig. 1, and terminating at the Gloucester Road Junction (Croydon) B.T.-H. switch cabin, where the pressure is again reduced by G.E.C. transformers to 6,700 V for distribution through an operating switch cabin, feeding the overhead conductors from which the trains collect current by pantographs.

The h.p. cables were supplied and laid by Messrs. Johnson & Phillips, Ltd., in addition to several miles of 0.5 sq. in. concentric 11,000-volt cable, running along the South London line from the Peckham Rye switch cabin, which supplies the previously electrified area, to Battersea Park. This cable at present operates at 6,700 volts and boosts the New Cross-Croydon transmission line, *via* Battersea Park and Balham Junction. Both the high- and medium-pressure cables are laid in wooden troughing, fig. 2, or earthenware ducts securely anchored, while fig. 3 indicates that each joint is bonded by means of a copper strand carried to an earth coil. Fig. 4 is a view of single-phase, 33,000-V joints in a manhole, and fig. 5 shows a van containing a 120,000-volt Delon testing outfit that derives its low-pressure from the S.R. testing car to which it is coupled; the 3-core cable to be seen in the foreground was being used as a condenser.



Fig. 5.—Delon 120,000-V Cable Testing Plant.



Fig. 6.—J. & P. Feeder Cable along Line; 11,000 V.

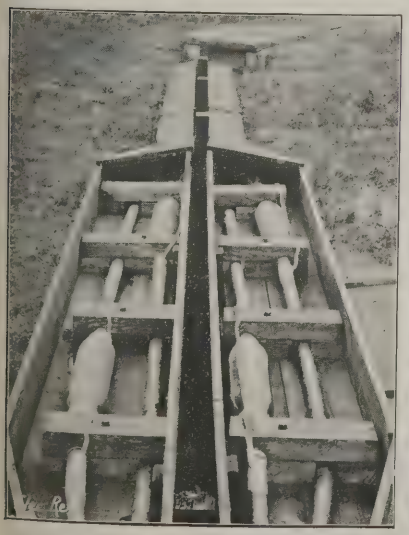


Fig. 3.—Cable Joints and Bonding.

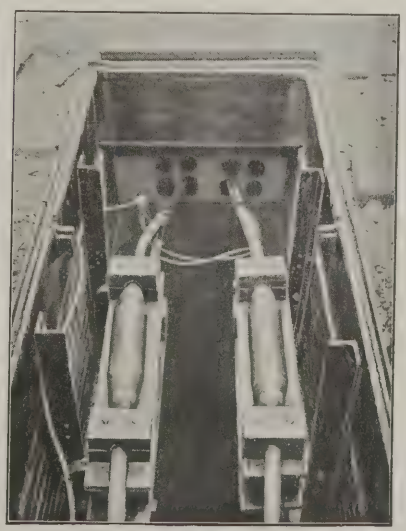


Fig. 4.—Single-phase 33,000-V Cable Joint.

The conversion of the Brighton section has involved the installation of 15 sub-stations, or switch cabins, suitably disposed along the track. The trains are fed from overhead trolley or contact lines, which are sectionalised in accordance with usual practice, each section being supplied from its switch cabin. The switchgear equipment, supplied by the British Thomson-Houston Co., Ltd., is in all instances on similar lines, with modifications depending on the number of tracks supplied, density of traffic, and consequent variation in the chance of heavy overloads or short circuits occurring, importance of section, &c.

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*ELEC. REV., April 10th and June 5th, 1925.

In all cases switching is effected by oil-immersed circuit breakers installed in cubicles of brick and stone; oxide-film lightning arresters are provided, and the current transformers are used as through insulators between the top and bottom chambers of the cells.

The sub-stations at Peckham Junction, Tulse Hill, and Gloucester Road will usually have operators in attendance, but the remaining switch cabins will not be attended under normal conditions. The oil circuit breakers are direct hand-operated in some cases and automatically-operated in others, in the latter case transformer-operated trips being provided. All automatic breakers are arranged to ring an alarm bell when



Fig. 7.—Cable Paying-out Train at Chislehurst.

they open, and an indicator informs the attendant which switch has operated in the case of the attended stations, but in the other cases the bell is in the nearest signal cabin. Special interlocking is also provided in connection with the protective equipment to enable testing and repairs to the contact lines, &c., to be carried out in safety.

At Peckham Junction, Tulse Hill, and Gloucester Road reactors are provided; should a fault occur on the contact lines, switches in parallel with the reactors will automatically open so that the contact lines will be fed through the reactors, thus affording a chance for the fault to clear itself by the automatic reduction of the

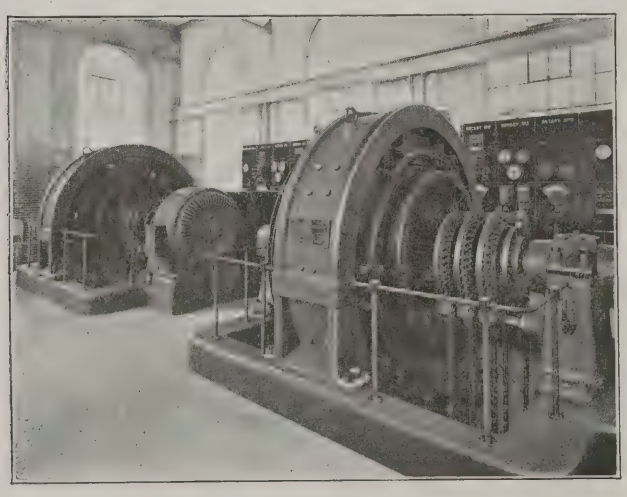


Fig. 8.—G.E.C. Barnehurst Sub-station; A.C. Side.

line voltage. Should this not take place, the oil circuit breaker will automatically open after a time interval.

In addition to various protective features, there is a main "potential block protective system"; the track is divided into sections, all the overhead trolley wires for the up and down tracks for one section being paralleled at both ends on the sub-station bus-bars through the trolley feeder equipment. Each section is fed at one end only through a group feeder equipment, but may at the other end be connected to a similar end of another section through an automatic bus-coupler. The group feeder equipments consist of two oil breakers, one of which short circuits a reactor, which at 6,700 volts will limit a fault current to 1,800 amp. maximum, and it is considered that the minimum fault current which can be dealt with as a fault would be approximately 0.6 times this, or 1,080 amperes. The maximum number of trolley lines in parallel for the purpose of considering fault isolation is four, so that the medium fault current per trolley feeder is a quarter of 1,080 amperes, namely, 270 amps.; this figure is less than the normal rating of the trolley feeders, which are provided with current transformers of 400 :5 amperes ratio. In order to prevent the overload relays from tripping the switch

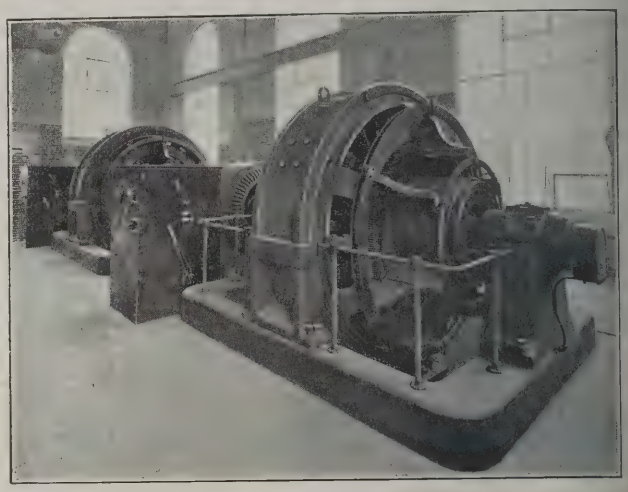


Fig. 9.—D.C. Side of G.E.C. Rotary Converters.

under normal circumstances, "potential block relays" are fitted which short circuit the automatic features of the feeder switches so long as the voltage of the system remains normal, or above, say, 3,800 volts; however, the most important point is that the contacts shall close with the voltage rising from zero to between 4,000 and 4,500 volts, the latter figure being more desirable. The relays are fitted with a dashpot time lag which operates as the contacts open, but not as they are

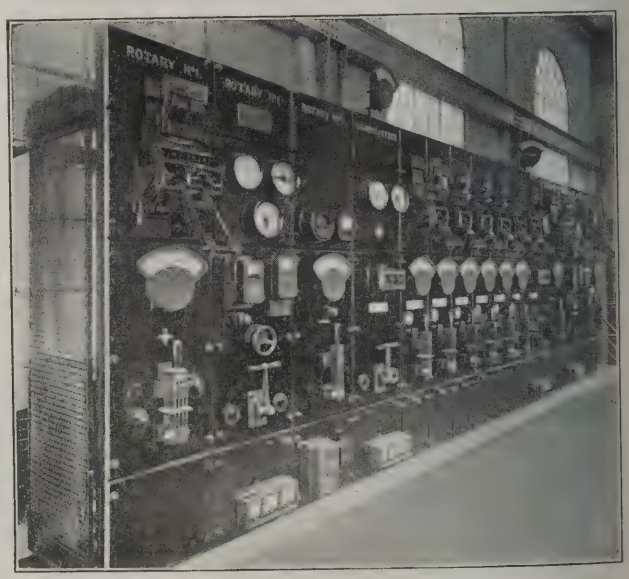


Fig. 10.—Dartford Sub-station; G.E.C. Control Board.

closing, and prevents operation due to momentary overloads opening the reactor switch, and also gives time for the automatic switches on trains to operate before restoring the automatic features of the trolley feeders.

When a fault occurs on a trolley feeder system the reactor switch supplying that section will trip, and if the section is coupled to the adjacent section through an automatic bus-coupler, the setting on this switch should be such that it will trip also. After a short interval due to the induction relay on the group series switch, the latter switch will trip, thus isolating the whole section. With all potential removed, the "potential block"

relays will open and restore the automatic features to the trolley feeder switches. When the operator in the main distributing cabin is warned that a fault has occurred by the opening of the two group feeder switches and the consequent ringing of the alarm bell, he will close the group switch, at the same time short-circuiting its automatic features by means of the pull-button switches.



Fig. 11.—G.E.C. Oil Breaker Cubicles.

The S.E. & C. Section.—For the conversion of the South-Eastern and Chatham section, Messrs. Johnson and Phillips are supplying, laying, and jointing over 25 miles of 0.25, 0.15, and 0.1 sq. in. three-core, 11,000-volt, paper-insulated, lead-covered, single wire-armoured and served feeder cable, which is carried on short concrete posts alongside the track, as indicated in fig. 6. For station lighting and signalling purposes the

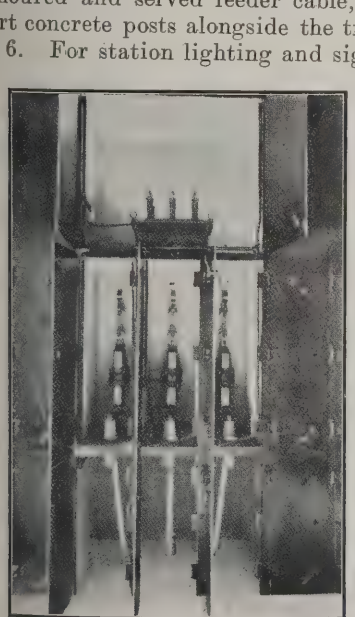


Fig. 12.—Instrument Transformers in Stonework Cells.

company is installing approximately 55 miles of 0.15, 0.1, 0.0225, and 0.06 sq. in. 3,300-volt concentric cable, paper insulated, lead covered, single wire-armoured and served. The cable contract was placed with Messrs. Johnson & Phillips, Ltd., who sublet 25 per cent. of the manufacture to each of the following firms:—Callender's Cable & Construction Co., Ltd.; the Pirelli-General Cable Works, Ltd.; and Siemens Bros. & Co., Ltd., this S.E. & C.R. cable contract as a whole being claimed to be the largest ever placed in connection with railway electrification. Fig. 7 illustrates a cable paying-out train at the entrance to Chislehurst tunnel; the 11,000-V, 3-core, 0.1 sq. in. cable is shown on two drums weighing 9½ tons gross, each drum carrying 634 yards, and the cable was laid through the tunnel without a joint. In stations, under and over bridges, &c., the cable has been laid in bitumen-filled troughing or drawn into fibre conduit, while for the Deptford Creek crossing a length of submarine cable was used.

On the three routes between Victoria, Holborn Viaduct, St. Paul's and the Crystal Palace and Orpington, *via* Catford, and also Herne Hill, electrical operation commenced on July 12th. The London Electric Supply Corporation, Ltd., delivers electricity from its Deptford generating station to the railway's main sub-station at Lewisham by seven 0.25 sq. in., 11,000-V feeders. Power is thence distributed to 19 sub-stations by duplicate 11,000-V, paper-insulated, lead-covered, and single-wire armoured cables. The switchgear and metering equipment is by the Metropolitan-Vickers Electrical Co., Ltd. The S.E. & C. section is operated on the d.c., 660-volt, third-rail system, and the Lewisham sub-station contains also rotary converters, in addition to three 400-kVA frequency changers, manufactured by the English Electric Co., Ltd., for supplying single-phase, 75-cycle energy for signalling and lighting circuits.

The twenty d.c. sub-stations contain 25-cycle, 11,000-V, 3-phase switchgear and transformers, fifty 1,500-kVA rotary converters, and the necessary 660-V d.c. switchboards. In addition, five of the outlying sub-stations contain duplicate 10-kVA frequency converters for supplying the local signalling circuits. Seven of the sub-stations have been equipped by the English Electric Co., Ltd.; they contain 19 rotary converters, each of 1,500 kW and 500 r.p.m.

The contract entrusted to the General Electric Co., Ltd., included the equipment of eight sub-stations containing 16 converter sets. Each sub-station, one of which is illustrated in figs. 8 to 12, houses two 1,500-kW rotary converters, six-phase, compound-wound, with transformers and a.c. and d.c. switchgear. The G.E.C. also supplied the cable work inside the sub-stations and batteries for the trip coils, &c., complete with rectifiers and switchgear for charging purposes. The specification required that each

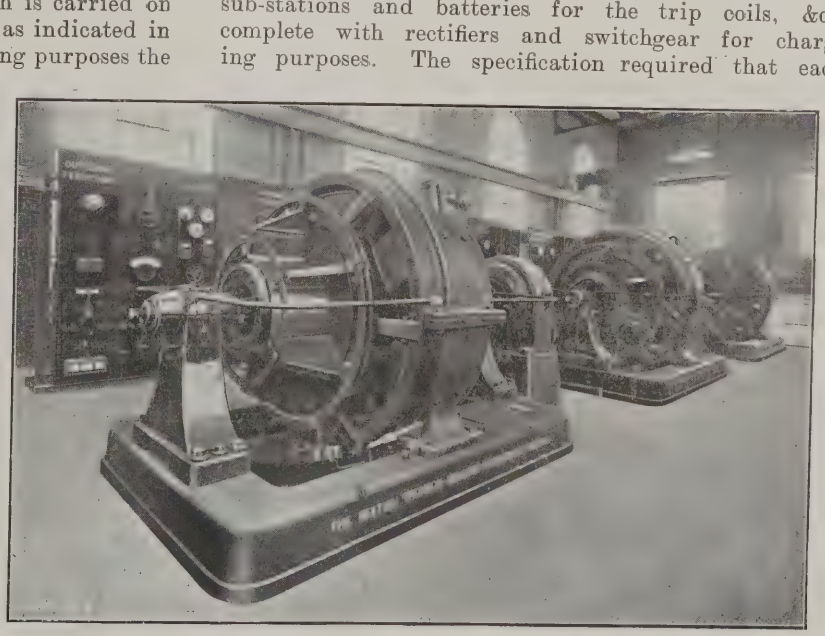


Fig. 13.—D.C. Ends of B.T.-H. Rotaries; Catford Bridge Sub-station.

should withstand a load of 4,500 kW, *i.e.*, 200 per cent. overload for 10 seconds. The machines were actually tested in the presence of the railway company's engineer for 25 seconds on this load, and during the preliminary trial the load was increased to 11,000 amperes without severe sparking, which represents an actual load of over 7,000 kW, and the following efficiency results were

obtained on test:—Efficiency at full load, 96.26 per cent., and at half load 94.65 per cent. As the load on traction rotaries necessarily varies, it is of importance that their efficiency at half load should be high. The converters operate in conjunction with self-synchronising gear.

The starting pillars (fig. 8) are mounted on the floor close to the rotaries, and in place of the usual open type of panel all the apparatus is enclosed in a black enamelled steel-plate pillar with hinged doors. The switches are provided with external handles, and the synchronising choke coils are mounted in the basement below. The e.h.p. switchgear is in moulded-stone cubicles in the basement, with operating mechanism and instruments mounted on panels to form an integral portion of the l.p. switchboard on the floor above.

Each incoming or outgoing feeder and main transformer cubicle is fitted with a mechanically remote-controlled type V.T. 3-phase oil circuit breaker, having a maximum breaking capacity of 200,000 kVA and a

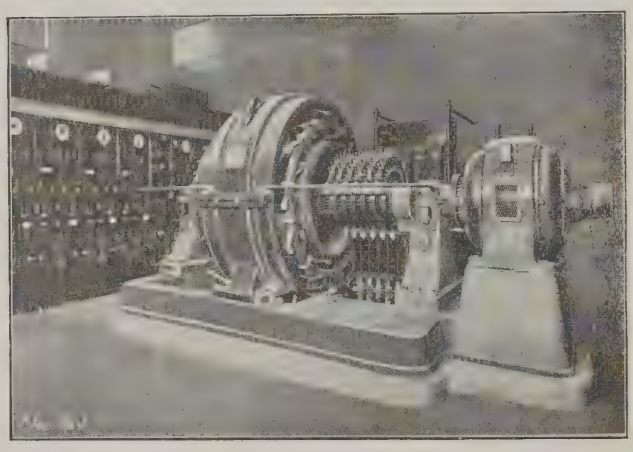


Fig. 14.—B.T.-H. Single-unit Sub-station at Dorking.

separate steel tank for each phase. The cubicles are arranged with the bus-bars in two sections, which can be separated by isolating links when desired, the various feeders and transformer circuits being divided between the two sections.

The d.c. switchgear and a.c. operating panels are on the main floor of the sub-station and arranged as one complete board. The circuit breakers on the d.c. panels are of the new G.E.C. type, whilst the d.c. watt-hour meters were made at the G.E.C. associated Chamberlain and Hookham works.

The complete equipment of the five three-unit sub-stations, one of which is illustrated in figs. 13, 15, and 16, has been provided by the British Thomson-Houston Co., Ltd., and, in addition, the order for feeder-protective apparatus and battery-charging equipment throughout the whole system was entrusted to this company. The three self-synchronising rotary converters in each sub-station have a normal rating of 1,500 kW and run at a speed of 500 r.p.m. They are designed to stands overloads of 25 per cent. for two hours and 150 per cent. for 20 seconds, being guaranteed also to stand a momentary load of four times full load without flashing-over. Induction-motor starting is used, and the rotaries are synchronised in less than 40 seconds, the starting current being approximately 30 per cent. of the full-load

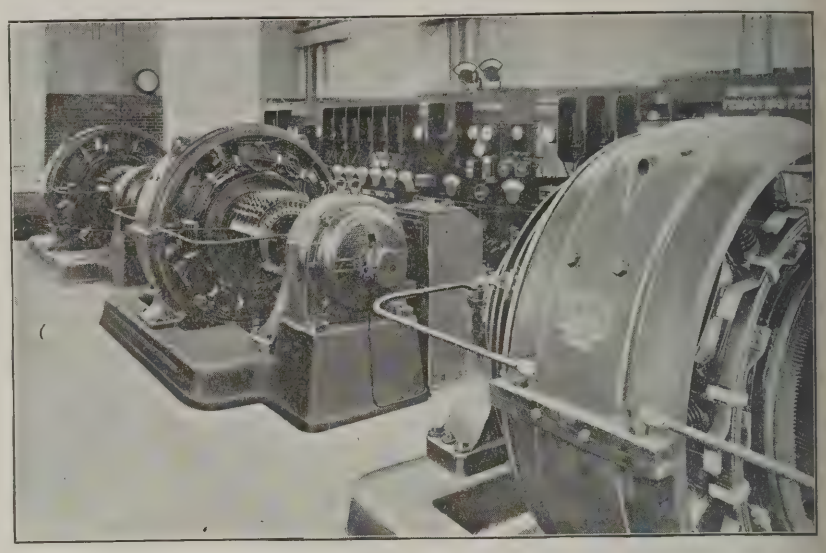


Fig. 15.—A.C. Ends of B.T.-H. Rotaries; Catford Bridge Sub-station.

current. The switchgear is of the cubicle type; except at the Holborn sub-station, the equipment is arranged on two floors, the 11,000-volt switchgear cubicles and outdoor-type oil-immersed transformers being on the ground floor, and the switchgear-operating and metering panels, rotary converters, and starting cubicles on the first floor. The h.p. cables are paper insulated, lead covered, and wire armoured, and each e.h.p. feeder equipment is provided with a set of current transformers for operating the balanced-current protective gear, these transformers being independent of those used for the overload protection and instruments.

The three-phase oil circuit breakers have a breaking capacity rated at 180,000 kVA, and the e.h.p. bus-bars are sectionalised by rotary isolating switches fitted with earth contacts, enabling the whole of one section of the switchgear to be shut down. On the d.c. side the traction feeder panels form an extension of the a.c. switchboard on the first floor, while the positive and negative rotary control panels are placed on either side of the machine transformer feeder panel. The rating of each machine d.c. circuit breaker is 3,000 amperes and of each d.c. feeder circuit breaker 2,000 amperes. The machine circuit breakers are provided with overload



Fig. 16.—B.T.-H. Switchboard; Catford Bridge Sub-station.

trips and auxiliary switches for closing the alarm bell circuit, while a shunt trip is used for cutting the

machine off the d.c. bars in the event of overspeed or reverse current conditions. Between the lightning arrester and choke coils, which are in the positive track circuit, there is an isolating switch and auxiliary switch, the latter being used to stop the alarm bell ringing after the breaker has opened; if the track should still be alive when the breaker opens, indication is given by a pilot lamp.

Auxiliary supply at the sub-stations is obtained from two oil-immersed, three-phase transformers, ratio 11,000/110 volts, connected to the incoming feeders through current-limiting resistances and controlled from an auxiliary switchboard in a corner of the sub-station; in the event of this supply failing, an automatic changeover switch will connect the lamp circuit to a battery. G.T.-H. "Tungar" rectifiers are used in all the sub-stations on the system to charge the batteries.

Protective apparatus on the system, already mentioned as a product of the British Thomson-Houston Co., is of the multi-parallel feeder type without pilot cables; greater sensibility is obtained on earth faults, as compared with phase faults, although the time setting on each is the same, while under through-fault conditions stability is maintained. Biasing transformers are used and the apparatus can be extended under certain conditions to protect any number of parallel feeders without the necessity for pilot cables. A feature of the system is that there is no necessity for the protective current transformers to be specially balanced, while a load such as that experienced by the Slades Green sub-station, which is teed off from the main line, can be protected merely by the inclusion of incoming protective apparatus in that sub-station.

Nearly 400,000 track bonds were supplied by British Insulated & Helsby Cables, Ltd., for this section of the Southern Railway, the total single-line mileage involved being 250. The rolling stock for the new electrical services consists of 124 three-car train units and 59 two-car units. The three-car units are formed of two motor cars with a trailer car coupled between them. Each motor car is equipped with two 300-h.p. motors made by the English Electric Co. and control apparatus by the Metropolitan-Vickers Electrical Co. The two-car units are not fitted with motors, and will be operated at times of heavy traffic coupled between the three-car units. Inspection of the electrical equipment of the new stock will be carried out at Orpington and Slades Green, and electrical and mechanical repairs will be effected in a new shop at Slades Green which has been built for the purpose. Fig. 14 is a view of the G.T.-H. sub-station at Dorking on the South-Western section of the railway, which will be referred to next week.

(To be concluded.)

Telegraph and Telephone Notes.

Brazil.—TELEPHONE CONCESSION.—The Municipal Council of the State of Sao Paulo has awarded to the Brazilian Telephone Co. (a Canadian corporation), a monopolistic contract for the provision of the whole of the telephone services to the capital. Considerable opposition, emanating from commercial, industrial, and agricultural interests, against the Council's action has been manifested and an appeal to cancel the concession is about to be presented to the State Congress.—*Reuter's Trade Service* (Sao Paulo).

Empire Radio Communication.—INDIA.—It is announced by the *Daily Telegraph* that the Marconi Co.'s engineers have arrived at Bombay from England for the purpose of commencing at once the construction of the "beam" wireless stations at Poona and Dhond in connection with the Empire chain of stations. The chairman of the Indian Radio Telegraph Co., which has undertaken the work, has returned to Bombay after studying systems in America, England, and France.

ENGLISH STATION SITES.—The Postmaster-General announces that a site at Winthorpe, near Skegness, for the receiving station for the "beam" services with Australia and India, was selected by him at the disposal of the contractors on August 1st. A site near Grimsby for the transmitting station was awarded to the contractors a few weeks ago; the stations were to, under the contract, to be completed by May 8th, 1926.

Holland.—SHIP-SHORE TELEPHONY.—It is reported that the Dutch Government intends to utilise one or more radio stations as links in a scheme for enabling passengers at sea to talk with people on shore by means of the ordinary telephone facilities. Tests are being carried out and the *Evening News* understands that the ultimate aim is not only to provide a local service, but to extend the facilities to other countries by means of their own land lines. Similar experiments have been made in America, England, and Germany; whereas the Germans used 100-m. waves, the Dutch will probably use a wave-length of between 800 and 900 m.

Italy.—NEW RADIO-TELEGRAPH STATION.—A radio-telegraph station is being built near Rome by Germany as part of her reparation payment to Italy. According to the *Evening News* the station is to cost nearly £780,000, and will be completed next April. It will be able to transmit and receive five messages or programmes simultaneously. The aerials are supported by seven towers, each 850 ft. in length, and covering an area of 150 acres.

International Telephony.—ANOTHER COMMITTEE.—The International Chamber of Commerce complains of the inadequacy of the present Continental telephone services and, according to the *Financial Times*, has appointed a committee, the purpose of which appears to be to develop the use of telephone service internationally and to find practical means of effecting improvements.

The whole system of telephone circuits to France from this country is to be overhauled during the next two months, says the *Morning Post*. Engineers have been sent from the General Post Office to the French coast to inspect the repeaters and cables, while others will overhaul the lines on this side of the Channel. Major J. B. Stevenson has been in charge of all the tests carried out by telephone between London and foreign cities. There are 16 circuits between London and Paris, but it is hoped to create several new "phantom" circuits. The French Post Office authorities, realising the importance of becoming the "switchboard of Europe," hope to finish the overhaul by November in time for the next International Telephone Conference.

Japan.—TELEPHONE DEVELOPMENT.—The Japanese Government has developed a plan for the improvement of the telephone system of the country. According to *Commerce Reports* over 50,000 new telephones will be installed each year during the period 1925-1930, as well as an average of 10,000 miles of new toll lines per year.

Portugal.—NEW RADIO-TELEGRAPH STATION.—On May 20th, 1925, a new radio-telegraph station was opened at Lavadores, a suburb of Oporto, by the Portuguese Government. It will be under the direction of the ministry of marine, and its official name is Posto Radio-telegrafico Naval do Porto at Lavadores, the call letters being CTP. The Marconi systems used are spark and continuous wave on 600 metres and on 2,400 metres respectively, the transmitting range by day is 300 miles, and by night 900 miles. The station has no midday signal, but repeats the meteorological reports from Monsanto (Lisbon) when requested by vessels, free of charge. A radio-goniometer will be installed shortly to give ships their position for a fee.—*Commerce Reports.*

United States.—LONG-DISTANCE TELEPHONY.—The telephone cable, 861 miles long, which links New York and Chicago and has been designed to furnish telephone and telegraph services practically immune from storm interruptions, was joined up at Swanton, Ohio, on August 11th. The cable, which is the longest in the world, the laying of which began seven years ago, is made up of 447,000 miles of wire, and involved an outlay of $25,000,000 (£5,000,000). It will handle 250 telephone and 500 telegraph messages at the same time. Of the total length 717 miles are above ground and 144 miles in underground conduits, says *The Times*.

Radio Notes.

Artists' Dispute.—NEGOTIATIONS SUSPENDED.—The negotiations with regard to artists' services which have been in progress for some time between representatives of British concert promoters and the British Broadcasting Co. have been temporarily suspended, a deadlock having been reached with regard to a continuance of professional services upon the terms hitherto in force.—*Daily Mail.*

B.B.C. Studios.—LONDON IMPROVEMENTS.—A large new studio is being equipped at 2LO, the London station. The ceiling and walls are being hung with adjustable curtains, arranged on a system of wires, swivels, and pulleys, so that the producer of a play or dramatic entertainment will be able to control the volume of sound. Hitherto only the engineers have been able to vary the volume. Folding glass doors across the middle of the studio will enable one half to be used for "effects" and "noises," and the other for the artists; the floor is of stone. The present upper studio, from which entertainments have been broadcast for the last three years, is to be abolished, but the main studio is being retained, while a new studio for talks only is being furnished.—*Daily Mail.*

Broadcast Advertising.—A Sheffield Suggestion.—The Sheffield representative of the British Broadcasting Co. has, we understand, invited the Chamber of Commerce of the city to introduce to his company representative speakers—business men interested in the city's affairs—who could advertise the city and its productions by means of broadcasting.

Canada.—New Station.—The new Vancouver broadcasting station of the Canadian National Railways was opened on August 12th at 5 a.m. British summer time, bringing the number of the C.N.R. stations up to ten. The call of the new station is CNRV and the wave-length 291 metres. The studio is in Vancouver, but transmission will take place from Lulu Island, a short distance away.

France.—Wave-length Tests.—As the result of the recent meeting at Geneva of the directors of the International Radiophone Union, wave-length tests were conducted from the Eiffel Tower, Paris, at night last week-end. The wave-lengths used were 64 and 200 metres. Similar experiments will take place next week.

New Continental Stations.—British Plant.—A further field for long-distance listeners will soon be available when the new broadcasting stations at Milan (Italy) and Brno (Czecho-Slovakia) are opened. They are being erected by Marconi's Wireless Telegraph Co., Ltd., and are of the same type and power as the new 2LO station; the power used will be 12 kW. The Peruvian broadcasting station at Lima (call letters OAX and wave-length 360 metres) which was formally opened on June 20th, is giving very satisfactory results. This station uses a standard Marconi 6-kW type "Q" transmitter.

Receiving Licences.—Proceedings Threat.—The Postmaster-General calls attention to the fact that now that the Wireless Telegraphy (Explanation) Act has been passed, the legal obligation to take out a licence for a receiving set—whether crystal or valve—has been placed beyond doubt, and he gives notice that he proposes in future to institute proceedings in cases coming to his knowledge in which sets are installed or used without licences.

Summonses Issued.—Mr. R. M. Ford, who some time ago challenged the Postmaster-General to prosecute him for not having purchased a licence, has sent a communication to the Postmaster-General, in which he says that under Section 1, sub-section 7, of the Wireless Telegraphy Act, 1904, he proposes using electrical apparatus for purposes other than the transmission and reception of messages (with which alone the Wireless Acts are concerned), and calls upon the Postmaster-General to take such steps as may be necessary to prevent Post Office messages reaching his apparatus. Mr. Ford has, it is understood, received three summonses issued at the instance of the Postmaster-General.

Short-wave Transmission.—New Station.—It is announced that the Edison Swan Electric Co., Ltd., has had the call sign 5VR allotted to it, and will shortly commence experimental transmission on wave-lengths of 23, 45, and 90 metres. Reports of reception will be appreciated and acknowledged by the company, and times of special tests will be sent to anyone on request.

The Radio Industry.—In a report issued for the benefit of the American wireless manufacturing industry by the American Government trade experts, it is declared that the development of the wireless industry in Great Britain has reached such a high state of efficiency that American wireless apparatus manufacturers cannot hope to compete in the British market.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Adwick-le-Street.—Urban District Council. September 14th. Internal wiring for electric lighting of Council houses. (See this issue.)

Australia. — Melbourne. — September 29th. Postmaster-General's Department. Telephone protective apparatus.*

October 20th. Switchboard cable. Sched. C.39, jumper wire. Sched. C.40, bells and buzzers.*

New South Wales.—November 11th. New South Wales Railways and Tramways. 5-ton 3-motor electric overhead travelling crane, 56 ft. 2 in., for iron and steel foundry, Eveleigh workshops.—*Tenders.*

September 23rd. Four feed-water meters for White Bay power house.

October 15th.—Newcastle City Council. 2,000-kW, or, alternatively, 1,500-kW turbo-alternator, complete with condensing plant.—*Tenders.*

October 7th. Victorian Government Railways. Two electric transporters complete. (AX.2303.)*

Commonwealth. October 27th. Timing clocks and calculagraphs. (See this issue.)

Bristol.—August 27th. Board of Guardians. Electrical fittings for six months for St. Peter's Hospital. (Particulars from T. S. Lamb, clerk, at the hospital.)

Egypt.—Cairo.—September 9th. Ministry of Education. One 50-h.p. Diesel engine, generator, electric motors and machine tools for the Mansurah Trades School.*

Ministry of the Interior. Supply and installation of an electric power station and distributing system for the town of Minieh.*

Edinburgh.—September 14th. Royal Infirmary. Supply of X-ray and electro-medical equipment for the new Radiological Department. (August 14th.)

Fleetwood.—August 24th. Urban District Council. Feeder cable and pillar. (August 7th.)

India. — September 15th. Madras and Southern Mahratta Railway Co., Ltd. Telegraph line materials, copper wire, &c. (See this issue.)

Leeds.—August 25th. Property Committee. Electric lighting work required for public wash-houses and slipper baths at Stocks Hill.

London.—Acton.—August 28th. Borough Council. Overhead wiring at the Council's Isolation Hospital, Wales Farm Road, Acton. (August 7th.)

Newport (Mon.).—September 7th. Electricity Department. Induced draught plant, extension of flues, &c. (See this issue.)

New Zealand.—Wellington.—September 29th. Public Works Department. 560 galvanised steel transmission line towers, complete with cross-arms, ground stubs, and accessories. (A.X. 2,250.)*

Marlborough.—Electric Power Board. September 22nd. Two 750-h.p. turbines, with generators, switchboard, &c., for Waihopai River development.—*Tenders.*

Portsmouth.—September 1st. Tramways Committee. Stores for 12 months, including insulating materials, lamps, overhead line materials, &c. (See this issue.)

Rochdale.—September 9th. Paving and Sewering Committee. Motors and electrical gear, together with the necessary wiring in connection with the electrification of sludge pressing machinery at Roch Mills sewage disposal works. (August 14th.)

South Africa.—Johannesburg.—October 1st. Railways and Harbours. Four 4-ton electrically-driven portable jib cranes complete. (A.X.2299.)*

Stockport.—September 5th. Board of Guardians. Conversion of lift at Stepping Hill Hospital from hydraulic to electric power. Particulars from the Steward at the hospital.

Stoke-on-Trent.—Stoke and Wolstanton Union. Installation of an electrically-driven pumping plant at the Turnhurst Road Institution, Chell. Specification from Mr. T. Wood, Clerk to the Guardians, Stoke-on-Trent.

Town Council. E.h.p. testing equipment. (See this issue.)

Warrington.—September 7th. Electricity Department. Twelve months' supply of earthenware conduits. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Closed.

Edinburgh.—Electricity Committee. Recommended:—

Soot blowers (£1,168).—Stirling Boiler Co., Ltd.

Switchgear for sub-station at Saughton (£775).—A. Reyrolle & Co., Ltd.

Transformers for Saughton sub-station (£540).—Ferranti, Ltd.

Glasgow.—Cleansing Committee. Recommended:—

Frequency changers for new refuse works (£8,197 each).—Messrs. Brush-Peebles & Co., Ltd.

Refuse power plant: Turbine, Fraser & Chalmers Engineering Works; alternator, General Electric Co., Ltd.; condensing plant, Messrs. Mirrlees, Watson & Co.; transforming plant, Messrs. Ferranti, Ltd.; cooling towers, Premier Cooling & Engineering Co.

Tramways Committee. Accepted:—

Crossings and crossovers.—Messrs. Edgar Allen & Co., Ltd.

Recommended:—

D.c.c. wire.—London Electric Wire Co. & Smith's, Ltd.

L.c. cable.—Western Electric Co., Ltd., and the Hackbridge Cable Co., Ltd.

Two steel wire haulage ropes for the Subway (£6,544 each).—Messrs. T. & W. Smith, Ltd., and Messrs. R. S. Newall & Son, Ltd., Liverpool.

In this connection the Committee reports that five tenders were received all at the same time, and it has recommended that with regard to future supplies foreign tenders be invited. The Committee has asked the Town Clerk to call the attention of the Government to the position of matters in the supply of wire rope as disclosed by the fact that the prices quoted for the contract are the same in all cases.

Haworth.—Urban District Council. Accepted:—

Erection of sub-station in connection with a supply of electricity from Keighley.—Mr. E. Metcalfe.

Irish Free State.—Dublin.—Borough Commissioners. Materials for the wiring of 180 houses on the Marino Estate:

Wire (approximately 25,000 yd. required) per 100 yd.—

	£	s.	d.
Kabelwerke Duisberg	0	8	5
Holland Insulated Wire & Cable Works	0	9	6
Deutsche Kabelwerke. (Accepted.)	**0**	**9**	**6½**
Siemens-Schuckert (Ireland), Ltd.	0	10	9
Land-und-Seekabelwerke	0	12	5
Macintosh Cable Co., Ltd.	1	1	6
Drake & Gorham Wholesale, Ltd.	1	1	6
W. T. Henley's Telegraph Works Co., Ltd.	1	1	6
General Electric Co., Ltd.	1	1	6
British Insulated & Helsby Cables, Ltd.	1	1	6

Capping and casing (approximately 30,000 ft. required) per 100 ft.—

General Electric Co., Ltd. (Accepted.)	**0**	**7**	**7**
British Insulated & Helsby Cables, Ltd.	0	11	6

.eeds.—Tramways Committee. Accepted:—
50 gear wheels.—National Steel Foundry (1914), Ltd. (£443 15s.).
Special work for siding.—Titan Track Work Co., Ltd. (£300).
Special track work.—Edgar Allen & Co., Ltd. (£790 and £805); Messrs. Hadfields, Ltd. (£1,800); Titan Track Work Co., Ltd. (£870 and £700).

.ondon.—London and North-Eastern Railway Co. \epted :—
Four e.l. type welding plants for Stratford Works.—Equipment and Engineering Co.

Manchester.—Electricity Committee. Accepted :—
Adhesive tape.—L. Andrew & Co., Connolly's (Blackley), Ltd.
Batteries (dry).—Ever Ready Co. (Great Britain), Ltd.
Box compound.—British Insulated & Helsby Cables, Ltd.
Bittite tape.—Callender's Cable & Construction Co., Ltd.
Cable cover tiles.—Doulton & Co., Ltd., Hall & Rogers, G. Woolliscroft and Sons, Ltd.

Margate.—The Education Committee. Electric lighting \tallation at the Girls' Central School and Gymnasium :—
A. F. Dunkley (accepted), **£235.**
E. A. Pinto, £223.
W. J. Cannon & Co., £223.
C. Hayward & Son, £237.
E. Saunders, Ltd., £256.
H. S. Tett & Co., Ltd., £260.
Baker & Sons, £319.

Sheffield.—Electricity Committee. Accepted:—
Three 500-kVA transformers (£1,169) and one 500-kVA transformer, Scott-connected (£502).—British Electric Transformer Co., Ltd.
Twelve 8-way, 3-phase, 4-wire feeder pillars (£633).—Messrs. W. Lucy and Co., Ltd.
Erection of sub-station in Benly Lane (£1,093).—Messrs. Wellerman Bros., Ltd.

Stretford.—Electricity Committee. Accepted:—
Increasing the capacity of the ash bunker (£394).—H. Simon, Ltd.

Winchester.—City Council. Accepted:—
Extensions to the electricity works (£3,489).—Wise & Lansdell, Ltd.

Forthcoming Event.

British Association for the Advancement of Science.—At Southampton. From August 26th to September 2nd. Ninety-fifth annual meeting.

Notes.

District Apprentice Training Scheme.—We learn from *Machinery* of an interesting scheme in connection with apprenticeship training which is being developed in Milwaukee, U.S.A., where a "district apprentice system" has been inaugurated. A group of shops in a given locality, or in a certain district of a large city, co-operate in the training of apprentices, who are transferred from shop to shop to obtain diversified training. The speciality shop may take them for only a few weeks, teaching those processes that are highly developed in its plant. The small shop takes them in hand for training in the processes likely to be more highly developed in a small organisation than in a large one. In this way all the shops in a certain locality aid in developing an all-round mechanic, each one bearing its share of the burden of providing for the supply of future skilled machinists, and none can offer the excuse that the special conditions under which it operates make it impossible to carry its share of this obligation. The apprentice also profits by obtaining a more all-round training than he would be likely to get in a single shop.

The Professional Classes Aid Council.—Annual Report.—The report of the Council for the past year shows that applications for help received during the year numbered 686, and financial assistance was given to 150 families, affecting 344 individuals; 305 other applicants were advised where to obtain help. Special attention was given to education and training, as the most satisfactory branches of expenditure; 200 boys and girls were helped with school fees, outfit, and in some cases maintenance, and 41 persons were in training. In many cases help given in emergency for a short period enabled the person to regain employment, and the Council was successful in obtaining pensions from other sources in several cases. The expenditure increased from £6,645 to £8,388, resulting in a deficit of £880. The Council would welcome contributions sent to the Secretary, 251, Brompton Road, London, S.W.3.

Marine Direction-finder Improvement.—An improvement in ships' direction-finding equipment has been made by the Marconi International Marine Communication Co., Ltd. It consists of the replacement of the large double-loop aerial system by two fixed-frame aerials, which are mounted in a light wooden framework, measuring 8 ft. in height by 4 ft. wide. The two frames are fixed permanently at right angles to each other, one being parallel to the fore and aft line of the ship, and the other athwart-ships. The aerials are formed by a number of turns of stranded wire, the ends of the loops being taken through insulated connections to the direction-finding instrument. This development obviates the use of expensive fittings in the way of posts or stays to support the aerials and allows great latitude in the position of the direction-finding instrument itself, for it is not necessary to install the instrument immediately under, or even adjacent to the aerial system. The two recent additions to the Cunard fleet, the *Alaunia* and *Carinthia*, have both been equipped with this new direction-finding installation, bringing the number of Cunard ships carrying Marconi direction-finding apparatus up to 15, while 10 other ships have been or are being equipped.

A Russian Diesel-Electric Locomotive.—According to our Russian contemporary *Elektritschestwo* a new Diesel-electric locomotive has recently been put into operation on the "Oktober," formerly known as the Nicolai, railway. It has been built to the designs of Prof. Haekel, of Leningrad, and except for the engine and roller bearings is entirely of Russian construction. The motive power is supplied by a Vickers ten-cylinder engine of the four-stroke, non-reversible type, and is stated to develop 1,030 h.p. at 935 r.p.m. It is located in the centre of the locomotive and drives a generator at each end. Normally the two generators are designed to give 1,500 amp. at 380 V, but at low speeds, that is, under 19 m.p.h., they are run in parallel to give 3,000 amp. The locomotive has altogether 24 wheels—a leading and trailing pair and ten axles, arranged in groups of three, four, and three, each driven by an electric motor, the ten motors working in parallel. The engine is started by one of the generators, which can be made to run as a motor when it is supplied with current from a 600-Ah, 110-volt battery of accumulators. The locomotive can be driven from either end, the controller being adapted to give 13 parallel and 7 series working positions. The total weight of the machine is 180 tons.

New Aluminium Alloys.—The *Zeitschrift fur Metallkunde* states that the Frankfort Metal Bank, of Frankfort-am-Main, has lately introduced two new aluminium alloys known as "Seleron" and "Aeron," which are claimed to be specially useful for the manufacture of electrical apparatus. The alloys consist of 85 per cent. aluminium, the balance being made up of Cu, Ni, Zn, Mn, Si and lithium; it is the latter element which is stated to give the alloys their great elasticity and hardness. The melting point is stated to be 600 deg. C., the specific gravity between 2.8 and 3, and the limit of elasticity 10 to 20.

C.T.A.A. Dinner.—It will interest many of our readers to know that the Chief Technical Assistants' Association has arranged for a dinner in honour of two members who have recently been appointed borough electrical engineers—Messrs. John H. Parker and William Weekes. The dinner will be held in the St. Dunstan's Room, Anderton's Hotel, Fleet Street, on Saturday, August 29th, at 6.30 p.m.

A 5-ton Electric Tractor.—The latest production of Messrs. Richard Garrett & Son, Ltd., Leiston, is an electric tractor capable of hauling a trailer with a load of 5 tons. Weighing approximately 2 tons, the tractor has a normal drawbar pull of 500 lb. and a temporary maximum of 3,000 lb.; hauling a full load the vehicle can on hard level roads cover a distance of 32 miles on a single charge of the battery.

Trade Facilities Guarantees.—An official paper issued last week states that the guarantees which have been given by the Treasury under the Trade Facilities Acts, 1921-1924, up to June 30th, 1925, amount to £54,452,936. Recent guarantees include £20,000 (guaranteed as to principal and interest) to the St. Austell and District Electric Lighting and Power Co., Ltd., for the erection and equipment of power station and provision of mains; £1,250,000 to the Benguella Railway Co. (guaranteed as to principal and interest for 25 years) for the purchase of rolling stock and railway materials in Great Britain; and £50,000 to the Nottingham Coal Carbonization, Ltd. (guaranteed as to principal and interest for seven years) for the erection of plant to treat coal by a process of low-temperature carbonisation.

The Hydro-Electric Power of Tasmania.—We have received from the chief engineer and manager of the Hydro-Electric Department of Tasmania a publication under the above title. It comprises a well-illustrated and thorough description of the Great Lake hydro-electric development, and of the Tasmanian electricity supply system. Apart from the description of the works, including the constructional operations, considerable space is given to the history of the concern and to the transmission system, &c. The establishment of the plant was due to the foresight of Mr. J. H. Gillies, a Melbourne metallurgist, who in 1908 realised the developments possible by the utilisation of the great water reservoir. He formed a company to undertake the project, but owing to financial difficulties the work was taken over by the Tasmanian Government. The initial installation of 10,000 h.p. was put into operation in 1916, and the station was completed to its present capacity of 52,000 continuous h.p. in 1923. The electrolytic industries which Mr. Gillies aimed to establish, *viz.*, the production of zinc and carbide, are now established, and electrical energy is being distributed over a large area. The rates charged to the electrolytic industries are extremely low; the Electrolytic Zinc Co. has a contract of 30,000 h.p. at £2 per h.p. per annum. The work is published by the Tait Publishing Co. Pty., Ltd., Melbourne, &c., at the very reasonable price of 2s. 6d. There are 60 illustrations, many of which are detailed drawings of the plant.

Parliamentary Loud-speakers.—When the Italian Parliament reopens the Chamber and Senate will be joined by a direct telephone wire, which, by means of microphones and loud-speakers, will permit speeches made in one House to be heard in the other. The microphones will be placed on the orators' tribunes, and the loud-speakers will be at the back of the President's bench. When the two Houses sit simultaneously the device will be switched off to avoid interference

The Italian Electrical Industry.—The development of the electrical industry in Italy has so far proceeded that at the beginning of this year the total plant installed represented 2,107,000 kW, of which 545,000 kW applied to Piemont, 500,000 kW to Lombardy, 205,000 kW to Venice, and 170,000 kW to Umbria. In 1923-24 the total consumption of energy amounted to 6,200 million kWh and it is expected to exceed 7,000 million kWh this year. As to the distribution in the former year, it is reported that the mechanical industries absorbed 51.4 per cent., the textile industry 13 per cent., electro-chemistry and electrometallurgy 11.3 per cent., lighting 9 per cent., the food industries 8 per cent., and traction 7.3 per cent. The aggregate capital invested in the electricity supply industry, comprising about 170 companies, amounts to 5,000,000,000 lire, of which 4,300 million lire is held by the large groups of the S.I.P. of Turin, the Edison group of Milan, and the Adriatica group of Venice.

Versatile Electrical Contractors.—A recent note in the official organ of the E.C.A. appears to confirm a view which is held by a number of people that the day is approaching when every man will be his own electrical contractor. The note quotes two instances of the combination of contracting with other businesses very remote from it. The first presents a chimney sweep who announces on his trade card: "Chimneys swept; electrical installations." The other records a visit of a member of the E.C.A. to the Isle of Wight, where he inspected a dairy in a window of which radio apparatus was displayed for sale. The proprietor described himself as a "Cowkeeper, builder, and decorator."

The "Blackstone" Spring Injection Oil Engine.—We have been informed by Messrs. Blackstone & Co., Ltd., that the "Blackstone" spring injection heavy-fuel-oil engine, which we described in our issue of August 14th, was awarded a silver medal at each of the following agricultural shows held this season: the Royal Dublin Society's Agricultural Show in May, the Royal Lancashire and the Northumberland Agricultural Shows in July, and the Royal National Welsh Show in August. It is claimed that with oils at their present prices, the "Blackstone" engine will develop power at the rate of 50 b.h.p.-hours for 1s.

A Novel Hydro-electric Plant.—A novel type of hydro-electric plant has been set to work by an American firm in Yungan, Fukien, China. It comprises a 36-in. turbine working under a head of 10 ft. and driving a vertical shaft reaching above the dam. Bevel gearing and a belt are used to drive the 25-kVA generator, which is arranged on a lighter moored on the upstream side of the dam. This arrangement was adopted so that the electrical plant would be safe in case of flood. The set lights the native city.—*Indian Engineering.*

Fatalities.—An inquest was held at Greenwich on August 12th into the death of Charles Harwood, assistant switchboard attendant at the Stowage Wharf generating station of the London Electric Supply Corporation. From the evidence it appeared that the deceased was told to attend to an earthing device in a 10,000-V switch room. As he was absent a long time fellow workers went to the room and found Harwood lying on the floor with burns on the fingers of one hand. The inquest was adjourned.

At the City of London Coroner's Court on August 12th, Mr. F. D. Thomas held an inquest into the death of George W. Stimson, who was killed while engaged in the construction of the new Post Office tube which will connect the head office with the principal London railway termini. Major J. R. Kingston said that the deceased man, who was travelling with six others in a trolley, must have raised his head and have been caught by the top of the tunnel. Although the work had been in progress for three years, with men constantly travelling in this manner, this was the first fatality. A verdict of "Accidental death" was recorded.

Smoke Abatement Conference.—The ever-increasing interest in the problem of securing a purer atmosphere, with its resulting benefits, will receive a further impetus from the Smoke Abatement Conference to be held at the Palace Hotel, Buxton, in the autumn. This meeting, which is to take place during the week-end, October 2nd to 5th, is being arranged by the Smoke Abatement League of Great Britain, 33, Blackfriars Street, Manchester, and support is promised from many influential quarters. Certain practical proposals for reducing both domestic and industrial smoke are being prepared by the League for full consideration by those attending, and prominent individuals have agreed to open the discussions at the various sessions. It is hoped that a constructive programme of useful work will be initiated, the results of which can be reviewed at the Smoke Abatement Exhibition and Conference to be held at Birmingham in 1926.

Appointments Vacant.—Junior cable engineers to fill positions of mains clerks of works for Hackney Borough Council Electricity Department; second assistant engineer in the Electricity Department of Worthing Corporation; combustion engineer or efficiency man at the Pigeon House electricity works for the Dublin Corporation; plumber-jointer for the Radcliffe Urban District Council electricity department; draughtsman, £160 + bonus, for the Royal Aircraft Establishment, South Farnborough. (See our advertisement pages to-day.)

Educational.—The 1925-26 session of the Engineering Day College of the Northampton Polytechnic Institute, St. John Street, E.C.1, commences on September 28th. (See our advertisement pages to-day.)

Electrical Development in Alsace-Lorraine.—The *Electric World* says that the electrical industry of Alsace-Lorraine pa a much higher wage scale than prevails throughout the re of France. This is considered a handicap, and legislation regulation to remove it is sought by the producers and di tributors of electricity. The electrical companies of Alsac basing their average wage scale on the rate in vogue Strasburg in 1914, have paid an average wage since 19 which shows an increase of 270 per cent., whereas the i crease in the rest of France is but 155 per cent. In 19 346 million kWh was distributed in this province, again 291 millions in the proceding year. The Franco-Swiss agre ment with respect to the regulation of the flow of the Rhi river by a dam at Kembs will largely increase the possibilit of producing electrical energy throughout the region, whic it is asserted, will accordingly become that part of Fran where the use of electrical energy will see its highe development.

Electricity in Large Brick Field.—According to t *Electrical World*, the Brisch Brick Co., Stickney, Ill., is buil ing a plant with a capacity for eight million bricks p month, in which 1,000 h.p. of electric motors will be installe Among the motor-driven machines will be an electric dr for handling clay from the pits. The consumption is estimat at 13 kWh per thousand bricks. The supply will be taken fro the Public Service Co. of Northern Illinois by means of 33,000-V line.

Ship Electric Lighting.—The s.s. *Hildebrand*, one of t Booth Line, is fitted throughout with "Osram" electr lamps. The saloon is illuminated by 100-V, 40-W "Whi Osrams," and ventilated by "Freezor" fans.

Thin Leaf Metals.—According to the *Financial Times*, Pr fessor Mueller, of the Reich Physical and Technical Institu in Berlin, has succeeded in producing leaf metals of hither unattained thinness. He has obtained gold leaf, silver le steel leaf and copper leaf a millionth of a centimetre thick a completely transparent. The invention is regarded as being great importance for technical work.

New Guatemalan Railway.—Some further particulars a now available regarding the electric mountain railway whi is to be built between San Felipe and Quezaltenango on t Pacific Ocean side of Guatemala, the contract for whi has been secured by the A.E.G., of Berlin, Germany. T necessary power is to be supplied by a hydro-electric stati with an original capacity of 5,600 h.p., but capable of bei later extended to 14,000 h.p. The line will have a length about 28⅛ miles, in the course of which it will rise from altitude of 1,640 to about 9,840 ft. above sea level. It mainly intended for the transport of the coffee grown on t high lands in the Quezaltenango district.

A New Type of Hack-saw Blade. — Messrs. Fr (London), Ltd., inform us that, as the result of a new machi which they have recently perfected, they are putting on t market a new type of hack-saw blade, the "Exray Flex." is claimed that this blade is without any hard-defined porti liable to break off, and owing to a more uniform hardeni process, has stood tests more severe than the usual blade called upon to stand. It is further claimed that the blade c be bent in a coil of about 1 in. diameter and then uncoi without any fracture in any portion of it; also that it d not require the experience of a trained mechanic in u

Coal v. Electricity on the Swiss Railways.—Under t above title the United States Commercial Attaché at Pa recently reported that the high cost of water-power devel ment in Switzerland had rendered it questionable whet hydro-electric power was really cheaper than coal for r ning the Swiss Federal Railways. "The use of water pov is unquestionably desirable in theory, since such a devel ment would remove from the trade balance a large part of of the most important of the import items—coal—and t contribute to the economic and political independence of Sw zerland. Looked at from a commercial point of view, h ever, electrification may be bad business if, for a long peri operation costs are greater than would be involved in contin use of steam locomotives." It was shown that coal prices l fallen since electrification had been decided upon and w still decreasing. "Under these circumstances, with alre heavy fixed charges, decreasing traffic, and high freight a passenger rates, it is obvious that the demand for a revis of the electrification programme, or at least a slowing do of its execution until the economic outlook becomes clea will receive increasing popular support."

Progress of French Railway Electrification Schemes The *Electric Railway Journal* says that the electrification of Paris-Orleans-Bordeaux lines is nearing completion. The li are largely of suburban or interurban classification, the l stretches over which it was proposed to run the Fran Spanish international expresses being relegated to a m remote future. The company has erected a locomotive shop Vitry-sur-Seine in suburban Paris for the equipment and re of its electric locomotives already in service on the Austerl Juvisy and Bretigny-Dourdan lines, and a new secti Bretigny-Juvisy, is soon to have its energy from a new s station. During the past year the company has received electric locomotives, three electric motor-cars, 34 passen cars and nine freight cars, for its electric lines. Delivery expected soon of 195 electric locomotives, 77 electric mo cars and 76 trailers.

A Ceylon Hydro-Electric Scheme.—Our Indian correspondent says that an important hydro-electric scheme is being carried out in Ceylon. The necessary water is to be obtained from the Aberdeen and the Laxapana rivers, both of which rise in the central plateau of the Island, at an elevation of some 7,000 ft. They fall rapidly in gradually converging valleys, until they meet and form the upper reaches of the Kelaniganga at an elevation of about 400 ft. Advantage is to be taken of the rapid fall and proximity of these two streams to convey the water by conduits to a point on the ridge dividing the two valleys, where the combined flow can be concentrated and led down the hillside in pipes to the power-house. In the first instance a gravity section masonry dam is being built on the Kehelgamu-oya; this will impound sufficient water to deal with the daily peak load of over 40,000 kW at minimum flow. The intake to the outlet conduit is to be placed 150 yd. above the dam. The conduit will be able to carry enough water to provide for a peak load of 50,000 kW. The forebay is to consist of a tunnel driven through Morahenaganga Hill, terminating at the outlet end in a built penstock chamber or surge tank, the outer walls of which will carry the penstock sluices. This chamber will be divided into two by a wall, and each half of the chamber will have its own inlet and scour valves, so that either may be closed for cleaning, or when otherwise necessary, without interfering with the other. Steel pipes 40 inches in internal diameter will connect the surge tank with the power-house. At first only two lines of pipes are to be laid, but for the full scheme there are to be six. The length of the pipes, from the forebay to the power-house, will be 5,250 ft. and the vertical fall 2,050 ft. The spot chosen for the power-house is 50 feet above the highest recorded point reached by the river when in flood. Rock foundations are situated at a depth of 50 ft. below the surface of the ground. The initial capacity of the station will be 12,000 kW as a 24-hour load. Work for the second stage will include the construction of a reservoir at Glencairn; the extension of the penstock chamber; the laying of an additional line of 40-in. pipes; and the extension of the power-house, generating plant, &c. At the completion of the second stage the power-house will be able to supply 34,000 kW as a 24-hour load, the total capacity of the plant installed being 52,000 kW. In stage 3 the flow from the Laxapana or Maskeliya-oya Valley will be taken in, the result being that the capacity of the power-house will be more than doubled, the total capacity of the plant installed being 104,500 kW, and the total 24-hour output raised to 71,300 kW. It is expected that the first stage will be completed in from three to four years. The other two stages will be proceeded with as and when the demand for power warrants their being undertaken.

South Canadian Electrical Development.—We learn from the *Electrical World* that the Southern Canada Power Commission has completed the installation of six 5,000-h.p. units at Hemming's Falls, near Drummondville, Quebec. Several H.V. transmission lines are also nearly completed. These will supply energy to all the more important districts on the south side of the St. Lawrence by two separate lines, thereby minimising the possibility of interruption, and improving the service. The company has recently completed a sub-station at Richelieu connecting with the system of the Montreal Light, Heat & Power Co.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

The York Corporation Electricity Committee recommends that Mr. Ernest M. Pearson, of Lancaster, be appointed chief assistant technical engineer, at a salary of £450 per annum.

Colchester City Council has appointed Mr. W. H. Soulby as tramway manager, in succession to Mr. R. C. Bullough, at a salary of £350 per annum.

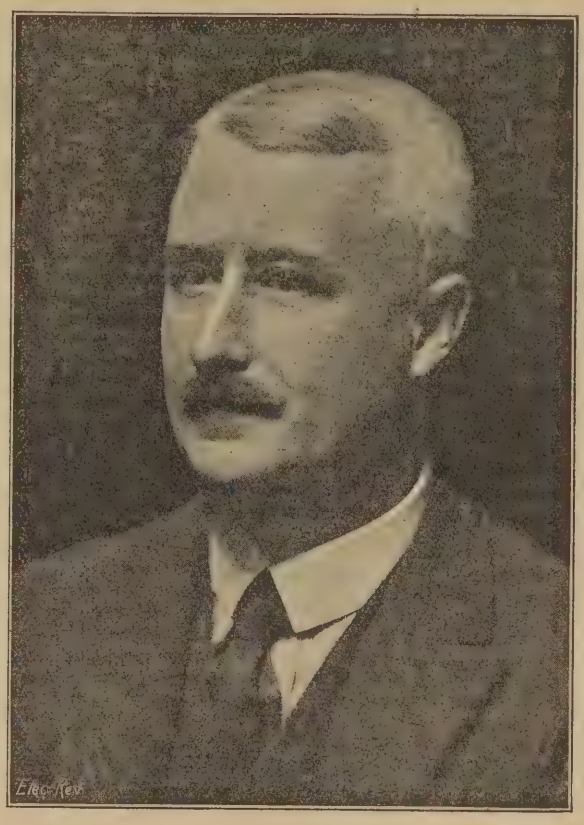
Mr. E. R. Briggs, who has been with the English Electric Co., Ltd., for many years and has been chief mechanical engineer, has been appointed to succeed Mr. H. F. Hemmings as works manager at the Willans Works, Rugby.

Sir Henry Maybury, Director-General of Roads, and chairman of the London Traffic Advisory Committee, left this country on Saturday last on a visit to study traffic conditions and the methods of dealing with them in the principal cities of the United States.

Mr. L. M. Jockel, A.M.I.E.E., chief assistant engineer at Willesden electricity works, is leaving the North Metropolitan Electric Power Supply Co. at the end of the current month to take up the position of station superintendent at the Nottingham Corporation's new "super station" at North Wilford. Last year Mr. Jockel was elected vice-chairman of the Junior Institution of Engineers, of which he is one of the most active members.

Mr. W. Wilde, charge engineer at the Horden "B" power station of the Newcastle-on-Tyne Electric Supply Co., Ltd., has been appointed charge engineer at the Lancaster Corporation electricity works.

The accompanying portrait is that of Mr. V. Watlington, who is acting as managing director of the English Electric Co., Ltd., during the absence on leave of Mr. P. J. Pybus. Mr. Watlington was educated at Bedford Grammar School and, later, at the City and Guilds Engineering College under Prof. W. E. Ayrton. He obtained the A.C.G.I. diploma in 1896. Upon leaving college he joined Messrs. Robert Blackwell and Co. and was engaged on the construction and equipment of tramways in all parts of the United Kingdom. In 1906 he founded the firm of Watlington & Co., which specialised in the supply of tramway materials. This firm was subsequently absorbed by the Siemens & English Electric Lamp Co., Ltd.,



Gainsborough Studio,] *[London.*

Mr. V. Watlington, M.B.E., A.C.G.I., M.I.E.E.,
Acting Managing Director of the English Electric Co., Ltd.

of which Mr. Watlington is a director. He joined Messrs. Dick Kerr & Co., Ltd., as sales manager in 1911, and when the English Electric Co., Ltd., was formed in 1919 he was appointed general sales manager. Mr. Watlington has been chairman, since its inception, of the Revising Committee of the B.E.A.M.A., which has standardised general contract conditions for the electrical industry. He is a Member of the Order of the British Empire and of the Institution of Electrical Engineers.

The Leeds Corporation Electricity Committee has made the following staff promotions: Mr. H. Topham, from shift engineer to assistant mains engineer (Grade 8a); Mr. T. Hewson, from assistant shift engineer to shift engineer (Grade 8a); and Mr. R. Rogers from assistant switchboard attendant to assistant shift engineer.

Mr. J. G. M. Hilton, who is well known in Indian electrical engineering circles, has been appointed sales engineer in the Far East for Messrs. Johnson & Phillips, Ltd. His headquarters will be in Singapore, and his address for the present is c/o the company's commercial agents, Messrs. Sime, Darby and Co., Ltd., Singapore.

Obituary.—Mr. E. P. Simpson.—The death occurred at a nursing home on August 12th of Mr. Edward Percy Simpson, a director of Worthington-Simpson, Ltd.

Mr. A. A. Kent.—The death is reported of Mr. A. A. Kent, who was for many years inspector of telephones in the Uxbridge district.

Mr. A. E. Mills.—*The Times* reported the death, on August 15th, of Mr. Alfred Ernest Mills, M.A., M.I.E.E., at North Finchley. Mr. Mills was a Fellow of the Physical Society and a consulting engineer.

Sir Adam Beck.—The death occurred at London, Ontario, on August 18th, of Sir Adam Beck, LL.D., who had been suffering from pernicious anæmia for some time. Sir Adam was a powerful figure in Canadian politics, particularly in the province of Ontario, but it was as chairman of the Hydro-Electric Power Commission that he was known to our readers. Although a Conservative in politics, he was a vigorous proponent of the public ownership of the abundant water power with which Ontario is blessed, including the Canadian side of the Niagara Falls. From his *début* as a cabinet minister in the Ontario Government, in 1905, right up to his death he directed in the ablest manner the hydro-electric affairs of the province, and the huge undertaking, whose latest

report is by a coincidence reviewed in this issue, is a lasting monument to his courage and ability. Sir Adam, although of German descent, was a native of Ontario and thoroughly Canadian in his outlook. He was knighted in 1914 in recognition of his services in connection with the treatment of tuber-



The Late Sir Adam Beck, LL.D.,
Chairman of the Hydro-Electric Power Commission of Ontario.

culosis. He was a horse breeder of note, and during the war acted as Director of Remounts to the Canadian forces.

Sir Adam contributed a special article on Canadian water power to the Jubilee Issue of the Electrical Review in November, 1922.

Mr. W. M. Milnes.—We regret to hear that Mr. W. Mayall Milnes, A.M.I.E.E., M.Inst.T., general manager and engineer of the Wigan Corporation Tramways, passed away recently while on holiday. Mr. Milnes was formerly assistant engineer and manager of the Coventry tramways.

Will.—The late Mr. R. H. Best (chairman of Messrs. Best and Lloyd, Ltd., Birmingham) left £85,280 gross and £82,746 net personalty.

New Companies Registered.

Thames Welding Co., Ltd. (207,800).—Private company. Registered August 10th. Capital £5,000, in £1 shares. Objects:—To carry on the business of electric arc and oxy-acetylene cutters and welders of metal and alloys, smiths, founders, workers, manufacturers of and dealers in all kinds of metals or electrical appliances, &c. The subscribers (each with one share) are:—A. J. Markwell, 38, Bellingham Road, Chesham, Bucks., clerk; and F. H. Davies, 39, Middleton Road, Dalston, E.8, clerk. The first directors are not named. Secretary (pro tem.): A. J. Markwell. Solicitor: Frank Budd, Devonshire Chambers, 146, Bishopsgate, E.C.2. Registered office: 146, Bishopsgate, E.C.2.

W. J. Henderson & Co., Ltd. (207,768).—Private company. Registered August 8th. Capital £3,000, in £1 shares. Objects:—To acquire the business carried on at 351, Fulham Road, S.W., as W. J. Henderson & Co., to adopt an agreement with W. J. Henderson and A. F. Phelps, and to carry on business as radio manufacturers, factors, merchants, dealers in hardware metal, and other merchants' requisites, &c. The directors are:—A. F. Phelps, 3, The Drive, Hove; W. J. Henderson, 351, Fulham Road, S.W.; R. M. Dillon, 49, Centurion Road, Brighton. Qualification: £10. Solicitors: Darling & Taylor, 7, New Square, Lincoln's Inn, W.C.2. Registered office: 351, Fulham Road, S.W.

Wheatley, Smith & Co., Ltd. (207,788). Private company. Registered August 10th. Capital £1,500, in £1 shares. Objects:—To carry on the business of motor, mechanical, wireless, and electrical engineers, founders, &c. The permanent directors are:—S. M. Wheatley, 86, Nightingale Lane, Wanstead, E.11, radio engineer; J. L. Smith, 22, Nightingale Lane, Wanstead, E.11, radio engineer. Qualification: £150. Remuneration as fixed by the company. Secretary: S. M. Wheatley. Solicitor: Arthur A. Banes, London. Registered office, 170, Strand, W.C.2.

Radio Supply Co., Ltd. (207,815).—Private company. Registered August 11th. Capital £1,000, in £1 shares. Objects:—To acquire the business of dealers in radio apparatus, components, parts, and accessories for radio transmission and reception carried on by R. L. Hazlemen, A. MacKinnon, and J. A. G. MacKinnon, at 22, Medway Street, Chatham, as the "Radio and Electrical Supply Company." The subscribers (each with one share) are:—R. L. Hazlemen, 22, The Paddock, Chatham, Kent, financier; A. MacKinnon, 66, Barnsole Road, Gillingham, marine engineer; J. A. G. MacKinnon, 66, Barnsole Road, Gillingham, electrical engineer. The permanent directors are R. L. Hazlemen and A. MacKinnon. Qualification: £100. Remuneration: £100 per annum divided between them. Secretary: R. L. Hazlemen.

Gregson & Partners, Ltd. (207,843).—Private company. Registered August 12th. Capital £10,000, in £1 shares. Objects:—To carry on business as chemical, electrical, gas, civil, constructional, and mechanical engineers, erecting and manufacturing contractors, &c. The first directors are:—E. P. Taudevin, 74, Endcliffe Edge, Sheffield, engineer; C. Gregson, Edenthorpe, Tapton Park Road, Sheffield, engineer; and J. O. Taudevin, Endcliffe Edge, Sheffield, engineer. The first two are permanent. Qualification of permanent directors, 1,000 ordinary shares; of ordinary directors, ordinary shares. Remuneration (except managing director) as fixed by company. Solicitors: Broomhead, Wightman & Reed, 14, George S Sheffield.

The Nelson Electric Co., Ltd. (207,770).—Registered a public company on August 8th with a nominal capital of £50,000 shares. Objects:—To acquire the business of a manufacturer of, and in valves and electric light bulbs carried on by the Notable Electric Ltd., with all the assets thereof (including any patents to which F. W is entitled), and to manufacture, assemble, erect, install, equip, mai repair, and deal in wireless, telegraphic, and telephonic apparatus, mag and radio-active instruments, &c. Minimum cash subscription: 7 shares. directors are:—Sir Wm. D. Henry, 60, Bickenhall Mansions, W.1, cha Anglo-Oriental and General Investment Trust, Ltd.; W. H. Edwards, tingley," Kingston Hill, Surrey, director, Tavoy Tin Dredging Corpor Ltd.; F. Warner, "The Lawn," Merton Road, S.W.19, managing di Notable Electric Co., Ltd.; A. E. Wallenburg, Berkeley Hotel, W.1, n engineer (naturalised British subject of Swedish origin). Qualification, Remuneration as fixed by the company. The directors may borrow up nominal amount of the capital for the time being. Solicitors: Mawb Barrie, 101, Salisbury House, London Wall, E.C.2. Registered office Salisbury House, E.C.2.

Benson Super Power Corporation (2,448 F).—Particu filed on August 6th pursuant to Section 274 of the Companies (Consolid Act. The capital is $55,000,000 in 5,500,000 shares of $10 each ($5,0 preferred stock and $50,000,000 common or general stock). The compan incorporated in Delaware on July 13th, 1922, to acquire the property, and privileges of the Benson Engineering Corporation of Delaware. principal place of business is at Georgetown, County of Sussex, Dela The British address is at Crosshaven, Sidcup, Kent, where W. H. T. Ga authorised to accept service of process and notices on behalf of the con The directors are:—W. H. T. Gahan; R. Rowland, "Eastwood," S C. W. Oliver, "Okanagan," Sidcup; C. H. Vickers, 274, Elgin A Maida Vale, W.; and R. F. Rubinstein, 6, Blandford Road, W.4.

Official Returns of Electrical Companies.

Folkestone Electricity Supply Co., Ltd. (51,825).—Ca £150,000 in £1 shares (100,000 ordinary and 50,000 preference). Return April 10th, 1925. All shares taken up and paid for in full. Mortgage charges, £99,100.

International Wireless Manufacturers, Ltd.—Issue February 21st, 1925, of £1,300 debentures, part of a series already regi

L. Weekes, Ltd.—B. T. Crew, C.A., of George S West, Luton, was appointed receiver and manager on August 1st, 1925, powers contained in debentures dated May 26th, 1912, and July 16t November 13th, 1919.

Ledion, Ltd.—W. C. Todd, of 3, Cannon Street, E ceased to act as receiver and manager on July 31st, 1925.

Clear Hooters, Ltd.—Particulars filed of £2,500 de tures authorised July 16th, 1925, charged on the company's undertakin property, present and future, including unpaid capital and calls and li of members, the amount of the present issue being £1,200.

Llanelly and District Electric Supply Co., Ltd.—Mort by sub-demise dated June 16th, 1925 (supplemental to trust deeds dated 3rd, 1911, November 11th, 1912, November 30th, 1916, and February 9th securing £300,000 debenture stock), charged on certain lands near North Llanelly. Trustees: Century Insurance Co., Ltd., 18, Charlotte Square, burgh.

"Ego" Engineering Co., Ltd.—W. A. J. Osborn 119, Finsbury Pavement, E.C., was appointed receiver on August 5th powers contained in debenture dated May 7th, 1925.

Pressland Electric Supplies, Ltd.—Issue on August 1925, of £1,500 debentures, part of a series already registered.

Mid-Cheshire Electricity Supply Co., Ltd.—Satisfacti full on May 14th, 1925, of letter of deposit with title deeds dated July 1925, securing all moneys due or to become due on special loan acco the Westminster Bank, Ltd.

Receptors, Ltd.—Issue on July 28th, 1925, of £500 d tures, part of a series already registered.

Oriental Telephone and Electric Co., Ltd. (40,69 Capital, £900,000 in 600,000 ordinary and 300,000 preference shares each. Return dated July 3rd, 1925. 428,941 ordinary and 188,971 pre shares taken up. £338,660 10s. paid on 149,857 ordinary and 188,791 ence, including £12 10s. paid on 50 ordinary shares forfeited. £279,08 sidered as paid on £279,084 ordinary shares. Mortgages and charges, £1

Beck & Moss, Ltd. (69,298).—Capital £2,500, i shares. Return dated March 4th (filed May 5th), 1925. All shares tak £525 paid. £1,975 considered as paid. Mortgages and charges, nil.

W. H. Allen, Sons & Co., Ltd. (66,440).—C £500,000 in £1 shares. Return dated June 8th, 1925. 408,750 shares up. £58,757 paid. £349,993 considered as paid. Mortgages and c £49,000.

Cross & Cross, Ltd. (105,754).—Capital £20,000, i shares. Return dated June 23rd, 1925. 10,000 shares taken up. £4,84 £5,155 considered as paid. Mortgages and charges, nil.

Electric Zinc Co., Ltd. (127,838).—Capital £2,000,0 400,000 preference and 1,600,000 ordinary shares of £1 each. Return December 31st, 1924 (filed June 6th, 1925). Seven ordinary shares tak Nil paid. Mortgages and charges, nil.

Hillingdon Screw & Manufacturing Co., Ltd.—Debe dated July 31st, 1925, to secure £600, charged on the company's under and property, present and future, including uncalled capital. Holder: Baker, "Hartfield," Mycenae Road, Blackheath, S.E.

W. J. Furze & Co. (121,420).—Capital £35,000, in cumulative preference and 26,000 ordinary shares of £1 each. Return May 13th, 1925. 9,000 preference and 21,029 ordinary shares take £10,735 paid on 10,735 ordinary shares. £19,294 considered as paid o preference and 10,294 ordinary shares. Mortgages and charges, nil.

West Coast of America Telegraph Co., Ltd. (52,11 Capital, £232,520 in 53,008 ordinary shares of £2 10s. and 100,000 pre shares of £1. Return dated May 26th, 1925. 45,008 ordinary and preference shares taken up. £100,020 paid on eight ordinary and preference. £112,500 considered as paid on 45,000 ordinary shares. Mo and charges, nil.

Chislehurst Electric Supply Co., Ltd. (50,980).—C £15,000 in £1 shares. Return dated April 20th, 1925. All shares tak £15,000 paid. Mortgages and charges, £7,000.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Wellman Smith Owen Engineering Corporation, Ltd.

The annual meeting was held on August 11th. Mr. F. N. Pickett, A.M.I.E.E., who presided, said that their hope of maintaining the ten per cent. dividend had been disappointed; after paying an interim dividend of 5 per cent. they were unable to recommend any final dividend. The position was due to the failure of several important and remunerative prospects, and the conditions still indicated necessity for the strictest economy. The company had acquired a controlling interest in its parent company, the Wellman-Seaver-Morgan Company, of Ohio, to prevent the latter company from entering into an amalgamation which seemed likely to prove unfavourable to the Corporation. Negotiations were proceeding for the commencement of the production of special welded tube-producing machinery and they were encouraged to hope for excellent results owing to recent developments in the manufacture of hollow steel ingots. They had manufactured for a subsidiary, the Wellman Seaver Rolling Mill Co., Ltd., a very modern tube plant which had been installed at Sheffield and was working satisfactorily, and they had also completed the work of assimilating the American designs of coke-oven machinery and gas producers. The prospects for the future depended largely upon the state of the iron and steel industry in this country.

Tyneside Tramways and Tramroads Co.

The half-yearly meeting of this company, whose report was reviewed in our last issue, was held on August 11th. Mr. G. E. C. Henderson, the chairman, said that the traffic receipts had decreased by £1,456, and the profit on the traffic account had fallen to 1,959 from £3,451 for the corresponding period of 924. The directors did not consider it advisable at present to reduce the services, they were hoping for a revival of employment. The chairman attributed the decrease in revenue to trade depression, unfavourable holiday weather, and motor-bus competition. While they had added £1,089 to the reserve and they had spent £1,216 on rolling stock. He regretted that they were unable to recommend a dividend on either preference or ordinary shares. The report was adopted.

South-Eastern Power and Light Co.—This company, which was formed in September last, and acquired certain interests in Alabama from the Alabama Traction, Light and Power Co., has published its first accounts embracing the operation of the properties acquired for the whole of last year, and of the company itself for the last three months of 1924. The gross income is given as $9,810,829 and the net income as $4,911,649. After providing for interest charges, preferred dividends, renewals, obsolescence, &c., there remains a surplus of $1,058,954.

Underground Electric Railways Co. of London, Ltd.—A return covering the period from January 1st to August 8th shows that the traffic receipts of the Common Fund companies (electric railways and motor omnibuses) were £7,863,221, an increase of £438,470 as compared with the receipts for the equivalent period of 1924. On the other hand, the London and Suburban Traction Group (tramways and 'buses) records a decrease of £24,661 in the same period—the revenue being 1,195,055 as against £1,219,716 in 1924.

Burndept Wireless, Ltd.—It is announced that this company, which was formed early this year, has organised the Burndept Wireless Corporation of America with offices in New York. This is the latest subsidiary and the company is now represented in a number of European countries and the Dominions.

East London Railway Co. — The Act transferring the company's undertaking to the Southern Railway Company has now received the Royal Assent. Accordingly steps are to be taken to issue stocks of the latter company to the debenture stockholders and to make the agreed cash payment to holders of consolidated stock. The East London Railway Co. had been in existence for 60 years.

Companies to be Struck Off the Register.—The following companies are to be struck off the register at the expiration of three months unless cause is shown to the contrary:—

Dominion Mica Corporation, Ltd.
Gibaud Magneto Co. (England), Ltd.
International Dowsing Electric Heating and Appliances Co., Ltd.
Lobita, Benguella and Catumbella Light and Power Co., Ltd.
London Electrical Trading Co., Ltd.
Northern Electrical Engineering and Plating Co., Ltd.
Romapac Tramway Construction Co., Ltd.
Tramway (Conduit) Point Syndicate, Ltd.

Fairbairn, Lawson, Combe, Barbour.—An interim dividend of 2½ per cent. has been declared on the preference shares.

Charles Clifford & Son, Ltd.—A dividend at the rate of 10 per cent. per annum, free of tax, has been declared on the ordinary shares in respect of the past half year.

Torquay Tramways Co., Ltd.—The ordinary shares are to receive an interim dividend of 4 per cent., free of tax.

Lancashire Dynamo and Motor Co., Ltd.—The interim dividend is being paid on the preference shares.

Stocks and Shares.

MONDAY EVENING.

THE effect of the recent reduction in the Bank Rate is continuing to make itself felt amongst all the investment markets in the Stock Exchange. Some people hoped, in fact, that the Rate would come down again last Thursday, and that it would be reduced to the round 4 per cent. Although this did not occur, its advent is supposed to be merely delayed, and, until further developments occur in the Money Market, there will be weekly anticipations of a 4 per cent. Bank Rate until this minimum is established. The demand for investment stocks and shares continues to be considerable. For August, the Stock Exchange is decidedly busy. The feature amongst electricity shares is the manner in which the Cable Manufacturing issues continue to forge ahead.

Home Railways are dull. The outlook seems to grow a little more depressing with every Sunday, the day upon which the rift between employers and employés inappropriately grows wider. Jobbers in the market declare that Home Railways are hopelessly unpopular, and admit that it is not surprising, in view of the incessant mutterings of the weekly orators. The rise in the price of domestic coal is a factor that does not make for hopefulness as regards the Home Railway market.

East London Railway quotations have at last disappeared from the pages of the Stock Exchange Official List. Royal Assent has been given to the Southern Railway Act, 1925, and this completes the absorption of the East London into the Southern Railway. Holders of the ordinary stock will receive terms rather better than the last-quoted value of 5¼. With the disappearance of the East London, the tale of the smaller railway lines runs practically to its conclusion. The grouping system may now be said to have attained completion.

Brazilian Tractions spurted 3½ points to 63½ upon the anticipation of an increase in the present 4 per cent. dividend. The company is doing well, as was pointed out when the recent report appeared, and, with rubber at a price which will stimulate Para production, the hope is that Brazilian Tractions may receive 5 per cent. dividend. River Plate Electricity ordinary stock has receded several points to 205. British Columbia Electric Railway deferred is 3 up at 106, upon aggressive demand in a market somewhat short of stock. Mexicans are heavy. Madras Electric Tramways drooped to 16s. 6d.; on the other hand, Madras Electric Supply 7 per cent. debenture has risen to 101½.

Anglo-Argentine Tramways preference gained ground upon the suggested acceptance, by a Buenos Aires Municipal Committee, of the company's scheme for the construction of new city subways. The Anglo-Argentine Tramways and an American company both submitted proposals. The Buenos Aires Committee favours that put forward by the British undertaking. If the Municipality agrees, the Anglo-Argentine Tramways should enter upon a lease of new life, for the long friction between company and city will be replaced by a settled agreement. Both classes of preference shares went better upon the news.

Cable manufacturing issues are an outstanding feature of strength. Rises have occurred in British Insulated, Callenders, Henley's, Metropolitan-Vickers, Siemens and Enfield Cables. Higher dividends are expected in each case. The spasm of weakness which attacked this section a fortnight ago is forgotten. Since then, prices have risen from 5s. to 7s. 6d. Nobody talks, to-day, of the raw rubber advance being likely to curtail the profits of those manufacturers. The market is in a condition of mild exuberance. The price of raw rubber has gone back a little, but rubber is no longer regarded as an element of importance in this department.

Movements amongst electricity supply shares are mostly upward. Several prices have recovered the amounts of the interim dividends deducted last week. Notting Hill preference fell 10s. to 9½ upon a few shares coming in, but other members of the London group keep very hard. County of London ordinary strengthened to 53s. 3d.: the company's new 6 per cent. preference have advanced to 1s. 6d. premium. This makes the price 22s. for the fully-paid, and the senior preference are better at 23s., the latter giving the modest yield of £5 4s. 4d. per cent. upon money invested at the current price.

Cable companies' issues are uninteresting: all the excitement centres around the shares of the construction and equipment concerns. Globe ordinary are a little better at 17½.

Marconis, now ex dividend, continue to be a heavy and neglected market. The price has sagged to 25s., and Marconi Marines drooped to 17s. 6d. Wireless shares are out of favour. Marconi 5½ per cent. debenture stock looks reasonably-priced at 103: there is a half-yearly interest payment due next month. In the iron and steel lists, changes are slight and negligible. Babcocks at 53s. retain their handsome rise of last week.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	1924	Price Aug. 17, 1925	Rise or (fall)	Yield p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	13	14	2⅝xd	+ 1/32	5 0 10
Brompton Ordinary	1	10	10	1¾	—	*5 14 3
Charing Cross Ordinary	1	14½	15	4 /6xd	+ 1/16	6 11 10
do. do. 4½ Pref	1	4½	4½	17/-xd	—	5 6 0
Chelsea	1	12	12	1⅞	-	6 8 0
City of London	1	15	15	45/9	—	5 11 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	30/-	—	5 3 3
County of London	1	15	15	53/3	+ 6d.	5 14 0
do. do. 6% Pref.	1	6	6	2 /-	+ 6d.	5 4 4
Edmundson's Ordinary	1	7	7	20/6	—	6 1 7
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	33/3	—	6 0 4
Kensington Ordinary	5	14	15	12⅝xd	+ ⅛	5 18 8
Lancs. Light and Power	1	7½	7½	25/6	—	5 17 8
London Electric	1	10	10	33/6	+ 6d.	5 19 5
do. do. 6% Pref	5	6	6	5⅛	—	5 7 10
Metropolitan	1	10	11	37/-xd	—	5 19 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	23/3	—	5 4 4
Newcastle-on-Tyne Ordinary	1	6	7	22/6	—	6 4 5
do. 5% Pref.	1	5	5	18/3	—	5 9 7
do. 7% Pref.	1	7	7	24/6	+ 6d.	5 14 3
Notting Hill 6% Pref.	10	6	6	9½	— ⅛	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	14 /6d	+ ⅜	6 5 0
South London	1	15	15	2½	+ 1/16	6 0 0
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref.	1	6	6	19/6	—6d.	6 3 1
Westminster Ordinary	1	15	15	43/6xd	—	6 18 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/6	—	7 13 10
Yorkshire Elec.	1	8	8	29/-	—	5 10 6
HOME RAILS.						
Central London Ord. Assented Stock	4		4	68	—	5 17 8
Metropolitan	4		5	67½xd	—	7 8 2
do. District	3½		3½	44½	—	7 1 4
Underground Electric Ordinary	10	Nil	Nil	2½	—	Nil
to do. "A"	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds	6		6	98	—	*6 2 5
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref. Stock	6		6	103½	—	5 15 11
do. Def.	1½		1½	24	—	6 5 0
Automatic Telephone	1	3	6	2⅛	—	2 18 2
Chili Telephone	5	6	5	5¾	—	*4 13 0
Cuba Sub. Ord.	10	5	5	6¾	—	7 8 2
Eastern Extension	10	10	10	17½	—	*5 15 11
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 15 11
Globe Tel. and T. Ord.	10	10	10	17½	+ ⅛	*5 14 1
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	22	31	—	7 1 11
Indo-European	25	7	8½	41½	—	*5 2 5
Marconi	1	10	10	1¾xd	— 1/16	8 0 0
Marconi Marine	1	10	7½	17 6xd	—	8 11 6
Oriental Telephone Ord.	1	12	12	24	-	*5 12 11
United R. Plate Tel.	5	8	8	7¼	—	5 8 6
Western Telegraph	10	10	10	16½	—	*6 3 1
HOME AND FOREIGN TRAMS, &C.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3 3/4	+ 1/16	8 12 6
do. do. 2nd Pref.	5	6	6	8 1/16	+ ⅛	9 16 0
do. do. 5% Deb. Stock	5		7	71½	—	6 15 2
British Electric Traction Ord.	6		6	112	—	5 7 2
do. do. 6% Pref.	6		6	101	—	5 15 5
Brazil Traction	100		4	63¾	+ 5/16	6 6 0
Brit. Columbia Elec. Rly. Pcc. Stock	5		5	88½	—	5 11 9
do. do. Preferred	96/-		96/-	81½	+1	*5 14 0
do. do. Deferred	129/5		129/5	106	+3	*6 2 0
do. do. Deb.	4½		4½	77½	+1	5 9 8
Lond. & Sub. Trac. 5% Pref.	2½		Nil	4/6	—	Nil
London United Tram. Deb. Stock	4		4	42½	—	9 8 4
Mexico Trams, 5% Bonds	5		5	62½	—	8 0 0
Mexican Light Common	100		Nil	Nil	25	—	Nil
do. Pref.	100		Nil	Nil	56	- 2	Nil
do. 1st Bonds	5		5	61½	-2	8 2 8
Yorkshire (West Riding)	1		5	—	17 6	—	5 14 3
MANUFACTURING COMPANIES						
Babcock & Wilcox	1	12	12	52/-	—	*4 12 4
British Aluminium Ord.	1	5	10	30/9	—	6 12 6
British Elec. Transformer Pref.	1	Nil	7	17/6	—	...
British Insulated Ord	1	15	15	3¼	+ 3/16	4 12 4
Brush Ord.	1	10	10	1¼	—	10 0 0
Callenders	1	15	15	3¾	+ 1/16	4 9 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅝	—	...
Edison-Swan	4/-	10	10	9/3	—	5 2 9
do. 5% Deb. Stock	5		5	80½	—	6 4 3
Electric Construction	1	10	10	3/3	—	6 11 2
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	17 9	—	5 12 8
do. do. Pref.	1	6	6	20 6	—	5 17 1
Gen. Elec. Pref.	1	6⅓	6⅓	23 6	—	5 10 8
do. Ord.	1	5	7½	24/-	—	6 5 0
Henley	1	15	16	3½	+ 1/16	4 18
do. 4½% Pref.	5	4½	4½	1¼	—	5 6 0
India-Rubber	1	5	5	19/6	—	*5 2 6
Johnson & Phillips	1	10	10	2¼	—	4 9 3
Met-Vickers, Ord.	1	8	8	24/-	+2/6	6 10 8
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	1 7/16	+ 1/16	5 4 4
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemical and Metals.

IT should be remembered, in making use of the figures appeari in the following list, that in some cases the prices are only gene and they may vary according to quantities and other circumstanc

CHEMICALS, &c.		Price August 18th.	Fortnight Inc. or de
a Acid, Oxalic	per lb.	5¾d.	...
a Ammoniac, Sal	per ton	£60	...
a Ammonia, Muriate (large crystal)	"	£52	...
a Bisulphide of Carbon	"	...	...
a Borax	"	£25	...
a Copper Sulphate	"	£25 10s.	...
a Potash, Chlorate	per lb.	4d. to 4½d.	...
a " Perchlorate	"	5½d.	...
a Shellac	per cwt.	£15 15s.	...
a Sulphur, Commercial	"	£7 15s.	...
a " Roll	"	£7 15s.	...
a Soda, Chlorate	per lb.	3¾d. to 3¾d.	...
a " Crystals	per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks	per lb.	4d.	...
METALS, &c.			
b Aluminium, Ingots	per ton	£120 to £125	...
b " Wire	per lb.	1/9 to 2/6*	...
b " Sheet	"	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net	£239	...
Grade II	" "	£169	...
Grade III	" "	£95	...
c Brass (rolled metal 2" to 12" basis)	per lb.	9¾d.	...
c " Tubes (solid drawn)	"	1/- to 1/0½	½d. inc.
c " Wire, basis	"	10½d.	...
c Copper Tubes (solid drawn)	"	1/1½	½d. inc.
c " Bars (best selected)	per ton	£93	£2 inc.
c " Sheet	"	£93	£2 inc.
c " Rod	"	£93	£2 inc.
d " (Electrolytic) Bars	"	£67 15s.	...
d " Sheets	"	£143 10s.	...
d " Wire Rods	"	£77 15s.	...
d " H.C. Wire	per lb.	9¾d.	...
f Ebonite Rod	"	to 2/6	...
f Sheet	"	2 3 to 2/6	...
n German Silver Wire	"	2/3	...
h Gutta-percha, fine	"	9/9	...
h India-rubber, Para fine	"	3 2	11½ de
i Iron Pig (Cleveland Warrants)	per ton.	nom.	...
l " Wire, galv. No. 8, P.O. qual.	"	£21	...
g Lead, English Pig	"	£39	1/6. inc.
g Mercury	per bot.	£13 12s. 6d. to £13 17s. 6d.	2s. 6d. de
e Mica (in original cases) small	per lb.	3d. to 8/-	...
e " medium	"	4/- to 8/-	...
e " large	"	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	"	1/3½	...
p " drawn bars & rods	"	1/3	...
p " rolled strip & sheet	"	1/2¾	...
p " wire	"	1/3¾	...
o Platinum	per oz.	£26	...
d Silicium Bronze Wire	per lb.	1/0¾	...
r Steel, Magnet in bars	"	7¾d.	...
u Tin, Block (English)	per ton.	£156 15s. to £257 5s.	£7 10s. t £7 15s. de
n Wire, Nos. 1 to 16	per lb.	8/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd
n P. Ormiston & Sons.
o Johnson, Matthey & Co. Ltd.
o C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Standard Guarantees for American Accumulators.—standard ninety-day guarantee on storage batteries and a sta dard rating for radio "A" batteries were adopted at the co vention of the American National Battery Manufacture Association lately held in Chicago. At a previous meeting standard rating for radio "A" batteries was adopted whi was based on a continuous discharge of one ampere, starti with a specific gravity of 1.285 and a temperature of 85 deg. continuing the discharge until a voltage of 1.75 per cell reached. Due, however, to the fact that many batteries on t market are rated on a basis of intermittent discharge, it w decided to adopt a second rating which provides for a dischar of ¼-ampere per positive plate, the discharge to be for fo hours, followed by a rest period of twenty hours, then d charged for four more hours, and so on until the voltage p cell has fallen to 1.75. It was recommended that these ratin be placed on the name plates of all radio "A" batteries. T idea of a standard warranty includes the prospects of eve tually selling all batteries on the same basis on which mot vehicles are sold, where the manufacturer sells his mercha dise on its reputation and makes good defects in mater and workmanship only. The warranty is as follows:—

"We guarantee each new battery manufactured by us to free from defects in material or workmanship under norm use and service; our obligation under the guarantee hei limited to making good at our factory any part or parts ther of which shall, within ninety (90) days after delivery of su battery to the user, be returned to us with transportati prepaid, and which, upon examination, shall disclose to o satisfaction to have been defective. This guarantee shall n apply to any battery which shall have been repaired or open outside our factory or duly authorised service station, n which has been subject to misuse, negligence, or accident.

An Electrically Driven Stone Quarry.

The Leckhampton Quarries Co.'s Undertaking.

...r the Leckhampton Quarries Co., Ltd., is up to date is indi-...d by the fact that all the plant and machinery of this ...ucestershire undertaking is electrically operated. More-...r, the company generates its own electricity by means of a ... type of 3-phase alternator which was described in our ... 15th issue.

...he power station contains two 250-b.h.p. Premier 4-cylinder ... engines, fig. 2, each driving a Hunt 440-volt, 200-kVA, ...ycle, self-paralleling alternator, fig. 1, built by Messrs. ...dycroft, Ltd. The two sets of gas producers were supplied ... Messrs. Crossley Bros., and the auxiliary plant includes an ...compressor and receiver and furnace exhaust fans required ...starting the plant, driven by a small oil engine; a 7½-h.p. ...or drives the fan and pump of the Heenan & Froude cooler ... the main engine circulating water, while water is fortu-

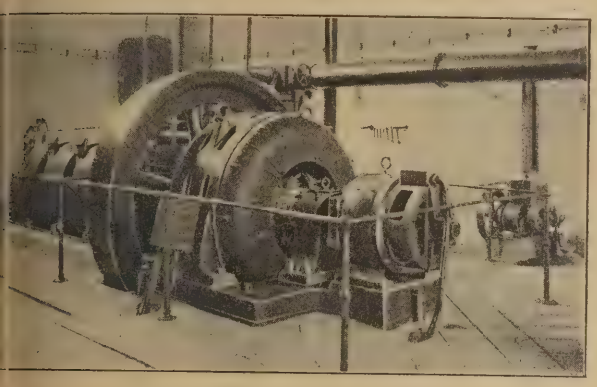


Fig. 1.—A Hunt 200-kVA Alternator.

...ly available in abundance at a sufficient head from neigh-...ring springs to supply the gas scrubbers, engines, and ...age tanks.

...e 8-panel 4-wire switchboard is by the Metropolitan-...ers Electrical Co., the supply being at 440 volts, 3-phase ...ycles to motors, and at 250 volts between each phase and ...tral for lighting.

...e limestone quarry is on a hill at a distance of one mile ...n the power station, and for supplying motors at the ...workings the voltage is stepped up at the power house to ...0 volts and the power transmitted by an underground cable ... sub-station on the hill where step-down transformers re-...e the pressure again to 440 volts. The h.p. Henley cable ...aper-insulated, lead-covered, and steel-armoured. A 4-pair ... cable is laid underground from the power house and offices ...he hill sub-station for telephone communication and also ...signalling by electric bells between the hill workings and ...shalling yard at the foot of the incline.

...e Swedish 3-phase step-up and step-...n transformers for this supply are in ...s, each pair being of a capacity of ...kVA coupled in parallel. The hill ...station supplies a haulage motor, two ...p. motors driving exhaust fans for ...kilns, a fuel elevator motor (4 h.p.), ...ntrifugal pump motor (1 h.p.), and ...kiln furnace blower motor (7½ h.p.).

...e necessary lighting for the night ...is furnished at 250 volts off each ...se and transformer neutral. A con-...rable amount of water is required ...the hill workings and, as no natural ...ply is available at that altitude, water ...mped up from a pond at the power ...e level to storage tanks on the hill ...3-throw lift pump driven by a 3-h.p. ...or.

...e main and tail haulage gear (by ...srs. Bullivant) controls the descent of ...ks loaded with limestone and the ...ng of trucks which are sometimes ...ty and sometimes loaded with fuel for the kilns. The ...gauge is standard 4 ft. 8½ in. and the loaded ...s on reaching the marshalling yard at the foot ...e incline are drawn by steam locomotives to the ...R. main line. The maximum loads for which the haulage ...was designed were two 6½-ton G.W.R. trucks, each loaded ... 10 tons of stone (33 tons) down, and either 23 or 15 tons ...according to whether fuel or another load was being raised. ...gave a general out-of-balance load of from 10 to 18 tons ...vour of the drive by gravity, but as the incline is a vary-...gradient, there are certain lengths of the track where driv-...power is necessary; for instance, when the descending load ...arly on the level and the ascending load is on the steepest ...ient (1 in 5). Also considerable torque is required to start the loaded trucks on the level before commencing the descent. The rate of travel is 5 miles per hour.

After the haulage plant had been in operation a few months it was found advantageous to load the trucks with the exact quantities of material ordered, and as such loads varied and were frequently light, the assistance by gavity was reduced and more load thrown on the motor. The motor is a single-speed cascade machine of 80 b.h.p., built by Messrs. Sandycroft, Ltd., to Mr. L. J. Hunt's design, and has proved quite capable of standing short overloads up to 50 per cent., and momentary overloads up to 100 per cent. The speed is controlled by mechanical brakes on the haulage drums and electrical regenerative braking on the motor when the speed exceeds synchronous speed. The controller regulates the resistance in the stator circuit, and when the motor is returning current to the line all controller resistance is cut out. A Heenan & Froude hydraulic brake forms part of the haulage equipment as a standby and safeguard in emergency. The heights above sea level of the hill workings and the power house are 850 ft. and 550 ft. respectively; consequently, the height through which the haulage operates is 500 ft.

On the occasion of our visit there were in operation 198 h.p. of motors of various makes connected to the stoneyard machines, and an overhead travelling cane now nearing completion will take a further 158 h.p., while hydrating plant is shortly to be installed which will require 120 h.p.

The generating plant was guaranteed to give full load at a consumption of 1.35 lb. of anthracite (of 14,500 B.th.u. per lb.) per kWh; also 1.65 lb. at ¾ load and 2.2 lb. at ½ load. We are informed by Mr. H. D. Wilkinson, consultant to the quarry proprietors, that on a full day's test run with fuel of 14,670 B.th.u. per lb., the consumption was 1.27 lb. fuel per kWh at 92 per cent. of full load and 0.98 power factor; 1.45 lb. at ¾ load and 1.53 lb. at ½ load, as against the guaranteed figures (corrected for calorific value) of 1.33, 1.63, and 2.17 respectively. These figures were obtained after deducting the power used for engine cooling (6.6 kW) from the total output, and prove that the plant has a high efficiency in respect of each of the three generating stages in producing electricity from coal.

Interesting Coal-handling Equipment.—An example of modern coal-handling equipment recently installed by Messrs. Fraser & Chalmers engineering works (General Electric Co., Ltd.), at the new power station of the West Gloucester Power Company at Lydney, possesses interesting features, inasmuch as the coal may be conveyed by it direct from the pit head to the boiler-house bunkers; provision has been also made for dealing with coal brought from adjacent collieries by rail. From the colliery screen house a 24-in. inclined Robins belt conveys the coal to a junction tower situated near the end of the boiler house; the coal here changes its direction and, still ascending, is conveyed right over the top of the boiler-house

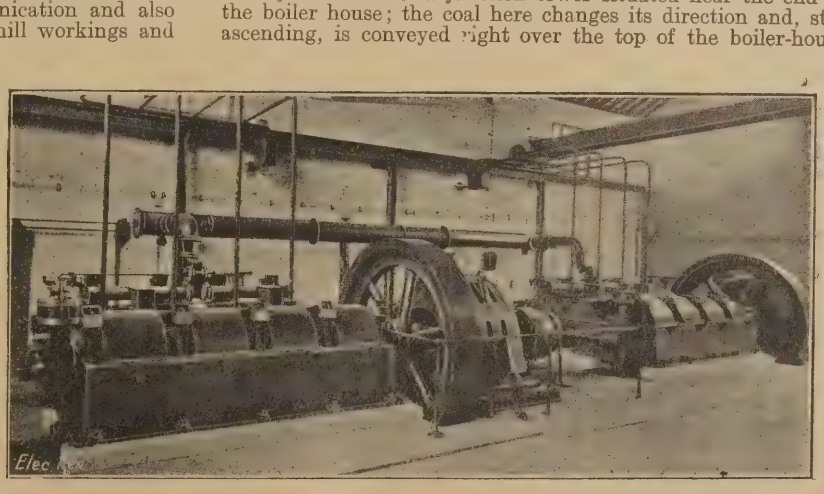


Fig. 2.—Premier 250-b.h.p. Gas Engines.

bunkers; the conveyors run at a speed of about 250 ft. per minute and have a capacity of 100 tons of coal per hour. The cast-iron rollers are mounted on hollow shafts lubricated with solid grease, whilst the "Durabelt" consists of graduated plies of cotton duck cemented together with rubber compound, or "friction" as it is called, the whole being enveloped in a rubber cover; the top cover is further reinforced by means of a special open fabric, which is used to key the top cover to the body of the belt. These belts were individually designed with regard to weight of material, plies of cotton duck, and composition of rubber, to meet the particular services for which they have been installed. The coal on reaching the boiler house is conveyed by a horizontal belt over the bunkers, into which it is distributed by a travelling tripper.

Breakdowns and Failures of Electrical Plant and Equipment.

Contained in the Technical Report for 1924 of the British Engine, Boiler and Electrical Insurance Co., Ltd., are many accounts of breakdowns and failures selected from the casualty list of the year, either because of some interesting peculiarity or as suggestive to makers and users of such plant. From the electrical and allied sections we cite the following cases.

An instance of turbine blading troubles was discovered in a 500-kVA turbo-generator running at 3,000 r.p.m. and working at a steam pressure of 125 lb. per sq. in. and a temperature of 450 deg. F. The turbine was of the Curtis type, with three wheels each containing two rows of blades. As it was noticed that the set failed to give its rated output with the normal steam supply, the turbine was opened out. It was found that the two rows of blading on the first rotating disk were indented at the steam side, the marks being in some cases $\frac{3}{8}$ in. wide, and the blading of the corresponding inlet nozzles was indented at the edge adjacent to the first row of the rotor blading; the intermediate guide blading for the first wheel also was bruised. The damage, which was not caused by distortion, and which did not bear the appearance of having been caused by water, was evidently brought about by the jamming of some foreign substance between the stationary and the revolving blades; the strainer was found in order and no loose part could be found, nor could the cause of the damage be definitely traced. It was seen, however, that there were two small blowholes at the bottom of the cylinder at the high pressure end, the holes being about $\frac{3}{4}$ in. in diameter and $\frac{3}{8}$ in. in depth. It is possible that either small portions of this porous metal or a piece of a core nail from some other part of the casting may have become detached and caused the damage. This case exemplifies the value of the recommendation that a turbine should be opened out at least once a year for examination. It is by no means uncommon, on a turbine being opened up, to find that the blading is damaged.

A case where an alloy ring, for retaining the ends of the armature conductors connected to the commutator, suddenly broke axially along its whole length and caused the wrecking of the generator of a 1,000-kW turbo-generator, is recorded. After being at work carrying half the full rated load, the machine was being shut down in the usual manner; the load had been gradually reduced, the controlling switch for the generator opened, and the steam valve tripped immediately afterwards by the engine driver, who had been awaiting the signal from the switchboard attendant; steam was then shut off. The governor was at the time in good order and no observable rise in speed took place when the switch was opened. When the speed had fallen to about 1,000 r.p.m. the trouble occurred.

The broken ring, which at first continued revolving with the shaft, opened out with the centrifugal force of the portions near the line of cleavage and of the contained windings, and, after shearing the set screws by which a ventilating fan was secured to it at one end, struck the cast-iron field frame, fracturing this also; fragments of the frame were hurled in various directions over the engine house, while the ring itself catching on the field frame was opened still wider and flung clear of the machine with only small pieces chipped off. The connections between the armature winding and the commutator, no longer held down, flew outwards and were broken; the field coils and the armature winding were damaged beyond repair. Fig. 1 shows the end of the field frame after the accident. The ring was 42 in. in diameter and $17\frac{1}{4}$ in. in width; it was pressed on to the armature core at one end, and near the other rested on lugs formed on a drum beneath the conductors. A flange, $3\frac{1}{8}$ in. deep, was cast at the end near the lugs to form one side of the fan, which was situated between the ring and the commutator, the runner of the fan being spigoted into the base of the flange, where it was further secured by fifteen $\frac{3}{8}$-in. steel set screws. Axial and circumferential movement were prevented by twenty dowel pins, screwed into the ring and sliding inside sockets cored in the lugs on the lower drum. The thickness of the body of the metal was about 1 in.; this tapered down to .55 in. near the armature core, where the thickness of the lip was .375 in. The surface speed of the ring, 13,750 ft. per minute, was by no means excessive; the stress at the inside, caused only by its own centrifugal force, would not have exceeded 2.5 tons per sq. in. and at the inside of the flange 2.75 tons per sq. in. The total running stress would have been well within the safe working limit for a sound casting.

An investigation was carried out to determine the cause of the failure, and microscopic examination showed that the material was of an excessive grain size. All the specimens examined showed a large amount of oxide inclusion and a number of small blowholes, which were distributed throughout the metal; in addition, there were, locally, cavities of appreciable dimension. Considerable difficulty was experienced in polishing the specimens owing to foreign matter, which exuded from the cavities and scratched the surface. Sections, examined both along the principal axial fracture and along a small longitudinal crack which branched off from this, showed that the fractur were in several positions inter-crystalline in character owi to the local weakness at the boundaries caused by defects. several places the cracks passed through large cavities a areas containing the gamma compound; one area of this natu is shown by a photomicrograph to possess a crack commenci at a cavity in one of the white-coloured grains, and runni into the fractured edge at a similar grain. The material prov defective owing to the metal having been cast at too high temperature and allowed to cool too slowly.

In another case, perished and brittle insulation on the arm ture coils resulted in a breakdown on a 1,500-kW, 0.8 pow factor turbo-alternator, three-phase, 11,000 volts, 50 cycl 1,500 r.p.m. The stator insulation was uniform throughou the insulation on the conductors and the partition insulati in the slots between the two rows of conductors not bei reinforced at the terminal ends. A serious burn-out occurr owing to an arc being set up in the stator end windings, t tween the top two conductors in the first slot connected to o of the terminals on the machine; the arc jumped to earth one of the clamping bolts, severing the leading-out conduct and the end turns of the conductors of the neighbouring s on the same phase, across which the former was bound. T machine caught fire and the flames, fanned by the draug were carried round the windings; all the insulation, at t exciter side, of both the stator and the rotor was burnt co

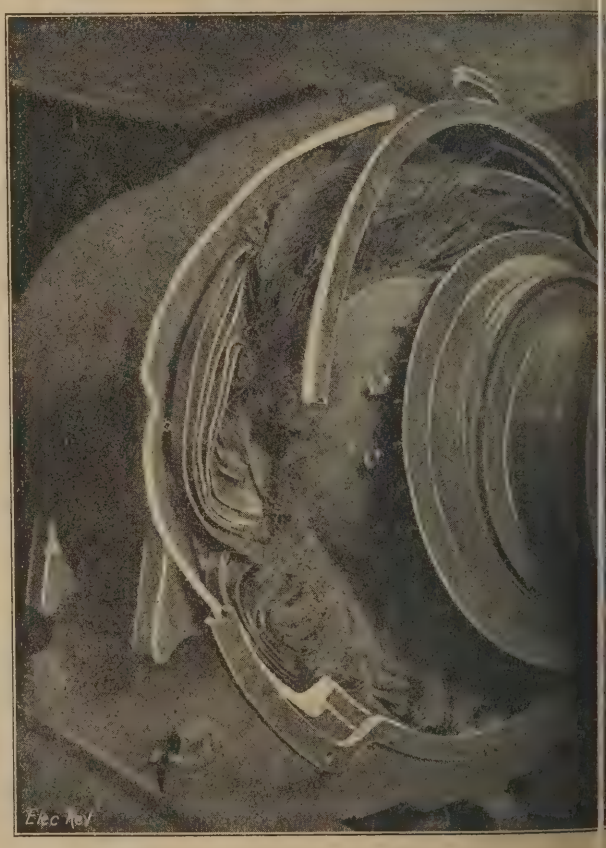


Fig. 1.—The 1,000-kW. Damaged Generator.

pletely through. The complete generator had to be retur to the makers for re-winding. The burn-out was caused the insufficiency of the partition insulation between the rows of conductors in a slot.

An accumulation of dirt in the rotor windings resulted a breakdown on a 750-kW turbo-generator, 400 V, three-ph 50 cycles, 3,000 r.p.m. It was noticed, immediately bef stopping time, that undue vibration was taking place. the following morning considerable difficulty was experien in maintaining the alternator voltage, and smoke was s issuing from the air outlet. When the end covers of the al nator were removed, it was seen that the smoke was com from the ventilating ducts in the rotor core; this contin for four hours. A test of the rotor windings, made after smoke had subsided, showed the very low insulation resista of 0.001 megohm. The rotor was returned to the mak works, where the end bells were removed, and the coils ex ined and tested. The tests this time showed perfectly nor results, but it was discovered that a short circuit had ta place between the lower turns of a group of coils and the l ing-out strip to the slip rings. The improved test had c about owing to the removal of the end bells; this had allo the faulty turns, which normally were pressed against leading-out strip, to spring outwards and create a clear

ace. All the windings of the machine had suffered from the cumulation of dirt, and the insulation of the rotor was found have perished considerably. The dirt consisted mainly of ne and iron, the latter being present, in a large measure, the form of sulphide. The air intake for the machine was the vicinity of the ash tip and the coal chute for the boilers, e opening being only protected from the dust-laden atmo-here by means of sheets of perforated metal. The rotor was mpletely stripped and re-wound, and the installation of an -filter was recommended.

A breakdown on a 400-kW turbo-generator, four-pole, com-und wound, 525 volts, 1,500 r.p.m., was attributed to shrink-e of the insulation and the resulting chafing; a short cir-it developed between a top and a bottom bar in one of the mature slots. Several bars had to be removed before the ults could be located; after the faulty bars were taken out, e insulation was tested and found to be unsatisfactory. It is decided to re-wind the armature entirely and to renew the t insulation.

A 500-kW motor converter converting to d.c. at 460/550 V, 040/910 A, from three-phase, 6,600 volts, 50 cycles, 53 amps., is subjected to a breakdown which took the form of a "short" side one of the slots between the two bottom conductors, e of which was an end conductor connected to the ter-inals; the fault occurred after the set had been in operation r three or four hours. At that time it was discovered that e charging resistances were burnt out; the resistances were placed and all the conductors, together with the insulation the faulty slot, were renewed. Two months later, while e set was being started, a humming noise was heard when e oil switch was closed; the machine was found to have oken down again. The breakdown occurred, as before, be-een two bottom conductors, one of which was an end con-ctor but on a different phase to that which had failed pre-ously. On this occasion the charging resistances were found order and, with the exception of the faulty bars, the insu-ion resistance between each conductor and the remainder, d also to earth, exceeded 100 megohms. It appears probable at the second fault developed as a result of the insulation ing strained while the charging resistances were out of mmission. The insulation of the end conductors was similar that in the remainder of the machine and not adequate. view of the high pressure between the turns, and of the essure rise which is to be expected at times of switching or the occurrence of a surge, the insulation of the end turns ould have been reinforced.

Trouble as the result of a rotary converter being worked at ow power factor in order to obtain a d.c. pressure regulation sulted in a shut down on a 300-kW, six-pole, shunt-wound terpole rotary converter, designed for converting six-phase, -cycle alternating current at 0.98 power factor to direct cur-nt at 520 volts. The machine was used for supplying at 420 lts, the transformer windings being arranged to suit.

A burn-out of this machine took place at the slip-ring end, tween the end of the core and a binder, confining the over-ng of the windings, which was $\frac{5}{8}$ in. from the end of the re. It could be seen that all the conductors of one slot and but one of the neighbouring slot had been melted through, d that nine other coils were burnt owing to the flame being rried round the periphery; molten copper, which had been rown out, had collected under the formers of the field coils; e intersegmental micas and some of the commutator bars d suffered also.

The trouble commenced with the overheating of the coils nnected to the slip rings; one of these was situated at the ntre of eight adjacent burnt-out coils and the arc evidently rted in this. Under the working conditions of this machine, hough the output on the direct-current side may be kept low the rated value, the current in the windings referred may still be excessive, as it was in this case.

The case of a 330-b.h.p., vertical, water-cooled, squirrel-cage, hase induction motor, 2,750 volts, 40 cycles, 1,180 r.p.m., which trouble was experienced owing to the rotor and stator res coming into contact is of considerable interest. The otor, which was totally enclosed, had a water-jacketed stator re. The jacket was divided into two sections, each provided ith longitudinal ducts connected so as to afford a zigzag path r the water, which was drawn from the rising main. The r in the motor was circulated by means of a fan, and the at transferred to the water by means of longitudinal ribs st on the outside of the jacket.

On the motor being dismantled after the trouble, it was und that the jacketed stator core had become loose in the ter frame on account of wear at the surfaces where the cketed core made contact with the outer frame. The fixing as effected by means of sixteen machined pads cast on the side of the outer frame, eight at each end; these bore on rresponding T-shaped lugs, 2 in. long axially, cast on the tside of the jacket; the bottom pads were secured to the wer end cover by set screws which prevented turning and ial movement. Owing no doubt to vibration, the set screws d worked loose and allowed movement of the interior por-n of the stator frame, the lugs being originally a loose fit side the pads. As a result of the cumulative movement hich occurred, both the T-shaped lugs and the machined pads re worn, in some cases by as much as 30 mils. defective joints were found in the rotor windings, is probable that uneven current distribution in the tor bars was in a large measure the cause of the vibra-n. New bars were fitted to the rotor and new end rings cast on. The stator winding, which had suffered somewhat from oil and water, was thoroughly dried, cleaned and re-varnished; after this it showed a satisfactory insulation resist-ance and withstood a pressure test of 4,000 volts for one minute. The arrangement was not considered satisfactory on account of the lightness and ill fit of the fixing lugs; it was found possible, however, to effect a satisfactory repair by locking the set screws securely and affixing additional set screws on the periphery of the outer frame and passing through the pads; these, after the jacket had been set central, were secured by locking plates to the outside of the casing. A year later, on the occurrence of a second failure, it was found that one of the stator coils was "earthed." Examination showed that the water jacket was very nearly choked with deposit, causing the motor to overheat. Considerable difficulty was experienced in cleaning out the water jacket, and finally the use of acid was resorted to. The stator winding was completely rewound and improvements were made to prevent oil being drawn into the motor through the bearings.

In another instance the shaft of a 220-b.h.p., three-phase, slip-ring type, induction motor, 400 volts, 50 cycles, 364 r.p.m., broke close to the housing at the pulley side of the inside bearing of the machine. The outer bearing was broken to fragments but the inside bearing sustained little damage. The trouble arose from the entire absence of a fillet at the change of diameter, where the journal joined on to the oil thrower; this led to a concentration of stress there. The shaft was further weakened by the presence of an area of segregated matter containing a considerable quantity of sul-phur; it could be seen clearly from the progressive markings on the fractured surface that the failure had emanated from this locality.

Several records are shown of static transformer breakdowns. In one interesting case two 1,000-kVA transformers, arranged Scott-connected, primary 6,600 V, three-phase, 50 cycles, 177 amperes, secondary 2,300 volts, two-phase, 435 amperes, were arranged with the primary windings of each transformer in two sections wound concentrically, the secondary windings being sandwiched between these; and each set of windings traversed the full length of the core. The primary and secondary of the transformers were each controlled by auto-matic oil switches set to operate with full load current. Both switches were fitted with auxiliary contacts, charging resist-ances being placed between the main and the auxiliary con-tacts. The transformers were situated at the generating end of the system close to the alternator, while the switching on or off was effected each day with the secondary on open circuit and the alternator generating full voltage. The insulation, of the transformer connected to the 86 per cent. tapping, failed half-an-hour after being switched on and while the combined load was only 200 kVA, the full-load current having at no time been exceeded. It was found that arcing had taken place be-tween the top turn of one of the inner sections and the iron core; several of the neighbouring turns were charred, the insulating cylinder, on which this coil was wound, pierced, and the core burnt locally by the arcing; the insulating cylin-der on which the secondary was wound had also collapsed at the bottom. Considerable movement of the windings had taken place owing to their lack of rigidity and in consequence the insulation of the top turn of the inner primary winding on the second limb had been bared owing to the winding hav-ing been forced against the supports; the insulation elsewhere was in good condition. The dielectric strength of the oil was, when tested, found satisfactory, the oil being free from acidity and withstanding 22,000 volts across a 0.15 in. gap. The trouble appears to have arisen from the insufficient support of the windings and to shrinkage having allowed these to move and cause a breakdown of the insulation of the end turns, the re-sultant arc causing the remaining damage. As the makers considered it possible that the insulation of the end turns was damaged during the switching operations, it was arranged that in the future the primary of the transformers should be kept permanently in circuit. The movement of the windings ne-cessitated the complete re-winding of the inside section of the primary of both limbs, and, owing to damage to the insulating cylinders on which the secondaries were wound, the replace-ment of the cylinders involved the complete re-winding of the secondaries.

Among the breakdowns recorded in the miscellaneous elec-trical equipment is the case of an oil-immersed switch, de-signed for working on a 75/125-ampere, 440-volt, three-phase, 50-cycle circuit, through a three-phase transformer, the star point on the low-pressure side being earthed. The switch was of the pillar type, the contacts being immersed in the usual manner inside a cast-iron tank; the tank was attached to a cast-iron bonnet containing the operating mechanism and elec-trical connections, an ammeter being connected to one of the outgoing phases. The tank and bonnet were separated by a three-ply wooden partition, pierced for the connections and operating bars; this would prevent any part of the upper chamber, which might become detached, from dropping into the oil tank. The switch was fitted with one no-volt and three overload trips, but was not provided with a gas vent. The oil in the tank had been replaced two months prior to the failure, which occurred at a time when there was only one 10-b.h.p. motor in operation on the circuit controlled by the switch, the motor being used for driving mechanical stokers.

An explosion occurred inside the switch, resulting in the tank bursting and the ammeter being blown out of the panel and destroyed. One of the overload coils was completely burnt

out and the aluminium bar for operating the overload trips was broken; the inside connections of the switch also bore evidence of the arcing which had taken place.

It was established that care had been taken to fill the oil tank to the correct level, but that the aluminium overload trip bars of other switches had been found broken on previous occasions at times of examination; a breakage of this nature could readily lead to a short circuit owing to the congested arrangement of the interior connections of the switch. At the time of the explosion an electric crane was working in the vicinity, but off another circuit. The evidence points to the fact that the trip bar was broken prior to the mishap and came into tact, possibly owing to vibration, with one of the amm connections. The aluminium trip bar, which was earthed once formed a short-circuit path for one of the phases thr earth, causing current to pass through the overload trip in this phase, burning it out. The current, which would passed through the overload coil, was unable to trip the sw owing to the bar being broken; the arc to earth, resul from the short circuit, evidently developed into an arc betv phases and spread across the connections inside the sw igniting accumulated gases and causing an explosion.

High-Pressure Steam Turbine Development.

Some Swiss Opinions and Achievements.

At a recent meeting of the Association Suisse des Electriciens, in Berne, M. Ad. Meyer, chief engineer of Messrs. Brown, Boveri & Co., Baden, read a paper on "Recent Installations of High-Pressure Steam Turbines," in the course of which he pointed out that at the price at which it was then being offered for delivery in large quantities at Basle, coal as fuel could successfully compete with water power in the generation of electrical energy in Switzerland. The author stated that according to various authorities the cost of fuel, including depreciation, interest, and general expenses, was estimated in the United States to amount to 75 per cent. of the total cost in the case of power stations with an output of several thousand kilowatts. Although in Switzerland coal was more costly than in America, and consequently entered more largely into the operating expenses, he based his calculations for the sake of simplicity on the American figure.

At the present time boilers were being constructed in Switzerland to deliver steam at a pressure of 35 atmospheres and a temperature of 400 deg. C. His company, in utilising steam at this pressure, was now able to supply turbines under a guarantee that, using coal yielding 7,500 calories per kilogramme and with a suitable condensing installation, the fuel consumption would not exceed 0.47 kilogramme per kilowatt-hour at the generator terminals. Estimating coal at 4 centimes per kg. (about 32s. per metric ton), the cost would be equal to only 1.88 centimes per kWh (at the present rate of exchange 100 centimes would be worth approximately 9.6d.). Figured on the 75 per cent. basis mentioned above, the total operating cost of a high-pressure, steam-operated power station would work out at approximately 2½ centimes per kWh for a co-efficient of current utilisation, that is to say, a load factor, of 60 per cent.; but if it was assumed that the load factor was 40 per cent., the production cost of a steam station would be 3.65 centimes per kWh, and with a load factor of only 20 per cent. the cost would be 5.4 centimes, figures which, in the author's opinion, could be favourably contrasted with those of a hydro-electric station. Such figures could, however, only be attained by the adoption of a much higher steam pressure than had hitherto been in general use. Although, having regard to the large quantities of coal that would need to be imported, it might be questionable whether in a country like Switzerland it would not be preferable to rely on hydro-electric stations, there were many instances in which steam at not unduly high pressures was required, in which it was undoubtedly economical to produce steam at a higher pressure than necessary for heating and other purposes, and to reduce the generated pressure by the expedient of utilising it for driving turbines. An installation of this kind had recently been completed at the Brown, Boveri works in Baden, which would shortly be heated throughout by exhaust steam. The installation comprised boilers designed to produce steam at a pressure of from 15 to 18 atmospheres and a temperature of from 350 to 380 deg. C. for power purposes and for the turbine-testing department. The steam was first used to drive a turbine, the expansion being there utilised to the condensation pressure, the latent steam heat being then transferred to the water circulating in the condenser; the water when it emerged from the latter at a higher temperature was circulated by pumps through the heating radiators, from which it returned to the condensers to repeat the cycle of operations. In order to meet heating requirements which varied in accordance with the external temperature, the water must emerge from the condenser at temperatures ranging from 50 to 90 degs. C. Taking as a typical example working live steam at a pressure of 18 atmospheres and a temperature of 350 deg. C., and an absolute back pressure of 0.5 atmosphere, the water circul for heating purposes could be heated up to about 80 deg. under such circumstances each kilogramme of steam w contain 753 calories. In the case of an ideal turbine the pansion (adiabatic) would absorb 166 calories from the ste leaving 587 calories per kg. in the exhaust steam available heating purposes. Coming down to realities, however, author pointed out that, taking turbine efficiency at 74 cent., and having regard to mechanical losses and the en lost by radiation, the calories actually converted into chanical energy by the turbine would only be 118, which w leave 635 calories per kg. (753—118) in the exhaust steam 85 per cent. of the energy of the live steam.

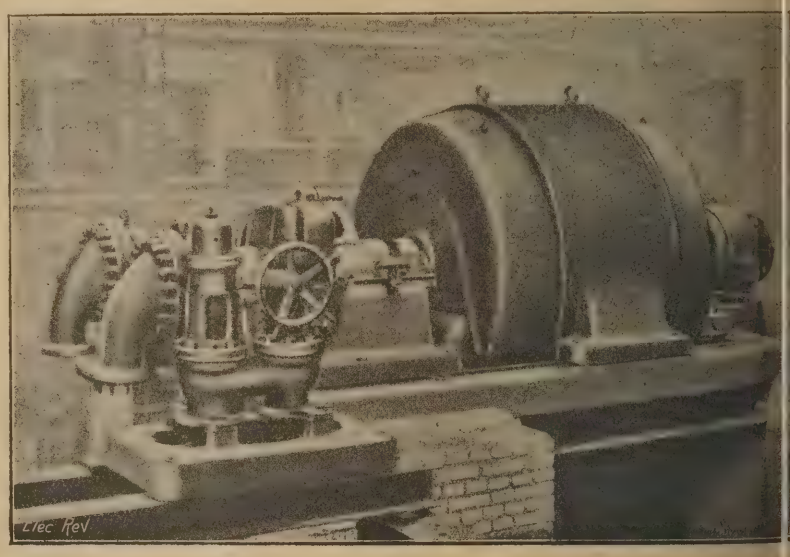


Fig. 1.—A High-pressure Brown, Boveri Steam Turbo-alternator Set.

With a turbine steam consumption of 7 kg. per kWh, a boiler having a vaporisation co-efficient of 8.75, the fuel sumption would be equal to 0.8 kg. per kWh. Owing to the latively high temperature at which the condenser water util as feed water reached the boiler, such a favourable vapo tion co-efficient could be expected without demanding too h a boiler efficiency, which under such conditions would exceed 77.5 per cent. With coal at 50 francs (£2) per m ton, the 7 kg. of steam per kWh would cost 4 centimes. only 18.5 per cent. of the useful energy would taken for power purposes, the remainder being util for heating purposes, the cost per kWh would fall to $4 \times 18.5/100$ = approximately 0.75 centime.

The double utilisation by back-pressure turbines of the en of steam would, however, be rendered difficult by reaso the fact that the demands for calorific energy and for dri power would not always be equivalent to the requisite r Whether one desired it or not, means had to be provide storing up one of the forms of steam energy. The u method being somewhat onerous and low in efficiency, plan of using a direct steam-driven turbine in place of of the back-pressure type had been tried. In this way on portion of the steam supply would be utilised in the turb to a point of expansion at which the pressure and tempera corresponded to the heating installation requirements, the o portion being allowed to expand on its way to the conden In this way it was possible during periods of excess po demands to draw steam for the turbine from the conde supply. Inversely, when a greater amount of steam was quired for heating than for power, the lower steam pres stages of the turbine could be cut out and the still live ste the pressure of which was reduced by a by-pass valve, hausted into the heating system pipes.

As a result of the high-pressure steam now available it had been made possible to replace the direct steam-driven turbine with a true back-pressure turbine in which all the exhaust steam was utilised for heating purposes. In cases where there was nothing to hinder the selection of live steam characteristics it was possible to determine the specific turbine steam consumption to ensure the requisite division of steam for power and heating purposes and the desired degree of back pressure.

Since they commenced the construction of steam turbines the Brown, Boveri Co., the author stated, had supplied normal condensing plant to the extent of, roundly, 4 million kW, an analysis of which showed the average live steam pressure to be 12 atmospheres, although in certain cases 20 atmospheres had been attained; the steam temperature had, however, never exceeded 375 deg. C. Progress was now being made in the direction of higher pressures: The North Tees (England) station* had for some years been working turbines with steam from Babcock boilers at 33 atmospheres and 370 deg. C.; a paper mill in Sweden was equipped with two "Atmos" boilers, one working at 50 atmospheres and one at 100 atmospheres, while two sets of 80-atmosphere plant were in course of construction in America. Finally, the author mentioned that the Brown, Boveri Co. had just completed a 1,750-kW turbo-alternator for the power station of the Société des Centrales Electriques des Flandres at Langerbrugge, Belgium (the machine was being submitted to test) which was designed to utilise steam at a pressure of 51 atmospheres and a temperature of 442 deg. C. The turbine ran normally at 3,000 r.p.m., but it would drive the alternator by means of gearing at 1,500 r.p.m. Fig. 1 illustrates the machine and it will be noticed that the turbine is so inconspicuous that it is hardly visible at first sight. Steam is fed to the turbine through a nest of tubes instead of the usual single pipe. The author stated that, in his opinion, there was a big future for the joint running of electric power stations and steam heating and cooking installations, which with high-pressure steam could be operated on a very economical basis.

* See Elec. Rev., July 4th, 1924, p. 19.

The Hydro-Electric Power Commission of Ontario.

Seventeenth Annual Report.

The seventeenth annual report of the Hydro-Electric Power Commission of Ontario, covering the year ended October 31st, 1924, is a record of continued and, in some cases, rapid progress. As we have said with regard to previous reports, the contents do not lend themselves to complete treatment in a small space (the report contains over 640 pages), we are only able to indicate the contents, and note the principal developments.

The consolidated accounts of the 241 municipalities (as against 224 in the preceding year) which take supplies of "Hydro" power on "cost contracts" for detail distribution, show a total revenue of $18,798,723. Against this was charged a total of $17,634,813, representing the cost of power, operation and capital charges, and depreciation, leaving a surplus of $1,163,910. Practically all the municipalities operated at a profit, there being only 16 showing deficits which in the aggregate amounted to $18,552. The net assets of the whole of the systems were valued at $72,884,271, and there were liabilities of $43,065,052, reserves amounting to $13,518,402, and surpluses totalling $16,300,817. The percentage of net debt to the total assets fell from 62.6 to 61.4; this ratio has steadily fallen from 88 per cent. in 1913. It is noteworthy that 39 municipalities were free of debt at the end of the year, while 24 others are expected to be clear by the end of 1925.

During the year the Commission operated twenty water-power generating plants with an aggregate capacity of 799,445 h.p., and a steam plant of 20,000 h.p. The total output was 5,878,576 kWh, but in addition the Commission purchased 2,922,465 kWh from outside sources, making a grand total of 8,001,801,041 kWh for the year as against 2,842,416,705 kWh in 1923.

A great deal of information is given regarding the work carried out in and the operation of the various systems into which the undertaking is divided. The principal of these is the Niagara system, whose three developments—the Queenston, "Ontario Power," and "Toronto Power" plants—produced no less than 2,526,662,700 kWh of the total output during the year. In May, 1924, the sixth unit, developing 62,000 h.p., was put on load at the Queenston plant and work proceeded on the installation of four more large generating sets. This work involved considerable rock excavation and placing of concrete, and the installation of penstocks, Johnson valves, turbines and other hydraulic equipment. The installation of the seventh set was practically completed and the eighth set was expected to be ready early in 1925, and the ninth in September next. When these sets are in operation the station will have a capacity of 500,000 h.p. The new plant has involved a great amount of new transmission line and equipment. Heavy steel-tower lines which were under construction in 1923 were completed and put into service during the early part of the year; these will deal with the power generated by the new sets. The Commission had in service at the end of the period 3,616 miles of transmission lines, including about 2,000 miles of 110,000-V conductors. The bulk of this is of plain and steel-reinforced aluminium, and the Niagara system includes the greater part of the mileage. In the Ontario Power Company generating station, the No. 15 unit was rebuilt. This was a 25,000-kW set, the generator of which burst in 1922 causing considerable damage. Two other generators were rewound during the year. The machines in the Toronto Power Company generating station were equipped with differential relay protection and the No. 11 generator was partly re-wound. In Toronto two new high-pressure sub-stations were completed and placed in operation in October last. These are of the outdoor type, each having a capacity of 30,000 kVA. Seven other sub-stations were placed in operation during the year and the equipment at eleven stations was augmented.

Since the last report the Severn, Eugenia and Wasdells systems have been combined and are now known as the Georgian Bay system. The separate plants are so interconnected that they can be loaded so as to best conserve water for the good of the whole system. In the first month of the year there was a water shortage, but the heavy demand for power was met by outside purchases. The capacity of the Eugenia plant was increased by 1,200 h.p. in May, 1924, a second pipe line and surge tank having been installed. Maintenance work only was carried out in the Severn and Wasdells divisions. A commencement was made upon the extension of the South Falls development which is to raise the output from 1,700 to 5,400 h.p.

The load on the Muskoka system was so near the limit as to preclude the shutting down of plant for overhaul during the year. Power was purchased from Bracebridge to enable the system to cope with the demand. The completion of the South Falls extension will enable both of the generating sets to be shut down and overhauled in turn.

The demand on the St. Lawrence system was lightened by the loss of a large industrial consumer, and the Rideau system load showed no material increase owing to the quiet industrial conditions prevailing in the district.

The Cameron Falls generating station in the Thunder Bay system completed its fourth year of operation with a steadily-increasing load. Two new sets, each of 12,500 h.p., were placed in commission during the year, and the new transmission line was brought into use. The development assisted the Kaministiquia Power Company by supply power during the first half of 1924. The addition of the Great Lakes Paper Company to the system gives an extra load of 10,000 h.p. and brings the total up to about 40,000 h.p. Arrangements have been made for the installation of the fifth and sixth generating units at Cameron Falls, and it was expected that they would be ready for service by the end of 1925.

In the report on the Ottawa system special mention is made of the growth of the domestic load which makes a steadily-increasing demand upon the generating plant.

Important generating stations and lines have been added to the Central Ontario and Trent system. A new automatic generating station commenced to deliver power to the system in September, 1924. This three-unit station is equipped with relays which make its operation entirely automatic if desired, but it is intended to operate normally under the control of the operator of the Ranney Falls plant, which is about four miles upstream, through the medium of remote supervisory control equipment. By pressing a button, the operator can bring a unit on the line and have it delivering power in from 15 to 20 seconds. The generator switches close, bringing the generator on the line at approximately synchronous speed, with field short-circuited, but almost instantly afterwards the short-circuit is removed, the field switch is closed and the generator pulls into step. If desired, all three units may be started or stopped simultaneously. A similar automatic plant is under construction at a lower dam, and this concentration of so much power in the neighbourhood of Campbellford has necessitated the construction of additional 44,000-V lines to ensure the delivery of power to the system, and also to ensure the uninterrupted flow of water from plant to plant, which would be seriously upset for a time if any one plant in the Campbellford chain were to be cut away from the system. A new municipal receiving station was opened at Peterboro during the year. Following a dry summer and early autumn in 1923, there was a moderately good precipitation during November and December, and this proved sufficient for the power requirements owing to the industrial depression and absence of system load growth.

The power shortage on the Nipissing system was relieved by the placing in service of the first 600-h.p. set at the Bing-

ham Chute power house in December, 1923; a second, similar, set was put into operation on March 31st, 1924. At the Nipissing plant one of the turbines was remodelled and the 450-kVA generator was replaced by one of 1,250 kVA. The inadequate wood pipe line reached the end of its useful life and was replaced by one of a larger capacity. An emergency Diesel-engine station has been erected at North Bay, but at the date of the report had not been required for service. The increase in the generating capacity of the system was accompanied by a large increase in load—an increase of 37 per cent.

During the year under review the Rural Hydro-Electric Distribution Act was amended to provide for including transformers and secondary equipment in the grant of the Provincial Government to help meet the disparity between the cost of urban and rural services, the amount of this grant to remain the same as when applied to primary lines only, *viz.*, up to 50 per cent. of the cost. The assistance thus given by the Government makes it possible to extend the service, and its beneficial influence upon agriculture and upon the general economic life of the province is already a factor of importance and worth. The minimum of three farm contracts per mile of line constructed, or the equivalent, is still the standard requested by the Commission as the basis of the application for the grant towards rural lines. During the year 285 miles of primary line was constructed, rehabilitated and absorbed, of which 38 miles was underground, and arrangements were made to construct a large number of additional rural lines during the current year. The capital cost of the latter was put at $321,103. At the date of the report 7,881 h.p. was being distributed in various rural districts, the bulk of i the Niagara system. Special propaganda work dealing v the merits of electricity in farming has been undertaken the Commission.

A great deal of testing, research, and inspection was car out in the Commission's laboratories during the year. of the special features of the work of the high-pressure general electrical testing laboratory was the making of donograph* records in the detection of over-voltage surges power lines. In the approval laboratory heating applia formed the largest group submitted, wiring devices being next largest, with motor-operated appliances very closely hind in point of numbers. A great deal of auxiliary r equipment—battery charging sets, lightning arresters, &c., submitted. The work of the photometric laboratory consi mainly of maintaining the quality of the incandescent la which are made under the auspices of the Commission.

A section of the report deals with the street railways oper by the Commission. This shows that the Essex system gressed satisfactorily, but the revenue earned by the Gu District and the Toronto and York District railways decli owing to the industrial depression in those areas.

The detailed accounts and statistics of the municipali connected to the systems occupy over 370 pages, and t are appendixes containing statistics of transmission li transforming station details, distribution lines and syste and reprints of Acts affecting the Commission passed du the year. The volume is illustrated with 36 views of var parts of the undertaking and 25 diagrams.

The Safety-in-Mines Research Board.

A Review of the Annual Report's Electrical Features.

The third annual report of the above-named Board (H.M. Stationery Office, price 1s. net) opens with an account of the scheme of co-operation which has been settled with the United States Bureau of Mines, the object of which is to co-ordinate the researches into problems of safety and health and to secure mutual assistance between the investigators of the two countries. The scheme has been worked out in official visits paid to this country by Dr. Foster Bain and Mr. G. S. Rice, director and chief mining engineer respectively of the Bureau of Mines, and to the United States by Dr. R. V. Wheeler, director of the Board's experimental stations, who was joined by Mr. H. Walker, H.M. chief inspector of mines.

The first combined publication has already appeared [Chemical Society, Trans. 125 (September, 1924), 1858], Dr. S. C. Lind, chief chemist of the Bureau of Mines at Washington, contributing an addendum to a paper by Dr. Wheeler on the electrical ignition of gases. Amongst the investigations that Dr. Wheeler saw during his visit were the X-ray examination of wire ropes and "wireless" underground signalling at the General Electric Co.'s research laboratories, while at the works of the Edison Co. at Newark the manufacture of the Edison alkaline-battery safety lamp, and the safety devices incorporated therein, was inspected.

The report shows that the funds expended by the Board during the twelve months commencing April 1st, 1924, included the following:—For general purposes, including the use of electricity in coal mines, £27,900; for research regarding the safe use of explosives and electrical shot-firing apparatus, £11,000, the total sum amounting to £48,400.

The second part of the report deals with the steps that have been taken to replace the Eskmeals experimental station. Accommodation for the large-scale experiments has been secured at a site on The Frith, by Harpurhill, two miles from Buxton, and laboratory work is now being carried out at Sheffield in temporary premises, but the University has offered a lease of an excellent site adjoining the University buildings and plans of new laboratories are being prepared.

The subject of the main part of the report is the progress of the Board's researches. A list of the programmes of research, numbering a hundred, is given in an appendix. The programmes are divided into ten groups, which include flame-proof mining electrical machinery, electrical researches, electrical shot-firing apparatus, devices for trapping dust generated by drills, and safety lamps. In the case of those programmes, numbering over 60, which have been selected as the most urgent, the investigators in charge give in brief statements of what they have done and are doing; for instance, numerous experiments with various makes of bulbs show that the whole range of explosive mixtures of firedamp and air can be ignited by heated wires (Mr. W. C. F. Shepherd). It is, therefore, essential to obtain some knowledge of the fundamental factors governing the ignition of explosive gaseous mixtures by heated filaments. To avoid complications due to oxidation of the metal filament, the research was begun with platinum wire as the source of ignition, and a number of factors which play an important part in ignition have been studied. A general conclusion to be drawn from the research, so far as it has gone, is that the same temperature of platinum wire is required to ignite all explosive mixtures of firedamp and there is no differentiation between one mixture and ano as with other sources of ignition.

As regards the propagation of flame (Mr. W. R. Chapm the effect of turbulence produced by mechanical agitation fo part of an investigation regarding the construction of ex sion-proof casings for electrical machinery. The simplest ditions under which gaseous explosions in closed vessels be produced (central ignition in a sphere) have been dealt v in paper No. 5, "Flame-proof electrical apparatus for us coal mines. First report—Flange protection," by Mes I. C. F. Statham and R. V. Wheeler (H.M. Stationery Of September, 1924, price 1s. 3d. net). The shape of the en sure, however, modifies the manner in which the flame spre and in consequence affects the development of pressure. W has therefore been continued, using cylindrical vessels different sizes, whilst the effect of turbulence in a spher vessel has also been investigated. Of a more empirical nat but of more immediate practical value, is a series of tests signed to provide flame-proof means of pressure-release f mining switchgear, alternative or supplementary to the met of release at a narrow gap between flanges. With the la enclosures the extent of flange may not be sufficient to all through the width of gap permissible, all the release of pres desired. The device which has been studied most closely bodies perforated metal plates. A specification with res to the thickness and area of the plate and the diameter spacing of the perforations has been worked out and a re on it will be published shortly.

From the records obtained (by means of a revol drum camera) in connection with the propagation of flam closed vessels (Mr. W. A. Kirkby) it has been observed the flame has a vibratory movement both in the initial final stages of inflammation. The speed of the flame va considerably during the different stages of the inflammat reaching 70 metres per second in certain experiments. appears that the time of attainment of maximum pres coincides with that of complete inflammation of the mixtur the vessel; the greatest pressure recorded in the vessel in is 70 lb. per sq. in. The explosions are more violent in tu lent mixtures, both as regards the pressure rise and the sp of the flame. In conjunction with the British Electrical Allied Industries Research Association, a considerable amo of information has been acquired bearing upon the construc of flame-proof casings for mining electrical machinery. ther investigations include a study of the effects of turbule such as might be produced in a motor casing or slip-ring co and also an inquiry into the effect of pressure piling, such might occur in a partially partitioned switch case.

Reference may also be made to a research carried out Mr. G. Lindley, the investigator appointed by the Br Electrical and Allied Industries Research Association, on construction of flame-proof plug and socket electrical conta which is nearing completion. The electrical work upon w most progress has been made is that dealing with the press produced in closed vessels when an arc is struck, a neces corollary to research upon the pressures produced by ex sions of firedamp and air in closed vessels, for in the desig mining switchgear it is necessary to take into account

*The klydonograph and its use were dealt with in our i of May 9th, 1924 (p. 770).

ssure effects. So far no pressures of any magnitude, due the arc alone, have been recorded; the experiments are ng continued, using greater power.

Regarding shot-firing apparatus (Mr. W. F. Crewdson), the rt under consideration at present is the current necessary cause ignition of firedamp-air mixtures, such as may enter switch casing, by the "break" spark produced when an luctive circuit is broken by the separation of metallic con-ts. The ease of ignition depends, among other things, on the rate of separation of the contacts, the inductance the circuit, the nature of the contacts, and the percentage firedamp in the mixture. A question has arisen as to advisability of substituting alternating for direct current en practicable, on account of its alleged greater safety. mparisons are being made of the relative igniting powers alternating and d.c. break-sparks as a check upon this claim.

The Sub-Committee for Research on Electrical Shot-firing paratus has completed its programme and its report is in paration; it is able to make suggestions for the improve-nt of the mechanical efficiency of the magneto exploders at sent in use so as to remove a fruitful cause of misfires, ich is the chief fault of these exploders. With the present es, if the handle is turned improperly a weak current may developed which will not fire the detonator, but will cause hemical change in the priming composition—the operative rt of the detonator—and this chemical change makes it more ficult to fire the detonator subsequently and may even result a misfire.

The Miners' Lamps Committee presented its final report ring 1924, thus bringing to an end five years of fruitful work wards the improvement of safety lamp design and practice. reviews in detail the official requirements with regard to testing of safety lamps and discusses possible lines of fur-r developments in design and construction.

The remainder of the Board's report is occupied by state-nts of the work done by the independent investigators, o are aided by grants made on the recommendation of the ard, and by an account contributed by Dr. J. S. Haldane of health inquiries carried on under the supervision of the alth Advisory Committee.

Mr. A. G. Gulliford, head lampman at Denaby and Cadeby lieries, Rotherham, has again been assisted with a grant £120 for the year to continue his experiments, under Dr. heeler's supervision, on firedamp detectors for electric lamps. is grant is solely for apparatus, materials and out-of-pocket penses in connection with the work, which is done at home spare time. Mr. Gulliford has completed the design of one m of firedamp indicator for attachment to an electric hand-lp, namely, one which will enable the miner to find out ether the atmosphere in which he is working contains more an 2½ per cent. of firedamp. The device is a simple one, nsisting merely of an exposed fuse-wire (suitably protected gauzes) which can be put in series with the lamp bulb by ans of a switch. If the atmosphere is clear of firedamp, the ht of the lamp-bulb is dimmed when the fuse-wire is thrown o circuit and the wire itself glows a dull red. The more edamp there is present, the dimmer does the light of the mp become and the more brightly does the fuse-wire glow til, when there is 2½ per cent. of firedamp, the fuse-wire lts and the lamp-bulb is extinguished. The miner can over his light by operating the switch.

As the result of many experiments, using different metals the fuse-wire, it is clear that platinum is the most suit-le. The small quantity of platinum used makes its cost in-finitesimal, but it can, if desired, be recovered without loss hen the fuse is renewed. Mr. Gulliford has designed the ode of attachment of the device to three different types of proved electric hand-lamps. In each instance the design is lat and the weight of the lamp is not materially increased. ture work will attempt to enable an exact measure to be ade of percentages of firedamp between 1 and 5.

Plastic Moulding.

A Recent English Manufacture.

Until recent years the art of plastic moulding was comparatively little known in this country, though the United States has for some few years taken up this class of work strongly. Under this type of moulding the materials that have made the most progress are phenolic condensation products. These products are the result of a chemical re-action between phenol (carbolic acid and formaldehyde, the result being a unique synthetic chemical product resembling the finer or natural gums during one stage of manufacture.

Mouldensite, Limited, of Derbyshire, began to manufacture a product of this nature in 1922, by which success was attained at the outset and with the growth of "wireless" the demand for the product developed rapidly. The "Mouldensite" moulding powder, which is prepared in black and brown forms of granular consistence, is now extensively used by the principal manufacturers of electrical equipment calling for a material possessing exceptionally high dielectric and mechanical strength, and as the insulation is usually in an exposed position the moulded work must present a fine polished surface which shall be unaffected by oils, water, petrol, &c. When the "Mouldensite" moulding preparation is heated it fluxes, pressure at from about 500 to 2,500 lb. per sq. in. is applied to it in this state of flux and the material is forced to every part of the mould; the pressure within the mould is hydrostatic, or nearly so. Owing to the almost liquid condition of the material when in this state of flux, a thin film of the substance is formed next to the surface of the mould, and it is in part due to this that the form of the surface of the mould is reproduced with exactness, and with a very high finish. Whilst the first effect of the heat used in moulding is to soften or flux, at the same time it induces a chemical reaction. This causes the material to harden more or less quickly according to the size of the piece being moulded and the temperature used. When this reaction has been completed by the mould having been a sufficient length of time under heat, the work is finished. The moulded article cannot again be softened or fluxed by heat.

Time and temperature play an important part in moulding "Mouldensite," and are important elements in the determination of cost of moulding and moulding equipment. Metal inserts can readily be incorporated. They are "anchored" in the mould to prevent movement whilst the charge is being pressed, during which time the charge is moving or flowing to conform to the mould.

The charge of the powder is slightly in excess of the weight of the finished piece, so that when the mould is closed and the charge is put under pressure, the excess is extruded from the mould. This excess is very small when moulds are properly made, and is easily removed in the form of a "flash." It can be moulded with a high degree of accuracy.

The moulds are made of steel and hardened, the working surfaces being highly finished and polished. Moulds made of brass or bronze quickly distort under the pressure of moulding, and are not satisfactory. The contraction usually allowed is 3 mils per lineal inch. The moulds must be strong to withstand the pressure used, but contain as little metal as is consistent with these requirements in order to ensure the rapid conduction of heat.

It is interesting to note that the "Mouldensite" materials will apparently flow up before they flow down, and in certain deep wall pieces in which difficulty is experienced in moulding, it is found that by turning the mould upside down, a perfect piece can be obtained.

It is claimed that these mouldings can be turned out with accuracy and precision of finish greater than anything possible in the way of high class machine tool work produced by the most expensive automatic machine tools. Needless to say the hydraulic presses required to produce the mouldings are a much less expensive proposition, both with regard to initial outlay and also upkeep and operation charges, than the class of machine tool which would be required to turn out similar work.

It is claimed that Mouldensite is anhydrous and non-hygroscopic, has extremely high dielectric resistance, is very hard, retaining its finish indefinitely, is unaffected by temperatures below those at which carbonisation begins, has great mechanical strength in tension, compression and shear, whilst it may be moulded with all kinds of metal inserts, which it will not discolour, even though they be of silver or similar metals, as being a stable product it cannot break down chemically setting up free gases or other substances of a corrosive nature. It is homogeneous throughout and holds its colour indefinitely. Whilst it can be readily machined, filed or sawn, and takes a high lasting polish when buffed, it is only in rare instances that these processes have to be resorted to, it being generally found that all such requirements can be provided for in the moulding process.

The specific gravity of Mouldensite being only 1.33 or approximately half that of aluminium, it will be seen that the material is extremely light, yet at the same time, it is in no way brittle and will withstand considerable shock. The moulds differ from those used for the moulding of hard rubber, celluloid, &c., and in this connection Mouldensite, Limited, has a service which includes free mould-design for the benefit of its customers. At the present time, the firm in question is making a point of the fact that its product is British and claiming that it can compete for both quality and price with any similar product manufactured abroad, and also urging buyers in this country to consider the national aspect when purchasing moulding powders or mouldings.

We have seen a number of mouldings made from this material, and the manner in which the impression of the mould has been retained with microscopic sharpness as well as the beauty of finish is very satisfactory.

Drought Curtailment of Hydro-Electric Power.—Continuing drought in the Mountain States, and especially in Colorado, says the *Electrical World*, has curtailed the production of energy at a number of municipally owned hydro-electric plants, notably Longmont and Loveland, and standby service has been required on several occasions. In the northern Colorado district the sugar-beet and vegetable crops are approximately one-third of normal, and the only farms successfully overcoming the effects of the dry spell are those with electrically operated pumps. The major portion of the privately owned power stations' daytime load is reported as being used for pumping.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A New Electrical Immersion Heater.

A new electrical immersion heater which has been placed on the market by Mr. Harold E. Trent, 259, North Lawrence Street, Philadelphia, Pa., is described in the *American Machinist*. It has been designed to meet the conditions necessary for the melting of salts such as lavite. The heating element is of the embedded type, packed in a steel tube to maintain a maximum of heat capacity. Its temperature may be

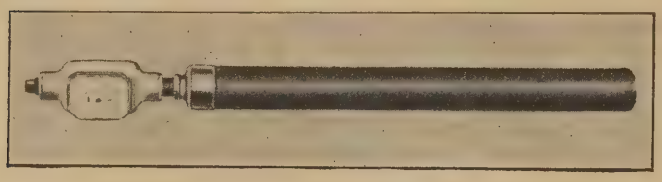


Fig. 1.—Immersion Heater.

raised to 1,600 deg. F. before the initial heating of the salt takes place. It is made in sizes up to 1,500 W capacity and 18 in. in length with a uniform diameter of 1.9 in. For the melting of other materials the loading may be increased, but care should be taken, as the salts under consideration are heat insulators and the thermo-capacity of the unit is limited. The plug connection on the end (fig. 1) can be supplied to suit.

A New Cable Connector.

Described in the *Electrical World* is a new cable connector, fig. 2, developed by M. Fauris, Lyons, France, by which it is claimed that connection may be established between cables of any cross section in making a tap on a branch feeder without cutting the feeder. The upper portion can be removed by unscrewing the lower nut, and connection and disconnection is rendered simple by means of a wrench. The device is manufactured in different sizes.

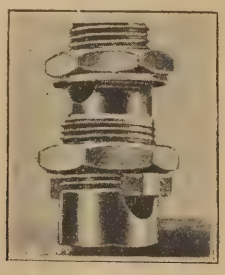


Fig. 2.—Cable Connector.

An Improved Arc-Welding Set.

The photographic reproduction herewith, fig. 3, is of a 6-kW electric arc-welding set marketed by Messrs. The Quasi-Arc Co., Ltd., 15, Grosvenor Gardens, London, S.W., who have adopted as the driving unit a 10-h.p. 4-cylinder marine-type petrol motor, made by Messrs. J. W. Brooke & Co., Ltd., Adrian Works, Lowestoft, driving direct by means of a flexible coupling. The generator is designed to give a 60/30 volt-drop characteristic, the lower pressure corresponding to a full load of 200 A, and is used in conjunction with a special reactance and field reactor; the former supplies the momentary pressure rise, whilst the latter, it is claimed, renders the pressure change of the machine exceedingly rapid. The field reactor is claimed to give the machine greater efficiency than other types of drooping characteristic welding dynamos; it consists of a static transformer, the primary winding forming part of the welding circuit, and the secondary part of the shunt field circuit; any change of current in the primary produces an e.m.f. in the secondary which is so connected as to accelerate the variation of current in the shunt field coils. A portable regulator is provided for effecting current regulation. An electromagnetic governor of the solenoid type controls the speed during the striking of the arc, after which period the duty is performed by a centrifugal type governor. The plant, including fuel tanks, radiator and cooling fan, is self-contained and the weight of the whole set does not exceed 18 cwt.

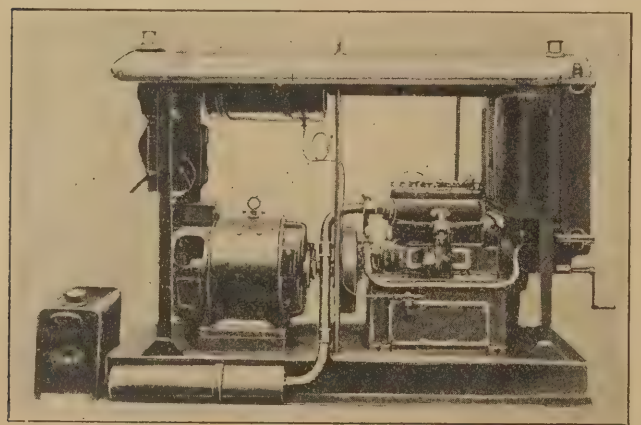


Fig. 3.—A 6-kW Arc-Welding Plant.

Electric Iron Indicator Plug.

We have received from Mr. W. T. Hughes, 74, The Downs, Altrincham, Cheshire, particulars of a unique indicator-plug for use with electric irons. The indication is given by means of an ordinary 2.5-V lamp of the flash-lamp type. This lamp is shunted across a spiral resistance which is in series with the element of the iron. The spiral resistance, which is designed to give a pressure drop of 1.8 V, also acts as a spring holder for the lamp. We understand that negotiations are at present taking place for the manufacture of this device, a section illustration of which is shown in fig. 4.

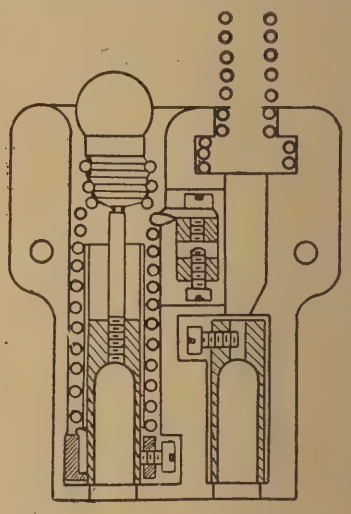


Fig. 4.—Section of Indicator-Plug.

An Improved Windmill.

We illustrate herewith, fig. 5, the "Empire" windmill which is made by Messrs. Cecil Hodges & Co., Ltd., Empire Works, Dalston, London. Its principle closely follows that of the old wooden windmills, and it consists essentially of from four to eight large wings. Each wing is divided into four panels which fit closely together and present a solid surface to the wind when it is blowing at a moderate rate, and which gradually and automatically open when the wind pressure gets beyond a certain strength, thereby maintaining a constant speed on the turbine and rendering it suitable as a means for driving electric generators. It is claimed that the mill can be operated in a wind of less than 5 m.p.h.

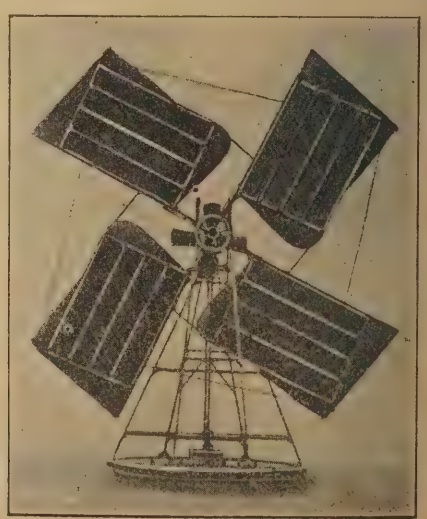


Fig. 5.—The "Empire" Patent Windmill.

The machine is fitted with ball and roller bearings throughout. It should prove a success in the lighting by electricity of country houses, farms and villages, the winds being normally strongest in those periods when the lighting demand is greatest.

A Novel Electric Cooker.

The "Quead" Cooker.

CONTRARY to many prevalent opinions on the subject of cookery an eminent London surgeon has expressed the view that "the flavour and digestibility of meat foods are impaired by prolonged cooking, owing to the coagulation by heat of the albumin which is the main constituent of all animal foods. The longer an egg is cooked, the harder it becomes and the longer it takes to digest, due to the stomach juices having to digest the coagulated albumin."

It may therefore be inferred that rapid cooking of short duration is desirable in that the external albuminous layers are thereby quickly coagulated, which allows the red internal juices to be retained in a semi-fluid and digestible condition. It is with such objects in view that the "Quead" cooker has been designed on novel lines for domestic use by Messrs. Wm. Appel & Co., who have discarded the idea of roasting in hot air or gases confined in an oven which has been the vogue for so long. Moreover, the new cooker has been arranged to improve upon the customary method of grilling, which cooks the top side only, while the juices are oozing out at the bottom. In the "Quead" cooker the source of heat is near the centre of the oven and consists of two vertically disposed elements adjustable horizontally so that they can be brought near to the joint for grilling, as shown in fig. 1, or moved apart for roasting, as indicated in fig. 2. The adjustment is made by means

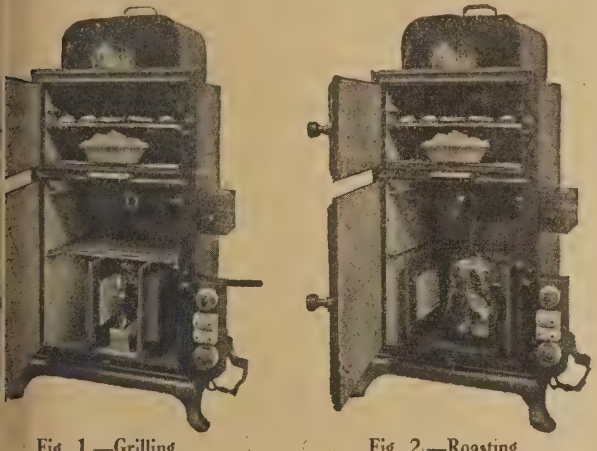


Fig. 1.—Grilling. Fig. 2.—Roasting.
Interior of the "Quead" Cooker.

of a lever at the side, and the meat to be grilled is held vertically, as illustrated in fig. 1, in a removable rack similar to that of a bread toaster.

Instead of being placed, so to speak, in a bath of radiant heat—a reversion to the old custom of roasting before an open fire—the meat is cooked remarkably quickly; the elements are thermally insulated from the metal inside of the cooker, and are consequently rapidly heated and ready for cooking in three minutes after switching them on. It is not necessary to have the walls of the cooker hot; in fact, simple grilling is sometimes commenced before they are even warm, and the energy required to maintain the necessary temperature is therefore comparatively small. The economy in this respect, coupled with the reduced time occupied in cooking, which is about one-half of that ordinarily required, it is claimed, ensures a saving of as much as 75 per cent. in electricity for roasting.

For roasting, the joint is hung on a hook which is slowly rotated by means of a clockwork motor, while means are provided for arresting the motor at any desired point. This is useful for certain shapes of joints, such as a saddle of mutton, which, if continually rotated, is apt to be cooked more at the sides than in the middle.

A device for automatic basting is provided in the form of a cup for holding the fat, with a small tap for regulating the flow of basting. The cup is supported by a socket and lever which can be swung out of the cooker for filling, &c., and it allows a joint to be roasted without any attention other than reducing the heat after the first 10 minutes.

Two patterns are exhibited at the British Empire Exhibition: One consists of two compartments, each being 16 by 12 in. and provided with separate doors; the lower compartment is 21 in. high and contains the two 1,000-watt heating elements for roasting, grilling, frying, broiling, and boiling, while it can also be used for baking. The upper compartment, which is 9 in. high, is heated by waste heat assisted by a 1,000-watt element, and can be used for baking, warming, &c., at the same time as the lower one is being used. The smaller pattern is a smaller one of similar type.

A thermometer is fitted, if required, and above the upper compartment a plate warmer is provided with a hood that entirely surrounds the plates and ensures that the top plates are as hot as those at the bottom. Boiling plates of various sizes and types are supplied, according to requirement, and the usual 3-heat control has been adopted with switches of the rocker pattern for turning up and down by moving the handle in either direction. The cooker is mounted on a cast-iron base and frame; the sides, doors, and top are lagged, while the interior is lined with enamelled plates.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Retailers and the N.A.R.M.A.T.

I note in a copy of *The Radio Trade Journal* which has been forwarded to the Wireless Retailers' Association, the statement that "each section has a voice" in the administration of the N.A.R.M.A.T. The important point, however, is that the retailers have only *one-fourth* of the voting power, and can consequently be outvoted every time. In other words, the manufacturing interests control the situation. In these circumstances the picture which is drawn of peace and progress prevailing at a round-table conference of members is suggestive of the lion lying down with the lamb, the irony of which strikes a distinctly humorous note. From this it will be seen that before he accepts the small increases of discounts offered to him, the retailer has to consider not only whether he will have "risked financial loss by promising not to sell foreign goods," but whether he will be entering into binding restrictions and rendering himself liable to other restraints in the imposition of which he has no effective voice.

In conclusion, the trade is entitled to know why the N.A.R.M. has attempted to form a Retail Section when there was already a retailers' association of some two years' standing in existence, and why the Wireless Retailers' Association was not consulted on the matter. In short, if peace and goodwill were really desired, why was not co-operation sought with the existing organisation? The multiplying of organisations, the N.A.R.M. must know, can only have the effect of weakening the section so split up.

Fredk. S. Horsey,
Chairman of the Wireless Retailers' Association.

London, *August 15th*, 1925.

Modernising Electric Tramcars.

The manager of the London combine tramways, Mr. C. J. Spencer, is to be congratulated for introducing the very fine cars described in your issue of the 7th inst. I am confident that the innovation of cushioned cross seats will be decidedly welcomed by the public, so much so that other progressive undertakings will have to adopt similar seating accommodation in the near future.

The progress of British tramcar design has been, in the past, rather disappointing, and has not compared favourably with electric train and motor omnibus development. Modern 'buses with powerful equipment, comfortable seats, bright interiors, and pneumatic tires, undoubtedly have provided a very attractive service in contrast with the generality of provincial tramways whose cars are, apparently, considered by the management to be good enough for 1925 though designed 20 or 25 years ago. It is, therefore, not difficult to understand how a large body of the public has, under the influence of a misguided and irresponsible Press, come to regard tramway transit as obsolete and has shown complete willingness to patronise any 'bus venture in preference thereto.

The service given by the L.C.C. is, very probably, the best in the country, yet its latest cars, though fast and attractively finished, still provide no better seating accommodation than formerly. Having used the London transit facilities for some years, I am very much of the opinion that the L.C.C. would, with cars having cushioned cross seats, secure a greater measure of public support. The average British tramcar does not appear to be the equal of the American street car. Why is this? Are British conditions so widely different that we cannot employ more extensively the separate entrance and one-man car with, of course, cross seats and higher speeds?

Too often is it the case that improvements in service are made only under the stress of 'bus competition, and it is at least open to question whether tramway managements have not contributed to their troubles by their ultra-conservative policy in the past. Our tramway undertakings are, perhaps, open to most serious criticism in persistently retaining the longitudinal wooden seat in spite of a marked public preference for superior comfort, such as is afforded by most progressive 'bus services. The prevailing type of tramcar seat was discarded by 'buses and American cars some years ago, and it certainly does not appear to be well suited to modern cars, with high rates of acceleration and braking. The conventional seating arrangements are supposed to facilitate the movement of passengers, but this has not prevented American systems from adopting the transverse seat.

Closely affecting the comfort of the passenger is the design of the undercarriage. On some of our largest systems the cars "jazz" and pitch in a most disagreeable and, in many cases, alarming manner. The jarring and bouncing whilst in motion, together with the din set up in negotiating crossings, suggest that a reconsideration of the conventional design would not be unprofitable. Even the illumination is often carried out on entirely incorrect principles, and reference has often been made to the extensive use of the unshaded filament by large traction systems. With low ceilings and large lighting units the result is decidedly unpleasant.

If I may venture an opinion it is that a more progressive policy is badly needed in the British tramway industry generally with regard to car design. Much improvement could be effected in the comfort and running of existing cars without appreciably increasing the operating cost. The important improvements in tramcar construction, in speed, comfort, lighting, &c., effected by Mr. C. J. Spencer are, therefore, of particular interest and value.

H. A. W.

Glasgow, *August 11th*, 1925.

A Proposed Institute of Radio Engineers.

On reading the statement of the I.E.E., in your issue of August 7th, it appears that the Wireless Section will be quite a subsidiary part of the Institution and would possibly be neglected when interests might clash.

In view of the enormous advance in wireless engineering during the past few years, and the certainty of further expansion, a separate Institute, to safeguard the interests of radio engineers, would certainly appear advisable.

With regard to the subjects for examination, these appear excellent, but there might be a tendency to set such papers chiefly from the electrical engineer's standpoint, and not from that of the purely radio engineer.

J. H. Tanton.

Halton, Bucks., *August 10th*, 1925.

Charges for Electricity Supply.

I have recently received two accounts from the Manchester Corporation for the last quarter's consumption of gas and electricity (lighting).

I was rather surprised to observe that although my consumption of "juice" for the quarter was only *twelve units* I am charged the amount of *ten shillings* (10s.). This amount is put under the heading "Minimum Charge." I presume from this that I am asked to pay £2 per annum whether I consume this amount or not. I understand that if the consumption exceeds this amount there will be a rebate. I may say that this is the second quarter's account as far as I am concerned, and it seems to me that the electricity department has the loan of my 4s. 6d. until the end of the year, notwithstanding that a deposit of £1 was paid before the installation was connected.

The gas department makes no mention of "Minimum Charge," and charges for B.th.u. consumed. Further, it offers a discount if the account is paid before a certain date, a feature which the electricity department omits. The gas department will install a cooker free of charge—the electricity department at a charge of 7s. 6d. per quarter. The rate for supply (power and lighting) under the electricity department (Norwich system) is in my case 11s. 8d. per quarter, plus ½d. per unit consumed, making a standing charge of 19s. per quarter—rather a stiff charge for the so-called convenience, cleanliness, &c., is it not?

I can well understand my non-technical friend's resentment at having to pay this minimum charge for lighting, and I myself feel it is not justified. The hire charges and rates for cookers make these articles a luxury which very few people can afford.

In view of the exhortation to use electricity and the knowledge that neighbouring towns make lower charges, it is very disappointing to find such things in Manchester. In fact one is tempted to say: "Save me from my friends."

"Stung."

Manchester, *August 17th*, 1925.

Railway Electrification in the United States.—Some particulars concerning the progress made during 1924 in railway electrification are given in abstracts in the *Railway Review* from the report of the Committee of the American Railway Association, Division V—Mechanical, on the subject of electric rolling stock. The activities in electrification were confined largely to adding rolling stock to existing projects, or the culmination of projects conceived previous to 1924. The development which is perhaps commanding the greatest interest is that wherein the sub-station plant is carried as part of the locomotive equipment. Under this heading are locomotives for the Detroit, Toledo, and Ironton and the New York, New Haven, and Hartford. The D.T. & I. project comprises a 25-cycle, 22,000-V, single-phase, a.c. distribution, with converting equipment on the locomotive to provide 600-V, d.c., for the traction motors. The transformers are so arranged that the locomotive can be operated from an 11,000-V supply. The New York, New Haven, and Hartford locomotives are designed to operate from the 25-cycle, single-phase, 11,000-V, a.c. trolley supply, which will be converted on the locomotive to d.c. An experimental oil-electrical locomotive was put into service on the New York Central, and tests indicate that it has great possibilities, particularly for switching and branch-line service. Anticipating the need for equipment to compete with the auto bus, as well as to reduce operating expense on branch lines, a considerable development has taken place during the year on gas-electric cars and small gas-electric locomotives. An experimental 3,000-V, d.c. multiple-unit car has been built primarily for terminal operation where the main line is 3,000 V d.c. trolley distribution.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the pri specification.
The numbers in parentheses are those under which the specifications wi printed and abridged, and all subsequent proceedings will be taken.

1924.

1,420. "Holder for crystal and necessary metallic contacts, used detector of electromagnetic radiation." L. Massey. January 18th, (237,299.)

1,876. "Electric relays." R. Haddan (J. B. Regan). January 23rd, (237,301.)

6,970. "Electric controllers of the liquid type." A. West & Co. an Breeze. March 18th, 1924. (237,317.)

7,277. "Instantaneous automatic governor for electrical machines." Junek. March 21st, 1923. (213,278.)

9,822 "Electric furnaces for melting and treating ores and metals g ally." T. Levoz. April 17th, 1923. (214,648.)

9,981. "Alternating-current relays." British Thomson-Houston Co., and A. S. Fitzgerald. April 22nd, 1924. (237,334.)

10,030. "Apparatus for varying the capacity of the resistance of an el circuit." Aktiebolaget Baltic. October 25th, 1923. (223,859.)

10,083. "Receiving valves such as are used in connection with pneu ticket-carrier apparatus." Western Electric Co., Ltd., and G. M. O. Jen April 23rd, 1924. (237,339.)

10,185. "Electric generator protector." T. W. Sampson and W. Chappell. May 2nd, 1923. (215,346.)

10,310. "Headlights of vehicles." J. Ayer. April 25th, 1924. (237,352

10,601. "Electric switchgear for variable resistances, particularly a able to Leonard drives." P. C. Rushon (Siemens-Schuckertwerke Ges.). 29th, 1924. (237,362.)

11,016. "Leads for headphones, telephones, and the like." J. W. L May 5th, 1924. (237,371.)

12,182. "Electric multiple-body comb for use all over the b O. G. C. L. J. Overbeck. May 17th, 1924. (237,384.)

13,151. "Valve-holders for wireless apparatus." A. P. Portway. May 1924. (237,393.)

14,008. "Design of magnets and pole-shoes, as used in wireless headp and the like." H. W. Bull, jun. June 10th, 1924. (237,402.)

14,223. "Telephone receivers and the like." J. Joseph and W. A. Appl June 12th, 1924. (237,404.)

15,426. "Holders for thermionic valves and the like." H. W. Gos H. D. Murray. June 26th, 1924. (237,414.)

17,714. "Electric cables." C. Vernier. July 24th, 1924. (237,427.)

18,267. "Electric flash-light or torch." H. W. Jones. July 31st, (237,431.)

19,418. "Device on prepayment meters for charging at different rate energy consumed." Landis & Gyr Soc. Anon. August 16th, 1923. (220

19,646. "Distributors for electric ignition systems." T. Dooley an Forrester. August 19th, 1924. (237,439.)

19,812. "Battery lamps for continuous lighting, especially cycle la watchmen's lamps, and the like." W. Botz. April 10th, 1924. (232,156

21,291. "Selector switches." Western Electric Co., Ltd. (Western El Co. Inc.). September 9th, 1924. (237,447.)

22,164. "Balancing arrangements for use in telephonic and like co tions." Siemens & Halske Akt. Ges. October 6th, 1923. (222,852.)

22,245. "Electric metal melting furnace." Hirsch Kupfer und Me werke Akt. Ges. September 20th, 1923. (222,145.)

22,472. "Electric signalling apparatus." W. B. Dale, R. A. Hopki and J. Hopkinson & Co., Ltd. September 23rd, 1924. (237,456.)

23,102. "Spool for coils in electrical apparatus." Landis & Gyr Soc. October 9th, 1923. (223,219.)

24,888. "Electric condensers." A. E. Alexander (U.S. Tool Co. October 20th, 1924. (237,466.)

25,211. "Pendant for supporting light bowls, such as are used be electric lights and the like." R. I. Scorer. October 23rd, 1924. (237,4

25,461. "Electric pumps." Dr. A. Nagel. December 5th, 1923. (225

25,557. "Radio frequency transformers." Dubilier Condenser Co., (formerly Dubilier Condenser Co. (1921), Ltd.) (H. W. Houck). October 1924. (237,469.)

25,890. "Protective devices for direct-current systems." Metropo Vickers Electrical Co., Ltd. November 5th, 1923. (224,526.)

26,074. "High-frequency telephone systems employing overhead power ductors." Telefunken Ges. fur Drahtlose Telegraphie. November 2nd, (224,247.)

26,110. "Wireless crystal detectors." S. E. Hall, J. H. Hall, and F Ratcliff. November 3rd, 1924. (237,471.)

27,022. "Mercury-treadle electric switches used on railways." Sie Bros. & Co., Ltd., and L. De M. G. Ferreira. November 12th, 1924. (237

27,121. "Electron discharge devices." British Thomson-Houston Co., November 13th, 1923. (224,906.)

27,482. "Loud-speaking telephonic apparatus." E. A. Graham. Nove 17th, 1924. (237,477.)

29,675. "Electric heater for fluids, gases, vapours, and the like." Neiss. December 10th, 1923. (226,207.)

31,046. "Railway and tramway switch-boxes or ground levers." Wrightson and C. R. Matthews. December 29th, 1924. (237,497.)

1925.

1,073. "Electrical control devices for electromagnetically operated ele acting on objects." C. S. Dutton and G. H. Derrick. January 13th, (237,503.)

1,189. "Dynamo-electric machines." British Thomson-Houston Co., January 14th, 1924. (227,845.)

1,611. "Vacuum-tube oscillation-generators for wireless transmiss Westinghouse Electric & Manufacturing Co. January 22nd, 1924. (228

2,092. "Short-circuiting devices for three-phase induction mot Deutsche Werke Akt. Ges. January 24th, 1924. (228,181.)

2,869. "Electrical and thermal insulating material." N. Stabile. Feb 2nd, 1925. (237,507.)

4,121. "Machines for forming pigtails and inserting them into glass of incandescent lamps or similar devices." Naamlooze Vennootschap P Gloeilampenfabrieken. March 6th, 1924. (230,431.)

4,769. "Head-bands for carrying telephone receivers." J. A. Ross an Taylor. February 20th, 1925. (237,514.)

5,118. "Incandescent cathodes for discharge tubes." Siemens & H Akt. Ges. February 26th, 1924. (230,066.)

6,688. "Electric lamps." J. Zelisko. March 11th, 1924. (230,836.)

7,993. "Electromagnetic sound-reproducers." Brandes, Ltd., and W Bartlett. March 25th, 1925. (237,531.)

9,716. "Mercury vapour rectifiers." Akt. Ges. Brown, Boveri et April 10th, 1924. (232,260.)

10,381. "Machines for making incandescent electric lamps and si articles." British Thomson-Houston Co., Ltd. April 22nd, 1924. (232,95

10,898. "Pantograph collectors for electric vehicles." Metropo Vickers Electrical Co., Ltd. April 25th, 1924. (232,985.)

13,169. "Coupling device for combined electric starters and dynamo automobile engines." Soc. Anon. pour l'Equipement Electrique des Véhi September 15th, 1924. (237,541.)

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Safety First—Within Reason.

TO get an idea hammered into its consciousness and then to be obsessed by it is, we believe, a characteristic of our race; it may be seen repeatedly in our political history, not always operating to our advantage. Doubtless it enabled us to hold out through the Great War; equally in times of peace it often determines our conduct, and it may lead us beyond due bounds if not controlled by the light of reason.

To class the slogan "Safety First" as liable to become an obsession may expose us to criticism as lacking in humanity; but is it not possible to sacrifice too much for the sake of a merely hypothetical return? By all means let all reasonable precautions be adopted to ensure the safety of the citizen—it is only when the safeguards become to our mind unreasonable that we feel bound to utter a protest, in the interests of the public as a whole. A case in point was the statute which stipulated that vehicles propelled by mechanical power should be preceded by a man on foot, bearing a red flag, and should not travel at a higher speed than four miles an hour. But for that regulation British engineers, who invented steam-driven road cars over a century ago, might have led the world in the development of the automobile—but it was not relaxed until Parliament was compelled in 1896 to permit motor-cars to travel (at 12 miles an hour!) on ordinary highways. That is a typical example of precaution carried to the limit, as a result of which it took us years to catch up the rest of the world in the manufacture of automobiles.

These thoughts were prompted by a recent visit to an English village remote from civilisation, which has been supplied with electricity for many years by a small plant which, if old and apparently inadequate,

nevertheless fulfils its purpose quite well. The proprietors do not seem to have heard of the Board of Trade (or *vice versa*) or of the Electricity Commissioners, for some of the overhead wiring—in particular, the tapping of services—conforms to no rules whatever; even for bell wiring it would hardly pass inspection. Yet *it works*, and so far as we could ascertain, it works well; and the pressure is 200 volts.

Last year we made a tour of the rural distribution system installed by Mr. S. E. Britton in the neighbourhood of Chester, which has been carried out on first-class lines, presenting a striking contrast with the system mentioned above. Being a statutory undertaking, and in the public eye, it has complied with every regulation laid down by the successors of the Board of Trade for ensuring the safety of the public, at a cost which renders it almost impossible to supply electricity for lighting at a profit; consequently the Chester Corporation of necessity must do its utmost to develop a demand for cooking and heating, and other uses of electricity. That is all to the good—but it should not be a necessity, for undoubtedly electricity can be supplied for lighting by simple and inexpensive means which bring it within the reach of the poorest consumer, and yet involve no appreciable risk to the passer-by.

We advocate neither of the extremes that we have cited. That there is a middle course we are convinced, having had occasion to visit other British rural distribution systems which are entirely adequate to their purpose but, without involving any perceptible danger to the public, have been constructed on economical lines. The regulations for overhead conductors laid down by the Electricity Commissioners are in some respects more stringent than, in our opinion, is warranted by the circumstances, at any rate in the case of rural distribution; but whilst the highest standards are defined in the official regulations, it by no means follows that they will be rigidly enforced, or that their stringency cannot be mitigated by the adoption of suitable methods subject to the approval of the Commissioners. So long as hundreds of miles of 500-volt trolley wires are suspended above crowded streets, constantly in a state of vibration and subject to wear, and sometimes dependent on solder for support—and yet do not give rise to frequent accidents, it cannot reasonably be argued that overhead lines of simple construction and exposed to far less arduous conditions are liable to become "death-traps." Not only reason, but experience—here and abroad—tells us that there is no appreciable risk from overhead wires at 200 volts, and that unduly high standards of construction involve an outlay out of all proportion to the slight and problematic benefits that they confer.

We have, on previous occasions, expressed similar views with regard to the "Regulations for the electrical equipment of buildings" issued by the Institution of Electrical Engineers, and we observe that, in the report of the I.E.E. Committee on Electricity in Agriculture, which is published in the current issue of the *Journal*, the Committee suggests "that the Institution should take steps to propose rules for rural distribution networks, overhead and underground. These Rules only to apply to distribution to farms, villages, and small industries, leaving other work to be carried out under the existing Regulations as at present approved by the Electricity Commissioners." We earnestly hope that if this suggestion is adopted, the result will not be to plant further obstacles in the way of the use of electricity in rural areas. The difficulties are already sufficiently numerous without our taking steps to add to their number.

The Place of Woman in Salesmanship.

In the course of a recent speech, Sir Alfred Mond said that the antiquated methods of our salesmanship needed revision. He was discussing the many problems which face us to-day as an industrial people with a vast army of unemployed, and the remark quoted was made in considering the needs of the future with respect to organisation and administration. Every day in the newspapers the advice is given to the rising generation who wish to succeed in these difficult times, when men's jobs are so scarce and applicants for them are so numerous, that they should take a course of salesmanship. Some naturally are foredoomed to disappointment, but if we can raise the standard of business-getting efficiency it will be advantageous to this nation of shopkeepers.

Training for salesmanship is not a closed preserve for mere men nowadays; the door is open wide for the woman of business capacity. It has long been so in retail shopkeeping, and in certain departments of wholesale trade, and wonderfully successful have some women been. We in the electrical trade can recognise too that woman has an important place to fill in securing the full rate of advance in electrical development, especially in the domestic field. The more readily and generously we recognise this fact and allow the members of the fair sex to exercise their powers of conviction and persuasion to the full, the better it will be for the whole electrical industry. What is more obvious than the disposition of the mistress or housewife to admit one of her own sex into the sanctities of the household, to talk pleasantly over the uses of electricity in domestic life and the various points requiring elucidation or demonstration in connection with installed apparatus? Where a male canvasser meets with a chilling reception, or is peeped at through a door nervously opened but half-a-dozen inches, one of the opposite sex is given a cordial welcome and is invited to call again and continue the subject. Borough electrical engineers and committees, and above all boards of directors, ought to consider this aspect of local domestic electrical development far more seriously than they have done.

Of course, it is not suggested that any and every female is fitted for such a vocation. There are many qualities and qualifications required of the perfect woman in salesmanship, but happily women are devoting close and organised attention to this matter, as witness the inclusion of the subject in the programme of the Conference of Women in Science, Industry, and Commerce held in July. One of the papers contained many points of interest to those who believe, as does the author of the paper (Miss Gladys Burton, B.A.), that "selling is an occupation which is fast being raised to the rank of a profession," that "selling offers a career of absorbing interest to girls of the right temperament," and that "for the successful saleswoman there is always a market." We agree that while a "delightful personality" is not wasted anywhere, it is of first importance in selling, and we may add that in electrical salesmanship it should be particularly welcome. With a delicate womanly touch, Miss Burton said that the only law of salesmanship was "to love one's customer as oneself" (assuming, of course, we suppose, that the said customer was not too masculine), by which we judge her to lay stress upon the importance of having a satisfied consumer, by giving lasting satisfaction and avoiding the opportunity of taking temporary advantage.

Knowledge of the stock handled, some particulars of its production, its operation, its good qualities, and the performance it can render, are of course essentials, both in a man and in a woman, particularly when endeavouring to convince, win, and satisfy electrical consumers. The saleswoman must even more be able to "understand the men and women with whom she is daily confronted," though a diverting tilt is made by the author at the professors of psychology who "find ordinary tact quite beyond them" . . . . "I suppose because one cannot understand people unless one loves them." We find it difficult as mere men to tell male canvassers that in order to understand their prospective customers they must give definite evidence of affection

for them—it might at times land them in awkward situations—but there is no disputing the truth of the more common rendering that we may use, namely, that the canvasser who is acquainted with the needs and difficulties of the consumer, and seriously and good-humouredly tries to meet those needs and overcome those difficulties, is showing a regard for the said consumer and for his employers' interests at the same time. "Salesmanship" is, after all, "the ability to sell goods that won't come back to customers who will." Of course, there is a very human and practical side to all this, as some supply employés, wearied with fruitless calls, irritated beyond endurance by the petty annoyances to which they are subjected, and conscious of their own and other people's limitations, will be feeling as they read these lines. We are not out to secure the supersession of our own sex at a time when so many good men are out of employment, but we feel that the position of woman on the commercial side of the electrical supply industry calls for more exploration than it has yet had, and that there is plenty of room for the profitable employment of electrical business-getting women in many localities without dispensing with the services of any present male employé.

Electrical Accidents in Mines.

The report of H.M. Electrical Inspector of Mines for 1924, which is abstracted elsewhere in this issue, reveals the regrettable fact that during the year there were 18 deaths attributable to the use of electricity in coal mines, of which 13 were due to electric shock; this is a bad showing compared with previous years—the worst since 1913, when the same number of deaths due to shock below ground was recorded. The average for the five years previous to 1924 was happily only five, and for the ten years 1914-1923 it was 4.9. It is to be hoped that the serious increase last year will prove to be exceptional, and that future records will be at minimum values.

Most of the fatalities due to electric shock occur in connection with the operation of coal-cutting machines, and frequently they are due to some defect in the earthing conductor or its connections. The Inspector considers that there is room for radical improvement in the existing designs of plug connector, and a perusal of the report certainly supports that view. A standard specification for plugs and sockets is being prepared by the B.E.S.A., and good progress has been made with it. The delay in dealing with this detail, of literally vital importance, has probably been due to the fact that the machines continue to work satisfactorily when the earthing device is inoperative, and as all goes well until a failure of insulation of the live conductors occurs, the first indication that anything is out of order may be a fatal shock. Regular examination and testing of the earthing devices would go far to minimise the risk of accident, but the Inspector points out that in many cases this procedure is not efficiently carried out; as the use of electricity in mines is constantly increasing, the importance of adequate maintenance cannot be over-emphasised, and the work should be entrusted only to fully qualified electrical engineers who thoroughly understand the machinery that is placed in their charge. It is true that a large proportion of the accidents recorded are due to the ignorance, carelessness, or temerity of the men who pay so high a penalty for their rashness, and it is impossible to guard against such occurrences, but at least every care should be taken to make sure that the apparatus employed is not at fault. One class of defect which in the past has been responsible for the loss of many lives is the omission of a set screw, leaving an opening in a casing intended to be flame-proof, and leading to an explosion of gas. Wherever it is possible, studs should be used instead of set screws, or the screw-holes so disposed that the loss of a screw does not necessarily leave a clear channel for flame to pass through.

Standards of Quality.

Our Canadian correspondent rightly takes us to task for overlooking the constitution and achievements of the Approval Laboratories of the Hydro-Electric Power Commission of Ontario in our recent leader on this subject. The organisation, procedure, and functions of these laboratories were described in some detail in our issue of April 29th, 1921, and they have frequently been referred to in our abstracts of the annual reports of the Commission, including that which appeared in our last issue. We had not, however, appreciated the fact brought out by our correspondent, that the verdict of the Ontario Laboratories was accepted by the electrical industry in the other Provinces of the Dominion, even when the approval of the Underwriters' Laboratories had not been obtained. The matter is of some importance, and we are glad to know that the restrictive influence of the Chicago institution with regard to the sales of British products in the Dominion of Canada is less effective than we imagined.

But still, it must not be supposed that this particular obstacle is not formidable, nor may it be assumed that the Ontario Laboratories offer a wide-open door to British products. We are well aware that the quality of these goods is generally well above the standards set by either of the authorities above-mentioned, and that in most cases they would be accorded the hall-mark of approval without demur; the trouble is that, as we indicated in our leader, there are difficulties of procedure besides that of communication at long range, in the absence of direct representation on the spot, which block the way through the Laboratories to the issue of labels. Years ago an attempt was made to meet the situation by appointing representatives of the Underwriters' Laboratories in London, and for some time Messrs. Heap and Digby fulfilled that office; the arrangements that were made were fully detailed in our pages at the time. But that system was ended, we believe, by the outbreak of the Great War, and whilst there is still a measure of co-operation between the insurance offices in this country and the Underwriters' Laboratories, there is no fully-organised system in operation. We are not aware that the Ontario Laboratories have ever been represented in Britain.

Of the hearty goodwill of both these testing institutions we have no doubt whatever. It was not the fault of the Underwriters' Laboratories that direct representation on this side was abandoned; as recently as 1922 the late president, Mr. W. H. Merrill, was in this country and made arrangements with the Fire Offices Committee in London under which the latter agreed to assist in the conduct of examinations and tests in England, a service which has been utilised upon occasion in connection with Canadian business. We are assured that the Laboratories are willing to do whatever is within their power to meet any demand on the part of British manufacturers who wish to export to Canada or the United States for service similar to that performed for American industries, and the same would apply to the Approval Laboratories of Ontario—but the difficulties, partly technical and partly administrative, are admittedly serious. It has been suggested that the Laboratories should deposit their specifications with a recognised testing institution in this country, such as the National Physical Laboratory, or Faraday House, and accept certificates from that body to the effect that British products which it has tested do—or do not—comply with the specifications; but the best solution, to our mind, would be the establishment of the British Proving-House which was so warmly advocated by the late Mr. C. H. Wordingham, and which, no doubt, would act in close accord with the two transatlantic bodies.

We have in our possession a pamphlet fully describing the organisation and practice of the Underwriters' Laboratories, and the last half-yearly list of electrical appliances inspected, which may be seen by persons interested in this subject.

The "Sila" Hydro-Electric Development Scheme.

A Great Electrical Undertaking in Southern Italy.

By J. S. BARNES.

A dense network of electric high-pressure transmission lines now covers almost the whole of Italy, and forms a national system of electrical power supply. Close on 2,000,000 kW is actually installed, producing over 5½ milliards of kW-hours a year, with an average load factor of approximately 45 per cent. The great majority of the installations are hydro-electric, though, as development continues apace, and engineers are driven to consider hydro-electric schemes in new districts less adapted to the construction of large artificial lakes, a



Fig. 1.—Map of Southern Italy and Sicily, showing Electricity Supply Mains, etc.

growing demand for supplementary thermal power stations is now being experienced and is in course of being supplied. Nevertheless, it is mainly her resources in water power that are enabling Italy gradually to become, industrially, a rich country; and no other country in the world offers such a complex and interesting example of the technique of co-ordinating power supply by which various kinds of power installations, dotted all over the peninsula from the Alps to Sicily, are linked up and made to remedy each other's deficiencies.

Naturally, the greatest development has come in the north and, in a second degree, in the centre of Italy, where the presence of large towns and long-established industries provided a ready market and where opportunities for the remunerative employment of capital were much greater than in the poverty-stricken south. Moreover, the more abundant and more evenly distributed rainfall in the north made hydro-electric development less costly. Gradually, however, as the technique of power co-ordination has developed along with the ability to transmit power over long distances without too great an economic loss, the south has begun to be opened up. South of Naples, six large hydro-electric power stations, besides a number of smaller ones, are already working, as well as three in Sicily, and the famous "Tirso" plant in Sardinia, which possesses the largest artificial lake in Europe.

The regeneration of the south of Italy depends very largely on the economical utilisation of water. The best land, lying between the mountains and the sea, is often devastated by malaria, which is principally caused by the flooding of large areas during short periods of torrential rain, and the subsequent partial drying-up, thus forming ideal breeding ground for the mosquito. The precious water, in this land of long dry summers, is at the same time wasted, being no longer available for the purpose of irrigation at the seasons when it is chiefly needed. The floods, too, cause incalculable damage by erosion. Moreover, the failure up to the present to discover mineral wealth on the main land of Southern Italy, coupled with the above causes which make even the only great local industries, namely, agriculture and afforestation, barely profitable, condemns the people of this beautiful country to an existence of the direst poverty, mitigated only by the fairness of the climate and the remittances of emigrants, who leave to gain their livelihood in other parts of Europe and in America every year to the tune of over 200,000.

Since the unification of Italy, something indeed has been done by the Government, to improve the lot of these districts by the expenditure of public money on the development of the means of communication, on the supply of drinking water, on the provision of quinine and wire netting whereby to combat the malaria, and on the provision of schools. But the efforts of the Government have in the past been unco-ordinated and sporadic. Since 1922, on the other hand, the various measures in the above sense have been speeded up by the Fascist Government and large extra funds provided. Yet, only lately has it come to be realised that the regeneration of the South can only be effected by solving the water question by comprehensive schemes, that is, by utilising the water power resources of the country for the provision of power for industries (especially those industries which either feed or are fed by agriculture); by impounding the water in large artificial lakes, whereby as much as possible of the comparatively small rainfall may be utilised in power production; by thus avoiding, at one and the same stroke, both the erosion and the floods, and at the same time providing water for irrigation either by the impounded waters or by means of electrical pumping; by exterminating malaria at its origins, and by the opening up of richer land to intensive agriculture.

With all these economic objectives can be attained in a single scheme, many projects, otherwise unproductive, can be made to pay; and the Government has learnt that in encouraging and assisting such schemes, public money may be most profitably employed in harmony with individual initiative. Sardinia, the topography of which lends itself peculiarly well to the purpose, is furnishing the most typical example of development on these lines. A plan of development has been drawn up for the whole island. The presence of numerous great artificial lakes, of which two are already in existence, will soon transform the aspect of the country, and within a generation this, the poorest of Italian provinces, promises to become one of the richest.

The problem of Sicily is more difficult, because the topography of the country is not suited to the creation of large artificial lakes. What can be done in this way locally has already been done. The final solution of the problem is awaiting the completion of the great power scheme in course of construction in Calabria, known as the "Sila" project—from the name of the plateau and forest of the Sila situated in the "ball," so to speak, "of the foot of Italy," whence power is to be derived and carried, not only to the neighbouring provinces of Basilicata, Puglia, and Campania (Naples), but also across the Straits of Messina to Sicily.

During a recent visit to Southern Italy I have been given opportunities through the kindness of the chairman of the "Sila" Company, Commendatore Maurizio Capuano, and of the famous engineer, Commendatore Angelo Omodeo, who is the author of the scheme, to visit the works now well under way.

The district is one of the most remarkable in Italy, not only for its natural beauty, but for its wildness and its contrasts with what one usually associates with Southern Italy. The Sila plateau lies between the Ionian and Tyrrhenian Seas, between the Port of Cotrone and the town of Cosenza; it is over 1,000 sq. kilometres in extent and at an altitude of over 4,000 ft. above the level of the sea. It is thickly covered by an immense forest of fir and pine, poplar and beech, and is broken by the ridges of higher mountains rising to 6,000 or 7,000 feet. For four months of the year it is covered with deep snow. The chief river draining it is the Neto, fed by its main tributaries, the Arvo, the Garga, and the Ampollino, which finds its way to the Ionian Sea a few miles north of Cotrone, all at once diving down from the height of the plateau into the low, fertile, but altogether deserted, undulating plain between the sea and the great mountain wall. Geologically the district is formed of ancient impermeable oleanic rock, thus combining with the local topography to present ideal conditions for a hydro-electric scheme requiring large artificial lakes.

The scheme, when completed, will be one of the largest of its kind in Europe, producing over 140,000 continuous kW in four power stations, the largest of which, namely, that of Timpa Grande, will produce over 97,000 continuous h.p., with over 160,000 kW of plant installed.

The accompanying map and diagram, fig. 2, illustrate the scheme, which I will now endeavour to describe in detail. For clearness it will be found convenient to divide the description into three parts, as follows:—

1. The creation of three storage reservoirs by means of three dams on the upper reaches of the Rivers Neto, Garga, and Arvo—the first two having a useful capacity of four million cubic metres each, the third of 157 million cubic metres (approx. 34,540,000,000 gallons). For all intents and purposes they will form one single reservoir, as they will be connected up by pressure tunnels and have a common top water level of 1,287 metres (4,223 ft.) above the sea. By thus impounding the waters of these three rivers, the *régime* of the latter will be completely regulated.

From the Ampollino reservoir an underground flume 3⅓ miles in length will carry the mean discharge of the above lakes into a fourth reservoir, namely, that of the Ampollino, having a useful capacity of 61 million cubic metres (approximately 13,420,000,000 gallons) and a top water level 1,270 metres (4,176 ft.) above sea level. Thence the continuous discharge will be 6.5 cubic metres per second (=approx. 85,800 gallons per minute).

Taking off from the Ampollino dam at a level of 1,250 metres, a tunnel will carry this water under pressure for 4,395 metres to a point immediately above the power station, known as the "Orichella" power station, situated lower down on the River Ampollino, about 800 metres above sea level. At the outlet end of the tunnel will be constructed a surge tower, and a pressure forebay for the pipe line. The mean head will be 467 metres and, as 1 cubic metre of water falling in one second through a vertical height of 1 metre is the equivalent of a little more than 13 h.p., we thus arrive at a figure of approximately 40,000 continuous h.p., or approximately 30,000 continuous kW, representing the amount of continuous power to be obtained at this point.

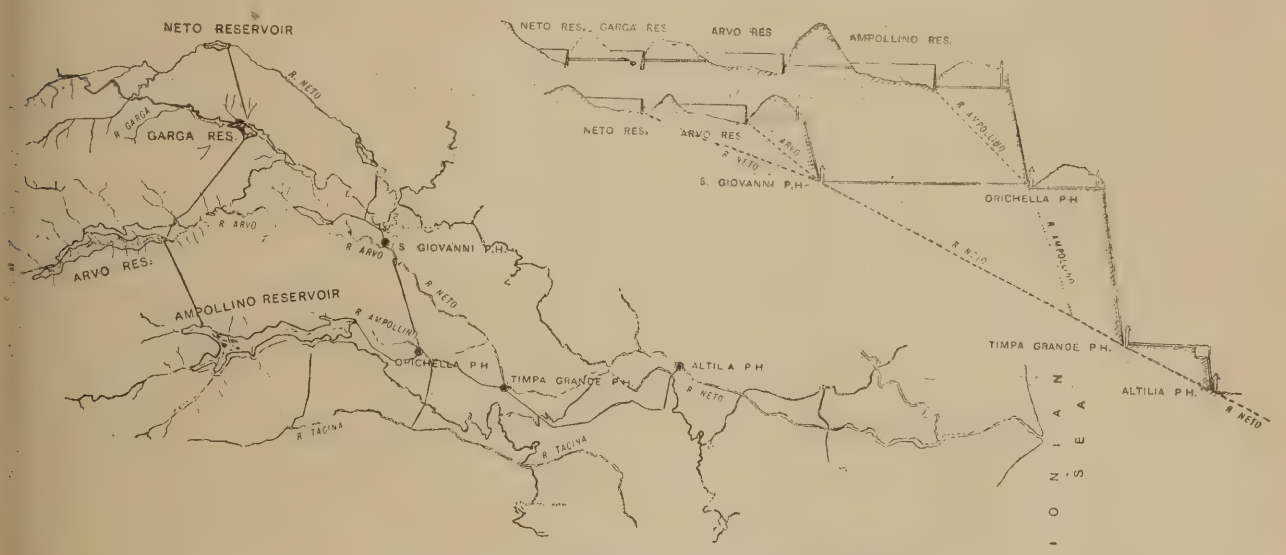


Fig. 2.—Plan and Vertical Section of the "Sila" Scheme.

The two big dams to be constructed in connection with this section of the scheme will be those impounding the waters of the Arvo and Ampollino. Both will be of the usual trapezoidal shape and built of masonry. Their respective measurements will be 40 metres (130 ft.) high and 270 metres (900 ft.) long; and 31 metres (102 ft.) high and 138 metres (450 ft.) long. The latter is already on the verge of completion.

2. The creation of two storage reservoirs of 20 million cubic metres capacity on the Neto and of four million cubic metres on the Arvo, approximately ten and eight miles respectively below the upper reservoirs, and having top water levels of 1,150 and 1,070 metres. From the latter the water will be led by tunnel under pressure to the head of the pipe line and surge tower. The water from the first reservoir will be discharged into the pressure tunnel about half way along its course of about 3½ kilometres. The total mean discharge has been calculated at 4 c.m. per second, so that with a mean head of 210 metres, another 11,000 continuous h.p. will be obtained at the second power station of S. Giovanni situated lower down in the valley of the Neto, about 850 metres above sea level. Thence the water will be carried by another tunnel and discharged into the bed of the Ampollino close to the first power station (Orichella).

3. From this point the combined discharges (amounting to 10.5 c. metres per second) will be carried by open flume and tunnel a distance of 3,665 metres to the head

of the third and greatest power station (Timpa Grande). Meanwhile the water available will have been increased to a mean of 15 c.m. per second by the addition of water derived, also by tunnel, from the upper reaches of the River Tacina, which runs parallel to and to the south of the Ampollino. The head being 467 metres, no less than 107,000 continuous h.p. will be generated at this point. Over 160,000 kW of plant will be installed. At the head of the pipe line there will be a penstock (already nearing completion), sufficient to regulate the varying requirements of the daily demand for power. There will be seven pipe lines.

4. Slightly below the discharge of the water from the turbines into the Timpa Grande (which joins the Neto a few hundred yards farther down) there is to be built an intake barrage, from which a second open flume and tunnel will carry the water into a second penstock at the head of the fourth and last of the projected power stations (the Altilia power station), situated on the lower Neto 164 metres below the mean water level of the penstock. Thus the power to be generated there will be a further 32,000 continuous h.p., making a total for the stations of over 190,000 continuous h.p., equal to approximately 140,000 continuous kW.

This will mean, including reserves, the installation of a total of over 300,000 kW of machinery in order to meet an estimated load of 50 per cent. l.f. The discharges of the last two power stations will not be entirely regulated by direct storage; but by disposing of the machinery in the right proportions between the stations and co-ordinating their operation, it will be possible to utilise the whole of the power nominally available. Thus the annual output of energy which will come actually to be sold will total approximately 1,250 million kWh or Board of Trade units.

Three main transmission lines, consisting each of two 3-phase circuits carried on lattice poles of reinforced concrete and steel structure, will start from the Timpa Grande station and will carry the current at the high pressure of 135,000 volts, the first to Taranto for Bari, Brindisi, and Lecca; the second to join up with an existing power station at Tanagro, near Potenza, whence energy is supplied to Naples; the third to Catanzaro and Reggio and across the Straits of Messina in Sicily. A fourth line at a lower voltage will serve Cosenza and Paola, and a fifth Cotrone (see fig. 1).

Only by transporting power over these very considerable distances will it be possible to secure the necessary markets. Naples and the thickly-populated Campania form a market with a continually increasing demand. The same, on a smaller scale, may be said of Taranto, now the chief naval station of Italy, and Bari, which is becoming an increasingly important commercial port and manufacturing centre. Locally it is calculated that, apart from special industries, not more than 25,000 kW will for some time be able to be absorbed. The importance of Sicily, therefore, as a market, with its teeming population, its considerable industries, its sulphur mines, and its need for water by pumping from the subsoil, cannot be overlooked. This, however, necessitates the transport of energy across the Straits of Messina. To this end the United States Steel Corporation has, through the American Bridge Co., of Pittsburg, which is controlled by it, been approached with a view to the construction of an aerial line across the Straits. No contract has as yet been signed, but the following scheme put forward by the American Bridge Co. has been accepted as the best solution :—

Two steel towers are to be constructed, one on each side of the Straits at a point slightly north of the narrowest point. Each of these towers will be 330 metres in height (a few feet higher than the Eiffel Tower), and the distance between them will be 330 metres. There will be two circuits of three cables each, running 30 ft. apart. The diameter of the cables, which will be of steel, will be .82 in., and the water in the centre will be cleared by a minimum of 70 metres. On one side of the Straits the cables will have a fixed attachment at the base of the tower, on the other an automatic movable one to allow for seasonal expansion and contraction and for wind pressure. The power will be carried at a pressure of 135,000 volts.

The United States Steel Corporation is prepared to begin the erection of the towers within eight months of receiving the order and to complete the work within two years. Further, it is prepared to guarantee the satisfactory working of the scheme for a period of five years after completion and to accept payment accordingly by instalments.

The cost, excluding that of the concrete foundations for the towers, has been estimated in the form of a firm offer at 800,000 dollars.

The capital for this great enterprise has been found by a consortium of the electrical companies chiefly interested, namely, the Società Meridionale di Elettricita, the Società Generale Elettrica della Sicilia, and the Società delle Strade Ferrate Meridionali, backed by the strongest Italian bank, the Banca Commerciale Italiana. The State is assisting, too, with a grant amounting to 200,000,000 lire (close on £2,000,000).

The Timpa Grande power station will be completed, together with the Ampollino storage reservoir, by the close of 1925, although it will not even then deal with the whole of the discharge of water described above. In other words, the extra water to be derived later from the River Tacina will not be included, while in consequence of the other power stations higher up the valleys not being in operation, together with the remaining reservoirs, the whole of the water available at the Timpa Grande will not be regulated, so that the continuous output at the beginning of 1926 will not correspond with the maximum figures given above. Nevertheless, about 30,000 continuous h.p. will be produced in this first stage of development, and progress with the remaining works will continue unchecked.

The Montecatini Co. has secured a site at Cotrone, which is a small port with a safe and deep anchorage close up to the quay side, for the erection of plant utilising the Fauser process for the production of synthetic ammonia. This plant, which will have a load factor of about 90 per cent., will employ about 20,000 kW, and thus form a useful fly-wheel, so to speak, to the total load of the whole hydro-electric system.

Before closing this summary description of this important enterprise we must not forget to mention that, in accordance with the principles enunciated at the beginning of this article, a further storage reservoir is to be constructed below the fourth power station with the object of providing water for the irrigation of the plain lying between the mountains and the sea. The complete regulation of the *régime* of the Neto will already have prevented the seasonal floods. The way will thus be paved for the gradual colonisation of this large and fertile area amounting to over 25,000 acres, hitherto practically deserted on account of lack of water and the malaria scourge, and an industrial agricultural company is being formed to exploit the new situation.

It may be of interest to British readers that the designer of this great scheme, Ing. Angelo Omodeo, is responsible for the plan of hydro-electric development in the Tay valley, known as the Grampian Electricity Supply Scheme, the construction of which, it is announced, will shortly be initiated under the auspices of the Power Securities Corporation.

Largest Synchronous Motor.—According to *Power*, a 9,000-h.p. synchronous motor, to be installed by the McKinney Steel Co. at its River Furnace Plant, will be the largest continuously rated industrial motor in the world. It will be connected to a Morgan continuous billet mill which will probably be in operation early in 1926. The motor will be of the G.E.C. design for 6,600 V, 107 r.p.m., 3-phase, 25 cycles, unity power factor. It will have shaft extensions at both ends and be coupled to a long layshaft running the length of the mill with bevel gearing to each stand of rolls. The mill will have 10 stands, six of which will be 21 in. and the remainder 19 in.

Induction Heating by Low-Frequency Currents.

The Use of the Induction Furnace for Melting Non-ferrous Metals.

By G. E. TAYLOR, A.M.I.Mech.E., A.M.I.E.E.

(*Concluded from page 287.*)

Figs. 6 and 7 show a side and front view of a 75-kVA, single-phase, 50-cycle, 440-volt furnace, having a nominal capacity of 600 lb. per hour.

Two sections of the same furnace are shown in fig. 8. It will be noted that the secondary portion consists of two arms forming an angle of 75 deg. Above them is placed a bath of molten metal, the upper part of each arm being rounded off at the point where it meets the bath.

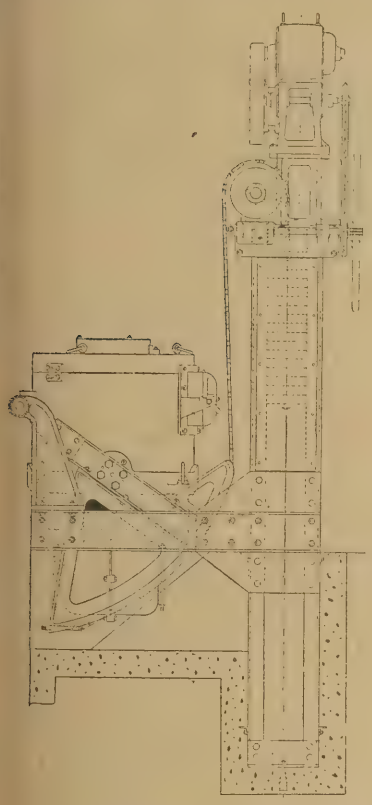


Fig. 6.—Side View of Ajax-Wyatt Furnace.

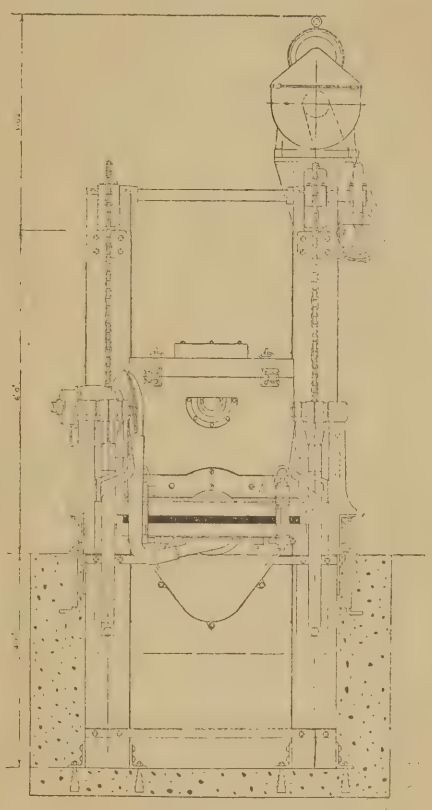


Fig. 7.—Front View.

The resistance of the lower or V-shaped part of the secondary channel is about 80 per cent. of that of the whole furnace. The V-shaped part contains about 21 lb. of metal. As the watt-hours required to raise the temperature of this amount from 950 deg. C. to 1,150 deg. C. (the temperature at which zinc volatilises in the alloy) is 285, it is evident that when the furnace is developing 74 kW, the rate of change of metal in the channel must be 3.5 times per minute to prevent the zinc volatilising. This flow of metal is obtained as described below.

To simplify construction, the furnace has been designed for single-phase working. The maximum kilowatt input of a single-phase furnace is limited, owing to the size of the secondary slot, to 80 kilowatts on 50 cycles and 90 kilowatts on 25 cycles. It may, however, be designed for polyphase working, when the maximum input will be increased in proportion to the phases used.

Conductors carrying current in opposite directions repel each other, if free to move, the magnitude of the force depending directly on the square of the current and inversely on the distance between the conductors.

When the conductors are composed of molten metal contained in rigid channels, this force will tend to bank up the metal on the outside of each channel, and where these are arranged so that a gradually diminishing force is obtained along their lengths, the metal will tend to flow from the adjacent ends. In practice it is found that when the channels form an angle of 75 deg. in relation to each other, a good metal flow is obtained.

As the channels widen out where they meet the bath, the current density at this point is much less than further down the channel; there is, therefore, an increased circulation of the metal due to the "pinch" effect.

The critical current density at which the force known as "pinch" effect will tend to reduce a rectangular conductor to half its cross section, as shown by Hering, will be given by the following formula: $C_D = 895\sqrt{G/H}$, in which C_D is the current density in amperes per sq. in.; G is the specific gravity of the molten metal, and H the depth of metal.

The current in the channel of the furnace shown in fig. 8 being many times greater than that given by the above formula, the "pinch" effect would break the circuit if it were not for the head maintained in the channel by placing the bath of molten metal above it.

The circulation of the metal in the furnace is due to various effects. As the metal becomes heated in the channels and forced to their outer sides, its place is taken by the colder metal flowing in, this flow being due to heat convection currents, or the "Joule" effect. The arrows in fig. 8 show the direction of this circulation. In making copper-zinc alloys, it is necessary that the metal should be well stirred, to ensure having a homogeneous alloy throughout the charge. Where the pit fire furnace is used, the stirring is done by the melter, using an iron bar for the purpose, just before the metal is ready to be poured. With this type of induction furnace, the stirring is automatic and continuous, being caused by the above-mentioned effects, which are of sufficient magnitude to displace the metal at the top of the bath.

The following figures give the electrical characteristics of a 50-cycle single-phase furnace:—

Nominal capacity, 600 lb. of brass per hour.

Input, 74 kW; p.f. 84 per cent.

Primary volts, 440; amperes, 200; turns, 80.

Size of primary copper, 0.125 in. × 0.75 in. (0.0937 sq. in.).

Secondary resistance, 2.9×10^{-4} ohm; amperes, 15,700.

Size of secondary copper, 3 in. × 0.75 in. (2.25 sq. in.).

Flux density in core, 12,000 lines per sq. cm.; in legs, 7,600 lines.

Copper loss (hot), 1,022 W; iron loss, 544 W.

Efficiency, 97.8 per cent.; temperature of primary, 150 deg. C.

The electrical gear external to the furnace, a wiring diagram of which is shown in fig. 9, consists of two

2-pole, change-over oil switches, interlocked with a 12-way plug board. In this case a 75-kVA auto-transformer is used to reduce the voltage from 525 to 440. The 440-volt winding is tapped up to the mid point, and is so connected to the switchgear that any voltage from 0 to 440 volts may be obtained in 20-volt steps. The ammeter and voltmeter are connected in the furnace circuit. It has been found in practice that so great a number of tappings is not required, and the switchgear and auto-transformer have therefore been simplified, as shown in fig. 10. A standard change-over 3-pole 200-A oil-switch, with two series overload trips and low-voltage release, has been substituted for the two 2-way switches, and a 220-kVA transformer with five tappings is used in place of the 75-kVA auto-transformer.

When a single-phase transformer is used to step down the voltage to that required for the furnace, provided this voltage is about 440, a tapping is generally taken out at the mid-point of the secondary winding and earthed as a precautionary measure against shock. When the furnace is connected to a 440-volt supply with unearthed neutral, an earth shield is fitted over the primary winding of the transformer. A 1-h.p. motor is provided for tilting the furnace, and a motor of $\frac{1}{2}$ h.p. is used for driving the transformer cooling fan.

Fig. 11 shows a three-legged furnace transformer on the centre leg of which is placed the winding, consisting of copper strip wound radially on an asbestos sleeve, mica or asbestos insulation being placed between the turns. The whole coil is then covered with a thin layer of special cement.

As the transformer has to be dismantled each time the furnace is lined, the laminations in the centre leg are shaped at the end and are arranged in layers of five to facilitate assembly. A small fan is used to blow air over the centre leg when in operation.

The furnace is lined with a refractory cement, which is rammed into the furnace by means of pneumatic hammers. The bottom castings are placed on a suitable stand and are lined with asbestos sheet and heat insulating bricks. The wood former, which forms the secondary channels, is placed in position and the cement is rammed round it. This is carried on until the cement is of sufficient height to place in position the former, which forms the hole to take the centre leg of the transformer. The bottom brass ring is also placed in position and the lining is rammed up to the point where the furnace shell is bolted on.

The first row of heat-insulating bricks is then placed inside the shell and the ramming is continued up to the point where the crucible form and spout forms are placed in position. Ramming is further continued until the top of the furnace is reached.

The different formers are then taken out, the furnace transformer is assembled, and the furnace is placed in its cradle, and then the channel former is burnt out. The furnace is now dried for a period of three or four days, after which about 200 lb. of molten metal is poured into it and the current is switched on.

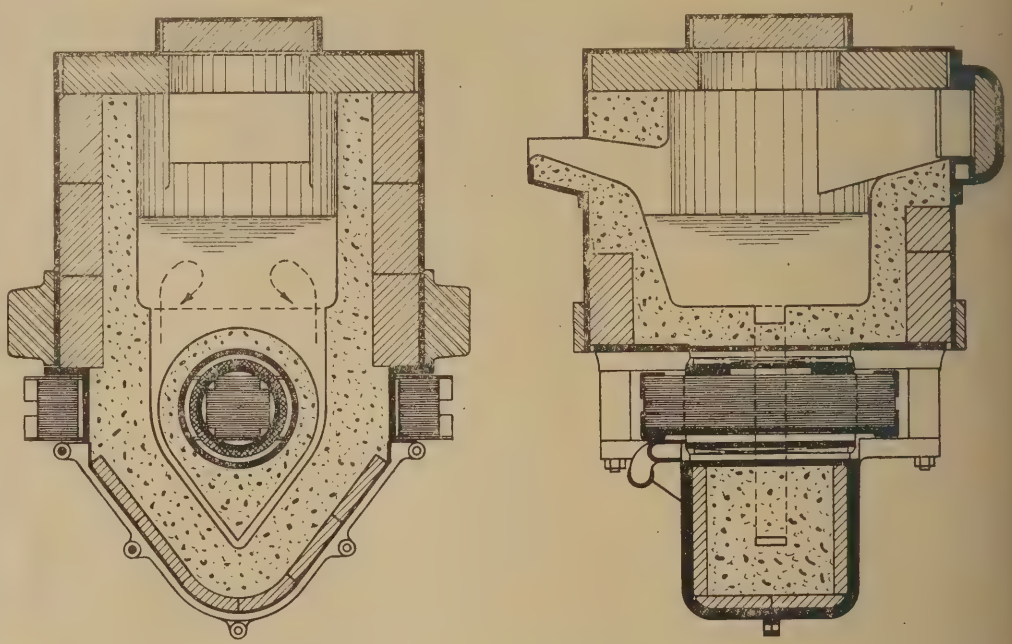


Fig. 8.—Sections of Ajax-Wyatt Furnace.

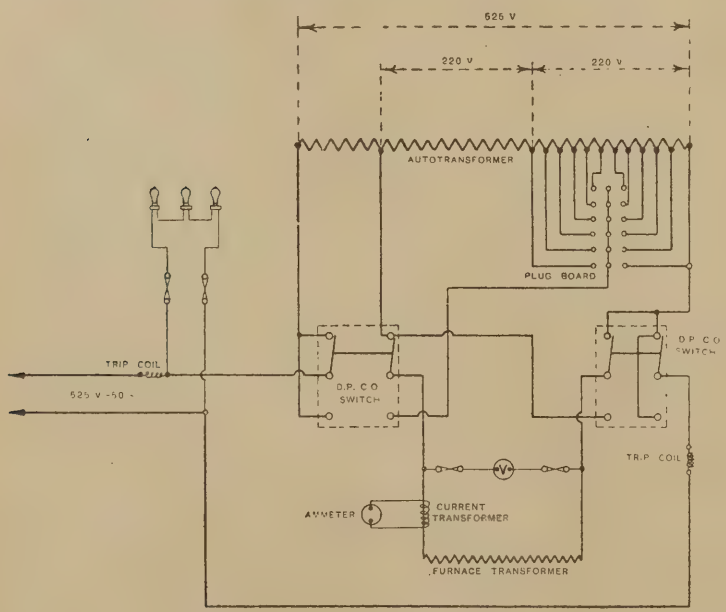


Fig. 9.—Wiring Diagram.

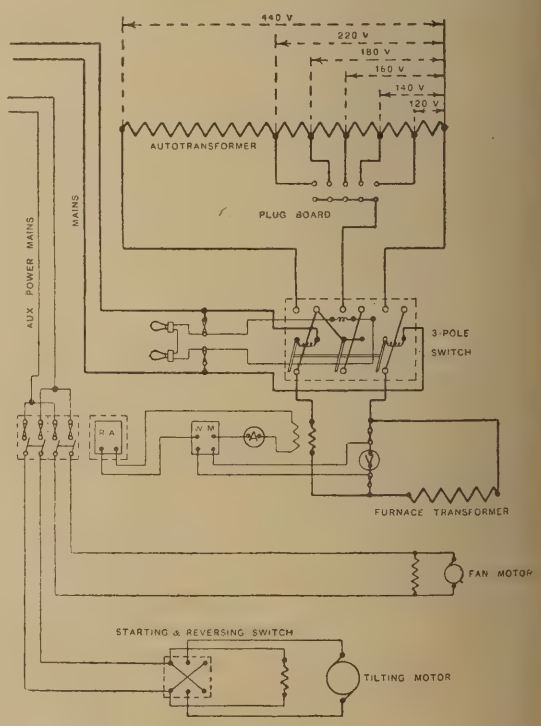
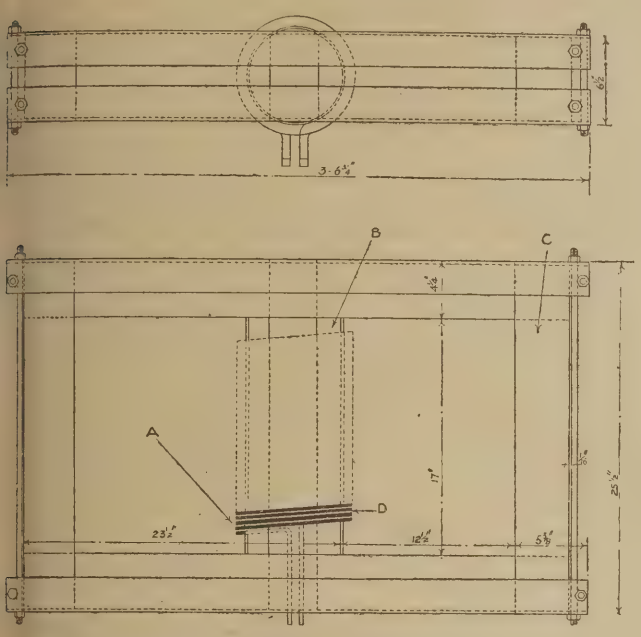


Fig. 10.—Simplified Diagram.

After the furnace is started, it may be charged with swarf, ingots, or scrap metal in any form. When the furnace has been completely charged and the whole of the metal has reached its correct pouring temperature, the needles of the instruments will begin to oscillate, owing to the varying conductivity in the channel. This is very interesting and extremely useful, for it indicates the correct pouring temperature of the metal, and so



A, primary coil; B, core; C, transformer iron; D, high-temperature insulating cement.

Fig. 11.—Three-legged Furnace Transformer.

does away with the necessity for highly skilled melters. This condition only holds good if the size of the secondary channel is made in correct proportion with regard to the power input.

The rate of flow of metal during the pouring operation is under complete control, the tilting of the furnace being carried out by means of a small electric motor. The controller is usually placed in the fixed centre about which the turn-table for the moulds revolves. The melter is therefore in the best position for observing the height of the metal in the moulds during this operation. As the lip of the spout is on the tilting axis, a constant pouring point is maintained.

The following table gives details of an actual day's run on a 65/35 brass:—

Time in hours. Melting	Melting Charging & Pouring.	Metal chgd. lb.	kWh per charge.	Lb. per unit.	kWh per ton.	Remarks.
m.	H. m.					
15	1 25	650	75·5	8·85	253	First heat —delay on moulds.
0	1 15	650	61·5	10·55	212	
55	1 5	650	67·5	9·63	233	
10	1 20	650	63·5	10·2	220	
0	1 13	650	58·5	11·1	202	
0	1 12	650	65	10	224	
0	1 9	650	58	11·2	200	
10	8 39	4,550	447·5	10·2	220	

The metal may be held at any required temperature by means of voltage regulation. As the furnace must be started up on molten metal, the usual practice is to keep it molten over week-ends, the power taken being approximately eight units per hour.

The switching operation is extremely simple, and a single change-over switch only is required, as it is found in practice that only the voltage necessary for giving the full load and that for stand-by are used.

The metal loss due to volatilisation is extremely low, and, if due precautions are taken to keep the furnace airtight, oxidisation may be practically eliminated. It is found that by adding a quantity of zinc equal to ½ of 1 per cent. of the total charge, the proportions of the mixture are maintained.

The energy consumption can be estimated from the above figures, which show that an average of 10.2 lb. of brass per kWh has been maintained throughout the shift, this including pouring time, when it is usual to reduce the load to about 8 kW.

We have, therefore, an energy consumption of 200 kWh per ton. If we take the empirical figure of 15 kW as the rate at which heat is applied to the furnace to keep the total charge at its pouring temperature, we have an efficiency of 78.5 per cent., with a furnace taking 70 kW.

The average life of the lining is approximately 500,000 lb. of brass melted, but in several cases this figure has been as high as 2,500,000, and in one case over 5,000,000 lb. The channels of the furnace do not become enlarged, as might be expected, from the violent circulation of the metal, but gradually make up, and in time the rate of melting becomes too slow for practical use.

Two men, who may be semi-skilled melters, are required to operate a 600-lb. furnace and moulds, when pouring about every hour. Four men are usually employed where banks of three furnaces are installed, and in some cases where a number of furnaces are in use, one man per furnace is found sufficient.

As practically the whole of the resistance is in the secondary channel, the kW input is independent of the quantity of charge in the crucible, and therefore the full rated load may be taken at any state of the charge.

It is usual to run the furnace for 24 hours per day, 5½ days per week. Assuming that it takes the furnace 60 minutes to melt the charge and 10 minutes for pouring time, when the load is cut down to about 8 kW, it is in operation for 108 hours at 70 kW and 18 hours at 8 kW, making a total of 8,424 kWh out of a possible 11,760 kWh, thus giving a load factor of 71½ per cent.

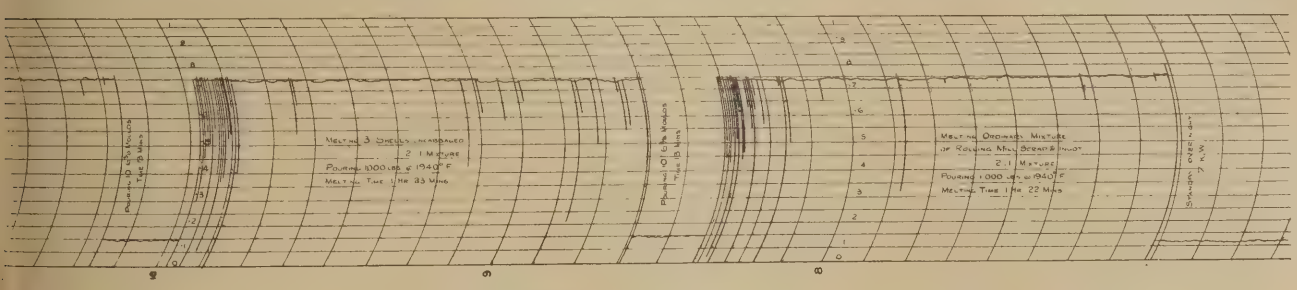


Fig. 12.—Reproduction of Kilowatt Record Chart.

Fig. 12 is a reproduction of an actual kilowatt record chart. It will be seen that the load is practically constant throughout the heat, until the charge is nearly ready for pouring. The load then begins to vary and produces the fluctuations shown on the chart. This is due to zinc volatilisation in the secondary channel. The drop in the curve at the end of the heat is caused by the load being reduced during the pouring. As soon as the metal is cast, the furnace is switched on to full load. Hence the power is practically constant during the melting period and an acceptable load is provided for the power supplier.

This form of induction furnace, which has a power factor of 85 per cent. at 50 cycles and 90 per cent. at 25 cycles, a steady and constant load with a correspondingly high load factor, a high thermal efficiency and a strong stirring action of the metal, is ideal for the making of alloys.

It is not generally realised that about two-thirds of the world's supply of yellow brass for rolling mills is now being made in this type of furnace.

The Southern Railway Electrification.—III.*

High- and Low-Pressure Cable Systems and Sub-Station Equipment.

(*Concluded from p.* 303.)

Electric traction was introduced on the suburban lines of the South-Western section of the Southern Railway in the autumn of 1915. The d.c., 600-volt, third-rail system is used, and the first section comprises 150 miles of single track, or 50 route miles. The second section, which was opened on July 12th last, covers 67 track miles and embraces the company's lines southward to Guildford and Dorking.

South-Western Extension.—For this section 61.1 miles of 11,000-volt cable was manufactured, laid, and jointed by W. T. Henley's Telegraph Works Co., Ltd., in addition to two miles of 7-core, eight miles of 15-core, and four miles of 19-core contol cable. The low-pressure cable was supplied by the Macintosh Cable Co., Ltd.

The track is supplied with d.c. at 660 volts from rotary-converter sub-stations which were equipped by the British Thomson-Houston Co., Ltd., as were the original ones. The most recent additions are four two-unit attended and three single-unit unattended sub-stations, together with extensions at two existing sub-stations and also at the Southern Railway Co.'s Durnsford Road power station, which feeds the sub-stations at 11,000 volts, 3 phase, 25 cycles.

The self-synchronising rotary converters both in the attended and unattended sub-stations have a normal rating of 1,250 kW and run at a speed of 500 r.p.m., being designed to stand overloads of 50 per cent. for two hours, 100 per cent. for five minutes, and 200 per cent. for 20 seconds, and are also guaranteed to stand a momentary load of four times full load without flashing-over. Induction-motor starting is used, and the general construction and arrangement of the switchgear in the four attended sub-stations is similar to that in the old sub-stations and to that described last week in connection with the South-Eastern section.

Special interest attaches to the unattended, or "automatic," sub-stations at Leatherhead, Clandon, and Oxshott, each of which contains a 1,250-kW rotary converter with automatically-controlled switchgear for the a.c. and d.c. ends of the set and the d.c. track feeders. The Leatherhead and Clandon single-unit stations are located at intermediate points in the run of e.h.p. feeders between adjacent two-unit sub-stations and are controlled from the two-unit attended sub-station at Effingham Junction. The Oxshott "automatic" sub-station is situated at the end of an e.h.p. feeder and is controlled from the Hampton Court sub-station.

In each case the 11,000-volt switchgear, which is constructed on similar lines to that in the attended sub-stations, is arranged on two floors at one end of the sub-station, while the 660-volt d.c. switchgear is on two floors at the opposite end of the building, the rotary converter and transformers being located in the central part of the building. The "automatic" apparatus is designed for remote control from a distant point, but provision is also made for control in the sub-station for inspection purposes when required.

To start up the rotary, the remote control switch in the distant station is closed by hand; this operation energises the master control contactor, which is so interlocked that it cannot close unless the motor-operated master controller is in the "off" position. When the master-control contactor closes, the motor-driven master-controller (which fixes the sequences of subsequent operations) closes the oil circuit breaker which connects the h.p. side of the main power transformer to the three-phase e.h.p. supply. Further rotation of the controller closes the "starting" contactor which connects the starting motor to the main transformer, and the auxiliary field winding on the rotary converter is connected to an auxiliary generator, which is driven from the rotary converter shaft. At this point the master controller stops and waits for the machine to synchronise.

As the rotary accelerates, the auxiliary generator builds up its voltage, thus energising the auxiliary field winding and fixing the polarity of the machine. When the voltage of the auxiliary generator attains approximately 80 per cent. of normal, the synchronising field contactor adjusts the resistance in the main field of the converter to the correct value for synchronising. When synchronism is reached, a synchronous-speed indicating relay re-starts the master controller, thus closing the "running" contactor which connects the rotary direct to the transformer, whilst the main field is disconnected from the synchronising tapping on the field rheostat and connected to the moving arm of the rheostat.

Further rotation of the master controller causes the auxiliary field winding to be disconnected from the auxiliary generator; the rotary will now be running in synchronism from the a.c. side, with correct adjustment of field, and will be ready for connecting to the d.c. bus-bars. The master controller, continuing its travel, closes the high-speed breaker on the "negative" side and immediately afterwards the high-speed breaker on the "positive" side closes. Thus, the machine is connected to the d.c. bus-bars. The master controller comes to rest in the "running" position, where it remains until the machine is shut down.

High-speed circuit breakers have been provided to protect against overload and short circuits; they can be set to trip at a predetermined current value and are under the control of a repeat-action relay, reclosing a predetermined number of times, but if the fault persists the rotary converter will be finally shut down and locked out. The other protective devices may be divided into two classes:—(1) Those which shut down the equipment but do not prevent automatic re-starting when conditions return to normal, and include an a.c. undervoltage relay, machine temperature delay, and d.c. reverse power relay, and (2) those which shut down the equipment either directly or indirectly and prevent automatic re-starting until the device which has operated has been re-set manually; these include an overspeed device, a.c. overload and earth-leakage relay, bearing temperature relay, a sequence-timing relay, &c.

Further, a "single-phase starting" protective relay prevents the machine from starting unless all three phases of the a.c. transmission line are energised. The high-speed circuit breakers controlling the d.c. track feeders are opened and closed by means of a control switch situated in the distant control station, but when this switch is closed by the attendant the breakers are under the control of automatic re-closing relays in the sub-station, operating in a similar manner to that described for the rotary-converter d.c. breakers. Provision has been made whereby once the breakers have been locked out, due to a persistent fault by the operation of the re-closing relays, the locking-out device can be re-set from the distant-control point after the fault has been removed. Indication at the distant-control point is given by a signal lamp to show when a feeder breaker has been locked out due to a fault.

The transformers in the attended and unattended sub-stations are of the British Electric Transformer Co.'s single-phase, oil-immersed type, arranged in banks to form three-phase units.

The new rolling stock for both the Western and Eastern areas has been built to the dsigns of Mr. R. E. L. Maunsell, chief mechanical engineer of the Southern Railway, Messrs. Herbert Jones and

* Elec. Rev., April 10th, June 5th, and August 21st, 1925.

laworth, the respective electrical engineers, having been esponsible for the electrical equipment. The motor nit formation is similar, comprising one trailer coach rranged between two motor coaches and, during the usy periods of traffic, two of these units are coupled ogether and augmented by a two-coach trailer unit. 'or the Western section, 52 motor coaches have been uilt by the Metropolitan Carriage and Wagon Co. and 6 trailer coaches by the Midland Railway Carriage and Vagon Co. The motor and trailer coaches for the astern section have been supplied by the Metropolitan arriage, Wagon and Finance Co. and the Birmingham ailway Carriage and Wagon Co. respectively. The ock for the two sections differs only in detail and imensions.

In addition, over 500 existing vehicles have been econstructed as motor and trailer coaches in the rail-ay company's works at Ashford. These vehicles are ounted on new underframes exactly similar to those f the new stock, and the passenger-carrying capacity identical; 144 existing bogie vehicles have also been dapted to act as two-coach strengthening units for ddition, when required, to the regular three-coach ectric units of both the Western and Eastern sections. For the Western section, the order for the complete ectrical equipment of 26 three-coach trains and 13 two-oach trailer units was placed with the Metropolitan-ickers Electrical Co. Each of the three-coach trains ill consist of two motor coaches, one at eac end nd one trailer coach in the centre. Each motor coach equipped with two motors, each giving an output of 75 h.p. at 600 volts on the one-hour rating, arranged in pairs on the bogies underneath the driving compartments. Each pair of motors is controlled by its own separate gear in the driver's compartments. One advantage claimed to be obtained by placing the control gear in the driver's cab directly over the motor bogies is that the weight of the apparatus is concentrated above the motors, producing more adhesive weight upon the driving wheels and reducing the possibilities of slipping under bad track conditions. Westinghouse brakes are used; the air is supplied by small compressors, directly driven by low-speed motors, one of which is placed in each motor cab. The action of all the compressors on a train is controlled by a master governor and switch producing uniform work on all the compressors, as all start and stop simultaneously.

In conclusion, the following table may convey an idea of the Southern Railway's electrification plans:—

Section.	Track miles completed.	Track miles in hand.	Total miles.
L. & S.W. ...	178	67	245
Brighton ...	70	82	152
S.E. & C. ...	—	250	250
Cost ...	£2,250,000	£5,500,000	£7,750,000

The conductor rails on the Elmer's End and Hayes line were recently charged at a d.c. pressure of 600 volts in connection with preliminary tests which will be continued at intervals till the electrified portion is ready for operation in, it is hoped, December next.

Correction.—The three 400-kVA frequency changers in the Lewisham sub-station and 15 10-kVA sets in the outlying sub-stations, mentioned last week, were manufactured by the Electric Construction Co., Ltd.

Notes from Canada.

(By our Special Correspondent.)

the issue of the Review dated July 3rd, is an itorial entitled "Standards of Quality and Perform-ice." It is rather noticeable that no mention is made of e Approval Laboratories of the Hydro-Electric Power ommission of Ontario which have now been function-g, in a manner similar to that of the Underwriters' aboratories in the United States, for over 10 years.

The following statement, quoted from the article in estion, does not apply to the Power Commission's proval for Ontario so far as the writer has been able ascertain:—

"Matters are so arranged that it is almost, if not ite, impossible for a British or other manufacturer secure the services of the Bureau."

Whether electrical materials, apparatus, or devices, ., have been approved by the Underwriters' Labora-ies or not, the Commission's approval must be ob-ned, though, usually, the Commission approves any-ng already approved by the Underwriters, whilst re-ving the right of independent action. Moreover, legal authority vested in the Commission, by the ovincial Legislature, under the provisions of the wer Commission Act, enables the Commission not only prevent the *use* of unapproved electrical apparatus, also to prevent its *sale* for use in the Province; the nmission has also power to prevent the advertising electrical apparatus (even though it be approved) such a manner as would be liable to lead to improper . For example, a manufacturer or dealer would not allowed to advertise a 1,000-watt electric heater as ng suitable for connection to an ordinary lampholder, such holders are rated at only 660 watts. There is le doubt that such restrictions will work to the benefit the community. A case that was mentioned to the ter some time ago may serve as an illustration:—

pair of electric curling tongs was purchased, and rtly afterwards a small child in the household got hold of the flexible cord, while the tongs were connected up, and bit it, with the result that his mouth was very badly burned. Investigation showed that the cord had no rubber insulation whatever, and was not fit for anything more than electric bell work; there was nothing on the device to indicate its country of origin, and its whole construction was such as to invite trouble. The device was bought at a "department store" in an Ontario city.

The Hydro-Electric Power Commission now has power to prosecute anyone found dealing in such unapproved devices for, of course, the one in question had never received its approval. Several persons have already been prosecuted and fined, and the results are said to be salutary. While the approval of the Commission is only required *by law* in the Province of Ontario, the writer is informed that its approval is usually sufficient to gain acceptance of a device in other Provinces without difficulty, even though the approval of the Underwriters' Laboratories in Chicago has not been obtained.

With regard to the work of the Underwriters' Laboratories and also to the National Electrical Code, it has always seemed to the writer to be unfortunate that it is only the fire and not the life insurance companies that are represented.

The natural tendency of the fire underwriters is to take care of the fire risk only, in connection with either electrical installations or apparatus, and though of recent years an honest attempt has been made to pay attention to the life hazard as well as the fire hazard, it is still evident that the latter gets more consideration than the former.

If there is a move in England to establish some form of approval, and to do it through the agency of the insurance companies, by all means let both the great branches of the insurance world be adequately represented, otherwise there will be a lack of proper balance.

[The constitution and working of the Approval Laboratories of the Hydro-electric Commission were described in the Electrical Review of April 29th, 1921.—Eds.]

D

The British Association.—I.

The Southampton Meeting.

On Wednesday last, the 95th annual meeting of the British Association for the Advancement of Science commenced at Southampton. In a number of respects this important sea-port is an ideal *venue* for such a congress, as within it and around are many things in wide variety to interest the scientific mind. The town is the home of the Ordnance Survey, to whose premises visits are being arranged; archæologists will find a great many matters to occupy their attentions; the New Forest provides material for the naturalist; while there are many undertakings exemplifying modern industrial and engineering progress. From our readers' point of view there are three works of outstanding interest in Southampton: the docks and harbour, the Pirelli-General Cable Works, and the Corporation electricity works. In the Engineering Section (G) papers are being read upon the first and last of these by gentlemen very competent to deal with them—Mr. H. Wauchope, the electrical engineer to the Southern Railway at the Southampton Docks, and Mr. W. G. Turner, the borough electrical engineer. The programme of visits and excursions includes visits to the docks and the Pirelli-General works, as well as to the Calshott Aerodrome, Messrs. Harland & Wolff's ship-repairing works, &c.

It is of interest to recall that the Association has previously paid two visits to Southampton—in 1846 and 1882. The programme in the latter year contained a large number of papers on electrical subjects, which was fitting when the president was Dr. C. W. (afterwards Sir Charles) Siemens. Reference to the Electrical Review of that period shows that the presidential address referred to the "new arts of applying electricity to lighting, to the transmission of power, and to metallurgical operations." A large part of the address was concerned with electrical units, and it was then suggested that the unit of electrical power should be named the "watt," and the terms "gauss" and "weber" were suggested for magnetic units. Dr. Siemens predicted that "the electric light may be worked by natural sources of power, such as waterfalls, the tidal wave, or the wind," a prophecy which has been abundantly fulfilled in two respects at least. A study of the papers presented at the meeting is very fascinating, but we cannot do more than indicate the nature of a few of them. Mr. F. J. Sprague described the Edison system of electricity distribution dealing with dynamos, lamps and meters; Mr. W. H. Preece read papers on "Recent Progress in Telephony" and "A New Arc Electric Lamp"; some "Notes on Atmospheric Electricity" were contributed by Mr. C. Michie Smith; Mr. R. Sabine dealt with electric light measurement; Lord Rayleigh presented a report of the Committee on Electrical Standards, dealing principally with the effect of temperature upon the resistance of metals; Mr. C. Vernon Boys described the principles of some electricity meters; and Dr. Siemens and Mr. A. K. Huntington presented a joint paper on the electric (arc) furnace.

This year's president is Dr. Horace Lamb, F.R.S., who was formerly professor of mathematics at Adelaide and Manchester. The president of Section G—Engineering—is Sir Archibald Denny, the well-known naval architect and marine engineer; the vice-presidents of the Section are Prof. G. W. O. Howe and Sir J. I. Thornycroft, F.R.S. Dr. G. C. Simpson and Prof. C. H. Desch are respectively presidents of Sections A—Mathematics and Physics and B—Chemistry. There is one woman president this year, Miss Lynda Grier, principal of Lady Margaret Hall, Oxford, who is presiding over Section F—Economic Science and Statistics.

The proceedings were to be opened on Wednesday evening with the inaugural general meeting at the Central Hall, at which Major-General Sir David Bruce was to relinquish the chair in favour of Prof. Lamb. The new president's address dealt with certain branches of geophysics, the structure of the earth being treated from the physical and mathematical aspects.

The real business was to begin on the following morning (Thursday), the sessions of all Sections opening at 10 a.m. The addresses of the Sectional presidents have again been spread over the programme, so that it is possible for those attending the meeting to hear more than one of the addresses if they desire, which was impossible under the old arrangement, by which they were all read at the opening session. The business of the Engineering Section was wholly marine. Sir Archibald Denny was to deliver his address, entitled "Fifty Years' Evolution in Naval Architecture and Marine Engineering," of which an abstract follows; this was to be followed by two or three papers on marine engineering subjects, and in the afternoon members of the Section were to visit the Southampton Docks.

The proceedings on the first day contained little of electrical interest, though a number of papers dealt with subjects in which the nature of electricity entered, as in a communication by Prof. L. S. Ornstein (Section A) on "Light Quantum Theory of Dispersion," while others might conceivably have electrical applications, *e.g.*, the paper on "Advances in the Treatment of Peat as a Fuel and the Production of By-products," by Dr. F. M. Perkin (Section B). Mention may also be made of a study of "The Resistance to Corrosion of Electro-Deposited Chromium," by Mr. E. A. Ollard (Section B); and a paper on metal-mining in Cornwall by Mr. E. H. Davison (Section C—Geology).

This year, as usual, "Citizens' Lectures" have been arranged for the general public. There are four of these, including one by Prof. E. V. Appleton on "The Rôle of the Atmosphere in Wireless Telegraphy" and another on "Some Technical Problems of Broadcasting," by Capt. P. P. Eckersley, chief engineer to the British Broadcasting Co. Between twelve and thirteen hundred members of the Association had, prior to the meeting, notified their intention to attend.

Fifty Years' Evolution in Naval Architecture and Marine Engineering.

(*Abstract of Presidential Address, Section G.—Engineering.*

As can be gauged from its title, this address dealt principally with the construction and propulsion of vessels during the last half-century, and only in parts was it of direct electrical interest. After dealing briefly with the types of engines in use between 1854 and 1890, the author said that the introduction of the Parsons turbine was a great advance. His first connection with the turbine was in 1890, when a small machine was used to drive a dynamo aboard the *Duchess of Hamilton* on the Clyde. It was a tiny plant, the turbine driving the dynamo direct at 10,000 r.p.m.; it was not very economical but as it was only used rarely on evening cruises, that did not matter much. It was, however, a forerunner of that great invention, permitting the economical use of the low end of the pressure curve which could not be efficiently used in the reciprocating engine, thus improving the economy of the steam engine, apart from the other advantages of freedom from vibration troubles and increased speed which could be obtained through its low weight per h.p. After briefly mentioning the first turbine-driven ships, the author said that there was no means of indicating the turbines prior to 1902. In that year the *Queen Alexandra* was put into service and an attempt to measure the torsion of the shaft was made. This was done by means of a telephone and contacts on the shaft at considerable distances apart. The system had been successfully tested on

, works shaft at about 200 r.p.m., but at the higher speed it vas not at first very successful. Thereafter an induction nethod, with permanent magnets and coils, designed by Mr. Chas. Johnson, was used for some time with success, but the tructure of torpedo boat destroyers upset the arrangement, vhich depended for its success upon a very small clearance etween the coils fixed to the hull and the sharp permanent nagnets fixed on the shaft. The Hopkinson-Thring instru- ient, using only a short length of shaft, with mirror and ght arrangement, was much used; and, also using a short ngth of shaft, Edgcombe constructed an averaging electrical ieter which had the great advantage of requiring only one eading even on the shaft of a reciprocating engine. There ere now several types of meter which could be used with onfidence. A part of the address was devoted to the develop- ient of the Diesel engine, and it was mentioned that the ton- age of motor ships had risen from 750,000 in 1919 to 2,000,000 ns five years later. The author said that mention was fre- uently made of an internal-combustion turbine; while he ad- itted that he was sceptical as to its practicability, he was ire that there could be no halt in invention and advance in ermal efficiency.

Reference was made to advances in other branches of marine ngineering, particularly boilers and condensing arrangements, nd the author said that in no direction had advance been reater than in the use of electricity on board ship. Swan nd Edison invented the carbon-filament lamp in about 1880, aking domestic and ship lighting a possibility. In 1884 the *rawa* and *Tainui* were fitted with incandescent electric light- g, but stand-by oil lamps were also provided because of the ability to failure of the electrical plant. In those days the witches were made with wooden bodies and there were no uick-break arrangements; sectional switchboards and fuse- oards were unknown; soldered joints on trunk wires insu- ted with rubber tape were made, and the wire available was ttle better than modern bell wire. The two dynamos were c. ribbon-armature Ferranti machines. That was fortunate, ecause, as the wiring was poor and the skin of the ship was ed as the return, had the current been direct there would ave been great danger from electrolysis and consequent fires. he total output was about 30 h.p. Nowadays hundreds of lowatts was used on a vessel of the same size, not only for ghting but for ventilating, local heating, cooking and for iving small machinery of all kinds, including frequently any of the important engine-room auxiliaries. There was nsiderable controversy as to whether the main dynamos ould be driven by Diesels or steam engines, and, in the case steam, whether it should be drawn at same stage from the ain engines before going to the auxiliary, or passed to the ain engine after going through the auxiliary, or the haust of the auxiliary used for heating the feed water, a combination of these arrangements. It would be teresting to watch the development of that controversy, as its proper solution further economy in full consumption ould result. Probably no one solution would suffice and in iesel motor-ships we might find the auxiliaries driven by eam—*e.g.*, when they were oil tankers requiring the steam heat the cargo oil—while in steam-driven turbine steamers might find the auxiliaries driven by electricity generated by iesel-driven dynamos. The auxiliary machinery in the engine om was now very extensive and the fuel consumed in deve- oping their power was such an important proportion of the al fuel consumed that their design and installation was be- ming, to a certain extent, a separate branch of engineering. Leaving the engineering side, Sir Archibald turned his atten- n to the design and construction of the ship itself. He owed how great had been the advance in the provisions for e comfort and convenience of the passenger. The old candle nps, swinging in gimbals at the mirror or fixed in the bulk- ads, one for each two cabins, which at best made darkness ible, had been replaced by powerful electric lights, one or re to each stateroom, with probably a reading lamp at the ad of each bed. Artificial ventilation, either with fans in h stateroom, or with trunk ventilation fed by powerful main is supplying air warmed or cooled as desired, was now fitted. t and cold water laid on to each stateroom had taken the ce of the old "goglets" and receivers. The navigating dge of a modern high-class steamer was an inspiring sight, th gyro compass probably fitted with an automatic quarter- ster, "tell-tales" from the engine room giving the revolu- ns of the engines and the direction of turning; similar ell-tales" to the rudder head showing the angle of the er; the steering gear, now fitted aft, and controlled by a elemotor," invented by A. B. Brown, of Edinburgh; there re radio rooms and radio direction finders, and, probably, derwater microphones for finding the position from under- ter land bells; probably a telephone system linking up the dge with the various chiefs of departments; automatic icators showing the water in all holds and ballast tanks; l means for closing all watertight doors below deck in the nt of fog or collision.

Light Quantum Theory of Dispersion.

By Prof. L. S. Ornstein.

bstract of a Paper read before Section A.—Mathematical and Physical Science.)

f we want to discuss the equilibrium of electrons and radia- n from the point of view of light quantum hypothesis, it is essary to put the probability of collision of an electron l a light quantum proportional to the square of its "wave gth." This result leads us to the hypothesis that a light quantum is a spherical volume of electromagnetic energy with dimensions of the order of wave length. This hypothesis may be used in order to find the refractive order. If a light quantum strikes over an atom a force will be exercised on the quantum which is proportional to the volume of the atom and to the gradient of the field in the quantum. The order of magnitude of this gradient may be estimated from the hypothesis mentioned. During the interaction the momentum of the quantum is put proportional to $hc/\lambda v$ (h Planck constant, c velocity of light in ether, v velocity in the quantum and λ wave length). From the above the retardation of a quantum by an atom can be calculated; and taking into account the probability of collision with the atoms the ordinary formula for the refractive index for long waves can be obtained. On the same base the Rayleigh formula for the scattering of light can be found.

In the light quantum theory, dispersion can be obtained by taking into account—just as in the old theory—the inertia of the electric masses in the atom. The influence of damping by radiation, which plays a part in the old theory, also finds its counterpart in our light quantum considerations.

The History of Cornish Mining.

By E. H. Davison.

(*Abstract of a Paper read before Section C.—Geology.*)

The history of Cornish mining is a record of progress in mechanical invention making it possible to work new types of ore deposits. The ore bodies of Cornwall consist of alluvial gravels and deep lodes. In the beginning, mining in Cornwall was restricted to the working of alluvial gravels and of lodes at their outcrops. The impossibility of raising water from any depth prevented deep mining all through the Middle Ages. The use of adits to drain away the water was, however, developed along the coast in the sixteenth and seventeenth centuries, and to some extent made use of in the inland mines. Till the middle of the eighteenth century mines seldom worked below 100 feet. The invention of pumping engines by Savory, Newcomen, Watt, Trevithick and others during the eighteenth century rapidly extended the depth to which mines could be worked. After that the chief factor which determined the type of ore deposit worked was the value of the metal. At first, copper was the more valuable metal, and the lodes were worked in the copper zones, tin being considered a by-product; then, when foreign copper ores reduced the price of that metal, the copper mines were either abandoned or carried down into the tin zone, thus becoming tin mines. Of late years, the older mines in the Camborne-Redruth area have become more or less exhausted, and deep development to the north has been carried out on the basis of geological forecast. This development is now in process, but has been successful already in one instance. The available mineral wealth of Cornwall, so far as tin is concerned, is of two types:—(1) The unworked tin zones below abandoned copper mines; and (2) Lodes some distance from the granite outcrop, which carry tin at depths which were too great for profitable mining in the past.

Legal.

Colwyn Bay U.D.C. v. Llandudno and Colwyn Bay Electric Railway, Ltd.

This action was mentioned to Mr. Justice Finlay in the Vacation Court on August 19th, on a motion for an interim injunction restraining the defendant company, until the trial of the action, from running tramcars on Sundays in alleged breach of an agreement of 1906.

Mr. E. W. Cave, K.C., on behalf of the Council, stated that the agreement had been observed by the company until within the last few weeks, when it began to run Sunday cars.

Mr. G. B. Hurst, K.C., for the company, said that he desired time in which to answer the affidavits. It was a matter of the greatest importance to his clients as they had been running the cars every Sunday since June 21st, and they wanted the matter disposed of quickly.

Mr. Justice Finlay said it was obviously a case which should be disposed of promptly; he allowed the motion to stand over until August 26th.

Dublin and Lucan Electric Railway.

Mr. Justice Hanna, in the Free State High Court, Dublin, recently appointed Mr. P. McDowall Grosart provisional liquidator in the matter of the Dublin and Lucan Electric Railway, with power to negotiate for the sale of the undertaking as a going concern, and to protect the assets and property of the company. A petition for the winding-up of the company was allowed to stand over.

Tempering of Bronze.—According to the *Mining Journal*, it is reported from Stockholm that after many years' experiments, M. O. Gustafsson, an Oskarshamn foundry foreman, has invented a method of tempering bronze to the hardness of steel.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Employment During July.—The review of labour conditions during July which appears in the August *Ministry of Labour Gazette* states that employment in the engineering industry generally remained bad and showed a slight decline in practically all sections. Conditions remained fairly good in electrical engineering, however. The percentage of unemployed in the whole of the engineering industry was 11.4. In marine engineering it was as high as 20.3 per cent. and in general engineering and engineers' iron and steel founding the figure was 12.4 per cent. On the other hand, the electrical branch had a percentage of 6.0 unemployed, as compared with 5.6 in June, and 6.0 in July, 1924. There was an increase of 0.6 to 8.6 per cent. in the proportion of unemployed in the wiring and contracting industry, but in the electrical cable, wire, and lamp manufacturing group, there was a fall of 0.5 to 7.2 per cent.

A Report Upon Hungary.—The Department of Overseas Trade has received a report upon the commercial and industrial situation in Hungary (Stationery Office, 1s. 6d. net) from Mr. E. C. D. Rawlins, the British Commercial Secretary at Budapest. In an introduction it is said that, although at the beginning of 1924 the general economic condition of the country was far from good, the end of the year brought hope and promise for the future. This is attributed to the programme of reconstruction, assisted by an international loan, and the appointment of the Commissioner-General of the League of Nations. Another favourable feature of the year was the abolition of a mass of trade prohibitions and restrictions and licences, which had led to retaliatory tariffs and proved a hindrance to trade. It has been stated that taxation has reached its highest point and cannot be further increased. The Budget for 1924-25 included an allocation for the laying of a telephone cable between Budapest and Vienna, which is expected ultimately to cost 10 million kr. (gold). An appendix to the report contains particulars of foreign trade during 1924. It is seen from this that 11,018 quintals of electrical machinery and apparatus was imported during the year. The bulk of this came from Germany (46 per cent.) and Austria (40 per cent.); Great Britain's share was only 0.29 per cent. of the total. The exports of electrical machinery totalled 3,951 metric tons, valued at 17,400,000 kr. (gold). It is stated that the Austrian machine industry has good prospects, as stocks are beginning to be exhausted, and all those household articles which were previously supplied by Bohemia and Austria, or by other foreign countries, can now be manufactured by local factories. The industry appears to be able to compete with foreign products, and especially is this true in the case of agricultural machinery, electrical machinery, and equipment, internal-combustion engines and steam engines. Among other details of development, it is mentioned that three automatic telephone exchanges are under construction for Budapest.

The Leipzig Fair.—The German Customs authorities are making special arrangements for inspecting the baggage of visitors to the Leipzig International Fair (August 30th to September 9th) on the trains instead of at the usual bureaux. The Fair embodies a section devoted to the display of small electric power plant for country house and institution lighting, including water-turbine installations.

Local Exhibitions.—Stockport.—An Ideal Homes and National Trades Exhibition is being organised by Mr. L. Batley, Gorsey Works, Stockport, for the period from September 16th to 26th.

Hanley and Oxford.—Modern Housekeeping Exhibitions are being organised in these towns by Messrs. Gibson, Life and Co., St. John's House, 3, Fulwood Place, Holborn, W.C.1, in the first case from November 11th to 24th, and in the case of Oxford from December 11th to 22nd.

E.D.A. Activities.—The British Electrical Development Association has sent us a copy of a coloured poster (E.D.A. 571) which it has recently produced to encourage the use of electricity for cooking. This bears a picture of a lady using an electric cooker, and informing the reader that "I cook my food the electric way for a unit a day." If the charge per kWh is one penny, the Association will substitute "a penny" for "a unit" in the "slogan."

Contribution to E.D.A. Funds.—The Radcliffe District Council, at its meeting last week, decided that the Electricity Committee should contribute £35 (one-tenth of 1 per cent. of the total income of the undertaking for the year ended March 31st, 1925) towards the publicity campaign promoted by the British Electrical Development Association, subject to the sanction of the Electricity Commissioners.

Buenos Aires Subways.—A message from Mr. G. Ward Price which appeared in the *Daily Telegraph* last week, stated that if the contract between the Intendente of Buenos Aires and the Anglo-Argentine Tramways Co., Ltd., for the construction of two underground railways at a cost of £10,000,000 was ratified by the Municipal Council, the whole of the material needed for the works would be bought in England.

Book Notices.—"*Journal* of the American Institute of Electrical Engineers," Vol. XLIV, No. 8, August, 1925. New York: The Institute. Price $1.

"*Journal* of the Institution of Electrical Engineers," Vol. LXIII, August, 1925. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"The Theory of Electric Cables and Networks," by Dr. A. Russell. Third Edition. Pp. xii + 356; figs. 88. London: Constable & Co., Ltd. Price 24s. net.

The Technology Reports of the Tôhoku Imperial University, Sendai, Japan. Vol. V, No. 2, 1925. Maruzen Co., Ltd.: Tokio and Sendai.

Scientific Papers of the Institute of Physical and Chemical Research, Tokio, Japan.—Nos. 32 and 33, June, 1925; Nos. 34, 35, and 36, July, 1925. The Institute.

"Japanese *Journal of Engineering*." Abstracts of the National Research Council of Japan, Tokio. Vol. I, 1921; Vol. II, 1922. The Council.

The Oxford University Press has issued a list of books on science and technology, which includes a number of works on electrical and radio matters.

Lead Market Report.—Messrs. James Forster & Co., in their letter dated August 22nd, say:—"Closing prices yesterday were £39 for August, and £37 1s. 3d. for November against £37 12s. 6d. and £36 6s. 3d., respectively, at the end of last week. The feature of the market this week has been the daily widening of the backwardation, which accurately registers the shortage of early arrival lead. The Mexican lead has at last arrived in London, totalling about 2,500 tons, but this, as we anticipated, had not the slightest effect on the market, as it was all sold to consumers long ago. The American price was advanced another 25s. a ton this week, and it is reported that, owing to the recent heavy sales to Germany, there is no more American lead available before November delivery. If this proves to be the case, we must anticipate an even more stringent position than at present during the next two months, with the prompt price going to a still higher premium over forward. There seems nothing to prevent the price going over £40 a ton again."

Electrical Development at Greenock.—The chief engineer and manager of the Greenock Corporation electricity undertaking (Mr. F. H. Whysall) has sent us a copy of a booklet which has been sent to all domestic consumers. This sets out in an attractive manner the methods of charging adopted, which, it is seen, are very reasonable. The principal system is based on the normal consumption for lighting in houses of various sizes; this is charged for at the lighting rate, and all energy consumed in excess of the stated quantity is subject to the heating rate. Another system employs a fixed weekly charge, again based on the size of the house (number of apartments), and a secondary charge of ½d. per kWh. Energy for water-heating between the hours of 10 p.m. and 6 a.m. is charged for at the rate of ½d. per kWh.

Mannesmann Interests in Morocco.—Prior to the war the German Mannesmann seamless tube concern obtained concessions in Morocco by which it was hoped to obtain sufficient copper, zinc, and lead to make Germany independent of other foreign supplies of these metals. By the Versailles Treaty, the firm lost its concessions in French Morocco, and the subsequent disturbances in the Spanish zone have rendered development impossible. According to the *Financial Times*, efforts were made to sell the concessions first to French and then to Spanish interests, but these proved unsuccessful. The Mannesmann concern is now in negotiation with an Anglo-American group whose identity has not been divulged.

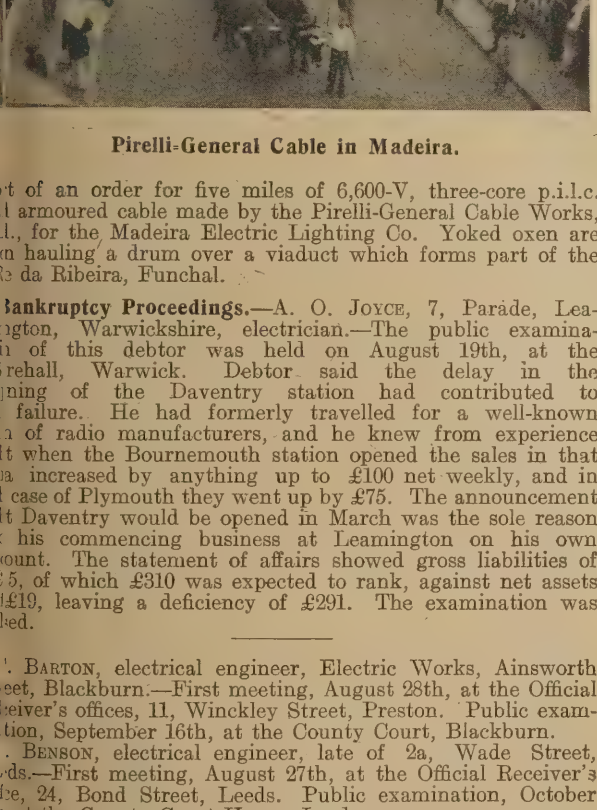
The United States and the British Radio Market.—In a review of the radio situation in Great Britain, *Commerce Reports* says that the restriction of the use of foreign apparatus under the original broadcasting regulations enabled British manufacturers to develop and "dig themselves in," and they thus gained an effective control of the market. The position of the industry is so strong that only in the cases of loud speakers and headphones is competition seriously felt. "It should be apparent to American manufacturers desiring to sell radio goods in the British market that there is no opportunity to sell any appreciable quantity of goods of ordinary manufacture. Imported sets or parts must make an exceptionally strong appeal, either on the basis of their efficiency or uniqueness or because of unusually low prices for unquestionable value." "Next to the United States and Canada, Great Britain is probably the most highly developed radio market in the world."

Domestic Appliances for British Columbia.—The Department of Overseas Trade announces that Mr. L. B. Beale, Trade Commissioner at Vancouver, is at present in this country and will attend at the Department, 35, Old Queen Street, S.W.1, from August 31st to September 4th. He is desirous of meeting manufacturers of goods of a number of classes among which are household electrical fittings and utensils. Interviews can only be given by appointment and applications should quote reference 5832/T.G.

Fires.—There was an outbreak of fire at the premises of Messrs. William Geipel & Co., The Borough, S.E., on August 4st, the third floor of the building being destroyed. The situation of the building made the work of the fire brigade very difficult, but the flames were subdued in a comparatively short time.

On the previous day considerable damage was caused by fire at the works of Messrs. Pratt Bros. (Edinburgh), Ltd., electrical contractors, West Park Place, Dalry Road, Edinburgh. In this case the firemen were hampered by dense fumes from burning celluloid in a battery-charging room in which the fire is believed to have originated.

British Cable in Madeira.—In all parts of the world British cables are known and respected, and even where transport methods are of a primitive nature they can be found, for instance, in Madeira. The accompanying illustration shows a



Pirelli-General Cable in Madeira.

part of an order for five miles of 6,600-V, three-core p.i.l.c. armoured cable made by the Pirelli-General Cable Works, Ltd., for the Madeira Electric Lighting Co. Yoked oxen are seen hauling a drum over a viaduct which forms part of the Ribeira da Ribeira, Funchal.

Bankruptcy Proceedings.—A. O. Joyce, 7, Parade, Leamington, Warwickshire, electrician.—The public examination of this debtor was held on August 19th, at the Shirehall, Warwick. Debtor said the delay in the opening of the Daventry station had contributed to his failure. He had formerly travelled for a well-known firm of radio manufacturers, and he knew from experience that when the Bournemouth station opened the sales in that area increased by anything up to £100 net weekly, and in the case of Plymouth they went up by £75. The announcement that Daventry would be opened in March was the sole reason for his commencing business at Leamington on his own account. The statement of affairs showed gross liabilities of £345, of which £310 was expected to rank, against net assets of £19, leaving a deficiency of £291. The examination was closed.

T. Barton, electrical engineer, Electric Works, Ainsworth Street, Blackburn.—First meeting, August 28th, at the Official Receiver's offices, 11, Winckley Street, Preston. Public examination, September 16th, at the County Court, Blackburn.

J. Benson, electrical engineer, late of 2a, Wade Street, Leeds.—First meeting, August 27th, at the Official Receiver's office, 24, Bond Street, Leeds. Public examination, October 5 at the County Court House, Leeds.

H. P. Galt, electrical engineer, 56, Norbury Road, Thornton Heath. Trustee, Mr. T. Gourlay, Official Receiver, 29, Russell Square, W.C., released, July 23rd.

J. Cowan (Cowan & Cox), merchant of electrical appliances, 7, Dickenson Street, Manchester.—Last day for proofs for dividend, August 27th. Trustee, Mr. J. Sykes, 30, Belgrave Terrace, Stalybridge.

H. E. Dixon (Creswick Dixon Electric Co.), Bodega Buildings, High Street, 101a, Albert Road, 451, London Road, and 63, Chesterfield Road, Sheffield, and Electric House, Knifesmith Gate, Chesterfield.—Last day for proofs for dividend, September 2nd. Trustee, Mr. C. Turner, 155, Norfolk Street, Sheffield.

Roberts & Co., electrical engineers, 61, Old Town Street, Plymouth, and Fore Street, East Looe.—First meeting, September 3rd, at 5, Princess Square, Plymouth. Public examination, October 16th, at the Western Law Courts, Plymouth.

Private Arrangement.—R. C. & A. H. Yeldon, dealers in electrical and radio goods, 20, New Road, Portsmouth.—A meeting of the creditors of the above was held on August 19th, at Portsmouth, when the chair was occupied by Mr. M. P. Winstoun, of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C. It was reported that the liabilities amounted to £384 and the assets totalled £572. The debtors started business about three years ago in partnership, the elder brother having put capital of £200. They carried on the business successfully until the beginning of this year, when, owing to the slump in the radio trade, it was found difficult to carry on. The turnover had been about £50 weekly, but latterly it had fallen considerably. The expenses, including drawings, amounted to about £10 per week. The chairman stated that the debtors had executed a deed of assignment to Mr. W. A. J. Osborne, of Messrs. Corfield & Cripwell, as trustee for the protection of the assets. The debtors stated, however, that they would be able to carry on the business and discharge their liabilities in full. It was decided that the debtors should execute a composition deed to Mr. Osborne as trustee with a committee of inspection, the deed to provide for payment by the debtors of the sum of £30 a month by weekly instalments of £7 10s. until the whole of the liabilities were discharged in full. The following are creditors :—

	£		£
General Electric Co., Ltd.	101	S.D.H. Mfg. Co.	23
Brown Bros., Ltd.	29	Silvertown Co., Ltd.	47
Webber, J. M., & Co.	36	Hobday Bros.	33

Company Liquidations.—Chase Electrical Manufacturing Co., Ltd., 195, Archway Road, Highgate, N.19, and at Hornsey.—A meeting of creditors was held recently at the offices of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C., when the chair was occupied by Mr. W. A. J. Osborne, who stated that the shareholders had passed the necessary resolutions for voluntary liquidation and had appointed him to act as the liquidator. The statement of affairs presented disclosed liabilities of £1,765; £1,040 was due to trade creditors, there were sundry creditors in respect of salaries, &c., £562, and cash deposits amounted to £163. The net assets were estimated at £671, leaving a deficiency of £1,093. Mr. Osborne stated that the cash deposits were money sent by small traders in different parts of the country for articles which they had never received. The company was incorporated in February, 1920, with a nominal capital of £6,000, divided into 5,000 ordinary shares and 1,000 employés' shares of £1 each; no employés' shares had been issued. The company took over certain plant and machinery from Mr. Chase for £858. In 1920 the company took premises in Potters Bar and spent a large sum of money in alterations, but after some 18 months it was found that serious losses had been incurred and the company was compelled to vacate the premises. In September, 1924, the company took over Mr. Hooydonk's business in Hornsey. It was decided to confirm the voluntary liquidation of the company with Mr. Osborne as liquidator, and a committee of inspection was also nominated. The following are creditors :—

	£		£
Aldenham Bros.	85	Spencer & Sons	36
Hart Mfg. Co.	31	Sankey & Sons, Ltd.	54
Lawerell Mfg. Co.	64	Standard Screw Co., Ltd.	20
Morgan Crucible Co., Ltd.	42	Smith & Co. (Clerkenwell), Ltd.	31
London Electric Wire Co. and Smiths, Ltd.	28	Walsall Mfg. Co.	144
Pethick Advertising Co.	252	Chase, F.	345
		Pethick, —	150

F. W. Smith & Co. (1907), Ltd., Manchester, electrical engineers and contractors.—A meeting of creditors was held recently at Southport. The liquidator of the company, Mr. C. Leigh, I.A., of Southport, presented a statement of affairs which showed liabilities of £2,568, of which £2,054 was due to the trade; there was a bank overdraft of £109, and the managing director's salary amounted to £405. There were net assets of £1,874, leaving a deficiency of £694. The bank overdraft was guaranteed by the managing director, and the bank also held as collateral security debenture stock amounting to £272. The company was incorporated in 1907 with a nominal capital of £5,000. The issued capital was £4,286. It was stated that the managing director's salary for the past three years had been £500, £350, and £234. The turnover in 1921 amounted to £10,081 and there was a loss of £373. From 1922 to the date of liquidation the turnover had never been more than £8,000, and no profits had been made. It was decided to confirm the appointment of the present liquidator and to appoint a committee of inspection. The following are the principal creditors :—

	£		£
General Electric Co., Ltd.	798	Walsall Hardware Mfg. Co., Ltd.	101
Brown Bros., Ltd.	222	Beardsall, W. E., & Co., Ltd.	69
Chloride Electrical Storage Co., Ltd.	148	Marconiphone Co., Ltd.	67
		Leigh, C.	67

W. A. Saxby & Co., Ltd., battery manufacturers, 3, Gayford Road, S.W.12.—A meeting of the creditors in this matter was held on August 20th, when Mr. Saxby stated that he had been appointed to act as the liquidator in the voluntary liquidation of the company and receiver for the debenture holders. No statement of affairs was presented, but Mr. Saxby reported that the liabilities to trade creditors amounted to £311. In addition there were debentures for £450. Mr. Saxby stated that the debenture holders had agreed to accept 15s. in the £ in respect of their claim. The assets, after allowing for debentures and preferential claims, amounted to £119. It was stated that included in the assets was an amount of £250 representing goodwill, and although negotiations were pending for its sale, it was very doubtful whether it would fetch that amount. The company was formed in November, 1923, taking over the business previously carried on by Mr. Saxby, for £100. The nominal capital of the company was £1,000, of which £600 had been issued as fully paid. Accounts for the period of 12 months to November 15th, 1924, showed that the sales were £2,514, and there was a gross profit of £560. The expenses amounted to £849, and there was a net trading loss of £282. Mr. Saxby stated that the liquidation had been forced by the execution of a writ by one of the largest creditors. After some discussion the meeting broke up without any resolutions being passed. The voluntary liquidation of the company will, therefore, be continued with Mr. Saxby as liquidator.

Associated Electric Traders, Ltd.—Last day for proofs for dividend, September 2nd. Liquidator, Mr. G. D. Pepys, Official Receiver, Carey Street, W.C.

Northumberland and Durham Radio Engineering Co., Ltd.—A meeting of creditors is called for September 4th, at Atlas Chambers, 88, Westgate Road, Newcastle-on-Tyne. Liquidator, Mr. J. Mitchell.

Dissolutions of Partnership.—Luminaux Electrical Supplies, factors of electrical supplies, 553, Mansion House Chambers, E.C.—Mr. S. G. Wallis Norton and Mr. W. Sanders have dissolved partnership.

H. Derricott, general brassfounders and manufacturers of electrical fittings, Reliance Works, Penn Street, Birmingham.—Messrs. E. H. and P. W. Derricott have dissolved partnership. Mr. P. W. Derricott will attend to debts and continue the business under the same style.

Daradio Wireless and Service Depot, London Road, St. Leonards-on-Sea.—Mr. S. W. Davies and Mr. J. E. Radermacher have dissolved partnership. Mr. Radermacher will attend to debts.

Deeds of Assignment.—T. H. Joyce (T. & H. Joyce), electrical and wireless factors, 210B, Shaftesbury Avenue, W.C.—Particulars of claims to be sent by September 4th to the trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2.

B. E. Crow (Crow, Toogood & Co.), electrical engineer, London, Bournemouth and Eastbourne.—Particulars of claims to be sent to the trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., by September 4th.

Catalogues and Lists.—Messrs. Farrow & Sons, Ltd., Spalding, Lincs.—A stock list of new and second-hand electrical and mechanical equipment. Priced.

The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.—A folder, illustrating the illumination of various departments of a clothing factory.

Messrs. S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.C.—List No. 2E, illustrating and describing the "Sbik" lightning arrester.

The Electric Furnace Co., Ltd., 17, Victoria Street, S.W.1. Pamphlet D, illustrating and describing electric resistance furnaces.

Mr. Walter Balmford, "Electric House," Steelhouse Lane, Birmingham.—Two illustrated pamphlets, dealing respectively with radio valves and insulating staples.

The Cox-Cavendish Electrical Co. (1924), Ltd., 105, Great Portland Street, W.1.—A pamphlet, dealing with actinotherapy or the use of artificial sunlight in healing. Illustrations and prices of apparatus are given.

The Stonebridge Electrical Co., Ltd., Victoria Road, North Acton, W.3.—List 91/1, containing an illustrated description of electrical apparatus for measuring the velocity of water.

Messrs. George Green & Co., 40, Aybrook Street, W.1.—An illustrated and priced booklet containing particulars of "Gee Gee" electric water-heating apparatus of various patterns.

Sir William Arrol & Co. (Swansea), Ltd., King's Dock Works, Swansea.—A profusely-illustrated brochure describing the company's works and some contracts which have been carried out.

Messrs. Cole, Marchent & Morley, Ltd., Bradford.—A pamphlet advertising central-exhaust steam engines.

Messrs. Landis & Gyr, Ltd., Elgee Works, Windmill Road, Hampton Hill.—An illustrated leaflet advertising the firm's switchboard meters.

Superlamp, Ltd., 92 and 94, Paul Street, E.C.2.—A fully-illustrated price list of electric lighting pendants, lanterns, bowls, shades, and other fittings; domestic appliances; and signs.

Trade Announcements.—Messrs. Brewer & Phillips have opened premises as electrical engineers at 66, Regent Street, Plymouth.

British Brown-Boveri, Ltd., states that as the result of a friendly arrangement its interest in and control of the firm of Scintilla, Ltd., completely ceased as from April 1st, 1925.

The new address of Merchants & Agencies, Ltd., is 38, Great Russell Street, W.C.1. Telephone Nos.: Museum 6634-5.

Automatic & Electric Furnaces, Ltd., informs us that in order to cope with the increasing demand for "Wild-Barfield" furnaces in Birmingham it has opened branch offices in that city at 21, 22 & 40, Guildhall Buildings, Navigation Street. Mr. A. Vincent, who has been representing the company's interests abroad, is taking charge of the branch. The company is carrying out demonstrations at the Birmingham Corporation's Summer Lane generating station; the first period was from August 24th until to-day (Friday), and another is from August 31st to September 4th.

Messrs. Philips Lamps, Ltd., have opened a branch at 27, Womanby Street, Cardiff, under the management of Mr. A. H. Smith.

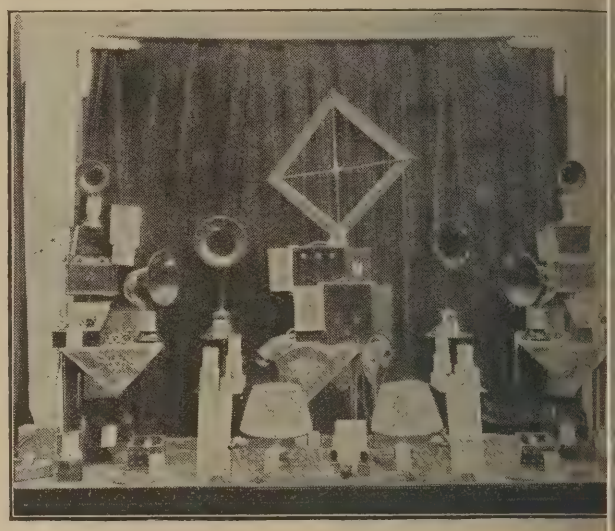
The works of Messrs. Belling & Co. have been transferred from Edmonton to Enfield. The new address is Bridge Works, Southbury Road, Enfield, and the telephone no. "Enfield 1123" (3 lines).

Mr. E. M. Parsons, 38a, Brook Street, Hull, electrical and radio engineer and contractor, wishes to receive catalogues of electrical and radio goods.

The Electrical Imports of Paraguay.—The *Board of Trade Journal* states that the value of electrical goods imported by Uruguay during 1924 was £18,185. Of this amount £10,078 is attributed to Argentina, £400 to the United Kingdom, £4,24 to the United States, £2,603 to Germany, and £13 to Italy.

Large American Electricity Merger.—The *Electrical Worl* announces that the Pennsylvania Electric Corporation is t be purchased by the Pacific Gas & Electric Co., operated b the J. G. White Management Corporation. By this transaction which, it is reported, involves a cash payment of $20,000,00 public utility companies with combined assets exceedin $175,000,000 will be brought together, the consumers number ing about 300,000 in an area stretching from western New Yor through Pennsylvania and Maryland. The Associated Ga and Electric Co. controls the Manila Electric Corporation.

A B.T.-H. Display at Selfridge's.—The art of window dressing is seen at its best at the Oxford Street premises o Messrs. Selfridge's, the outstanding feature of the window being the specialist nature of each display. Radio apparatu made by the British Thomson-Houston Co., Ltd., has recentl been dealt with by the company and the result is seen in th



A B.T.-H. Window at Selfridge's.

accompanying illustration. A few examples show the wid range of the products—frame aerial, loud speakers, receivin sets, valves, &c.—a veritable *multum in parvo*.

British Trade Mark Applications.—The following ar among the recent applications for British trade marks. Objec tions against any of the proposed marks may be entered withi one month from August 19th :—

R.W. (lettering and design). No. 457,744. Class 6. Carbon brushes part of metal, graphitic and bronze brushes, copper and brass gauze brushes, &c.-Ringdorffwerke Gesellschaft, 1, Bahnhofstrasse, Mehlen-am-Rhein, German (British representatives: Haseltine, Lake & Co., 28, Southampton Building W.C.2.)

Venner. No. 455,457. Class 8. Electrical time switches.—Venner Tim Switches, Ltd.

Peter Pan. No. 458,434. Class 8. Instruments and apparatus for use i radio-telephony and telegraphy.—Radio Accessories, Ltd.

Bullphone. No. 459,824. Class 8. Instruments and apparatus for use i radio-telephony and telegraphy.—W. Bullen, 38, Holywell Lane, E.C.2.

Rotala. No. 459,414. Class 8. Instruments and apparatus for use i telephony and telegraphy.—Rotax (Motor Accessories), Ltd.

Design of Polar Bear. No. 460,152. Class 8. Apparatus and instrumen for use in connection with radio-telegraphy and telephony.—Radio Commun cation Co., Ltd.

Indigraph. No. 460,297. Class 8. Variable condensers and variable i ductances, being parts of radio instruments.—Igranic Electric Co., Ltd.

Vacularm. No. 460,421. Class 8. Measuring and indicating instruments.-Cecil Gordon Vokes, trading as C. G. Vokes & Co., 38, Conduit Street, W.

Trulov. No. 460,600. Class 8. Apparatus and instruments for use in co nection with radio-telegraphy and telephony.—Radio Communication Co., Lt

Fabrolite. No. 460,563. Class 50. Electrical insulating materials.—Th British Thomson-Houston Co., Ltd.

Glasgow and the Joint Industrial Council.—The Glasgo Corporation recently received a communication from the Secr tary of the Scottish District Joint Industrial Council asking the Corporation would accept the findings of the Council an contribute to its expenses. The Corporation's Conditions Service Committee recommends that no action be taken.

For Sale.—British Insulated & Helsby Cables, Ltd., in vite offers for surplus generating plant. The Paignton Ele tric Light & Power Co., Ltd., will shortly be taking a bul supply of electricity, and is therefore inviting offers for th purchase of plant at its electricity works. Plymouth Co poration Electricity Department has for disposal one 500-k direct-coupled engine and d.c. dynamo. (See our advertis ment pages to-day.)

Meter Approved.—The Electricity Commissioners hav approved of the construction and pattern also the means pr vided for fixing and connecting meter known as the Ferran Type "F.H." d.c. mercury motor ampere-hour meter, rat from and including 20 amp. to 100 amp., fitted with t terminals.

Social Event.—The employés of Messrs. Ferguson, Pailin Ltd., held a sports meeting at their new ground at Bel Vue, Manchester, on August 15th. This was the first of wh is hoped to be an annual series, and the abundance of athlet talent and excellent weather made the occasion a very enjoyab one.

The German Electrical Industry.—Dealing with the situation of the German electrical industry, a Frankfort newspaper states that despite the financial difficulties it has been possible for considerable progress to be made recently in the direction of the extension of the electricity supply works, which has naturally brought orders to the manufacturing industry. In individual cases (the Saxony works, the Mark works, &c.), the financing of the developments has been effected by the raising of loans, but in most cases the cost of the expansion has been defrayed out of the current income of the municipal and State works resulting from the present high charges for the supply of energy. This development has caused the manufacturing industry on the whole to have a good turnover and in most cases has ensured full activity. On the other hand, the foreign trade has considerably declined because German export prices are higher than those of foreign competitors, although there are certain articles in which individual works are claimed to surpass foreign firms, and technical developments will soon, it is said, again result in these articles coming on the export market. After these general observations the Frankfort newspaper proceeds to discuss the situation of the electrical manufacturing industry in the Frankfort district. Among the branches mentioned are the production of switchgear and switchboards, installation material, measuring instruments, heating installations and appliances, electromedical apparatus, telephones, telegraphs, clocks, &c. Summarising the situation it is submitted that the Frankfort electrical branches are not badly occupied, but in part are well employed, although the export trade leaves much to be desired. The financial position is not easy, but is said to be certainly better in many cases than in other branches of business.

South American Rubber.—According to the *Board of Trade Journal* the exports of Para rubber from Para, Manaos, and Iquitos during the first half of the current year, amounted to 3,345,000 kg., of which 7,753,000 kg. went to the United States and 5,449,000 kg. to Europe. The British Consul at Iquitos informs the Department of Overseas Trade that the improved prices for rubber have led to merchants in the district taking a renewed interest in the extraction of the latex. Most of the rubber trees have not been tapped for seven years, and it is anticipated that they will give an exceptional yield.

Australian Preference Conditions.—In the Australian House of Representatives, on August 21st, Mr. Pratten, Minister of Trade and Customs, introduced the Customs Act Amendment legalising the imposition of a condition that goods, in order to enjoy full preference, must be 75 per cent. of British manufacture.—*Reuter* (Melbourne).

Irish Free State Electrical Imports.—The value of the imports of electrical goods into the Irish Free State during May last is officially returned at £35,647—a decrease of £8,336, as compared with May, 1924, bringing the total for the first five months of the year to only £134,836, as compared with £189,776 in the corresponding period of 1924.

Copper, Lead and Rubber Prices.—Messrs. F. Smith & Co. report August 25th:—Copper (electrolytic) bars, £69 15s., £2 increase; do. do. sheets, no change; do. do. wire rods, £78 10s., 5s. increase; do. do. h.c. wire, 9⅞d., ⅛d. increase.

Messrs. James & Shakespeare report August 25th:—No change in the prices for copper bars (best selected), sheet and rod; English pig lead, £40 10s., 30s. increase.

Messrs. Edward Till & Co. report August 25th:—India-rubber, Para, fine, 3s. 1d., 1d. decrease.

New Municipal Showrooms.—The Warrington Corporation is to establish separate municipal showrooms for the Electricity and the Gas Departments, both of which will be situated in Horsemarket Street. There was some criticism of these proposals at the last meeting of the Town Council, one of the main arguments being that there should be a combined showroom for both departments. The chairman of the Electricity Committee (Sir Peter Peacock) said that the Electricity Committee had been looking out for premises for the last four years.

Chinese Tariff Conference.—The Chinese Government has forwarded to the Powers an invitation to attend a special tariff conference in Peking in accordance with the Nine Power Washington Treaty. The date of the Conference is to be October 26th. The invitation expresses China's desire to confine a conference in accordance with the provisions of the Treaty, at the same time reminding the Powers that her right to bring up the question of tariff autonomy at an opportune moment was reserved by the Chinese delegates at the Washington Conference.—*Reuter* (Peking).

Lighting and Power Notes.

Ampthill. — Electricity Supply. — The Urban District Council has given its consent to the application of the Bedford Town Council for a Special Order to supply electricity to the town.

Barnsley.—Mains Extensions.—The Electricity Committee is to carry out mains extensions at a cost of £5,230.

Bristol.—Year's Working.—We have received from Mr. H. Braday Proctor, city electrical engineer, his annual report and the statement of accounts of the electricity undertaking for the year ended March 31st last. The total revenue was £421,011, as compared with £370,906 in the preceding year. Working expenditure increased from £216,886 to £252,014, leaving a gross profit of £168,997, as against £154,020, to which was added a sum of £14,059, being adjustment of income tax, and £262 from the obsolescence reserve fund, making a total of £183,317. Capital charges absorbed £112,633, leaving a net surplus of £70,685, as compared with £67,809 in the preceding year. Of the surplus £16,000 was contributed to the district rate, and the remainder transferred to reserve. The net capital expenditure during the year amounted to £121,115, and included £72,295 for mains. The sales of electrical energy amounted to 56,082,891 kWh, an increase of 5,957,411 kWh, and the average price per kWh obtained fell from 1.67d. to 1.64d. The maximum supply demand rose from 23,107 to 26,345 kVA. The number of electric cookers connected during the year increased from 112 to 451, and an additional 41 miles of cable was laid. The change-over of the system of supply in the Fishponds and Brislington districts was completed, and good progress was made in the Clifton, Horfield, and Knowle districts.

Burnley.—Year's Working.—The report on the working of the Corporation electricity undertaking (engineer: Mr. J. E. Starkie) for the year ended March 31st last shows a total income of £87,426, as compared with £85,708 in 1923-24. The working expenditure was £41,222, as against £40,118, and expenditure incurred in respect of plans for a new station—which have been rejected by the Electricity Commissioners—charged to revenue, amounted to £801, leaving a gross profit of £45,401 (£45,590). Capital charges absorbed £25,544, leaving a net surplus of £19,857, as compared with £19,895 in the preceding year. Of this amount £6,000 was transferred to depreciation and meters extension account, and the remainder to reserve. The capital expenditure during the year amounted to £24,773, the chief item being £17,514 for mains and services. The electrical energy sold increased from 8,068,242 to 8,223,508 kWh, and the maximum supply demanded from 3,770 to 3,900 kW. During the year application was made to the Commissioners for sanction to install two 5,000-kW turbo-alternators to meet the estimated increased demand during the winter of 1926-27.

Canada.—Hydro-Electric Development.—According to the *Electrical News*, work is to commence on the erection of a hydro-electric power station, on a site at Grand Falls, recently acquired by the province of New Brunswick. Plant with a capacity of from 50,000 to 60,000 h.p. will be installed at first, and additional plant of 25,000 h.p. added later. The ultimate development of the site is placed at 150,000 h.p. The Premier of the province has announced that already the Government has received demands aggregating 71,000 h.p. from paper mills in the province.

Cannock.—Extension of Supply.—In connection with the proposal to supply electricity to Cheslyn Hay and Great Wyrley, the U.D.C. proposes to extend the mains and provide the necessary sub-stations at an estimated cost of £20,785, and is applying for assistance to the Unemployment Grants Committee.

Chester.—Special Order.—The Corporation has applied for a Special Order, for the supply of electricity in the urban district of Tarporley, and in certain parishes in the rural district of Tarvin.

Continental.—Italy.—The Società Elettrica del Valdarno and the Società Ligure Toscana di Elettricita are erecting a new 120,000-V transmission line between Florence and Leghorn, a distance of about 47 miles. The line will be carried on ferro-concrete masts 69 ft. high.

Jugo-Slavia.—According to a recent official report the water-power resources of Jugo-Slavia represent a total of 2,982,922 h.p., divided as follows:—Serbia, 1,265,568 h.p., Bosnia-Herzegovina, 621,141 h.p., Slovenia, 260,308 h.p., Montenegro 280,098 h.p., Croatia and Slavonia 365,836 h.p., Dalmatia 59,700 h.p., and Woimoden 159,280 h.p. The foregoing figures refer to the power available at low water level, the power being on the average three to four times greater. So far only 7,529 h.p. is being utilised in Serbia, 11,330 h.p. in Bosnia-Herzegovina, 70,836 h.p. in Slovenia, and 60,600 h.p. in Dalmatia. Among the new plants at present under consideration are one of 24,000 h.p. on the River Sare, one of 100,000 h.p. in the Velebite Mountains in Croatia, and one of 100,000 h.p. on the Dwina in Bosnia.

Czecho-Slovakia.—A recent issue of the *Journal* of the Czecho-Slovakian Ministry of Public Works states that there are now four hydro-electric stations of a total of 7,270 h.p. in operation in the country, *viz.*, on the Elbe, near Konighof (2,100 h.p.), on the Morava, near Kromeric (2,130 h.p.), on the Elbe, near Podebrad (1,300 h.p.), and one on the same river near Nimburg (1,740 h.p.). Five additional plants of a total of 10,740 h.p. are in course of construction, and ten other hydro-electric power stations of a total of 101,070 h.p. are projected. The bulk of the electrical energy will be utilised in the Ostrau coal-mining area.

Eastbourne.—Inquiry.—An inquiry was held at the Town Hall on August 14th by Sir William Marwood, on behalf of the Ministry of Transport, into the application of the Corporation for sanction to supply electricity to Willingdon. Mr. H. Caldwell, for the Rural District Council, raised objection to the use of overhead lines. Mr. Brydges, borough electrical engineer, stated that the only way to provide electricity at a reasonable price in that neighbourhood was by means of overhead wires. Sir William Marwood will submit his report to the Ministry in due course.

Glasgow.—Year's Working.—We have received a copy of the 33rd annual report of the Corporation electricity undertaking (engineer: Mr. R. B. Mitchell) covering the year ended May 31st last. The revenue account shows an increase of income from all sources of £88,925, and working expenditure an increase of £80,315, the former from £1,153,194 to £1,242,119, and the latter from £571,119 to £651,434. The gross profit was thus £590,685, as against £582,075. Interest on loans amounted to £244,361, sinking fund charges to £235,961, and depreciation £98,590, leaving a net surplus on the year's operations of £11,772, as compared with £5,975 in the preceding year. This was transferred to the reserve fund, which now amounts to £88,349. The increase in the working costs is attributed to a large increase in respect of rates and taxes, and to the general increase in the repairs, and maintenance of buildings, plant, &c. The capital expenditure during the year amounted to £416,867, bringing the total expended on the undertaking up to £7,386,749. The chief items of expenditure were £78,554 for additions to Dalmarnock station and £141,826 for mains and cables. The electrical energy sold increased from 166,087,836 to 179,263,199 kWh, of which 8,181,500 kWh was generated at Port Dundas and the remainder at Dalmarnock. The average gross income per kWh sold was 1.663d., as compared with 1.666d. in 1923-24, and the cost per kWh sold 1.647d., as against 1.657d. The maximum supply demanded rose from 193,214 to 211,003 kW.

In connection with the Dalmarnock station, the report states that the building extensions to the turbine room, boiler-house, and switch house are nearing completion. The erection of the first of two 25,000-kW sets on order from Messrs. C. A. Parsons and Co. will commence early in September, and the set is expected to be in commission by December this year. The switchgear on order from Messrs. A. Reyrolle & Co., Ltd., is well advanced, and will, in all probability, be ready to take load by the end of November. During the year five additional substations were put into commission, and construction was commenced on three others.

Lymm.—Inauguration of Supply.—The new sub-station at Eagle Brow was opened on August 12th by the chairman of the Urban District Council. In December, 1923, the Council approached Warrington Corporation for a supply of electricity, and satisfactory terms were arranged. Electricity is generated at the Warrington Corporation electricity works and transmitted to the Lymm sub-station through duplicate feeders at 6,600 V, 3-phase, 50 cycles, where it is reduced for distribution. Two oil-cooled transformers of 150 kW each are at present installed. The h.p. switchgear was supplied by the British Thomson-Houston Co., Ltd., and the transformers by the Fuller Electrical & Manufacturing Co. British Insulated and Helsby Cables, Ltd., supplied the h.p. cables, and W. T. Glover & Co., Ltd., the l.p. cables. The scheme was designed and carried out under the supervision of the borough electrical engineer, Mr. F. V. L. Matthias.

Market Drayton.—Street Lighting.—The Urban District Council has accepted the offer of the Market Drayton Electric Light & Power Co., Ltd., for public lighting, from September 13th next to April 17th, 1926, at £3 10s. per lamp.

Northallerton. — Street Lighting. — The Urban District Council has accepted the tender of the Northallerton Electric Light & Power Co., Ltd., for public lighting for a period of two years.

Perth.—Electricity Charges.—A reduction of 5 per cent. in the lighting and power rates for electricity was sanctioned at the last meeting of the Town Council.

Pontypool.—Electricity Charges.—The Pontypool Electric Light & Power Co., Ltd., has applied to the Electricity Commissioners for a Special Order authorising it to revise the maximum electricity charges in the district.

Presteign.—Street Lighting.—The Urban District Council has accepted the offer of the Presteign Electric Co., Ltd., for street lighting during the period September 29th to March 31st next, at £2 per lamp.

Shelf.—Electricity Supply.—The Urban District Council is to support the application of the Electrical Distribution of Yorkshire, Ltd., for a Special Order authorising it to supply electricity within the urban district.

Southend-on-Sea.—Loans.—The Town Council is applying for sanction to the following loans:—£4,041, balance for the installation of one 750-kW Diesel engine at London Road station, and two similar engines at Leigh station; £3,059 for three waste-heat boilers, with piping, valves, &c., and the extension of the cooler room at Leigh station.

Southwell.—Electricity for Villages.—The Rural District Council has decided to ask the Derbyshire and Nottinghamshire Electric Power Co., which is about to carry overhead cables through a portion of the rural district from Farnsfield to Aversham, whether it will be willing to supply the various villages *en route* with electricity.

Spalding.—Electricity Scheme Delayed.—The electricity scheme is being held up by the Electricity Commissioners, who are urging the Urban District Council to take a supply in bulk from either Boston or Peterborough. The Council maintains that it will be cheaper to have its own generating station.

Taunton.—Loans.—The Town Council has applied for sanction to loans amounting to £7,000 for the following purposes:—Mains, £5,000; meters, £1,500; motors, £500.

United States.—Electrical Development.—According to *Power*, the Public Service Company of Northern Illinois has recently ordered a 50,000-kW steam-turbine for the Waukegan Station. This is the third set, the first being one of 25,000 kW, which was installed two or three years ago, and the second of 35,000 kW, installed last winter.

The *Electrical World* states that the Buffalo General Electric Co. has received a contract from the city of Buffalo to replace with electric lamps all the existing gas lamps of that municipality. The new contract runs for two years from the beginning of 1926 with the option of a renewal for another year. Equipment for the business streets will consist of 4-amp. and 6.6-amp. inverted magnetite lamps, and residential street illumination will be by incandescent lamps of from 100 c.p. to 150 c.p., with underground conduits. These will be of the same type as those which have already been installed in residential streets by the company to the number of about 2,000.

Wick.—Electricity Scheme.—The Town Council has decided to proceed with an electric lighting scheme for the borough.

Wimborne. — Electricity Supply. — The Urban District Council proposes to consent to the application of Torr, Dunnford & Co. for a Special Order to supply electricity to the town, subject to the maximum price of 1s. per kWh being reduced when the shareholders have received a dividend of 8 per cent.

Wirral.—Electricity Scheme.—At a recent special meeting of the Rural District Council it was decided to ask for tenders for the laying of cables for the first two sections of the work from the boundary of Ellesmere Port to the parish of Heswall, *via* Neston, and the second section from Wallasey to Moreton. Powers to borrow £110,000 for the work have been applied for by the Council.

Tramway and Railway Notes.

Argentina.—Buenos Aires.—The Anglo-Argentine Tramways Co.'s scheme has been accepted by the Municipal Executive. The company's proposals provide for the taking up of surface lines in a small congested area, but the rights to run traffic over these roads are to be retained. In addition, subways are to be constructed and omnibus services to be established in the suburban areas. The 'buses will run in connection with the tramways and subways. The whole programme will probably require 120,000,000 dol. paper, and will take a number of years to complete.—*The Electric Railway and Tramway Journal.*

Birkenhead.—Motor Omnibuses.—The Tramways Committee has decided to substitute motor omnibuses for tramcars on one of the routes.

Bury-Salford. — Through-Running.—A scheme for a through-running tramway service between the two towns is under consideration.

Dover.—Loan.—The Corporation is applying for sanction to a loan of £7,184 for track renewals.

Ipswich.—Railless Cars.—According to *Modern Transport*, the Corporation has now been granted powers to run railless cars over the whole of its existing tramway system. The application for Parliamentary powers to effect this alteration was made on the recommendation of Mr. A. Baker, general manager, Birmingham Corporation Tramways, who undertook the examination of the matter at the request of the Corporation, and decided that the existing tramways were worn out.

Lochgelly.—Tramway Scheme.—According to the *Electric Railway and Tramway Journal*, the Town Council has finally agreed to withdraw its opposition to the Provisional Order for the extension of the Fife electric tramway through Lochgelly eastwards. The proposed new line branches off the present line at the Cross, and continues eastward along East Main Street, across the foot of High Street, and through the Public Park on the south side of the Lochgelly Iron and Coal Co.'s Jenny Gray colliery.

London.—Old Street Station Improvements.—Escalators were put into service at Old Street underground station on August 19th. A basement booking hall, with passimeters, is being formed, whilst the station building will be replaced by one of modern Underground design, shops being a feature.

Progress of "Underground" Extensions.—According to *The Times*, excellent progress is being made with the work of extending the City and South London Railway to Morden. The tunnelling is now completed, and the engineers who will lay the track are about to take charge of the operations. The new rolling stock is being delivered. It is not expected, however, that the line will be open for traffic until early next year. The two-mile extension of the Kennington loop, which runs from Charing Cross to Kennington, via Waterloo, is making progress. Work is being carried out from four working shafts, with service headings. From the Charing Cross shaft the south-bound station tunnel is under construction, and two-thirds is now complete. On the north-bound line, tunnelling is going on under the river bed, over 50 yards having already been completed. This tunnel will make a junction with the north-bound station tunnel at Kennington, and in the south-bound tunnel a junction will be effected midway between Bethlem Hospital and Kennington station.

Breakdown.—A temporary breakdown of the electric train services between Broad Street and Richmond on the London, Midland and Scottish Railway occurred on August 19th. Steam trains to Richmond were put into operation at Broad Street, and these enabled the passengers to travel to their destinations with only about half an hour's delay.

A Large Electric Cable and Accessories Works.

A Visit to the Prescot Works of The British Insulated & Helsby Cables, Ltd.

The extensive works at Prescot of The British Insulated and Helsby Cables, Ltd., to which we recently paid a visit, and which at present occupy a factory space of some thirty acres, excluding extensions which are at present being carried out, were established originally by the British Insulated Wire Co. about 1888, the works then covering about two acres. The first products were small single wires and cables for lighting work, paper insulated and lead covered, and multiple twin conductors for telephone work. In 1902 an amalgamation was effected with the Telegraph Manufacturing Co., Ltd., of Helsby, resulting in the formation of The British Insulated and Helsby Cables, Ltd., of which Mr. James Taylor is the chairman and Mr. Dane Sinclair the general manager.

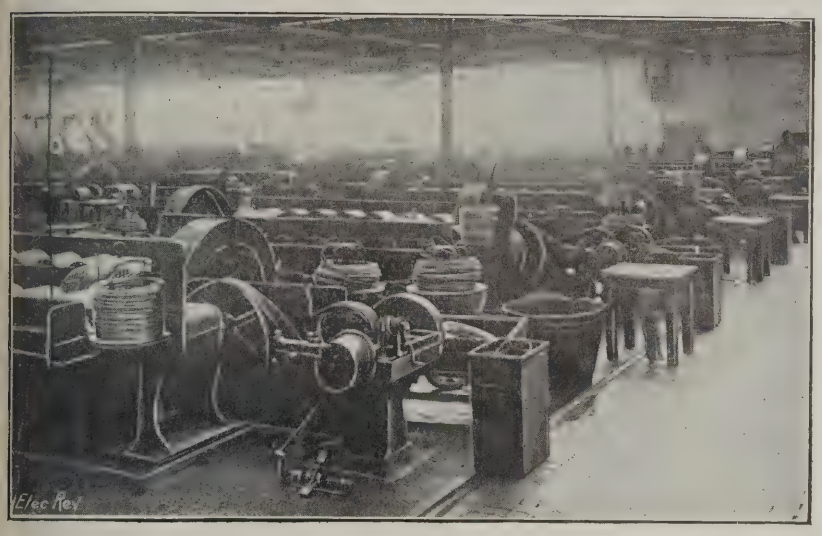


Fig. 1.—Automatic Wire Drawing Machines.

The works are favourably situated, with the main Liverpool to Warrington Road bordering them on the north side and the extensive sidings of the L.M.S. Railway on the east. A double track connects these sidings and the works, running through a central avenue of loading and unloading yards and sheds from which the various departments radiate. The principal manufactures of the works are, of course, copper wire and rod, &c., and paper-insulated cables of every description; but the accessories branch is by no means a small one, covering an area of about 12 acres; cable boxes, pillars, switches, fuses, and bonds are but a few of the products.

In a tour of the works, which is no light task in limited time, the first place of interest, taking the cable-making departments in the order of manufacturing process, is, curiously enough, also the last, being the copper refinery, where the scrap metal collected from the various departments is dealt with. The copper is melted down in oil furnaces and moulded into billets about 2 ft. long by $3\frac{1}{2}$ in. in diameter. These, with bulk supplies from outside sources, are dispatched to the rolling mills, where they are reduced to $\frac{1}{4}$-in. rod. There are at present three rolling mills, two being used for aluminium rod and sheet; but a fourth mill is being equipped for copper rod rolling, this being 210 ft. long by 70 ft. wide. Each copper-rod mill is equipped with a reheating furnace and three sets of rolls. After rolling, the copper rod carries a black oxide scale which is removed by immersion in weak acid. This is done in long pickling tanks. The next process of importance is the wire drawing, the bulk of which is effected in a new and well-equipped shop, 240 ft. by 156 ft., but the very fine wires are dealt with in two smaller rooms after being reduced to about No. 16 gauge in the first-mentioned shop. Two methods of drawing are carried out, on automatic and single block machines; wires for special uses and contracts are dealt with on the latter. Fig. 1 is a view of some of the automatic machines, and fig. 2 shows the single block drawers. The rod is first reduced through nine dies to No. 16 gauge and then through a further ten dies to No. 25 gauge. These dies are of chilled cast iron and are made at the B.I. & H. works. From No. 25 gauge the wire is drawn on the fine-wire drawing machines in the smaller shops through 16 or more diamond dies to reduce it to the smallest size, one mil diameter. In the final stage of drawing, the wires are hard. For the process of cable making it is necessary to anneal the wires; this is done in the annealing department, fig. 3, where the wires are passed through Bates & Peard bright annealing furnaces. In the chambers of these furnaces is a steam pressure slightly above that of atmosphere. Each chamber is air-tight, and the openings through which the wires enter and leave are water-sealed. Most of the machines in the



Fig. 2.—Wire Drawing Blocks.

wire mills are driven singly by electric motors, 4,100 h.p. of which are installed in the rolling and wire mills.

The extruding department is one of particular interest and importance. Here the metal, instead of being rolled, is extruded through dies in a semi-molten condition. Fig. 5 is a view of the extruding department; the heavy wire-drawing machines are shown in the foreground, and it is on these machines that grooved contact wire for traction work is drawn, forged steel dies being used. Much heavier work, such as bus-bars, &c., is dealt with on draw benches, on which the bars, &c., are carried along after extrusion on chain travellers. Some American metal presses, which also play an important part, were installed for munition-making purposes during the war. Aluminium sections, angle channels, beading, &c., are also products of the extruding department, which is served by a 5-ton Heywood crane.

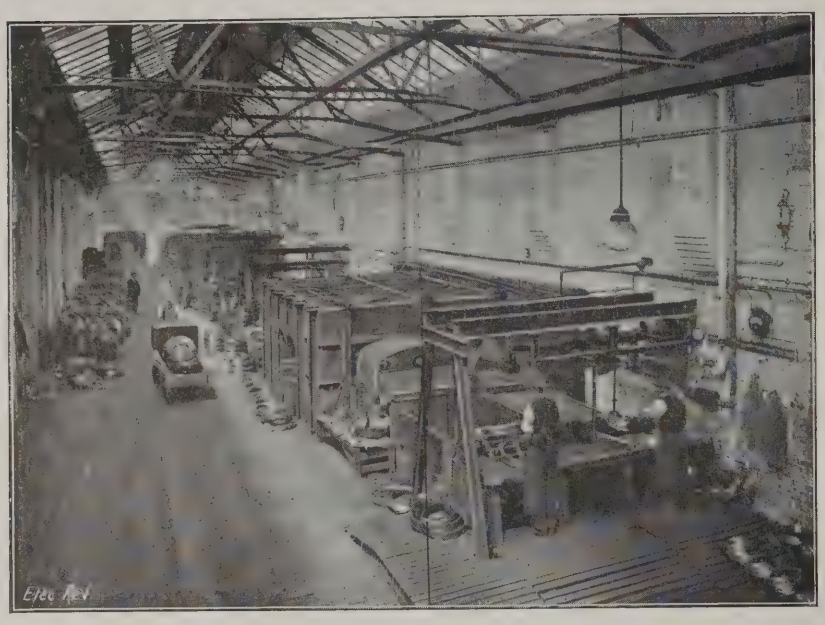


Fig. 3.—The Annealing Department.

At this stage of the cable-making process it is interesting to note that the output of copper exceeds 100 tons per day. All the wire for the B.I. & H. rubber-covered cable works at Helsby is manufactured at Prescot. This wire, in order to prevent action on the copper by the sulphur in the rubber, is tinned by passing it through baths of flux and molten metal. To comply with the B.E.S.A. specifications, all hard-drawn wires are subjected to the usual wrap and twist tests in the shops, and tests for elongation, conductivity, &c., in a fully-equipped testing laboratory.

It is necessary in many cases to produce longer lengths of wire than are turned out by the machines, and to meet these requirements electrical butt-welding machines of the firm's own design and make are installed in the wire-drawing shops.

The extensive rooms of the wire-stranding department make the next call on the metal. Stranding machines for all sizes of cable are installed, including those of the rotating-bobbin type, and others of more modern design in which the bobbins float in line with the cable. The stranded cores are now dealt with in the paper-covering rooms. Here, the paper, which is received in rolls 24 in. wide, is cut into strips of about 1 in. in width and wound on reels on paper-cutting machines, each machine dealing with a complete roll in one operation. The wound reels are installed on the paper-covering machines, which transfer the paper to the cable cores. These machines are of the tandem type, and some of the larger machines wind 40 layers of paper in one operation. The paper used for the insulation of the "outers" of concentric cables, not the overall insulation of other cables, is impregnated before application—in all other cases the cores are covered with dry paper. The cores are papered separately, after which they are built up on very large covering machines which twist the cores, run the spun yarn into the spaces between them, and apply the outer or overall insulation.

Samples of the paper received are analysed in the chemical laboratory to ensure that they contain no matter which will prove injurious to the metal, or to the paper itself in the course of time; also to ensure that it is of sufficient strength to run on the machinery. It is of importance that the paper should be able to withstand the temperatures to which it is subjected in the drying ovens, where it is treated after being applied to the cable, and again in the process of impregnation. The paper must have a certain limit of porosity sufficient to allow the impregnating oils to penetrate, but not sufficient to permit them to flow away. It is interesting to note that one function of the paper is to hold the oils in thin layers, it being a peculiar property of oil that it is stronger (electrically) in films than in bulk. The main insulating room is served by two cranes of 15- and 5-ton capacities. Insulating is also effected in two other rooms, one of which is mostly devoted to stranding. These departments, with the two long lead rooms and the general office block, occupy the south-east corner of the works. The impregnating plant is part of the equipment of the lead rooms, thus enabling the lead covering to be applied directly the cables leave the ovens, and cranes are provided for the quick transportation of the cables, the large room being spanned by a 15-ton and a 10-ton cranes, and the small room by a 15-ton and a 5-ton cranes.



Fig. 4.—The Braiding Shop.

When ready for lead covering, the cables are suspended (on the factory drums) in oil tanks; they are then unwound and passed through the lead-covering machines. These are of the usual type, in which the moulds receive the molten lead from overhead furnaces,

and apply it to the cable running horizontally through the centres; it might be more accurate to say that the lead is formed round the cable as, of course, any consideration of forcing the lead on to the cable is out of the question. Unless an alloy sheath is specified, pure virgin lead is used for sheathing.

The process, after testing, takes us to the armouring shop. This is a large room, 520 ft. long by 100 ft. wide, at the west extremity of the existing works, covered by a 15-ton crane. Two types of machines are installed, those for wire armouring and those for tape armouring. The former are similar in design and principle to those used for the core stranding, and the latter operate on similar lines to the paper-covering machines. A heavy machine arranged along the centre of the department is the outstanding feature; at the time of our visit it was dealing with a 0.25-sq. in., 3-core, 3,000-V cable for the City of London. A view of this shop is shown in fig. 6. A new building of steel and glass construction throughout is at present being erected for this department.

On this machine and other smaller ones the whole operation in connection with the armouring of the cables is effected. The lead is compounded at one end, and the cable is finally whitewashed at the other extremity, the covering of jute, cotton, or hessian tape, &c., over the lead, the winding-on of the armouring, and the final covering of jute, being done in order along the machine between these points. Welding machines serve a very useful purpose in this branch of the works for joining the lengths of wire and tape used for armouring. The railway track runs past the south end of this building, and across the lines is the drumyard, from whence the drums are transported to a distributing field on the opposite side of a by-road. A 5-ton "Goliath" crane, which runs on rails 80 ft. apart and has an effective span of 100 ft., serves the yard and field; it is electrically driven, the supply being collected from overhead wires run out on wooden poles. This crane is a recent addition, and its usefulness can be gauged by the large distributing area over which it operates.

All finished cables are dealt with in a fully-equipped cable-testing department adjacent to the armouring shop. This building, 240 ft. by 100 ft., is served by a 15-ton crane and is provided with three large immersion tanks in the centre. The actual testing operations are carried out at the sides. Three testing bays for pressure testing are arranged on one side of the test house, and a gallery above the bays is equipped with the necessary measuring apparatus. Each bay is used and equipped for testing up to a given pressure, the maximum pressures being 10,000, 50,000, and 200,000 V; the bay for the last-named is used also for h.p. experimental work. Included in the testing plant are two Mordey-Victoria 2,000-V alternators, relics of the original Prescot lighting scheme, still rendering good service. A 600-kVA G.E.C. (America) machine supplies the pressure-raising transformers at 1,000 V. For applying some of the lower pressures, an adjustable double coil is used in which the pressure is raised by balancing inductance against the capacitance of the circuit. All pressure tests are applied for 15 minutes or more.

The manufacture of telephone cables is carried out in its entirety as a separate branch in two buildings to the south of the works, one being 400 ft. long by 100 ft. wide, and the other about two-thirds of this size.

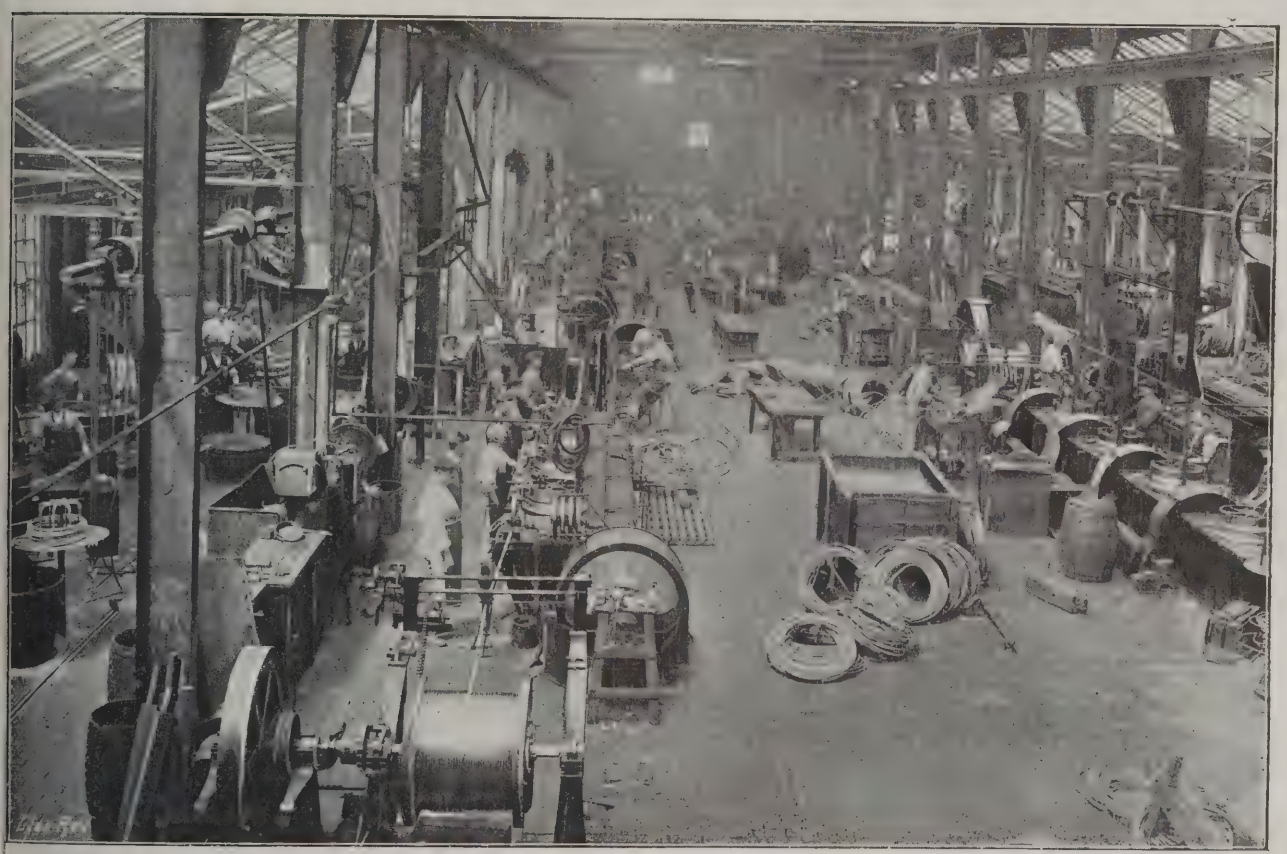


Fig. 5.—The Extruding Department.

The former is served by a 5-ton crane, and deals with the manufacture up to the lead-covering process which is carried out in the smaller house, also equipped for testing the cables; two cranes—10-ton and 7-ton—span this shop. Paper-lapping machines for covering the bare copper strands are of the revolving-bobbin type. The twinning of the paper-wound strands is carried out on horizontal and vertical machines. For multiple cables the process is carried out on special-precision twinning machines designed to ensure that the lengths being twinned are exactly equal in order to obtain the balance of capacities vital in telephone work. A most interesting feature of this department is a long cabling machine which will build up 165 pairs of wire in one operation. This machine is of the revolving bobbin type, and is made up of 10 fliers, each of which deals with one layer of wires or pairs of wires, each successive flier holding the larger number of bobbins required for the increased size of the concentric layer. Several machines of this type are installed in the department, and cables built up to certain sizes on some of the machines are transferred to others to be further increased. Cables consisting of 1,350 pairs of 6½-lb. wire have been built on these machines. All cables are tested for con-

tinuity before transportation to the lead-covering rooms. The braiding of aerial cable is effected on 24-bobbin machines. Fig. 4 is a view of the braiding shop; it will be seen that the cables are unwound and rewound, before and after braiding, on drums under the platform on which the machines are mounted. Special cables for hot and dry climates are dealt with on these machines. The cotton-covering shop is situated adjacent to the braiding room, and is equipped with cotton-whipping machines of several types, including some of the high-speed central bobbin type. The production of enamelled wire is carried out extensively, and it is interesting to note that 270,000 miles of this material were sold last year in sizes up to 0.052 sq. in.

The accessories department is by no means a small branch of the works, and occupies an area of about 12 acres at the N.E. corner. It is a factory within a factory, and employs something like 1,200 hands. Electrical equipment of every description is manufactured, including cable boxes and pillars, insulators, bonds, meters, fans, welders, &c. Two large foundries form a considerable part of this department, and turn out castings for the various products. The machine shop is of particular interest; here electrical welders are made for butt, seam, and resistance welding in many varieties of work. These machines are of B.I. & H. production, including some of the firm's own design. The company has been making electric welders for the last 23 years, and at present it is turning out over 80 different types.



Fig. 6.—The Armouring Shop.

Fig. 7 shows a seam welder, one of the latest productions of the firm. Bond making is carried out on a large scale, the output being somewhere in the region of 10,000 bonds per week. A special bond of the firm's own design, of the protected type, is of particular interest; it is intended for railway work, and is constructed on an oval frame; it consists of a continuous strip of copper, making several layers. The terminals are cold pressed on to the ends of the strip to remove any air which may be locked in before being forged. Twenty-one fires used for casting the heads for bonding are installed in the bond-making shop; also four new compressed-air moulding machines, besides numerous presses of every description.

The machinery of the meter-manufacturing shops presents a contrast to that of the cable-making and accessories departments. Tiny lathes are at work on the very delicate parts for electric meters, and modern American automatic pinion cutters and wheel-cutting machines are among the latest additions to the equipment. The production of electric fans is a further interesting engagement of this part of the works, and special fans for use in hot climates are turned out by mass production.

A fleet of 21 electric battery trucks is engaged on transportation duties in and between the various shops and departments throughout the works. These are mostly of the elevating-platform type, and are each of 2-ton capacity. The batteries for these vehicles are charged at a special station equipped with three panels each capable of dealing with five trucks at a time. A supply is received at 120 V d.c., and is equalised out at 40 V to each panel by a balancing set. One of the trucks is shown in fig. 8, which also gives a view of an electric 1-ton runway. This serves all the shops

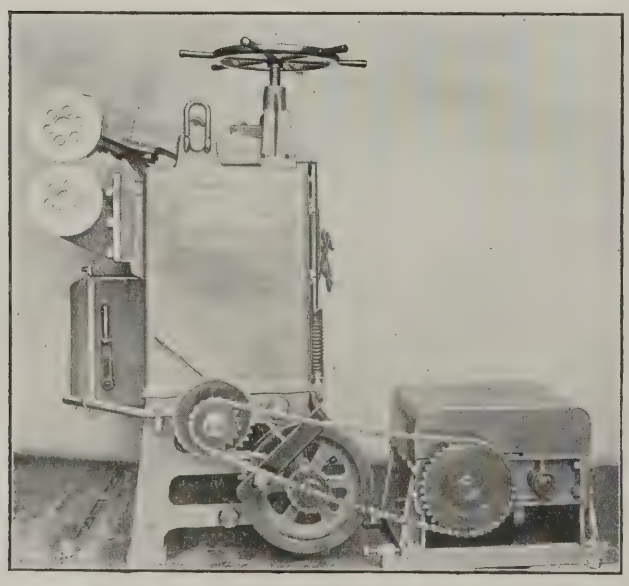


Fig. 7.—An Electric Seam Welder.

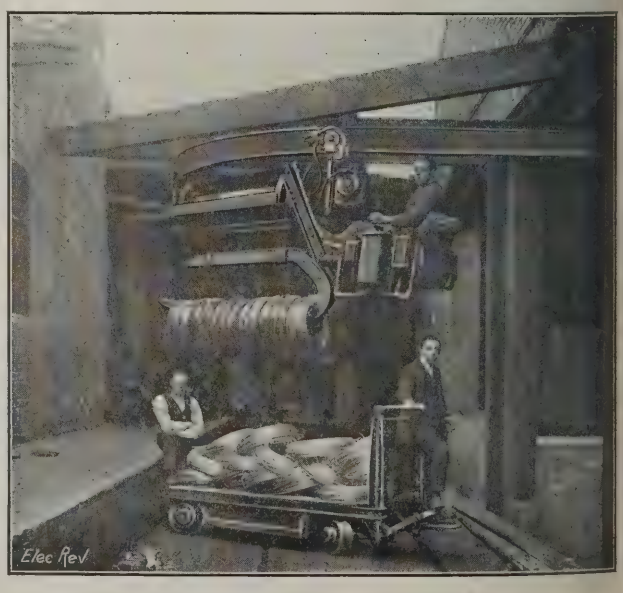


Fig. 8.—Electric Truck and Runway.

of the wire-mill department, except the extruding room. It will be seen that with the coils of wire placed together in a vertical plane the horizontal carrying arm can thread several in a single operation.

Practically the whole of the machinery throughout the factory is electrically driven, and the supply is received from the firm's own 5,500-kW capacity generating station situated on the site, supplemented by a supply in bulk from the Liverpool Corporation. The demand of the factory is in the neighbourhood

f 9,000 h.p., but the station also supplies the town f Prescot. The generation is 3-phase a.c., but most f the factory is equipped with d.c. motors, the neces- ary conversion being done in a rotary station put own by the company. The general offices face the ailway at the front of the works; they occupy a floor rea of 25,000 sq. ft. The departmental offices are rranged on the sites of the departments.

The welfare of the staff and workpeople is by no eans neglected. A large and well-equipped canteen, uilt in 1915, affords accommodation for those of the aff and workpeople who live at a distance from the orks. Four dining rooms are provided for the use f the male and female staffs and factory workers. eals are supplied at very reasonable prices, and those orkers who bring their own meals can have them armed up; gas, steam, and electricity are used im- artially for the cooking and heating apparatus. Rest ooms are provided for the female employés, and tached to these is a sewing room where overalls are rned out for use in the works. A trained ambulance aff is constantly in attendance at the ambulance ooms; these are situated in the centre of the works. djoining the ambulance station is a room fitted with -ray apparatus to deal with any casualties requiring ch attention. The latest development is a dental inic where employés can obtain first-class treatment reduced charges.

Telegraph and Telephone Notes.

Czecho-Slovakia.—Telegraph Service.—According to the nual report for 1924 of the Czecho-Slovakian Post and Tele- aph Department, there are now 3,631 telegraph offices and ,830 miles of telegraph wire in use in that country, the mber of messages handled last year having been 15,800,000.

Faroe Islands.—Radio-telephony.—New facilities for inter- mmunication between islands in the Faroe group have been ovided by the installation of two small duplex wireless ephone sets on the islands of Thorshaven and Nolso. The paratus, which is of the Marconi XP1a type, does not need attention of a skilled operator, being used in the same y as an ordinary house telephone. The set comprises a all power valve transmitter and a valve receiver, worked tirely from batteries, and with the aerial supported by sts 70 ft. in height, communication over a distance of 20 les can be maintained. The adaptability of this Marconi uipment to a variety of circumstances is shown by the fact at apparatus of the XP1 type has been supplied to the State lways of Siam for use in connection with that service.

France.—Call Disk Competition.—The French Post and legraph authorities are organising a competition for the most itable pattern of official call disk for subscribers of automatic ephones. Subscribers must submit their designs before tober 15th next. Full particulars of the competition can be tained from the Direction de l'Exploitation Telephonique, he Bureau, 103, Rue de Grenelle, Paris.

Germany.—New Atlantic Cable.—The submarine telegraph ble which the Deutsch Atlantische Telegraphengesellschaft to lay from Emden to the Azores, to connect with the Com- rcial Cable Co.'s and the Western Union's systems, has been ered from the Norddeutschen Seekabelwerken A.G. Nordeeham, says the *Financial Times*, and is to be ready the autumn of 1926.

Japan.—New Radio Company.—A Japanese wireless tele- aph company, managed jointly by the private interests con- ned and the Government, has come into being with Viscount ibusawa and Baron K. Nakashima as members of the com- ttee. The company is to be organised with the Government tion at Iwaki as its principal asset, reports the *Daily Tele- aph*. Supplementary subscriptions in shares will be made by minent business interests in Japan.

New Radio Service.—A new wireless telegraph service to pan has been inaugurated by Marconi's Wireless Telegraph ., Ltd., and is now available to the public. The rate is 4d. per word, and messages, which should bear the routing truction "*via* Marconi," may be handed in at the Marconi ices in London, Liverpool, or Manchester, or at any postal railway telegraph office in the United Kingdom.

Sierra Leone.—Telegraph and Telephone Services.—The nual report for 1924 on the Sierra Leone (West Africa) rail- y includes an account of the operation during the year of the egraph system of the country and the telephone exchange Freetown, both of which are under the management of the lway. The total mileage of telegraph and telephone lines the end of the year was 1,204, four miles less than in 1923, luding 156 miles of telephone lines in Freetown. The num- of electric train-staff instruments was 78, the number of egraph instruments was 40, and the number of telephone cuits on the Freetown exchange was 88, or six less than 1923. The double military line from Port Lokko to Mabanta was bought from the Army and dismantled, and the best of the material was used for the construction of a new line from Port Lokko in a northerly direction through Mange to the trading centre of Kambia. There is now a through line from Songo to Kambia, while a branch line of about three miles was constructed from Loawa, in the Northern Province, to Mattru. Since the departure in January, 1922, prior to retirement, of the European telegraph superintendent, the section has been in charge of an African telegraph inspector. Mr. Bennett, assistant engineer-in-chief of the Nigerian Posts and Telegraphs Department, following an inspection, reported that the section was in an unsatisfactory state. However, at the date of the report under review, May 1st, 1925, Mr. G. Cresswell, of the Nigerian Posts and Telegraphs Department, had just arrived to take up the appointment with the title of assistant telegraph engineer. He is responsible to the chief engineer of the railway and has a very large amount of work in front of him. Excluding messages on railway service, the number of telegrams dispatched during the year by the public increased by 1,682 to 45,206, and Government messages increased by 5,852 to 18,299. The number of subscribers, excluding the railway, connected to the Freetown telephone exchange was 34 public and 15 Government. Telegraph revenue increased by £773 to £5,500, and telephone income increased by £71 to £1,334.

Switzerland.—Automatic Telephony.—The Bollwerk central telephone exchange in Berne is to be converted into an automatic station. The installation will provide for 4,400 connections, with an eventual capacity of 9,000; extensions are also to be made at the various sub-exchanges. The contract for the work has been placed with the Siemens & Halske Co., of Berlin.

The Telephone Service.—New Exchange.—A new telephone exchange was opened on August 20th in specially-designed premises in Coolfinn Road, Victoria Docks, E.16, to meet the increased demand for telephone service in the neighbourhood of the Albert Dock. Equipment of the central battery type has been fitted, and accommodation for 1,500 subscribers' lines has been provided, with capacity for extension to 4,000 lines. The new exchange will serve an area of about six square miles now served by the East and East Ham exchanges, from which 900 lines were transferred, says the *Morning Post*, at the time of opening. To carry the traffic between the Albert Dock and other London exchanges 195 outgoing and 180 incoming junction lines have been provided. An estimated daily traffic at the time of opening of 22,000 outgoing and incoming calls will be handled by a staff of 31 telephonists.

Radio Notes.

Interference Elimination.—Wave-length Tests.—The night of August 31st—September 1st has been chosen for the all-Europe test in connection with the scheme to allocate every station such a wavelength as will prevent interference between one country and another. Practically every broadcast station throughout Europe will alter its wavelength, and nearly all the British stations will do likewise. The test will last for two hours, and will begin at midnight. Every station will transmit its own programme, and announce its identity every few minutes, so that any interference can be detected by listeners in every country in Europe except Russia; the National Physical Laboratory is acting for the B.B.C., and the success of the scheme depends on the accuracy of transmitting on the allocated wavelengths. Never before have fractions of a metre been used by B.B.C. stations. Representatives of the various countries will afterwards meet at Geneva to compare notes before the final scheme is put before their respective Governments for approval.

Long-distance Relaying.—A "Central" Receiver.—A season of international entertainment will be available to listeners this coming winter, for it is hoped to complete the new "central" receiving station which the B.B.C. is building at Hayes, near Bromley, in Kent, early next month. In October this plant will pick up American and Continental programes and relay them to Daventry, whence they will be re-radiated. The B.B. Co. has been developing proposals for the exchange of programmes in this manner, and the new station will have a 300—500-metre receiver, and another for shorter bands for long-distance reception. Direction-finding apparatus will be provided for locating sources of interference and for assisting in calibrating B.B.C. stations.

Russia. — Soviet Broadcasting. — The Soviet authorities evidently regard radio-broadcasting as an excellent means of propaganda, for the *Daily Mail* reports that over 6,000 workers' clubs have been fitted with receiving sets, and 12,000 reading rooms for the public have now been similarly equipped. When the British Broadcasting Co.'s experimental station at Hayes is ready, listeners in this country will have an opportunity of judging the quality of the Soviet broadcast programmes, as relayed by 5XX.

United States.—Range Tests.—Between 12.30 and 5.30 a.m. B.s.t. on August 25th and 26th, the General Electric Co.'s station at Schenectady, W.G.Y., was to broadcast test programmes on a wave-length of 380 metres as part of the experiments announced a fortnight ago. The power was to be changed every 15 minutes from 2½ kW (its normal output) to 50 kW, and more power will be used in future if necessary, the object being to ascertain the extent to which the range of the station can be extended.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Adwick-le-Street.—Urban District Council. September 14th. Internal wiring for electric lighting of Council houses. (August 21st.)

Australia. — Melbourne.—September 29th. Postmaster-General's Department. Telephone protective apparatus.*

October 20th. Switchboard cable. Sched. C.39, jumper wire. Sched. C.40, bells and buzzers.*

October 7th. Victorian Government Railways. Two electric transporters complete. (AX.2303.)*

Commonwealth. October 27th. Timing clocks and calculagraphs. (August 21st.)

Telephone transmitters. (See this issue.)

New South Wales.—November 11th. New South Wales Railways and Tramways. 5-ton 3-motor electric overhead travelling crane, 56 ft. 2 in., for iron and steel foundry, Eveleigh workshops.

September 23rd. Four feed-water meters for White Bay power house.

October 15th. Newcastle City Council. 2,000-kW, or, alternatively, 1,500-kW turbo-alternator, complete with condensing plant.—*Tenders.*

Belgium.—September 23rd. Ministry of War. 4,500 km. of field telephone cable.*

Edinburgh.—September 14th. Royal Infirmary. Supply of X-ray and electro-medical equipment for the new Radiological Department. (August 14th.)

September 7th. Electricity Supply Dept. Electric lighting installations at 288 houses under the Gorgie housing scheme. Specifications from engineer's office.

Egypt.—Cairo.—September 15th. Director-General, Mechanical Department, P.W.M., Cairo. Six generating sets for steamers for the Government workshops, Bulag.

Ministry of the Interior. Supply and installation of an electric power station and distributing system for the town of Minieh.*

India. — September 15th. Madras and Southern Mahratta Railway Co., Ltd. Telegraph line materials, copper wire, &c. (August 21st.)

London.—H.M. Office of Works.—September 15th. Supply of electrical and mechanical engineering labour in daywork in Cardiff. (See this issue.)

Bermondsey.—September 9th. Board of Guardians. Six months' supplies of electric lamps. Forms of tender from Mr. H. H. Reeve, Clerk to the Guardians, 283, Tooley Street, S.E.1.

Westminster.—September 9th. Board of Guardians. Electrical lamps, fitting, &c. Forms of tender from Mr. W. J. Leckley, Clerk to the Guardians, Guardians Offices, Princes Row, S.W.1.

Newport (Mon.).—September 7th. Electricity Department. Induced draught plant, extension of flues, &c. (August 21st.)

New Zealand.—Marlborough.—Electric Power Board. September 22nd. Two 750-h.p. turbines, with generators, switchboard, &c., for Waihopai River development.

Northampton.—September 4th. Town Hall and Markets Committee. Installation of new electrical fittings, lamps, switches, and winches, &c., in the Guildhall, Northampton. (See this issue.)

Portsmouth.—September 1st. Tramways Committee. Stores for 12 months, including insulating materials, lamps, overhead line materials, &c. (August 21st.)

Rochdale.—September 9th. Paving and Sewering Committee. Motors and electrical gear, together with the necessary wiring in connection with the electrification of sludge pressing machinery at Roch Mills sewage disposal works. (August 14th.)

South Africa.—Johannesburg.—October 1st. Railways and Harbours. Four 4-ton electrically-driven portable jib cranes, complete. (A.X.2299.)*

Stoke-on-Trent.—Stoke and Wolstanton Union. Installation of an electrically-driven pumping plant at the Turnhurst Road Institution, Chell. Specification from Mr. T. Wood, Clerk to the Guardians, Stoke-on-Trent.

Town Council. E.h.p. testing equipment. (August 21st.)

Warrington.—September 7th. Electricity Department. Twelve months' supply of earthenware conduits. (August 21st.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Glasgow.—Corporation. Accepted:—

100 time switches for hiring purposes.—Venner Time Switches, Ltd.

Government Contracts.—The following Government contracts were placed during August, 1925 :—

Admiralty (Civil Engineer-in-Chief's Department).

Electric cable.—British Insulated & Helsby Cables, Ltd.

Admiralty (Contract and Purchase Department).

Batteries.—Chloride Electrical Storage Co., Ltd.; D.P. Battery Co., Ltd.; Tudor Accumulator Co., Ltd.
Distributing boards.—Dorman & Smith, Ltd.
Conduits.—Talbot Stead Tube Co., Ltd
Air coolers.—Reavell & Co., Ltd.
Cooling tower.—Davenport Engineering Co., Ltd.
Copper tubes.—J. Wilkes, Son & Mapplebeck, Ltd.
Morse keys.—Baird & Tatlock, Ltd.
Electric lift.—W. Wadsworth & Sons, Ltd.
Motors, control gear, and spares.—Laurence Scott & Co., Ltd.
Transmitting panels.—H. W. Sullivan, Ltd.
Radiogoniometers.—Gambrell Bros., Ltd.
D.p. switches (5 and 15 amp.).—Hawkers, Ltd.; Barr & Stroud.
2-ton and 3-ton electric overhead travelling cranes.—T. Smith & Sons (Rodley), Ltd.

War Office.

Electric cable.—W. T. Henley's Telegraph Works Co., Ltd.; Pirelli-General Cable Works, Ltd.; Western Electric Co., Ltd.
Aerial frame windings.—Fuller's United Electric Works, Ltd.
Generators.—Small Electric Motors, Ltd.
Rotary transformers.—W. Mackie & Co., Ltd.

Air Ministry.

Push buttons.—Pinnacle Switchgear, Ltd.
Motor generators.—Small Electric Motors, Ltd.
Generators and spares.—W. Mackie & Co., Ltd.
Magnetos and spares.—British Thomson-Houston Co., Ltd.
W./t. valves.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Mullard Radio Valve Co., Ltd.; British Thomson-Houston Co., Ltd.
Voltmeters, thermo-ammeters, and milliammeters.—E. Turner.

Post Office.

Telephone apparatus.—Bonnella Bros., Ltd.; British Insulated & Helsby Cables, Ltd.; British L. M. Ericsson Mfg. Co., Ltd.; General Electric Co., Ltd.; Houghton Butcher Mfg. Co., Ltd.; B. W. Johnson; London Electric Wire Co. & Smiths, Ltd.; Phœnix Telephone and Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Sterling Telephone and Electric Co., Ltd.; Telephone Mfg. Co., Ltd.; T. Watson; Western Electric Co., Ltd.
Testing and protective apparatus.—Automatic Telephone Mfg. Co., Ltd.; British L. M. Ericsson Mfg. Co., Ltd.; W. Jones & Co.; Phœnix Telephone & Electric Works, Ltd.; Power Equipment Co., Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Battery parts.—Chloride Electrical Storage Co., Ltd.; Pritchett and Gold & E.P.S. Co., Ltd.
Cable (various).—British Insulated & Helsby Cables, Ltd.; Connolly's (Blackley), Ltd.; Enfield Cable Works, Ltd.; Fuller's United Electric Works, Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.
Joint-box castings.—Britannia Lathe & Oil Engine Co., Ltd.; Jones and Attwood; United Steel Cos., Ltd. (T. Butlin & Co.).
Loading coils.—Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Telephone cords.—British Insulated & Helsby Cables, Ltd.; London Electric Wire Co. & Smiths, Ltd.; Phœnix Telephone and Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Ward & Goldstone, Ltd.; Western Electric Co., Ltd.
Electric light fittings.—J. Lane & Sons, Ltd.
Insulators.—Bullers, Ltd.; T. De la Rue & Co., Ltd.; Doulton and Co., Ltd.; Taylor, Tunnicliffe & Co., Ltd.
Lead sleeves.—G. Farmiloe & Sons, Ltd.
Jointing sleeves.—Dugard Bros., Ltd.
Copper wire (annealed).—T. Bolton & Sons. Ltd.
Enamelled copper wire.—Concordia Electric Wire Co., Ltd.
H.d. copper wire.—Nevill, Druce & Co., Ltd.
Soft ditto.—Enfield Cable Works, Ltd.
G.i. wire.—Lancashire Wire Co., Ltd.; Shropshire Iron Co., Ltd.; Dorman, Long & Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Bristol-Weston-super-Mare: Pirelli-General Cable Works, Ltd. Bo'ness Junction-Bo'ness, Liverpool-St. Helens, Manchester-Bolton: British Insulated and Helsby Cables, Ltd. Birmingham-Walsall and Leicester-Rothley: **Siemens Bros. & Co., Ltd.**
Conveyors (Mount Pleasant new sorting office).—H. Simon, Ltd.
E.h.p. switchgear (K. E. B. sub-station).—Ferguson, Pailin, Ltd.
Electric lift (Leicester telephone exchange).—Medway's Safety Lift Co., Ltd.
Electric lighting installation (Sheffield P.O. and Telephone Exchange).—Marsh Bros. (Electricians), Ltd.
Telephone exchange equipment.—Hull Toll and Hatch End: General Electric Co., Ltd. New Cross, Putney, Ilford, Albert Dock, Western, Croydon, Lee Green, Palmer's Green, Walworth, Tottenham, Ravensbourne, Greenwich, Barnet, Wanstead, Enfield, Cosham, York, Richmond, and Walton-on-Thames: Automatic Telephone Mfg. Co., Ltd. Sub-contractors: Tudor Accumulator Co., Ltd., for batteries; Electric Construction Co., Ltd., for charging machine; Newton Bros. (Derby), Ltd., for ringing machine. Southport, Birkdale, Churchtown and Ainsdale; Automatic Telephone Mfg. Co., Ltd. Sub-contractors: Alton Battery Co., Ltd., for batteries; Newton Bros. (Derby), Ltd., for machine plant. Burgh Heath: British L. M. Ericsson Mfg. Co., Ltd. Sub-contractors: Tudor Accumulator Co., Ltd., for batteries; Crompton & Co., Ltd., for ringing machines. Chesterfield: Siemens Bros. & Co., Ltd. Sub-contractors: Chloride Electrical Storage Co., Ltd., for batteries; English Electric Co., Ltd., for charging machines; Crompton & Co., Ltd., for ringing machines. Staveley: Siemens Bros. & Co., Ltd. Toll (London): Western Electric Co., Ltd. Sub-contractors: Electric Construction Co., Ltd., for machine plant.
Private branch exchange equipment.—Shanks & Co., Ltd. (Barrhead, Glasgow); W. Delaney & Co. (Manchester); J. Waddington, Ltd. (Leeds); J. & H. Robinson, Ltd. (S.E.8); Lines Bros., Ltd. (Merton); S. H. Benson, Ltd. (Kingsway); Coutts & Co. (W.C.2); Battersea Borough Council; Wagon Repairs, Ltd. (Birmingham): Relay Automatic Telephone Co., Ltd.

H.M. Office of Works.

Lift (Foreign Office).—Marryat & Scott, Ltd.
Engineering labour (Manchester district).—Meta Mfg. Co., Ltd.
Cable.—Fuller's United Electric Works, Ltd.; The Receiver, H. W. Smith and Co. (1920), Ltd.

Crown Agents for the Colonies.

Paper-insulated cable.—W. T. Glover & Co., Ltd.
Electric light fittings.—J. Stone & Co., Ltd.
Electric lighting materials.—Siemens Bros. & Co., Ltd.
Electrical materials.—Belliss & Morcom, Ltd.
Flood alarm cabinets.—General Electric Co., Ltd.
Frequency changers.—Brush Electrical Engineering Co., Ltd.
Train lighting spares.—Chloride Electrical Storage Co., Ltd.
Telegraph ironworks, &c.—Bullers, Ltd.
Telephone materials.—British L. M. Ericsson Mfg. Co., Ltd.
Bronze wire.—Shropshire Iron Co., Ltd.
Copper wire, &c.—R. Johnson, Clapham & Morris, Ltd.
G.i. wire.—R. Johnson & Nephew, Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.

Irish Free State.—DUBLIN.—Contracts placed by the Controller of Stores, Department of Posts and Telegraphs during July, 1925 :—

Battery plates.—D. P. Battery Co., Ltd.
Cells.—Edison Swan Electric Co., Ltd.
Copper wire.—British Insulated & Helsby Cables, Ltd.
Insulators.—Wm. J. Kellie.
Spindles for insulators.—W. F. Dennis & Co.
Telephone accessories.—Hall Telephone Accessories Co.
Bronze wire.—W. F. Dennis & Co.; F. Routledge.

Polmont.—Nobel Industries, Ltd. Accepted:—

One 21,550-sq. ft. air preheater.—Howden-Ljungström Preheaters (Land), Ltd.

South Africa.—UNION TENDER BOARD.—Among recent contracts placed by the Board (reported in the *S.A. Mining and Engineering Journal*) are the following :—

Underground cable.—Eugene Phillips Electrical Works (Canada).
Telegraph material.—Telegraph Manufacturing Co.; Rogers, Jenkins and Co.; Hubert Davies & Co. (Johannesburg); and Stewarts and Lloyds (Pretoria).
Accumulator battery for Slangkop radio station (£1,550).—Hubert Davies and Co.

Southend-on-Sea.—Town Council. Accepted:—

Reconditioning of 750-kW Diesel engine, time and line basis (£2,650, maximum), and erection of exhaust boiler, staging and ladder (£40).—Belliss & Morcom, Ltd.
Waste heat boiler (£435).—Spencer Bonecourt, Ltd.
Coresill (£189 3s.).—Christie & Gray, Ltd.
Motor (£214).—British Thomson-Houston Co., Ltd.

Stirling.—Town Council. Accepted:—

Electrical work at new houses in Bannockburn Road.—Mr. Alexander Brewster.

Thirsk (Yorks.).—The tender of Mr. Eric Thompson has been accepted for installing electric light at the new Thirsk and Sowerby Institute.

Worksop.—Electricity Committee. Accepted:—

Two 510-b.h.p. crude-oil engines and two 320-kW generators.—Vickers-Petters, Ltd.
10-ton overhead travelling crane.—Herbert Morris, Ltd.

Notes.

An Alleged Impostor.—WARNING TO ELECTRICAL ENGINEERS.—We have received from the Town Clerk of Lancaster Corporation the following statement :—For the past year or two it appears that a man named R. C. Milner (*alias* Rollo Milton), who gives as his address 4, Rockley Street, Pendleton, Manchester, has been making applications to electrical engineers for posts as assistant engineer, mains superintendent, station superintendent, charge engineer, &c., and enclosing testimonials, all of which are fictitious. An effort has been recently made by the Lancaster Corporation to make an example of him, but their efforts have met with no greater success than those of others. It may, however, be of some service to record the facts. The Lancaster Electrical Engineer (Major G. C. Milnes, M.C.) last month advertised for a shift charge engineer at a salary in accordance with the N.J.B. Scale, Grade 8, Class B, applicants to have had experience with water-tube boilers and turbo-alternators in an e.h.p. power station. About 40 applications were received, including one from Milner. From a perusal of the application it appeared excellent. The man called to see the Engineer on August 5th, and as the applicant was one, having regard to the excellent application, whom the Engineer would in due course have put in a selected list, he interviewed him. When the Engineer looked at him, his face appeared familiar. The Engineer suggested that he had met him on some previous occasion, but Milner was unable to recollect previous acquaintance. The latter, however, suggested it might have been at the Engineers' Club, either at Manchester or London. As the Engineer is not a member of either club, he said this could not be the case. The matter was then dropped. At the interview Milner impressed the Engineer, and afterwards the Engineer referred to some applications he had received in October, 1923, for the appointment of mains superintendent. He found an application from a Mr. Rollo Milton. This was in many respects similar to that now received from Milner. The Engineer was convinced that Rollo Milton and R. C. Milner were the same person. Milner (or Milton) was interviewed by the Engineer in October 9th, 1923, along with other candidates—that was where he had seen him previously. In 1923 Milner gave his age as 38. His recent application gave 34. The Engineer then doubted the veracity of the present application. He made inquiries from the gentlemen who were purported to have given Milner testimonials—the Electrical Engineers of Bolton, Eccles, and Salford. The result of inquiries revealed that the statements with regard to service at those undertakings were fictitious. It was found that he had never been in the service of those undertakings at all. Milner also stated that he had been with the Leicestershire and Warwickshire Electric Power Company as senior engineer-in-charge for three years. The result of inquiries showed that he was there only a few weeks. The company doubted his competence, and called for his original testimonials. He said he would go to Manchester to get them, but he never returned. The Lancaster Corporation issued a summons charging him with an offence under the Servants' Characters Act, 1792, but the summons could not be served, as the address is apparently only an accommodation address, and the Salford police in whose area he was supposed to reside intimate that Milner is evidently a "bird of passage." Possibly he may be heard of again.

A High-Sensitivity Oscillograph.—Some particulars are given by the *Revue Générale de l'Electricité* of a new form of oscillograph, which is to be especially adapted for use in the plate and bridge circuits of vacuum tubes. It is sentitive within the range below one milliampere, and suitable for frequencies up to 3,000 cycles. In principle it consists of a thin, flat strip of silicon-steel alloy placed in an air gap with is surface perpendicular to the field due to a permanent magnet. The strip is suspended at its centre, and light springs at either end hold it in position. One of these springs is geared to a concave mirror. The coil carrying the current the variation of which is to be indicated, is sunk into the poles of the permanent magnet. The current causes the strip to rock to and fro on its pivot, communicating this motion to the mirror. The use of the silicon alloy suppresses the distortion due to Foucalt currents and to hysteresis. Examples are said to have been given of its application to the recording of noise, both aerial and submarine, the registration of wireless signals, and the measurement of small intervals of time.

Electric Steel Furnaces in Germany.—There are in operation in Germany approximately 100 electric furnaces, compared with 360 in the United States, 150 in Great Britain, 70 in France, 50 each in Italy and Sweden, and 40 in Canada. Germany's participation in the entire electric steel production of the world was 56 per cent. before the war and 21 per cent. in 1918, whereas the United States rose from a participation of 17 per cent. in pre-war years to 45 per cent. in 1918. In 1908 the production of steel in electric furnaces amounted to 0.2 per cent. of the total German steel output, growing to 4.7 per cent. in 1913 and to 16 per cent. in 1918, but declining to 7.6 per cent. in 1920. The electric furnace in steel foundries has largely replaced the crucible furnace, and the Martin furnace to some extent. It is not expected, however, that converters, crucibles, and Martin furnaces will be completely replaced by electric furnaces in the near future. The size of furnaces has been growing in Germany as in other countries, although the largest German furnace in operation has only a capacity of 30 tons. Three types of furnaces are extensively used, the Héroult, Nathusius, and Roechling...-Rodenhauser being the most numerous. A number of steel foundries in Germany are also operating induction furnaces, especially of the Roechling-Rodenhauser type. They are generally two-phase furnaces, and their general electrical and heat efficiency amounts to 60 per cent., compared with 86 per cent. generally assumed for arc furnaces. This is not very satisfactory, but it is stated by German foundries that, with due consideration of the cost of the graphite electrodes, initial expense, maintenance, &c., their operation is not more expensive than that of an arc furnace, so that the cost of one ton of steel produced by either the arc or the induction process is almost the same. —*Commerce Reports.*

A Tracing Cloth Substitute.—According to *Electrical World* a transparent celluloid, to be used as a substitute for tracing cloth where permanent drawings are subject to frequent and minor alterations, has been developed and is being used by several large operating companies. It is claimed to be particularly useful where records, maps, connection diagrams, and similar information must be kept up to date continuously, and where periodic reproduction is necessary. The material is about 0.015 in. thick; one side has a smooth finish, and the other a matt surface upon which the tracing is made. Tracings made in this way are said to be almost indestructible, since the ink lines may be easily removed with a sharp scratcher with no injury to the celluloid surface.

Bay of Fundy Tidal Scheme.—The New York correspondent of *The Times* states that by a referendum which is to be submitted to the State of Maine on September 14th next, the approval of the people is being sought for a project to harness the tides of the Bay of Fundy. A scheme has been prepared by Mr. D. P. Cooper, hydraulic engineer, who has selected two inlets on the boundary of Maine and New Brunswick—Passamaquoddy Bay, for the upper pool and Cobscook Bay, in Maine, for the lower pool. He proposes to build locks and dams across the narrow passages between the islands at the entrances to the pools, whilst between the two pools there will be a separating wall 3,600 ft. long, on which power houses will be placed. By opening the gates of the upper pool only during a rising tide and the gates of the lower pool only at low tide, there will be maintained a continuous difference in level between the two pools. The water pouring down from the upper to the lower pool should then yield a minimum of 500,000 h.p. throughout the year, Mr. Cooper asserts, with a possible maximum of 700,000 h.p. if required. It is estimated that the cost of construction will be about £15,000,000, and that the work will occupy 5,000 men for five years. If the Maine referendum is favourable, Mr. Cooper will approach the Canadian and United States Governments for sanction to the scheme. The Governor of Maine has endorsed the proposal.

Shannon Power Scheme. — Preliminary work on the Siemens-Schuckert Shannon scheme has begun in Co. Limerick. The Berlin office of the firm has completed its arrangements for the shipment of plant, and the first consignment will reach the Shannon in about four weeks. Railway connections must be built between the harbour and Limerick Railway Station and also from Long Pavement to Ardnacrusha, where the power station is to be erected. The railway work is expected to be finished by December, and it will employ some 600 men. The actual work of canal excavation will begin in the spring.—*The Times.*

A Wooden Pole Support.—A pole support, the "Malone," has, according to the *Electric Railway Journal*, been placed on the market by the Blaw-Knox Co., Pittsburgh, Pa. It is designed to reinforce wooden poles that have rotted at the ground line, but are otherwise in good condition. The support consists of three galvanised pressed and flanged steel plates adjustable to poles from 10- to 14-in. diameters at the ground level. These plates are arranged to clamp around the pole by means of bolts and washers, and are fastened to three "Malone" concrete anchors.

Canadian Mica Discovery.—What is claimed to be the largest "show" of mica unearthed in Ontario has been discovered at North Hastings, a short distance from Bancroft, by Sorser & Co., who have shipped three cars (120 tons) to the United States market. Crystals weighing as much as two tons have been taken from the show. The company proposes starting a factory there in the near future for the purpose of cutting mica to size. Experts who have visited the property assert that it is the largest yet found in Ontario.

An Acid-proof Apron.—In order to meet the demands of the new Home Office Accumulator Regulations (para. 14), that protective clothing for use in accumulator charging shall consist of "an apron made of material impervious to water, &c.," the Ray Manufacturing Co., Bristol, has placed on the market the "Raymac" acid-proof apron. This overall apron is claimed to be impervious to water and to be unaffected by sulphuric acid. It is made of a specially selected rubber composition, and is of three-ply construction to enable it to withstand hard wear. It forms a one-piece neatly fitting garment giving full flexibility to the body under working conditions; it is reversible, and made to fit any normal size. The buttons for the cross straps are of lead and no seams exist in the article, ensuring that no part is subject to acid attack.

Electric Sign Ban.—Flashing electric signs are not to be allowed in the city of Oxford under a town-planning scheme now under consideration, says the *Daily Mail*. It is felt that night signs having the appearance of intermittent illumination and roof signs are out of place in the University city, and it is proposed under the preliminary scheme to prohibit them.

New Power Development in Canada.—The purchase by the Kingdon Mining, Smelting, and Manufacturing Co. of power rights and property in the vicinity of Chats Falls, on the Ottawa River, is announced. The James Robertson Co., of Montreal, controlling the Kingdon Co., intends to start work shortly on a lead and zinc manufacturing plant which will cost in the neighbourhood of $2,000,000, as well as a large water project. The power development will probably be a joint enterprise between the company and the Ontario Hydro-Electric Power Commission, which expects to erect a power plant on the Ontario side of the river.

Accident. — Walter Hazelhurst (29), electrician, of Firwood, was admitted to Bolton Infirmary on August 20th suffering from burns to the hands received while cutting a cable.

The Institution of Electrical Engineers.—At the invitation of the Salford Corporation Electricity Committee, an afternoon inspection of the new Agecroft power station will be made by the members of the North-Western Centre on Thursday, September 24th. Arrangements have been made for lunch at the Engineers' Club, and transport in covered motor coaches will be provided.

Appointments Vacant.—Plumber-jointer for the Peterborough Corporation electricity department. Combustion engineer for the North Metropolitan Electric Power Supply Co. Electrical engineer for the Mains Department of the Calcutta Electricity Supply Corporation. (See our advertisement pages to-day.)

The Natal Railway Electrification.—A Durban correspondent of *The Times Trade and Engineering Supplement* states that in a number of instances the actual cost of equipment in connection with the electrification of the Natal railways has been considerably in excess of the estimates. Referring to the actual working, he says that very little trouble has been experienced, and it is considered that when further experience has been gained in the operation of the system and initial difficulties have been overcome, the advantages of the scheme as a means of improving and cheapening the working of traffic will be apparent, and also that in due course the anticipated benefit to the community from the provision and distribution of electric power at low rates will be fully realised.

Electricity in Mining.—The extent to which the use of electricity has developed in the South Wales mines is indicated by a recent statement by Mr. Theodore Stretton, president of the Association of Mining Electrical Engineers, that in that area the Powell Duffryn Co. alone uses about 160 million kWh per annum.

Electrolytic Method of Accelerating Corrosion.—In a paper by Messrs. Robert J. Anderson and Samuel H. Brooks, reprinted from *Mechanical Engineering*, dealing with a series of tests made on the accelerated electrolytic corrosion of brass, it is interesting to note the method of acceleration employed. The material to be tested is made the anode in the corroding medium (an electrolyte), and platinum wire is used as the cathode. A small current density is imposed through suitable connections, properly regulated, and the anode is rotated in the electrolyte. After a suitable time the sample is removed, washed, dried and weighed, and the actual loss in weight determined. In the particular tests referred to in the paper the brass employed was in the form of condenser tubing, ¾ in. outside diameter and .005 wall thickness. The test pieces were rotated at 140 r.p.m. by a constant-speed motor.

United States Electrical Statistics.—Reports submitted to the *Electrical World* by 77 per cent. of the generator rating of the electricity supply industry indicate the gross revenue from the sale of energy during May was $110,900,000, an increase of 9 per cent. over May, 1924. During the month the gross revenue was 5.3 per cent. below the estimated normal for that month, this normal being based on the operations for the past five years. The operating expenses during May totalled $51,250,000, a gain of 7.3 per cent. over the corresponding month of last year.

A Lightning Discharge.—During a thunderstorm on Sunday (23rd inst.) a block of two Council houses in Dene Avenue, Lemington-on-Tyne, was struck by lightning with rather interesting results. A correspondent (W. E. P.) informs us that the house was the lowest in the immediate vicinity; it had no wireless aerial, but neighbouring houses had.

The lightning struck the middle chimney stack, dislodging the three top courses of bricks and several tiles. It then spread throughout the fabric of the house by means of the gas pipes embedded in the walls, bursting off patches of cement plaster and burning the pipes at damp spots and at sharp bends, and blowing out staples where these were used to secure the pipes. It finally earthed through the water pipes, dislodging a bracket holding a cistern in the bathroom.

It is interesting to note that the damage occurred where contact resistance between fabric and metal was lowest, at points of high inductance (bends in pipes), and at points of high discharge density (staples).

Charges for Electricity Supply.—The following letter arrived too late for inclusion in our "Correspondence" columns:—

I note the remarks of your correspondent "Stung," and beg to explain a few of his statements which are inclined to be misleading.

With regard to the statement that the Manchester Electricity Department installs cookers at 7s. 6d. per quarter, the impression is given that this is the only price, which is not so, as cookers are hired in three sizes at quarterly rentals of 5s., 7s. 6d., and 12s. 6d., the 5s. cooker being of ample size for the requirements of a household up to four persons. While admitting that the Gas Department will install a certain type of gas cooker free, a decent type with an enamel finish is, I believe, 5s. per quarter.

"Stung" is correct in his assumption that he has to pay 10s. per quarter "minimum charge," or £2 per annum, but should his consumption exceed this amount the following quarter, he would receive a rebate. Does a consumer expect the Manchester Corporation to fix meters, cut-outs, and service (6 yards) free without any guarantee for the expenditure involved? It must be remembered that the Manchester consumer is not burdened with meter rents as a large proportion of other consumers are, and with regard to the £1 deposit, this is in the nature of a guarantee, and as long as this sum is in the keeping of the Corporation, interest is paid on it.

Lastly, I should be interested to hear of the towns in the neighbourhood of Manchester which, to use the words of "Stung," "make lower charges." I am under the impression that Manchester supplies the cheapest electricity for domestic use in South Lancashire, while the undertakings bordering the city—Salford, Eccles, Stretford, Sale, Cheadle, Stockport, Altrincham, &c.—do not hire-out electric cookers at all, and their rates of charge are certainly not under those of Manchester.

In view of the fact that the number of cookers ordered from the Manchester Corporation runs into four figures, and that they are installed in municipal houses, at the back of shops in small streets, &c., one can hardly call them luxuries, and is tempted to say, not: "Save me from my friends," but "What a friend we have in the Corporation."—F. C. Dain, Stretford, Manchester, August 24th, 1925.

Completion of Canadian Electrification Project.—The electrification of the main line of the Canadian National Railways between Lazard and St. Eustache was, says the *Electric Railway Journal*, completed on June 29th, giving the company a direct electric line from the Tunnel Terminal to St. Eustache, and permitting the removal from service of the storage-battery car which has been operating between Montreal and St. Eustache. The concern will put two new multiple-unit electric cars on this line in place of the storage battery line. The new cars were constructed in the Point St. Charles shops; they have an overall length of 80 ft., and accommodate 88 passengers, 72 of whom can be seated in the main body of the car.

Anthracite Coal in Devon.—According to the *Colliery Guardian*, operations carried out in the Bideford district since October, 1924, under the direction of Mr. Thomas Thornton, mining prospector, have resulted in the discovery, within a mile and a half of Bideford, of anthracite coal in large quantities. There are three proved seams running parallel at a distance of about 500 ft., and extending a mile and a half on the "strike," which runs 12 miles from the shores of Bideford Bay to Chapelton, in the valley of the River Taw.

Encouraging the Use of Electric Vehicles.—We learn that he New York Edison Co. has recently taken a step which hould further encourage the use of electric motor trucks and ans in the United States. It has arranged to supply charging oards and other battery-charging requisites on the deferred ayment plan, that is, by a first deposit followed by monthly ayments spread over twelve months.

"Non-Sulphatable" Lead Accumulators. — At a recent neeting of the Académie des Sciences in Paris, M. Ch. Féry ontributed a note on accumulators, in which he stated that the ulphation of lead batteries could be prevented by protecting he negative electrodes from the action of the oxygen in the ir and from the positive plates. By applying to an accumula- or the same arrangement as adopted in his air depolarisation attery, M. Féry stated that he had been able to produce a econdary battery which, after four months, retained 83 per ent. of its charge capacity, and that after being discharged nd put aside for two years it was recharged under normal onditions. The author considered that the new accumulator ossessed all the advantages of a dry battery and was destined o have many important uses in telegraph and industrial work.

Educational.—The new session for courses in electrical ngineering at the Polytechnic, 307-311, Regent Street, ommences on September 28th, the dates for enrolment being eptember 16th to 25th (19th excepted). The prospectus pro- ides for the first to sixth years' National Certificate and alter- ative courses.

Tramway Accidents.—In a recent issue of *Verkehrstechnik*, Herr A. Wolf deals at some length with the subject of acci- ents in tramway operation and the means of securing their eduction. The author considers that there is a "co-efficient f rolling-stock utilisation" above which the risk of accident o passengers increases rapidly. Taking as a basis the latest fficial figures available of the traffic accidents in Germany be- ween 1899 and 1919, those relating to tramways show that 3.77 per cent. of the accidents affected passengers and 56.23 er cent. pedestrians; of the total only 8.38 per cent. was due o tramway operation, a figure which, in Herr Wolf's opinion, ndicates that tramcars are not in themselves particularly angerous vehicles. The majority of passenger accidents were aused by attempts to board and alight while the cars were unning, too sudden application of the brakes, and collisions. he author considers that the number of accidents in the first lass can be reduced by the use of folding steps and gates on he rear platform; as regards pedestrian accidents, 34 per cent. re sustained by children, and it is suggested that urban uthorities should provide more playing grounds so that chil- ren should not have to play in the streets. Although less than 0 per cent. of accidents are due to the rolling stock and the perating staff, Herr Wolf considers that steps should be taken o secure a reduction. He is sceptical as to the value of life rotectors or guards, the bulk of them in use in Germany eing, in his opinion, too high from the ground, so that while hey may prevent a victim from being run over, they are bound o cause him serious injury. He considers it preferable that ore attention should be paid to the improvement of brakes, hat stopping places should be selected with greater care, and hat when they are located in the middle of the road, refuges hould be provided. The best solution is to run the tramcars long their own track separated from the public highway, lthough this can only be done in the case of new roadways of fficient width. Herr Wolf concludes by recommending that reater attention be paid to overhead conductors and to more areful selection and training of the tramway staff. Experi- nce has shown, he considers, that while it is wise to educate hildren to traffic dangers, rules and regulations for the public's enefit are of little avail, and that consequently it is the ehicles themselves that must be arranged, equipped, and con- olled so as to reduce the number of accidents to the minimum.

Inquest.—Mr. S. Brighouse, coroner, recently held an nquest on the body of Wm. Matthew Hendry (7), who was illed by a "live" wire on the railway at Bootle. The oroner found that Hendry was killed accidentally and ex- ressed the opinion that extra safeguards, such as barbed wire, ould be placed on fences as a deterrent.

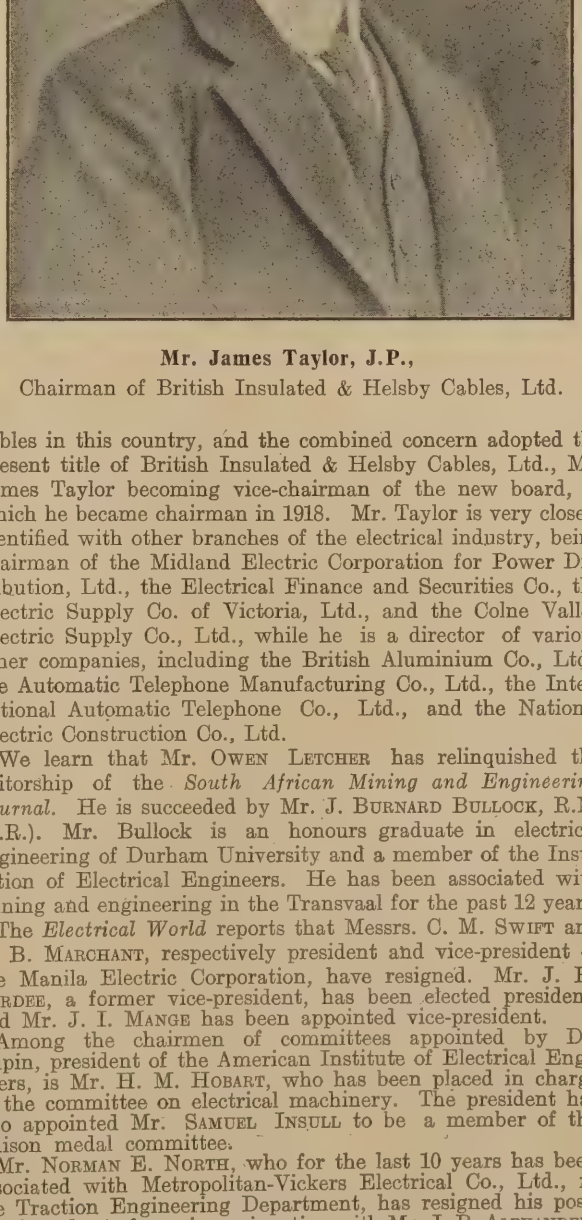
French Electrical Industries.—Some interesting statistics oncerning the electrical industries of France are given in the *lectrical World*. The capital invested in these industries in 924 exceeded 1,000 million francs, including new enterprises nd new capital for existing ones. The total capital now em- loyed in the production and distribution of electrical energy over 4,500 million francs. The number of employés ex- eeds 25,000. A recent census of the resources lists 109 central tations of capacities of 10,000 kW and over, the total reaching ,000,000 kW. The smaller stations are rated at 500,000 kW n all. The consumption per head of the population increased y 20 per cent. during the year and is now double that of five ears ago. The electrical manufacturing industry has an in- ested capital of 2,000 million francs against 300 million francs n 1913. Before the war the industry employed 25,000 hands; o-day the figure has increased to 70,000.

N.A.S.E. Scholarships. — The third annual award of cholarships under the auspices of the National Associa- on of Supervising Electricians has just been made. The xamining Board, composed of Messrs. F. Gill, A. Kirk, and V. J. Revell, reports a large increase of entrants and the nswers to questions as being very good. The winners of the cholarships are: Supervisors, Mr. E. North (London); Fore- en and Associates, Mr. G. Kirk (London), and Mr. A. Olding London).

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Mr. James Taylor, J.P., chairman of British Insulated and Helsby Cables, Ltd. (whose portrait appears herewith), has been intimately concerned with the cable-making industry since 1884, when he joined his brother, the late G. Crosland Taylor, who in the previous year had commenced the manufacture of cables at the Deeside Electric Works, Neston. About the beginning of 1886 the business was converted into a limited company, and the well-known Telegraph Manufacturing Co., Ltd., came into existence. This company played an important part in the manufacture of v.i.r. cables under that style until 1902, when, in order to increase the scope of the business, an amalgamation was effected with the British Insulated Wire Co., Prescot, the original manufacturers of paper-insulated



Mr. James Taylor, J.P.,
Chairman of British Insulated & Helsby Cables, Ltd.

cables in this country, and the combined concern adopted the present title of British Insulated & Helsby Cables, Ltd., Mr. James Taylor becoming vice-chairman of the new board, of which he became chairman in 1918. Mr. Taylor is very closely identified with other branches of the electrical industry, being chairman of the Midland Electric Corporation for Power Distribution, Ltd., the Electrical Finance and Securities Co., the Electric Supply Co. of Victoria, Ltd., and the Colne Valley Electric Supply Co., Ltd., while he is a director of various other companies, including the British Aluminium Co., Ltd., the Automatic Telephone Manufacturing Co., Ltd., the International Automatic Telephone Co., Ltd., and the National Electric Construction Co., Ltd.

We learn that Mr. Owen Letcher has relinquished the editorship of the *South African Mining and Engineering Journal*. He is succeeded by Mr. J. Burnard Bullock, R.N. (S.R.). Mr. Bullock is an honours graduate in electrical engineering of Durham University and a member of the Institution of Electrical Engineers. He has been associated with mining and engineering in the Transvaal for the past 12 years.

The *Electrical World* reports that Messrs. C. M. Swift and R. B. Marchant, respectively president and vice-president of the Manila Electric Corporation, have resigned. Mr. J. H. Pardee, a former vice-president, has been elected president, and Mr. J. I. Mange has been appointed vice-president.

Among the chairmen of committees appointed by Dr. Pupin, president of the American Institute of Electrical Engineers, is Mr. H. M. Hobart, who has been placed in charge of the committee on electrical machinery. The president has also appointed Mr. Samuel Insull to be a member of the Edison medal committee.

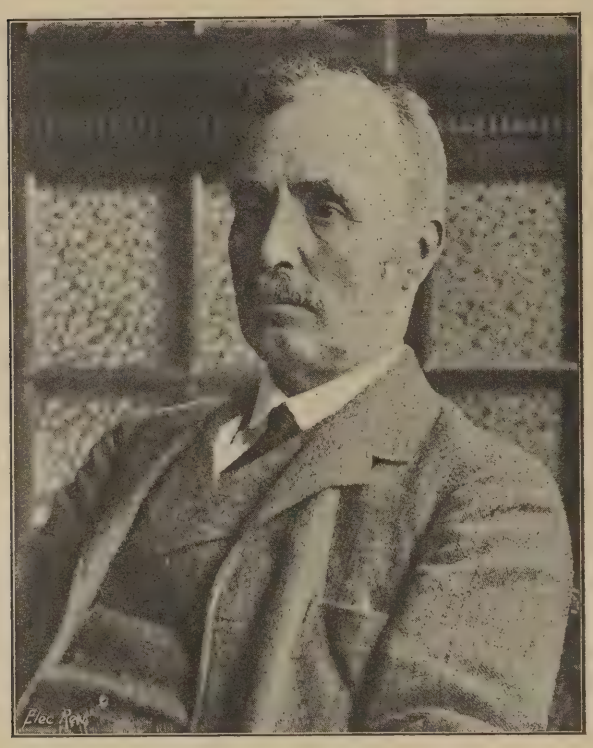
Mr. Norman E. North, who for the last 10 years has been associated with Metropolitan-Vickers Electrical Co., Ltd., in the Traction Engineering Department, has resigned his position in order to form, in conjunction with Mr. J. B. Alexander, late director of Ebonestos Insulators, Ltd., the Traction Equipment Co., Ltd., with offices at 36, King Street, Manchester,

and Windsor House, Victoria Street, S.W.1, to handle all forms of electrical apparatus for rolling stock, permanent way, and overhead equipment.

Mr. R. B. Hungerford, managing director of the Western Electric Co. (Australia), Ltd., is at present on a visit to this country. Later he is proceeding to the United States.

Mr. J. A. Partridge, a pioneer of short-wave radio transmission and one of the first to communicate by this means with the United States, has been appointed chief resident engineer at the B.B.C.'s new "picking-up" station at Hayes.

Mr. Dane Sinclair, director and general manager of British Insulated & Helsby Cables, Ltd., whose Prescot works are described elsewhere in this issue, started his electrical career in 1872, when he joined the Telegraph Department of the North British Railway. In 1875 he was one of those selected to go to Japan in connection with the erection of telegraph lines by the Japanese Government, and he remained as inspector for five years. For his services there he was subsequently awarded the Order of the Rising Sun of the Third Class, which at the time was the highest honour that the Japanese Government could confer on a foreigner. Shortly after his return,



Mr. Dane Sinclair,

General Manager of British Insulated & Helsby Cables, Ltd.

Mr. Sinclair was appointed engineer to the National Telephone Co. for the Glasgow district, and subsequently, after the amalgamation of the three principal telephone companies, he became London manager of the new National Telephone Co., and in 1892 he was appointed to the position of engineer-in-chief. He held this position until 1902, when he accepted the invitation of the directors of British Insulated & Helsby Cables, Ltd., to take the position of general manager of that company—an appointment which he still holds—and in 1923 he accepted a seat on the board of directors. During his service with the National Telephone Co. Mr. Sinclair was responsible for many inventions, some of which are in general use to-day. Mr. Sinclair is also a director of the Automatic Telephone Manufacturing Co., Ltd., the International Automatic Telephone Co., Ltd., the Constantinople Telephone Co., the Midland Electric Corporation for Power Distribution, Ltd., the St. Helens Cable & Rubber Co., Ltd., and the Enfield Cable Works, Ltd.

Obituary.—Senor Zuluetia.—The death recently occurred at Neguiri, Bilbao, Spain, of Don Juan Urrutia y Zuluetia, the president of the Spanish Associacion de Productores y Distribuidores de Electricidad. The deceased had played an important part in hydro-electric development work in Spain, and was a director of both the Sociedad Hidro-Electrica Española and the Sociedad Hidro-Electrica Iberica.

Mr. A. T. Hobbs.—The death occurred suddenly on August 17th of Mr. Alfred Thomas Hobbs. Mr. Hobbs had been engaged in home and foreign cable contracts for a number of the large cable companies. During the last three years he was mains engineer with the Northwood Electric Light & Power Co., Ltd.

Wills.—Mr. Hugh L. Williams, electrical engineer, of Worcester Park, Surrey, left £59,383 gross and £49,012 net personalty.

Mr. Joseph Furze, Tavistock, who was superintendent of the Commercial Cable Co., Liverpool, for 40 years, left £17,260 gross and £15,649 net.

The late Mr. Donald Barns Morison, J.P., who was chairman and managing director of Richardsons, Westgarth & Co., Ltd., left £81,735 gross (net personalty £76,014).

New Companies Registered.

Lee De Forest, Ltd. (207,976).—Private company. Registered August 20th. Capital, £500 in 1s. shares. Objects:—To acquire the benefit of inventions connected with radio-telephony and telegraphy and other methods of intercommunication, and apparatus, instruments, and appliances connected therewith, and to develop and work these, &c. The directors are:—Dr. Lee de Forest, Spayten, Dayvil, New York City, U.S.A.; C. F. Elwell, 60, Great Russell Street, W.C.1; H. G. Couchman, 91, St. Julians Farm Road, West Norwood, S.E.27; and Grace Gwyther, 46, Cavendish Avenue, Church End, Finchley, N.W.12. Qualification, 1 share. Remuneration as fixed by the company. Solicitors: Bartlett & Gluckstein, 199, Piccadilly, W. Registered office: 12, Craven House, Kingsway, W.C.2.

Radiophones (1925), Ltd. (207,881).—Private company. Registered August 14th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of manufacturers, merchants, commission agents, &c. The directors are:—N. Miller, 278, Kingsland Road, E.8, stock-keeper; and F. Padgham, 581, Barking Road, Plaistow, E., company secretary. Qualification (except original directors) as fixed by the board. Solicitors: C. Butcher and Simon Burns, 32, Gresham Street, E.C.2.

Anglo-Polish Chemical Syndicate, Ltd. (207,889).—Private company. Registered August 15th. Capital, £10,000 in £1 shares. Objects:—To manufacture in Poland and other countries synthetic ammonia, nitrogenous fertilisers and other chemical, agricultural, and industrial products, to acquire from the Polish and other Governments and public bodies and persons, concessions, licences, and rights for the construction and working of hydro-electric and other forms of power stations, &c. The subscribers (each with one share) are:—R. H. Palmer, Grove Hill House, Grove Park, S.E.5, clerk; L. E. Holt, 19, Addison Road, Walthamstow, E.17, clerk. The first directors are to be appointed by the subscribers. Qualification, 100 shares. Remuneration (except managing director), if any, £50 per annum, divided between them. Solicitors: Lewis & Yglesias, 6, Old Jewry, E.C.2.

Beardmore (Paisley), Ltd. (207,943).—Private company. Registered on August 17th with a nominal capital of £250,000 in £1 shares. Objects:—To adopt an agreement with Wm. Beardmore & Co., Ltd., and to carry on the business of manufacturers of, and dealers in motor-cars, vehicles and boats, aero engines, aeroplanes, motor launches and motor conveyances of every description, and parts, fittings, and accessories for the same; electricians, electrical and mechanical engineers, machinists, fitters, millwrights, founders, wire drawers, tube makers, saddlers, japanners, enamellers, electro-platers, &c. The subscribers (each with one share) are:—W. J. Newbert, 123, First Avenue, E.12, clerk; and W. C. Gibbs, 214, Victoria Road, Southend, clerk. The first directors (to number not fewer than three nor more than five) are:—Lord Invernairn of Strathnairn (chairman), V. Beardmore Stewart, and J. G. Girdwood. No share qualification required. Remuneration (except nominee of H.M. Treasury), £250 each per annum; of such nominee, such sum as may be approved by the Treasury. Solicitors: Nicholson, Graham & Jones, 19-21, Moorgate, E.C. Registered office: 36, Victoria Street, S.W.1.

Peerless Productions, Ltd. (207,879).—Private company. Registered August 14th. Capital, £500 in £1 shares. Objects:—To carry on the business of manufacturers of electrical and medical apparatus, specialities, &c. The directors are:—C. H. Rapinet, 148, Queen's Road, Bayswater, W.2, clerk; and R. J. Phillips, "San Marino," Upper Tooting Park, S.W.17. Remuneration, £225 each per annum (except managing director). Registered office: Peerless Works, Cowthorpe Road, Wandsworth Road, S.W.8.

Wenham Lighting Corporation, Ltd. (207,913).—Private company. Registered August 15th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of an electrical and gas engineer and factor hitherto carried on by W. R. Grigsby at 184, Gray's Inn Road, W.C.1. The directors are:—W. H. Lovatt, 21, Ironmonger Lane, E.C.2; and W. R. Grigsby, 1, Observatory Road, East Sheen, S.W.14. Qualification, 5 shares. Solicitors: Stone, Morris & Stone, 41, Moorgate, E.C.2. Registered office: 21, Ironmonger Lane, E.C.

Walbar Engineering Co., Ltd. (207,912).—Private company. Registered August 15th. Capital, £1,000 in £1 shares (250 preference and 750 ordinary). Objects:—To carry on the business of motor and electrical engineers, merchants and brokers, &c. The permanent directors are:—J. Gratrix, 93, Birch Road, Berry Brow, Huddersfield; W. A. Lord, 162, Woodside Road, Lockwood, Huddersfield; J. B. Littlewood, 1, Park Gate, Berry Brow, Huddersfield; and H. Langley, address not stated. Qualification, 50 shares.

Stuart Electrical Co., Ltd. (207,910).—Private company. Registered August 15th. Capital, £4,000 in £1 shares. Objects:—To carry on the business of electrical engineers and contractors, manufacturers of, and dealers in electrical, magnetic, galvanic, and other apparatus, mechanical engineers, &c. The subscribers (each with one share) are:—G. W. Wood, 45, Newman Road, Erdington, Birmingham, electrical contractor and engineer; Mrs. E. L. Wood, 45, Newman Road, Erdington, Birmingham. G. W. Wood shall be permanent governing director, so long as he holds 500 ordinary shares, at a salary of £300 per annum. Solicitors: C. F. Monk, 37, Waterloo Street, Birmingham. Registered office: Union Chambers, Temple Row, Birmingham.

Official Returns of Electrical Companies.

Madras Electric Tramways (1904), Ltd. (80,361).—Capital, £200,000 in £1 shares (125,000 preference and 75,000 ordinary). Return dated May 26th, 1925. 100,000 preference and 75,000 ordinary shares taken up. £85,240 paid on 67,500 preference and 17,740 ordinary shares. £89,760 considered as paid on 32,500 preference and 57,260 ordinary shares. Mortgages and charges, £130,000

Orford Electric Light and Power Co., Ltd.—Issue on July 20th, 1925, of £100 debentures, part of a series already registered.

W. H. A. Robertson & Co., Ltd. (95,906).—Return dated July 13th, 1925. Capital, £36,000 in 600 ordinary and 3,000 preference shares of £10 each. 600 ordinary and 2,180 preference shares taken up. £5 per share called up on 430 preference and £10 per share on 1,750 preference and 600 ordinary shares. £25,650 paid. Mortgages and charges, nil.

A. Hirst & Son, Ltd. (57,889).—Return dated May 28th, 1925. Capital, £20,000 in 100 preference and 1,900 ordinary shares of £10 each. 100 preference and 1,220 ordinary shares taken up. £2,200 paid on 100 preference and 120 ordinary shares. £11,000 considered as paid on the remainder. Mortgages and charges, nil.

British Electric Transformer Co., Ltd. (76,351).—Return dated April 21st, 1925. Capital, £1,000,000 in 300,000 preference and 700,000 ordinary shares of £1 each. 300,000 preference and 325,000 ordinary shares taken up. £539,821 paid on 290,776 preference and 249,045 ordinary shares. £85,179 considered as paid on the remainder. Mortgages and charges, £20,000.

United Electric Tramways of Montevideo, Ltd. (80,456).—Return dated July 2nd, 1925. Capital, £1,000,000 in 100,000 preference and 100,000 ordinary shares of £5 each. All shares taken up. £295,105 paid on 26,221 preference and 32,800 ordinary shares. £704,895 considered as paid on 73,779 preference and 67,200 ordinary shares. Mortgages and charges, £901,621.

Ever-Ready Co. (Great Britain), Ltd. (167,171).—pital, £500,000 in £1 shares (200,000 preference and 300,000 ordinary). nual return dated June 11th, 1925. 165,892 preference and 249,000 ordinary res taken up. £75,892 paid on 63,892 preference and 12,000 ordinary res. £339,000 considered as paid on the remainder. Mortgages and arges, nil. A further 34,108 preference shares were allotted, payable in sh and fully called up on June 16th, 1925.

Tingey Wireless, Ltd.—F. W. Lord, 37, Walbrook, E.C.4, sed to act as receiver or manager on April 21st, 1925. (Notice filed gust 15th, 1925.)

Allen West & Co., Ltd. (108,870).—Return dated March h, 1925. Capital, £150,000 in £1 shares. 141,724 shares taken up. 41,724 paid. Mortgages and charges, £60,000.

Cawnpore Electric Supply Corporation, Ltd. (84,233).—pital, £547,986 in £1 shares (160,000 preference and 387,986 ordinary). turn dated June 8th, 1925. 160,000 preference and 160,000 ordinary shares en up. £245,000 paid on 160,000 preference and 85,000 ordinary shares. ,000 considered as paid on 75,000 ordinary shares. Mortgages and charges, 0,580.

Llangollen and District Electric Light and Power Co., d. (75,384).—Capital, £6,000 in 3,500 ordinary and 2,500 ference shares of £1 each. Return dated July 16th, 1925. 1,754 ordinary 360 preference shares taken up. £2,110 15s. paid, leaving £3 5s. in ears. Mortgages and charges, £3,500.

Melton Mowbray Electric Light Co., Ltd. (53,018).—Re-n dated April 9th, 1925. Capital at date of return, £40,000 in £5 shares, issued and fully paid. Mortgages and charges, £19,100. (On April 30th, 5, the company increased its nominal capital to £60,000 in £1 shares.)

Indo-European Telegraph Co., Ltd. (3,953).—Capital, 0,000 in £25 shares. Return dated May 7th, 1925. 17,000 shares taken £425,000 paid. Mortgages and charges, nil.

Eastern Extension, Australasia and China Telegraph ., Ltd. (7,224).—Capital, £4,000,000 in £10 shares. Re-n dated June 25th, 1925. All shares taken up. £4,000,000 paid. Mort-ges and charges, £752,400.

Pritchett & Gold & E.P.S. Co., Ltd. (166,503).—Capital, 0,000 in £1 shares (100,000 preference and 100,000 ordinary). Return ed April 16th, 1925. 87,267 preference and 84,846 ordinary shares taken £2,507 paid on 2,500 preference and 7 ordinary shares. £169,606 con-red as paid on 84,767 preference and 84,839 ordinary shares. Mortgages l charges, nil.

Standard Electric Co., Ltd. (68,643).—Return dated June h, 1925. Capital, £10,000 in 5,000 preference and 5,000 ordinary shares £1 each. 3,077 preference and 5,000 ordinary shares taken up. £1 per re called up on 4,177 shares and 10s. per share on 400 shares. £3,700 sidered as paid, being £1 per share on 3,500 and 10s. per share on 400 res. Mortgages and charges, £300.

Hooper's Telegraph and India Rubber Works, Ltd. 947).—Return dated June 29th, 1925. Capital, £50,000 in 1,000 preference 4,000 ordinary shares of £10 each. All shares taken up. £40,000 paid the ordinary; £10,000 considered as paid on the preference shares. rtgages and charges, nil.

Dynamic Electrical Co., Ltd. (104,436).—Capital, £10,000 £1 shares. Return dated December 31st, 1924 (filed March 17th, 1925). hares taken up. £7 paid. Mortgages and charges, nil.

Jacqueline, Ltd.—Particulars filed of £2,000 debentures norised July 20th, 1925, charged on the company's undertaking and pro-y, present and future, including uncalled capital, the amount of the ent issue being £1,200.

W. A. Saxby & Co., Ltd.—W. A. Saxby, The Greenway, itton Road, Hounslow, was appointed receiver and manager on August , 1925, under powers contained in debentures dated April 17th, 1925.

Edward Deane & Beal, Ltd. (92,885).—Capital, £60,000 £1 shares (20,000 preference and 40,000 ordinary). Return dated December , 1924 (filed June 11th, 1925). 20,000 preference and 20,009 ordinary es taken up. £9 paid. £40,000 considered as paid. Mortgages and ges, £7,500.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Scarborough Electric Supply Co., Ltd.

The report for 1924, which is to be presented at next Monday's meeting, says that the directors have been in negotiation with the Scarborough Corporation for the purchase by the latter of the whole of the undertaking, which purchase, in any case, the Corporation has power to effect compulsorily in February next year. The directors have, subject to the shareholders' approval, entered into an agreement for the sale of the undertaking to the Corporation at a price to be fixed by arbitration. The shareholders are to be asked to confirm this agreement. The total profit for the past year was £22,878, and to this are added £240 brought forward, and £50 bank interest, making a total of £31,169. Out of this sum the directors have written off £3,619, the balance of the expenses of the debenture issue, and £190 from the apparatus on hire account; debenture interest absorbs £3,600; and £3,000 is placed to reserve, leaving £20,760. A dividend of 6 per cent., free of tax, was paid during the year; it is not proposed to pay a final dividend but to carry forward a balance of £13,018.

Mexico Tramways Co.—The gross earnings for 1924 amounted to $11,692,370 (Mex.), as compared with $1,226,830 in 1923, and the net earnings fell by $991,469 to $154,580. The continued decline in the earnings is attributed to the growing competition of omnibuses and other forms of transport. After meeting general expenses, bond interest and sinking fund allocations, there was a deficit of $543,368, as against $2,950 in 1923, and the 6 per cent. mortgage bonds again receive no interest.

Adelaide Electric Supply Co., Ltd.—The dividend for the half-year ending August 31st has been declared on the 6 per cent. cumulative preference shares.

Mexican Light & Power Co.—The report for 1924 records gross earnings of $15,864,260 (Mex.), as against $14,827,943 in the preceding year. The net earnings fell from $8,309,162 to $7,941,787, due to the larger provision for depreciation. After providing for general expenses and bond interest there is a balance of $2,593,070, which has been contributed to capital expenditure. There is thus again no surplus for the payment of interest on the 6 per cent. income bonds.

Sevenoaks and District Electricity Co., Ltd.—Last week the company published particulars, for public information only, of its capital and undertaking. The authorised capital is £54,948, divided into 89,792 8 per cent. cumulative preference shares and 20,104 ordinary shares of 10s. each, and there are debentures amounting to £49,850, which are convertible at par into preference or ordinary shares. It is proposed to recommend that the shares be converted into £1 shares, the holders receiving one new share for each two old shares.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Sevenoaks and District Electricity Co.—20,104 ordinary shares of 10s. each, fully paid, Nos. 1 to 20,104; 38,200 8 per cent. cumulative preference shares of 10s. each, fully paid, Nos. 1,593 to 39,792; 1,592 new 8 per cent. cumulative preference shares of 10s. each, fully paid, Nos. 1 to 1,592; 29,000 new 8 per cent. cumulative preference shares of 10s. each, 2s. 6d. paid, Nos. 39,793 to 68,792.

Aberdeen Suburban Tramways Co.—There was a profit of £1,937 on working during the six months ended July 31st, and the balance at credit of the profit and loss account is £6,917. It is proposed to transfer £1,500 to the renewal and depreciation account, to pay a dividend at the rate of 7 per cent. for the past year, and, after paying directors' fees, to carry forward a balance of £3,130.

International Telephone & Telegraph Co., Ltd.—It was announced in our last issue that this company had acquired the foreign subsidiary of the Western Electric Co. (U.S.A.). To enable this to be carried out the company is issuing 5½ per cent. convertible debentures, maturing in 1945, at 99 per cent., to the extent of $25 million.

Calgary Power Co.—The accounts for the last financial year show a net profit of $158,342, an increase of $38,632 as compared with the previous year's profit. The increase is attributed to the operation of the new contract with the City of Calgary.

Pinchin, Johnson & Co., Ltd.—The directors report that the results of the past half-year (to June 30th) were so satisfactory that they are able to pay a dividend of 10 per cent. (actual) on the ordinary shares as compared with 8 per cent. for the first half of 1924.

General Electric Co. (U.S.A.).—It is announced that the whole of the issue of 5 per cent. gold debentures maturing normally in September, 1952, are to be redeemed on September 1st, at 107½ per cent., together with accrued interest.

Tilling-Stevens Motors, Ltd.—The directors have given notice that all outstanding 5 per cent. 5-year notes are to be redeemed on August 31st in accordance with the terms of issue.

German Company.—The *Continental Company for Electrical Undertakings*, Nuremberg, reports a net profit of 319,573 marks for the year 1924-25, but no ordinary dividend is to be paid.

Southern Brazil Electric Co., Ltd.—The interest coupon due on January 1st, 1925, of the 6 per cent. mortgage debentures is being paid.

Canadian General Electric Co.—A dividend at the rate of 7 per cent. per annum has been declared on the preference stock for the quarter ending September 30th.

Victoria Falls & Transvaal Power Co., Ltd.—The company reports that the net earnings for the second quarter of the year amounted to £242,785 before providing for taxation.

Melbourne Electric Supply Co., Ltd.—The dividend for the six months ending August 31st has been declared on the 8 per cent. first cumulative preference shares.

Crossley Bros., Ltd.—An interim dividend of 3½ per cent. has been declared on the preference shares.

Stocks and Shares.

Monday Evening.

Until the Bank rate comes down—as it may do on the Thursday in this week—to 4 per cent., the Stock Exchange markets will keep in mind the probable reduction as a bull point for all the investment markets. Prices of sound securities are firm, and the tendency is for values to advance. In such ordinary shares as those, for example, of the cable equipment group, prices continue to make headway. Amongst electricity supply shares, a sudden spurt in County of London ordinary served to enliven the list. In foreign issues, Anglo-Argentine Tramways and Brazilian Tractions stand out with noticeable improvement.

The rise in County of London shares carried the price to 61s. before a setback occurred to 58s. 9d., the latter being

6s. 6d. higher on the week. Rumours of a possible bonus distribution of shares led to the jump in the price. Readers of this column have understood for some time past that the London undertakings are likely to capitalise their reserves and to pay these over to their proprietors, in the shape of shares. Study of the companies' balance-sheets will demonstrate the probability of such a distribution being made, but any conclusions drawn from such examination need to be salted with caution. They may easily prove misleading if handled with too airy optimism. County new preference are 1s. 7½d. premium.

Charing Cross ordinary are 1/16th higher at 48s. 9d. There is an impression that the "City" portion of the Charing Cross Company may be treated a little differently, for the time being, from other members of the London group in the matter of its capital reorganisation. City of London shares at 47s. are also 1/16th up. Newcastle-on-Tyne ordinary and first preference gained sixpence apiece. Bournemouth and Poole, at 3, have put on half-a-crown. Electric Supply Corporation went back to 31s. 3d.; London Electrics are 1s. higher at 34s. 6d.

Shares in the provincial power companies are being watched by people who think that industrial prospects point to early extensions of power developments, and that, in any new issues of capital made to cope with these, the existing shareholders will be given the opportunity for subscribing to shares at bonus prices; that is, at prices lower than those which rule in the market for the present shares. This is the reason why the latter stand at figures which seem hardly justified by the dividends now being paid.

Looking well ahead, some people anticipate the time when there will be a broad and an active market in the shares of the two big concerns that may spring from the amalgamation of to-day's electricity supply concerns into two comprehensive and important undertakings that will control the supply of current and power to London and the Home Counties. Dealings, it may be re-affirmed, have recently started in the new 7 per cent. preference shares of the Shropshire, Worcestershire, and Staffordshire Electricity Co., these shares being obtainable at 21s. 4½d., free of stamp and fee. A full dividend is due next month, and the yield on the money comes to £5 12s. 6d. per cent. On the basis of last year's profits, the dividend is covered 5½ times over.

The investor may be interested to know that a modest amount is available of the Yorkshire (West Riding) Electric Tramways 4½ per cent. first debenture stock at 78¾, January and July interest. The return is £5 14s. 6d. per cent. at this price. Redemption may be effected any time at the company's option at 105, and the interest-service is well covered.

Anglo-Argentine Tramways preference are both higher at the common price of 3¼. The 5 per cent. debenture gained 2, at 73½. If the Municipality of Buenos Aires accepts its own Committee's recommendation to adopt the Anglo-Argentine Tramways scheme for subway construction, in preference to that submitted by an American firm, this would put an end to the friction which has existed so long between the company and the Buenos Aires Council. Hopes of this materialising are responsible for the better prices now established in the company's issues. Brazilian Tractions at 66 are 2½ up since a week ago, and stand a little higher than the price of the shares on the eve of the war. Expectation looks, here, for a rise to 5 per cent. in the dividend, as already indicated.

The annual reports of the Mexico Tramways and the Mexican Light and Power Companies have now come from Toronto. From these it is evident that settlement in Mexico is still to seek. Both companies are making moderate progress in the face of considerable difficulty. Reluctance to meet their obligations on the part of municipal debtors is still manifest. Labour claims constitute a handicap upon profitable working. Nevertheless, the companies "keep on keepin' on" with a courage and determination that can hardly fail of reward in the future. The only alteration in the prices is a loss of ½, to 62, in Mexico Tramways 5 per cent. bonds. Para Electric Railway first debenture stock has risen to 44½ in sympathy with the rise in Brazilian Tractions, whose preferred shares are also higher at 68.

Home Railway stocks show little change. Metropolitans rose a point to 68½. Underground £10 shares eased off to 2⅜. British Electric Traction ordinary and preference are better at 113 and 105, respectively.

Indo-Europeans at 42½ have gained 20s., and Great Northerns at 31½ are a fraction up. The Eastern Division has not moved. Wireless shares are equally tranquil. Construction and manufacturing shares are again stronger. The feature is a 3s. rise in India Rubber shares to 22s. 6d., upon prophecies of a 7½ per cent. dividend. The company is at present paying 5 per cent. General Electrics gained a florin at 26s. Siemens are better at 30s., so are British Aluminiums at 3⅓. Callenders, Henleys, and British Insulated maintain their previously advanced prices, and the market, throughout, is a good one. Iron, steel, and engineering shares are dull; Babcocks eased off to 2 9/16ths. For this, the labour situation at home affords the explanation. People are growing weary of their shares; they are selling them to put the money into more popular areas, such, for example, as the rubber market, where prices are better upon the persistent buying of the good-class shares. Automatic Telephones keep steady at 2 1/16th. International Telephones put on several dollars upon the acquisition from the Western Electric Co. of its subsidiary, the International Western Electric Co.

Share List of Electrical Companies

Home Electricity Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Aug. 24, 1925.	Rise or fall.	Yield p.c.
Bournemouth and Poole	1	13	14	3xd	+ ⅛	4 13
Brompton Ordinary	1	10	10	1⅝	—	*5 14
Charing Cross Ordinary	1	14½	15	48/9xd	+ 1/16	6 8
do. do. 4½ Pref	1	4½	4½	17/-	—	5 6
Chelsea	1	12	12	1⅝	—	6 8
City of London	1	15	15	47/-	+ 1/16	6 7
do. do. 6% Pref.	1	6	6	23/-	—	5 4
Clyde Valley	1	8	8	29/6	—fd.	5 8
County of London	1	15	15	58/9	+ 6/6	5 2
do. do. 6% Pref.	1	6	6	2°/-	—	5 4
Edmundson's Ordinary	1	7	7	21/-	+6d.	6 13
do. 7% Pref.	1	6	7	21/6	—	6 10
Elec. Supply Corporation	1	10	10	31/3	—2/-	6 8
Kensington Ordinary	5	14	15	12⅝	+ ⅛	5 18
Lancs. Light and Power	1	7½	7½	25/6	—	5 17
London Electric	1	10	10	34/6	+1/-	5 16
do. do. 6% Pref	5	6	6	5½	—	5 7 1
Metropolitan	1	10	11	37/-	—	5 19
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 1
Midland Counties	1	5½	6	23/3	—	5 4
Newcastle-on-Tyne Ordinary	1	6	7	22/9	+fd.	6 3
do. 5% Pref.	1	5	5	18/9	+6d.	5 6
do. 7% Pref.	1	7	7	24/6	—	5 14
Notting Hill 6% Pref.	10	6	6	£½	—	6 6
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9
St. James' and Pall Mall	5	17½	17½	14xd	—	6 5
South London	1	15	15	2½	—	6 0
South Metropolitan Pref.	1	7	7	1½	—	5 12
Urban Ordinary	1	4	4	17/-	—	4 14
do. 6% Pref.	1	6	6	19/6	—	6 3
Westminster Ordinary	1	15	15	43/6xd	—	6 18
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	+6d.	7 10
Yorkshire Elec.	1	8	8	29/-	—	5 10

Home Rails.

Central London Ord. Assented	Stock	4	4	68	—	5 17
Metropolitan	,,	4	5	68½xd	+1	7 6
do. District	,,	3½	3½	44½	—	7 17
Underground Electric Ordinary	10	Nil	Nil	2⅜	— ⅛	Nil
do. do. "A"	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds	6	6	6	98	—	*6 2

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	103½	—	5 15 1
do. Def.	,,	1½	1½	24	—	6 5
Automatic Telephone	1	3	6	2 1/16	—	2 18
Chili Telephone	5	6	5	5½	+ ⅛	*4 11
Cuba Sub. Ord.	10	5	5	6⅜	—	7 8
Eastern Extension	10	10	10	17½	—	*5 15 1
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 15 1
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 14
do. do. Pref.	10	6	6	11	—	5 9
Great Northern Tel.	10	22	22	31½	+ ½	6 19
Indo-European	25	7	8½	42½	+1	*5 0
Marconi	1	10	10	1½	— 1/16	8 0
Marconi Marine	1	10	7½	17/6	—	8 11
Oriental Telephone Ord.	1	12	12	2⅜	—	*5 12 1
United R. Plate Tel.	5	8	8	7⅜	—	5 8
Western Telegraph	10	10	10	16½	—	*6 3

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	3¼	+ 1/16	8 9
do. do. 2nd Pref.	5	6	6	3½	+ 1/16	9 4
do. do. 5% Deb.	Stock	5	5	73½	+2	6 16
British Electric Traction Ord.	,,	6	6	113	+1	5 6
do. do. 6% Pref.	,,	6	6	105	+1	5 14
Brazil Traction	100	4	4	66¼	+2¼	6 1
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	88½	—	5 11
do. do. Preferred	,,	96/-	96/-	85½	+1	*5 12
do. do. Deferred	,,	129/5	129/5	106	—	*6 2
do. do. Deb.	,,	4½	4½	77½	—	5 9
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8
Mexico Trams. 5% Bonds	—	5	5	62	— ½	8 1
Mexican Light Common	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	56	—	Nil
do. 1st Bonds	—	5	5	61½	—	8 2
Yorkshire (West Riding)	1	5	—	17/6	—	5 14

Manufacturing Companies.

Babcock & Wilcox	1	12	12	2 9/16	—9d.	*4 13
British Aluminium Ord.	1	5	10	31/3	+6d.	6 8
British Elec. Transformer Pref.	1	Nil	7	17/6	—	... ...
British Insulated Ord.	1	15	15	3¼	—	4 12
Brush Ord.	1	10	10	1⅛	—	8 17 1
Callenders	1	15	15	3⅜	—	4 9
do. 6½% Pref.	1	6½	6½	23/9	—	5 9
Crompton Ord.	1	Nil	Nil	⅝	—	... ...
Edison-Swan	4/-	10	10	7/6	—	5 2
do. 5% Deb.	Stock	5	5	80½	—	6 4
Electric Construction	1	10	10	30/6	—	6 11
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0
English Electric	1	5	5	18/9	+1/-	5 6
do. do. Pref.	1	6	6	20/6	—	5 17
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10
do. Ord.	1	5	7½	26/-	+2/-	5 15
Henley	1	15	16	3¼	—	4 18
do. 4½% Pref.	5	4½	4½	4½	—	5 6
India-Rubber	1	5	5	22/6	+3/-	*4
Johnson & Phillips	1	10	10	2⅜	+ ⅛	4 9
Met-Vickers, Ord.	1	8	8	24/6	—	6 10
do. Pref.	2	8	8	2⅜	—	6 14
Siemens Ord.	1	—	7½	1½	+ 1/16	5 0
Telegraph Construction	12	20	20	26½	—	4 10

* Dividends paid free of Income Tax.

Electrical Accidents in Mines.

The Report of H.M. Electrical Inspector of Mines for the Year 1924.

As was the case for the year 1923, the report of H.M. Electrical Inspector of Mines for 1924* has been issued as a separate publication. An abstract of its contents is given below.

During the year the British Engineering Standards Association was requested by the Mining Association to undertake the preparation of specifications for such colliery requisites as were amenable to standardisation. A representative Sectional Committee was set up accordingly to organise and direct the work, and Regional Committees were formed with a common and definite programme for consideration. This preliminary investigation did not embrace electrical equipment, but one of the Regional Committees has already detailed a sub-committee to consider and report what components of the electrical installation may be standardised with advantage. Further progress in this direction may be expected during 1925.

During the past year the use of electrical energy increased by 117,758 h.p., making a total of 1,481,932 h.p. It is regrettable that there were again no fewer than 14 fatal accidents due directly or indirectly to the use of electricity. In 12 instances one life was lost in each case; there was one double fatality from electric shock, and in one of the two instances where gas was ignited four lives were lost, making in all a total of 18 deaths. With one exception all these accidents occurred below ground. Thirteen lives were lost by electric shock and five deaths were due to ignitions of gas. All occurred at coal mines.

Summarised Account of Electrical Accidents Resulting in Loss of Life during 1924.

1. *New London Colliery, Notts.* January 24th.—Deceased, a coal-cutter machine man, received a fatal shock from the plug of the trailing cable. It was found that the earthing conductor in the cable had been pulled out of its terminal, while one of the live conductors was also detached from its terminal and was touching the metal plug case so that this was "alive." The system was 3-phase at 500 volts, and the neutral point was earthed.

2. *Bowhill Colliery, No. 1 Pit, Fife.* April 17th.—Deceased, a miner, received an electric shock during an attempt to free an electric coal-cutting machine which had become wedged between roof and floor at the face where a 19-in. seam was being worked. Subsequent examination of the machine failed to disclose a point at which the insulation had broken down, but discovered that it was not possible to screw the "earthing pin" up properly so as to make a reliable electrical connection for the earthing circuit. The plug box on the machine had been repaired at some time, and a home-made "earthing pin" had been fashioned in such wise that the shoulder of his pin would not pass through the hole in the cover plate of the plug box, with the result that it was not possible to screw this pin sufficiently far in to apply pressure to the face of the plug casing, in accordance with the original purpose of the device. The system was 3-phase, 500 V, with free neutral.

3. *Cowdenbeath Colliery, No. 7 Pit.* April 17th.—Deceased was in charge of a coal-cutting machine and received a shock during an attempt against orders to repair a trailing cable and plug. His death was due to his ignorance, and followed an attempt to remove a similar plug without turning off the machine switch with which it was mechanically interlocked. The system was 3-phase at 500 V, with free neutral.

4. *Newton Cap Colliery, Durham.* May 13th.—Deceased was working a coal-cutting machine as chargeman when he received an electric shock from the machine. It was found that the earthing conductor in the trailing cable had been pulled out of its terminal, and that there was another defect, with regard to one of the live conductors, so that the machine frame ceased to be earthed and became charged electrically. The system was 650 V, 3-phase, with free neutral.

5. *Bridgewater No. 3 Pit, Lancashire.* May 30th.—Deceased was employed as a haulage attendant and was found unconscious near an open-type liquid controller. He had failed to turn off the main switch in the stator circuit when shutting down the motor, so that, although the motor was not running, the rotor circuit was energised inductively. A test with a voltmeter showed that the open-circuit rotor pressure was 400 volts. One slip ring was connected to the frame of the liquid controller and the other two slip rings to two insulated contact plates mounted on the two sides of the controller drum.

6. *Hartley Bank Colliery, Yorks.* May 23rd.—Six men working with, or in the vicinity of, an electrical coal-cutting machine, suffered serious burns, to which four of them succumbed, as a result of the ignition of firedamp attributable to open sparking at the reversing switch of the machine. It was found that one set screw was missing out of four intended for securing the base of the plug box to the side of the reversing switch box, so that a circular opening about 7/16 in. in diameter was left in the switch box permitting the entry of gas and the emission of flame.

*Stationery Office. Price 6d.

7. *Newbiggin Colliery, Northumberland.* July 23rd.—Deceased, employed as a pony driver, while waiting at the bottom of a dilly, raised his arms and took hold with both hands of a steel roof girder which was "alive" at the moment, owing to a defect of insulation in an electric light fitting. Investigation showed that joints had been made in the wiring of the lamp fitting and had been insulated with black tape, and that there had been a leakage of current between one of the conductors and the metal frame of the lamp fitting, which had burned a hole through the tape.

8. *Penrhiwceiber Navigation Colliery, No. 1 Pit, Glamorgan.* August 2nd.—Deceased, employed as an electrician, had been engaged during the preceding day in making a joint in a 3-core wire-armoured high-pressure cable. The following morning deceased, with three other electrical workmen, returned to the place to complete his work, and while they were otherwise engaged in the vicinity he opened the box and began to remove the temporary insulating tape without first seeing that the pressure had been cut off from the cable, with the result that he received a shock which proved fatal immediately. The system was 3-phase at 2,200 volts, with free neutral.

9. *Gwaunclawdd Colliery, Brecon.* August 18th.—Two men, a fireman and a haulier, were burned as the result of an ignition of methane attributable to open sparking at the commutator of a direct-current motor used for driving a pump, and the haulier died. Another fireman, who entered the district to investigate after the occurrence, was overcome by afterdamp, but was rescued and revived. The motor was of the totally-enclosed type, *i.e.*, the enclosure was intended to be such as to prevent free circulation of air between the inside and outside of the case, but not such as to be termed airtight.

10. *Lady Helen Colliery, Fife.* October 2nd.—Two coal-cutting machine men were killed by electric shock in a place which was 2 ft. 6 in. high while removing a sheet of corrugated iron, 8 ft. long by 2 ft. 3 in. wide, by sliding it on one long edge over the live trailing cable, between the machine and the props, in order to bring it into the road head. The electrical system was 3-phase at 500 V, the neutral point being earthed through a limiting resistance of 10 ohms. The accident was due to the ignorance or recklessness of the men, who should have switched off at the gate-end box and moved the trailing cable out of harm's way before withdrawing the iron sheet.

11. *Risehow Colliery, Cumberland.* October 29th.—Deceased, employed as a "trailer," was endeavouring, with the assistance of another, to replace a derailed full tub, and took hold of a trailing cable that was suspended by the side of the road. The insulation of the cable was defective, and he received a severe shock. The system was 3-phase at 500-550 V, the neutral point being free.

12. *Milfraen Pit, Monmouth.* November 27th.—Deceased, employed as a pump attendant, was found unconscious with one hand on the control switch of the pump motor and the other on the covering of the outgoing cable, as if he had been about to start or stop the pump. It transpired that the electrical staff had recently been at work upon this pump motor and had removed the slip ring control and had substituted direct switching of the stator circuit on to the line. The system was 3-phase at 500 V, the neutral point being insulated.

13. *Black Boy Mine, Durham.* December 3rd.—Two linesmen were set to work changing connections on the top of a 35-ft. "H"-type timber pole which carried two sets of 3-phase high-pressure lines. The insulators carrying the bare conductors comprising these lines were attached to three lengths of channel iron bolted horizontally to the two wooden poles. The linesmen had been cautioned and knew that these conductors were "alive," but one of them, while changing his position on the pole, attempted to pass between the line he was working upon and the live conductors, by way of the channel iron girders. It appears that he slipped and fell upon, or took hold of, one of the live conductors.

14. *Tudhoe Colliery, Durham.* December 18th.—Deceased was employed as a pump attendant below ground, and he appears to have opened the locked door of a high-pressure electric switch of the cubicle type in order to point out to a lad the live bus-bars at the top of the switch where mice used to be found dead prior to the fitting of a covering plate. Unfortunately, inserting a flame safety lamp which he took from the boy the better to illuminate the place, he touched a terminal at a pressure of some 1,600 V above earth. The system was 3-phase at 2,750-3,000 V, the neutral point being earthed.

Non-fatal Electrical Accidents and Dangerous Occurrences.

During the year, 47 notices were received of non-fatal electrical accidents at the time of their occurrence and 10 further notices were received later, making a total of 57 accidents of this class. Thirty-seven of these accidents occurred below ground and 19 above ground at mines under the Coal Mines Acts and one on the surface works at a quarry. In 53 instances some personal injury was caused affecting in all 57 persons.

Included in these totals are two cases of fire below ground due to electrical causes, and three instances of explosions of switchgear, one upon the surface and two below ground. It should be observed that outbreaks of fire above ground are not included unless personal injury directly results therefrom, and that explosions of switchgear are not compulsorily reportable as such.

One case of fire underground, that at Dodworth Colliery on November 23rd, was attributed to the insulation of one of the unarmoured direct-current cables becoming defective at the point where it touched the armouring of the 3-phase cable near the shaft bottom; arcing brought about a fault in the 3-phase armoured cable which caused the 3-phase circuit-breaker to trip. The failure of insulation on one pole of the direct-current system increased the stress on the insulation of the other pole with the result that the insulation of the unarmoured cables broke down and originated the fire.

Of the fires above ground, the destruction of the generating station at Ferndale on May 29th, is of interest, it being attributed to a defect in a large oil-cooled transformer

Maintenance of Electrical Equipment.

That there is room for improvement on this score must be admitted. There would be less difficulty in meeting the demand if all mine owners and managers realised, to quote from the preface of a recently-published text-book on colliery electrical engineering, 'that the electrical engineer has developed from a mere workman into a man upon whose knowledge of his work and conscientious execution of his duties they must depend to a greater and greater extent for maintaining and increasing the output of coal under economical conditions.' Systematic thorough examination and testing, with a convenient record and ready comparison of the results together form a necessary part of organised maintenance, and it is in this respect that many collieries, especially amongst the smaller ones, are deficient.

Revision of Official Memorandum on Electricity Regulations.

When the Electricity Regulations which were made under the Coal Mines Act, 1911, were established in 1913, a Memorandum was prepared by the Departmental Committee concerned, and was issued in the early part of 1914 to explain some of the practical points arising thereon. That publication served a necessary and useful purpose, both educative and administrative, but in 1920, when the Electricity Regulations applicable above ground came into force, it was decided that the time had come to enlarge the scope and revise the text of the memorandum. The original was therefore withdrawn and the new issue substituted in April, 1921. Certain paragraphs in that issue touching the matter of open sparking, or, as it is called to-day, flame-proof enclosure, opened new horizons and gave rise to considerable discussion, especially as to the degree of responsibility for suitability of design that could reasonably be assumed by the manufacturer. In the result, attention was usefully directed to the problems of flame-proof design, and the British Engineering Standards Association proceeded with the preparation of specifications for electrical apparatus with flame-proof enclosure. Arising therefrom, the British Electrical and Allied Industries Research Association explored the ground, and an investigation was undertaken at Sheffield University under the direction of Dr. R. V. Wheeler to determine or verify the factors governing the propagation of flame within closed and partially closed vessels, so that sure means of rendering them safe for use in coal mines might be devised. The results of the research into the problem of flange protection then undertaken have been published by the Safety in Mines Research Board, as Paper No. 5, by I. C. F. Statham and R. V. Wheeler.

Plug Connections for Trailing Cables.

In his report last year the Inspector referred to the preparation of a standard specification for plugs and sockets for mining use by the British Engineering Standards Association. That specification has not yet been issued, the delay being due to the difficulty of meeting all requirements as to space limitations, but such progress has been made that he hopes to be able to report publication next year. Although the primary object of that particular specification was to secure interchangeability, advantage was taken of the opportunity thus afforded to improve the design, in the direction of greater reliability, of the contact device which is intended to secure the continuity of the earthing circuit between plug and socket. That a radical improvement in this respect was desirable and indeed long overdue must have been obvious to anyone who had opportunities of seeing the condition of unreliability to which this earthing contact is frequently reduced, in the case of many existing designs, under working conditions. There have been a number of accidents due to the unreliability of the existing type of earthing contact, and the Inspector has, in the course of his routine inspections, come across many similar instances which, fortuitously, did not result in an accident. Systematic testing of the conductivity of these earthing devices would doubtless have disclosed the weakness of design and should have resulted in improvements both in design and in maintenance. Such testing, however, has been the exception rather than the rule. Defects in the earthing circuit do not interrupt the working of the plant and do not result in an accident unless there is also a failure of insulation, so that the testing of the earthing system is too often neglected for work that is more obviously pressing.

Automatic Protection of Circuits.

Although it is still probably true that in the majority of mines overload protection alone is used, that is to say, fuses or their equivalent in circuit-breakers are relied upon as the means provided to cut off all pressure automatically from the circuit affected by a fault, yet it is encouraging to note that in an increasing number of installations it is now recognised that something more is required to reduce the danger from fire consequent upon a failure of insulation in a cable or apparatus. Fuses are inherently incapable of preventing a sustained overload unless the setting is so close to the normal current as to result in tiresome and unnecessary interruption of service. Overload trip coils in circuit-breakers are preferable because the setting is more accurate and is less open to unauthorised interference, but without the addition of controllable time-lags so as to permit of close setting, overload trips are but little better than fuses for the prevention of fire due to an electrical breakdown. The solution of this problem will probably be found in the addition of leakage-protection, implying means to ensure the automatic isolation of a faulty circuit immediately the current leaks or flows in an abnormal path. Colliery engineers are now more generally adopting leakage protection, usually in the form of core-balance with current transformers, for 3-phase systems, and it is interesting to observe that in several direct-current installations the Cousen Rosebourn system of discriminative leakage protection has been adopted with satisfactory results.

Coal-Cutting Machines.

According to the annual returns, over 30 million tons of coal were got last year by electrical coal-cutting machines, and there were in use at the end of the year 3,046 electrical coal-cutting machines of the bar, chain, and disc types, with a few rotary drills. The relatively large number of accidents that are noticed elsewhere in the report as having occurred in connection with trailing cables and plugs is in some measure an indication of the need for improvement in existing designs of plug connector. If comparison is made between the number of machines driven respectively by electricity and compressed air, but excluding from the latter the percussive machines, it will be seen that the number of electrical machines, which was 66.3 per cent. of the reduced total in 1915, represented 68.8 per cent. in 1924. Referring to the total numbers of machines of all types while bar machines have increased 67½ per cent., chain machines have increased nearly six times, and percussive drills with a few rotary heading machines, rather more than two and a-half times in number.

Metalliferous Mines and Quarries.

The history of electricity in these mines is uneventful, and there have been very few reported accidents. The chief user of electric power are tin mines in Cornwall, followed, as to the horse-power of motors installed, by the iron-ore mines of Cumberland and the slate mines of North Wales.

There are no data available as to the use of electricity at quarries, but there are some considerable installations at work in particular those of the Buxton lime firms in Derbyshire. The Inspector also visited installations of some importance in connection with the Welsh granite quarries and the whinstone quarries in Ayrshire.

Conditions in the Netherlands.

Electric Lamp Works Prosperous.

Mr. R. V. Laming, O.B.E., the British Commercial Secretary at The Hague, has forwarded to the Department of Overseas Trade a report,* dated February, 1925, on the economic, financial, and industrial conditions of the Netherlands. It is stated at the beginning of the report that the worst of the effects of the war have been got over, and the general situation if not brilliant, is steadily improving, although slight relapses are sometimes felt in particular trades. The public financial situation is better than it has been for the last few years and the currency has steadily improved. About 133 million florins of fresh capital was issued during 1924. It is stated that there was a general disinclination on the part of the public to participate in purely industrial concerns without a wide margin of security, and in consequence higher premiums became necessary. Nevertheless, among the principal private issues was that of the Philips Incandescent Lamp Co. of ordinary shares of 3½ million florins at 150, and preference shares for 1,113,000 florins at 110. The incandescent electric lamp works reported a prosperous period, and at the end of the year they entered into a European combine.

Foreign Trade.

While actual figures of the electrical exports of the Netherlands during 1924 are not given, the report says that there was a larger demand for dynamos, transformers, &c., the principal

*Stationery Office, 2s. 6d. net.

rkets being Belgium and the Dutch East Indies, the latter taking increased supplies of steam boilers, steam engines, turbines. Machinery generally was exported in slightly ger quantities, chiefly to Germany and the Dutch East ies. More details are given with regard to electric lamp orts. A lowering of prices is apparent from the fact that, le the quantities were increased, the value was lower. The res were as follows:—1924: 5,013 metric tons, valued at 76,000 guilders; 1923: 4,678 tons (25,816,000 guilders). principal consumers were France, Russia, Italy, and Aus-ia.

urning to the imports of electrical goods, it is seen that many remained the principal supplier of motors, machinery apparatus, although supplies from this source were re-d during the year under review. The value of boilers im-ed increased by 1.1 million fl., Great Britain being second to Germany in importance. Larger quantities of Ger-steam engines and turbines were imported. The importa-of internal-combustion engines increased by 1,500 tons and value by 3.5 million fl., the greatest quantity coming from many and the greatest value from England. Imports of pressors, ventilators, pumps, cranes, &c., also increased. imports of insulated copper wire were practically entirely nan, and the same applied to lamps and lighting fittings. number of electric vehicles imported showed an increase, it is worthy of note that Hungary was the principal sup-r with 27, as compared with 18 from Germany.

Railways, Tramways, and Telephones.

he electrification of the railway between Leiden and The ue has been completed, but it has recently been stated electric traction on this section will not be put into ation for passenger and other traffic until the whole line rified. A number of steam tramways have been converted rified. A number of steam tramways have been converted ectric traction and others are said to be following. In the ntime, in order to compete with motor omnibuses and lorries, petrol-driven tramcars are being used on some systems. The railways and tramways have lost a certain amount of traffic to motor transport, but, although a reduction of tariffs again increased the traffic, no increase of revenue resulted. A Royal Commission on transport systems has reported that although at present motor omnibuses may be competing with, they will finally prove to be useful feeders for railways and tramways, and it has suggested legislation conducive to this end.

With the exception of Amsterdam, Rotterdam, The Hague, Arnhem, Maastricht and Enschede, the telephone system is in the hands of the postal authorities. According to the latest available figures, on January 1st, 1923, the number of instruments in use numbered 185,122, or 2.6 per 100 inhabitants, and the length of the lines to 600,000 km. or 8.5 km. per 100 inhabitants. The submarine telephone cable between England and Holland was duplicated during the year owing to the pressure of traffic. The new cable is of greater capacity and is also intended for international calls between England and Germany.

General.

At the end of 1924 a Revised Customs Duties Act became law. The original Act was introduced in 1862, but under modern conditions of trade many difficulties were experienced in working the tariff, and a complete revision in respect of technical classifications and definitions had become necessary. Speaking broadly, the general effect of the new tariff is to increase the import duty from 5 to 8 per cent. *ad valorem*.

As regards British trade, the most obvious fact is that the quality of British goods is still recognised, but prices in many cases are too high. At one time when deliveries from other countries were bad the British supplier scored, but when improvements in deliveries set in considerations of prices again weighed heaviest. Any diminution in the quality of British products would counteract the slight advantage which they hold owing to their good reputation.

Exports and Imports of Electrical Goods and Machinery in July, 1925.

Board of Trade returns for July show that there was little ge from the previous month in electrical exports and rts, so far as the totals were concerned, although there large fluctuations among the items. The export total slightly higher and the rises and falls in the items were t balanced. Submarine telegraph and telephone cable showed a big change, exports being trebled, while the st rise in value occurred in the case of telegraph and one instruments and apparatus. A large proportional ase is apparent in the figure for railway and tramway rs, and "other motors and generators" also experienced able rise. The greatest fall was one of about 25 per cent. e case of unenumerated electrical machinery, which more counterbalanced the rises in the other three items of the inery section. There were also serious decreases in the ts of batteries and accumulators, meters and instruments, ns, telegraph and telephone wires and cables (not sub-ne), and insulated wires and cables. A comparison with tatistics for July, 1924, reveals much the same position e comparison with June, 1925.

There were also a number of violent fluctuations in the import list, an outstanding example being insulated wires and cables, the imports of which were halved in value. Other notable decreases occurred in telegraph and telephone wires and cables (not submarine) and glow lamps. A number of important increases also occurred, particularly in the case of batteries and accumulators, which reached about twice the value recorded in June. An even larger proportional increase is shown against the item meters and instruments, and the unenumerated machinery and goods both reached enhanced values. The rise in the total as compared with July, 1924, is of important dimensions, and attention may be drawn to the large advance in the case of glow lamps.

The increase of £8,183 in the re-export total was mainly due to the greater values recorded for telegraph and telephone instruments, and unenumerated goods and apparatus.

The gradual augmentation of all three sections is shown in the seven-month figures which appear at the bottom of the table.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for July, 1925.	Inc. or dec. as compared with June, 1925.	Inc. or dec. as compared with July, 1924.	Electrical imports for July, 1925.	Inc. or dec. as compared with June, 1925.	Inc. or dec. as compared with July, 1924.	Electrical re-exports for July, 1925.	Inc. or dec. as compared with June, 1925.	Inc. or dec. as compared with July, 1924.
ical goods and apparatus enumerated)	£158 474	+ £15,689	— £12,601	£89,469	+ £10,122	+ £10,077	£6,757	+ £2,684	+ £1,847
ted wires and cables ...	200,764	— 36,603	— 7,171	33,066	— 32,755	— 35	1,58	— 1,388	+ 1,581
lamps	38,171	+ 12,719	13,644	39,445	— 9,917	+ 26 696	130	— 322	+ 51
mps and parts	298	— 4	— 263	279	— 53	— 802	5	— 23	— 70
ies and accumulators ...	87,775	— 20,065	+ 33,308	46 056	+ 23 368	+ 28.417	1,877	+ 294	+ 1,796
and instruments ...	20,268	— 9,358	— 21,107	28,935	+ 18 056	+ 15,319	898	+ 686	— 924
ns	900	— 1,041	— 966	6,520	- 7	— 4,350	120	— 64	— 154
lectrical Machinery—									
ical machinery (unenu-ated)	198 681	— 66 207	— 38.768	93.401	+ 13.128	+ 3 404	4.886	+ 66	— 4,066
y and tramway motors	53 864	+ 35.997	+ 2.229	—	—	—	—	—	—
motors and generators ...	183 254	+ 26.058	— 6 203	—	—	—	—	—	—
boards (not telegraph elephone)	8 1 5	+ 1,138	+ 2,443	160	+ 99	+ 148	187	+ 187	+ 185
legraph and Telephone ible and Material—									
aph and telephone wires cable (not submarine)	41.249	— 14.697	— 36.876	11.697	— 4,213	+ 3,024	318	— 149	+ 275
rine telegraph and tele-e cable	49,647	+ 33.725	+ 31,617	—	—	—	—	—	—
aph and telephone in-ments and apparatus ...	258.291	+ 37.226	+ 72,602	35.460	— 3,837	— 8,834	10,912	+ 6,212	+ 7,150
Totals	£1,299.751	+ £14,578	+ £31 888	£384 488	+ £13.481	+ £72.744	£27,671	+ £8,183	+ £7,674
ies for the seven months ended , 1925	Exports. £1,949,664			Imports. £739,712			Re-exports. £43,163		

The Automatic Disposal of Boiler-House Ash.

The Blackburn Meadows, Sheffield, Aerial Ropeway.

The aerial ropeway that was installed for the automatic disposal of the ashes from the boiler house of the Sheffield Corporation's Neepsend electricity generating station was described in our issue of April 9th, 1915. We are now able to illustrate a much more ambitious ropeway scheme, designed for the removal of the ashes from the Blackburn Meadows station.

In this case Mr. S. E. Fedden, chief electrical engineer and general manager of the Sheffield Corporation electricity undertaking, was faced with the difficulty of the disposal of the ash

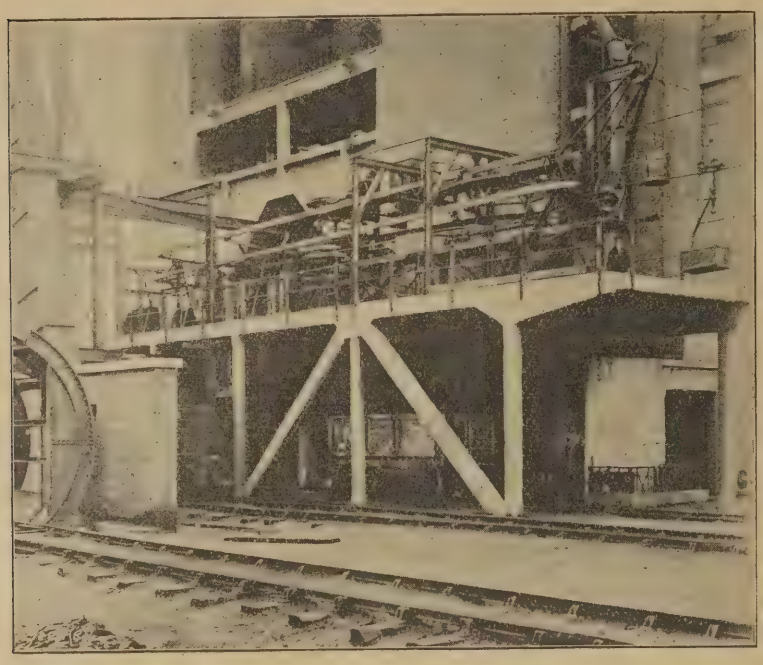


Fig. 1.—Side View of Loading, Driving, and Tension Terminal.



Fig .2—End. View of Terminal.

owing to the fact that there was no dumping room available in the immediate vicinity of the power station itself. The most convenient place was at a point about 3,000 ft. away, where a large valley offered a suitable dumping ground, but to get to this point it was necessary to cross the main line of the L.M. and S. Railway and also two highways; also in order to provide ample tipping accommodation, so as to eventually fill up the whole valley, it was found necessary to run the ropeway in a kind of circular tour at the discharging end, so as to envelop an area of about 12 acres, the whole of which would be available for tipping, giving a dumping capacity of approximately 30,000,000 cu. ft.

An aerial ropeway seemed to be the only possible form of conveyor that would meet the situation, and eventually the contract was again placed with Messrs. R. White & Sons, of Widnes. This ropeway is 7,127 ft. long overall and the capacity of the plant is 20 tons per hour in 5-cwt. net loads, with a dispatch of 80 loads per hour, or one load every three-quarter minute. The average gradient against the load is 1 12.8, whilst the steepest gradient against the load is 1 in 4.

There are a number of angle stations along the line and t whole of them are specially designed for absolute automa working, so that the carriers, whether loaded or empty, w pass through them both on the concave and convex sic without being released from the hauling rope, stopped, handled in any way. This, of course, is of great importan as it would have added very materially to the cost of t working of the plant if it had been necessary to have a m

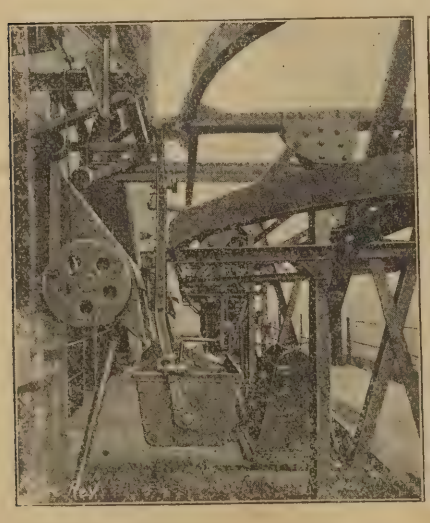


Fig. 3.—Carrier Box and Loading Shoot.

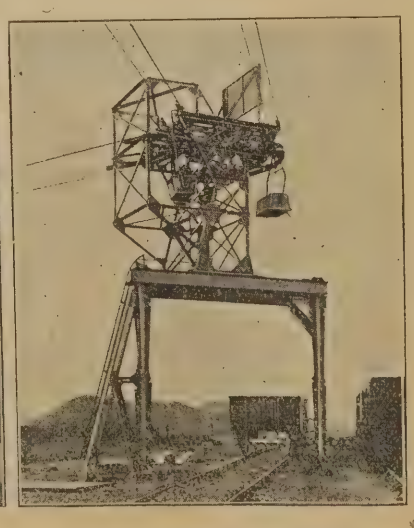


Fig. 4.—Automatic Angle Station.

in attendance at each of the five angle stations. As it is, man at the loading station is all that is required for ordinary working of the ropeway, for by means of Mes White's special system the incoming empty carriers, a being automatically released from the hauling rope on en ing the loading terminal, are run by gravity along the inclined fixed loading rail up to any particular loading point required, where each empty carrier is stopped automatic by means of special buffer gear in the right position loading. In the present case the ashes clinker are conveyed from the furnaces the boiler-house floor by means of suct plant into two overhead loading hopper about 1,730 cu. ft. total capacity, with loading shoots and valves of Messrs. Whi special construction. In addition an elec hoist takes tip wagons loaded with ashes clinker from the boiler-house floor automatically tips their contents into overhead loading hopper.

After the man in charge has filled ropeway carrier box with ashes by gra from the overhead loading bunker refe to above, simply by pulling a lever operates the loading valve, he pulls ano lever in order to release the buffer g when the loaded carrier is free to tr onwards along the inclined loading rail to the outgoing end of the terminal, wh it is automatically connected to the hau rope and starts on its forward journey the tipping ground. Each loaded carrie also tipped automatically at any requ point by means of a device which is n of a portable nature and can be move any point along the carrying rope whe is desired to discharge the loaded ca boxes on the tipping section of the rope This tipping gear is entirely self-contained, and does require any guy ropes to keep it in position.

It will be realised that a large saving is effected by suc plant in the cost of labour and attendance generally.

The carriers have all been fitted with an improved typ automatic gravity rope gripper, with a positive fric locking device which ensures a safe grip on the hau rope when the carriers are going up steep gradients, pas automatic horizontal angle stations, and also when pas

y sharp vertical angle stations at the intermediate towers. carrier sheaves, the hauling rope supporting rollers on intermediate standards, and the rope sheaves at the auto- ic angle stations, are all fitted with ball bearings, whilst shoot to form a continuous shoot right to the openings in the top of the platform, in order that whenever necessary, ashes may be loaded directly into railway wagons standing below.

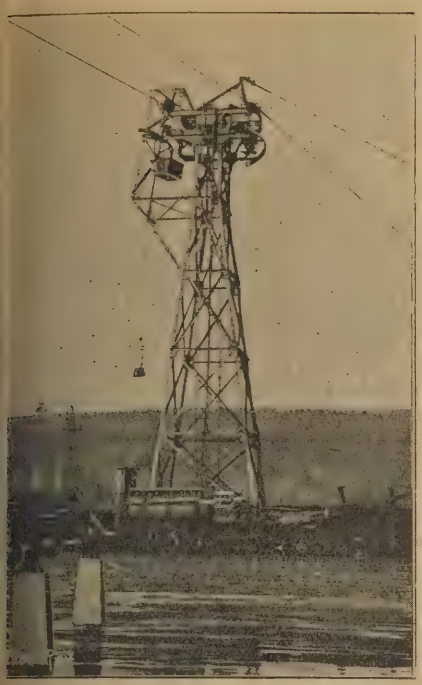
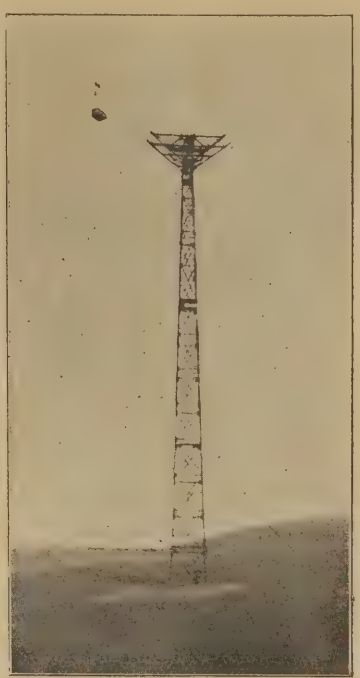


Fig. 5.—Automatic Angle Station.





Figs. 6 and 7.—Tipping Ground Angle Stations.

-coil carrying ropes are used in order to reduce the work- friction and give specially smooth and easy running. t the loading and driving station a 27-b.h.p. patent 2-speed ade induction electric motor has been installed, running

Fig. 4 illustrates the first automatic angle station from the loading terminal; it is self-contained in order to span the railway line without any guy ropes being required; it has an angle of 114 deg. and is 30 ft. high from the railway level.

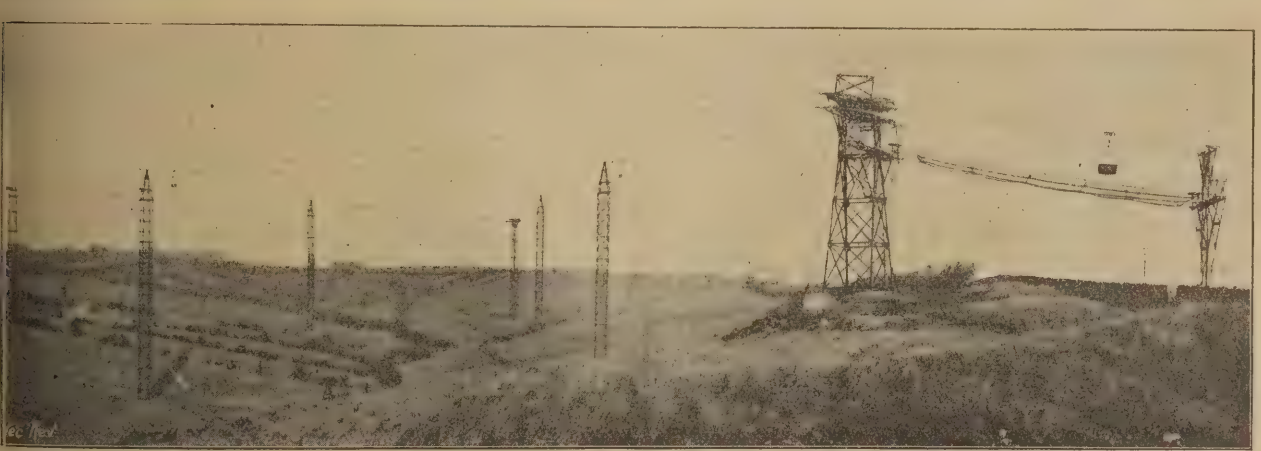


Fig. 8.—Triangular Tipping Section and Roadway Protective Netting.

ually at 720 r.p.m. with a hauling rope speed of 200 ft. per ute under ordinary working conditions but this speed can reduced to 480 r.p.m. with a hauling rope speed of 133 ft. minute when required occasionally for inspection pur- es. On the main horizontal shaft of the ring gear an automatic brake arrange- nt is fitted, so arranged that immediately ropeway is stopped the brake will come action automatically, in order to pre- t the ropeway running backwards in the of loaded carriers being left on the oing side, with only empty carrier boxes the return side.

eferring to the illustrations, fig. 1 is a eral side view of the loading, driving, tension terminal, built on the top of einforced concrete staging in order to the necessary clearance above the rail- w. Fig. 2 is an end view of the same minal with a loaded bucket just leaving loading station, and an empty bucket rning on the incoming side; this view shows the live weight arrangement pro- d to keep a constant tension on the ling rope. Fig. 3 shows a carrier and just after being loaded by gravity from shoot valve, and also the buffer gear stopping each carrier in the exact posi- required for loading. In this connection ay be mentioned that special trap doors e been provided at the top of the ferro-concrete staging, one end hinged, so that as the trap doors are lifted up free end will fit up against the lip of each fixed loading

Fig. 5 shows another automatic angle station, 40 ft. high, with an angle of 146 deg.

Fig. 9 is a side view of the protective bridge across the main line of the L.M. & S. Railway, with a clear span of 181 ft. 6 in.

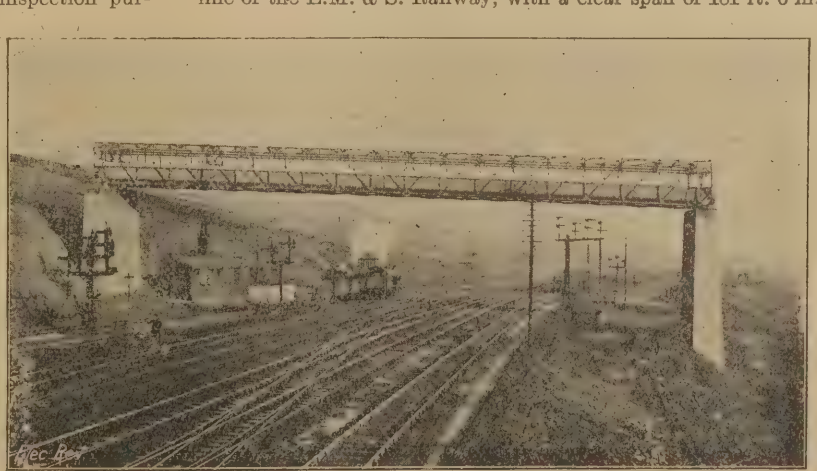


Fig. 9.—Protective Railway Bridge.

between the centres of the piers at each end. The bridge is made of steel with a wood platform and tongued and grooved boarding each side, the clear width of the bridge being 16 ft.

The two end piers are built up of bricks and are massive with heavy coping stones at the top, on which the ends of the bridge rest; the brick pier on the lower side of the railway is 59 ft. high whilst the one on the top side is 52 ft. high, measured from the top of the concrete foundations at the base. The clearance from the rail level to the underside of the bridge is about 45 ft. in the centre.

The protective netting across the new road to Rotherham has a span of 116 ft. with 20 ft. headroom from the road to the underside of the netting. The net itself is 16 ft. wide, with side nets 2 ft. 6 in. deep, reinforced with supporting wire ropes and cross spreader bars. The netting across Meadow Hall Lane has a span of 60 ft., with 20 ft. headroom, the net being 16 ft. wide with side nets. Fig. 8 is a general view of the triangular tipping section of the ropeway, and it also shows the protective netting over Meadow Hall Lane, together with the automatic angle station at the commencement of the tipping ground, which is 35 ft. high and has a divergent double angle, one of 119 deg. and the other of 155 deg., in order that each ropeway line may branch out in a different direction so as to meet the two further automat angle stations shown on this figure on the tipping groun One of them is indicated at the extreme right-hand side fig. 8 and is 100 ft. high with an agle of 86½ deg.; the oth can be seen in the far corner about the centre of fig. 8, ju beyond the two main supporting standards indicated; it 105 ft. high with an angle of 57 deg. As will be seen fr the illustration, the tipping section of the ropeway is of a t angular form with a valley in the centre, and the ordina supporting standards of square construction shown vary height from 100 to 120 ft. Fig. 6 is a near view of one of t automatic angle stations on the tipping ground, which al shows a carrier box in the act of automatically dischargi its contents, while fig. 7 is a front view of the ang station.

We understand that although this ropeway has to wo under very special and difficult conditions, owing to the nu ber of horizontal, as well as vertical, angle stations involve it has given every satisfaction in actual working and is ful up to the duty for which it was designed.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

A New Crystal Set.

The new "Cosmos" crystal receiving set to which METRO-VICK SUPPLIES, LTD., has drawn our attention has several distinctive features. Apart from its neat workmanship and appearance, the provision of an arrangement, to be seen on the left of fig. 1, for tapping off various amounts of the tuning inductance across the detector circuit is, we believe, unique and not only conduces to sensitivity, but also allows the user to vary the selectivity of the set. Fig. 1 indicates that the coils are concealed in the base of the receiver, while tuning is effected by a variable condenser. The set is fitted with terminals enabling either one or two pairs of head-telephones to be used, and two types of detector can be supplied: a dust-proof glass-covered cats'-whisker detector with split ball and socket adjustment for the contact arm, or a "permanent" detector, the former being fitted with a screw cap which allows

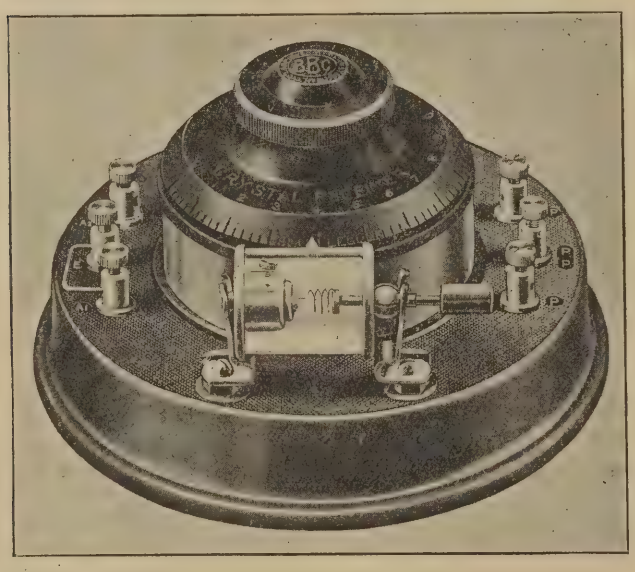


Fig. 1.—New Metro-Vick Receiver.

for any type of crystal to be used. The set may be hung on the wall if required, and a loop is provided for this purpose; when not in use the telephone can be hung on the tuning knob, thus making a neat and compact arrangement. It is claimed that good results can be obtained with this set at a distance of 75 miles or more from the Daventry high-power station, and 15 miles and over from a main station. The B.B.C. coil covers a wave-length from about 300 to 650 metres, and the long-wave coil from about 1,200 to 3,000 metres, depending upon size and height of aerial.

A Jacobean Cabinet Receiver.

A handsome product of the EDISON SWAN ELECTRIC CO., LTD., takes the form of a Jacobean cabinet radiophone loud-speaker set, which makes an excellent piece of furniture in oak with "old" brass fittings. Fig. 2 shows the arrangement as viewed from the front, the cabinet being 5 ft. high, 2 ft. 3 in. wide, and 1 ft. 7½ in. deep; the upper portion contains the receiver panel and wiring, while the lower portion is divided into three: First, there is an accessory drawer in which the tuning headphones may be kept; then there is compartment to accommodate an Ediswan "Televox" loud speaker that is adjusted by means of the usual modulat which is extended through the louvre front, which is shown i fig. 2. The loud-speaker leads are connected to the receiver b a plug and socket, an arrangement which enables the use to remove the loud-speaker for the purpose of extending th leads into an adjoining room. A recess is provided for a 6-vo filament accumulator in the loud-speaker compartment, belo which is a cupboard to house the h.p. accumulator or dry ba teries, as the case may be. The receiving circuit is of th dual type, embodying four valves and five stages: The firs valve functions as both a high- and low-frequency amplifier the second is the detector; and the third and fourth are bot

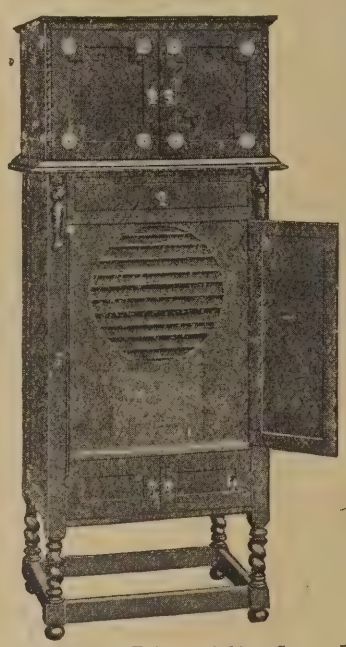


Fig. 2.—An Ediswan Cabinet Set.



Fig. 3.—A "Round" Crystal.



Fig. 4.—An Ediswan Loading Coil

l.f. amplifiers, the last being resistance-capacity coupled Capacity reaction is obtained by means of a variable condenser the plate voltage of the l.f. valves is 120 V, and a fixed bia potential is applied to the grid of the first valves and a variabl bias to the last two. Range "blocks" are provided with th instrument to cover wave-lengths of from 300 to 500 metres additional blocks for longer waves being obtainable if re quired.

A "Round" Crystal.

The varying sizes and irregularity of form in which crystals are sold often necessitate the exercise of much patience wher attempting to fit a crystal into its cup, but "standardisation" is the universal cry nowadays, and it is accordingly interest ing to note that a crystal is now being manufactured in a regular cylindrical form adaptable to practically all crystal cup in common use. The new product, a sample of which we ha received from TUNGSTALITE, LTD., is strong mechanically, and is, so far as we are aware, the only one of its kind that is made in a uniform size and shape. Fig. 3 indicates that

fit into ordinary-sized cups snugly without splintering; sensitive over its entire rounded, as well as over its cut es, and each specimen has a useful surface equal to a of three square centimetres.

A Plug-in Loading Coil.

have received from the EDISON SWAN ELECTRIC CO., LTD., ple WL 324 inductance coil of the plug-in pattern, which een designed so that existing sets can be easily converted, terposing the loading coil in the circuit, to receive broad- from the new Daventry high-power station on a wave- h of 1,600 metres. The coil sent us, fig. 4, is rigid and well ; it performed its function without trouble.

Modified "Amplion" Construction.

at is said to be an improved method of assembling plion" loud-speaker horns which are being fitted to their 4, AR19, and AR22 models, is announced by Messrs. Alfred am & Co.; these models became available to the public ily 15th. It will be observed from fig. 5 that the flare is

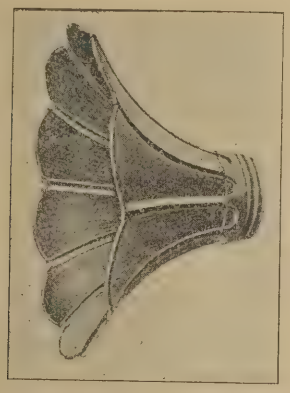


Fig. 5.—Modified "Amplion" Flare.

with a threaded metal screw which is firmly held to the conduit by a heavy rubber bush; by this means assembly ck and rigid. Also it will be noticed that the leaves of orn are united by crystalline finished metal ribs and that are similarly bound at the flare. The new method of ucting oak and mahogany horns is claimed to have d advantageous, but it will not affect the price of the ments.

The "Anvil" Coil Former.

t amateur radio-telephonists prefer to construct every- they possibly can for their sets; they will find the il" coil former, one of which has been sent us by Messrs. OOD CONCESSIONAIRES, LTD., a useful gadget that will their desire to wind coils cheaply. The ring is made of sand is fitted with a neat wooden handle, the 30 pin holes screwed; "Honeycomb," "Duolateral," and other pat- of coil may be wound on this former, which has been ionally patented.

Short-Wave Radio-Telephone Communication.

Messrs. Autoveyors' New High-frequency Relay.

the utilisation of short waves instead of waves l hundreds and thousands of metres in length hich we have been accustomed, will have a pro- effect on the art of radio communication cannot enied. Recent work with waves less than 100 in length has indicated clearly that conceptions ethods hitherto in vogue will have to be drastically l, facts which Messrs. Autoveyors, Ltd., have not been to appreciate. Under the guidance of their technical or, Mr. A. E. Chapman, they have tackled the subject fresh point of view, and attempted to take into account which seem to have been somewhat neglected, if not oked, in the past.

have announced that within the last few weeks they uccessfully completed the design of several novel devices together form what has been termed "compound apparatus. This gear is intended to be employed as a of short-wave radio-communication over long range, and mpany has applied, we understand, to the secretary of neral Post Office in London, and to the district radio isor in New York, for a concession authorising it to an ordinary commercial radio-telegraph service to traffic between this country and America. The com- main object in asking for such a concession was to by demonstration and "practical working," its claim that it is able to establish and maintain efficiently with the aid of its new apparatus constant long-range communication with extremely low power.

The term "compound focus" is used to indicate that the radiations from the transmitter will be emitted in the form of a "ray"; that is to say, the focusing will be in both the vertical and horizontal planes, not in the latter only as in the Marconi "beam" system. In order to allow for the variation in the plane of polarisation of the electromagnetic waves radiated from the transmitter during the day, we understand the receiver is to be a simple oscillator pivoted about its centre and capable of being rotated in any direction, so that its position may be changed from time to time throughout the day.

While awaiting the necessary authority to enable it to substantiate its claims in this manner, the company has partially changed its policy in that it has decided to license thermionic valve manufacturers to produce and market one of the new components embodied in the "compound focus" apparatus, *viz.*, the high-frequency relay, and thereby, through the medium of the many successful dx. experimenters in this country, if possible, to secure evidence that radio communication between any two points in the British Empire may be effected and maintained at such a low cost as to establish the claim that a charge of 2d. or 3d. per word will present adequate recompense for the provision of such a service.

Several other entirely new components are embodied in the "compound focus" apparatus, which will be placed at the disposal of the public in due course, and one of the h.f. relay models that Messrs. Autoveyors propose to market will be suitable for broadcast reception on the B.B.C. wave band, it is claimed, in conjunction with suitable loading inductance.

The three electrodes of the new h.f. relay, of which we have samples, are assembled in a small glass cylinder which is provided with an ebonite cap at each end, the caps each having three terminals; the relays are robust and their overall dimensions are 1 in. diameter and $2\frac{3}{4}$ in. in length. An unusual feature is that the relays are made positive and negative, one of each type being used in place of the common single-valve receiver. One of the several receiving circuits that may be used is reproduced in fig. 1, A and E being the aerial and earth, while the values of the coils used are marked on the diagram; B_1 and B_2 are the low- and high-pressure batteries respectively, the filament rheostats being marked R; the short straight tungsten filament F is surrounded by two concentric coils of thick wire (marked D) which are termed the "helix" and "rack" (*i.e.*, plate and grid), V+ and V− being joined as indicated in the diagram through two 0.00025 μF variable condensers C.

The filament voltage is from 1.8 to 2 V and its current 0.3 A; the helix voltage may be from 30 to 50 V, the emission at the lower voltage being stated to be 10 mA. When designing the h.f. relay an attempt was made to maintain magnetic symmetry, for it is maintained that the device functions electromagnetically in addition to electrostatically and that use has been made of phenomena differing considerably from those employed in the ordinary valve; the lengths of the arrows in the diagram are intended to represent, roughly, the augmented output that is obtainable by the use of the new component.

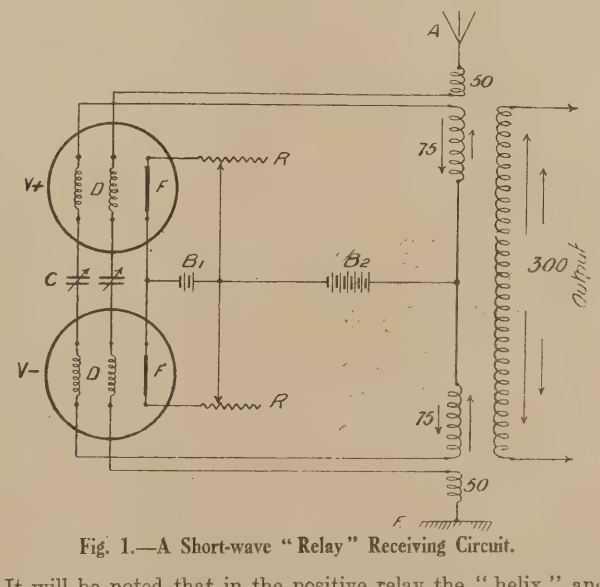


Fig. 1.—A Short-wave "Relay" Receiving Circuit.

It will be noted that in the positive relay the "helix" and "rack" are wound anti-clockwise, while in the other they are clockwise, and it is claimed that the high-frequency oscillating aerial currents which flow round the "racks" of the relays exercise an electromagnetic control on the filament emission and minimise interelectrode capacity, which is one of the chief difficulties encountered in short-wave work. Due to the reversal of the spirals in the negative relay, it is said that an increase of current in the positive relay is accompanied by a decrease in the negative one, and *vice versa*, so producing a push and pull action as indicated by the above-mentioned arrows.

Patents are pending, we understand, throughout the world, and in view of the somewhat bold claims of its inventor, it may perhaps be advisable to refrain from detailing and commenting upon the theoretical explanation of the action of the new "relay" until the specifications become available.

Reviews.

The Metallurgy of Aluminium and Aluminium Alloys. By Robert J. Anderson, B.Sc. Pp. xxxi+891. New York. Henry Carey Baird & Co., Inc. Price, 10 dollars net.

Since J. W. Richards's treatise of many years ago, little of a systematic nature has been published on aluminium from the metallurgical standpoint. The work under review enters in detail into the varied aspects of the metal and its alloys in industry, and the perusal of the volume impresses one with the advances which have taken place within recent years in this branch of metallurgical science. The whole volume bears the stamp of having been written by one who is not only fully conversant with the subject, but also possesses first-hand knowledge of the difficulties which beset the metallurgist of aluminium and its alloys.

The magnitude of the aluminium industry is shown by the fact that the world's production of the metal in 1923 amounted to 179,000 tons, 50 per cent. of which was consumed in the production of sheets, wire, and fabricated aluminium, the remainder being utilised in the manufacture of light aluminium alloys. In tonnage produced, aluminium now stands fourth among the non-ferrous metals, and it is exceeded only by copper, lead, and zinc. In nature aluminium is the most abundant of the industrial metals, being third in abundance of the elements in the earth's crusts, but in the commercial production of aluminium only two minerals are utilised, *viz.*, bauxite and cryolite; the process involves two stages, *viz.* (1) the preparation of alumina of high purity from bauxite, and (2) the electrolysis of the alumina produced in a liquid bath of cryolite and other added salts.

One of the chief difficulties in the metallurgy of aluminum lies in the fact that the metal, after being produced, cannot be refined as can copper and other of the common metals, and the purity of the metal secured by the electrolytic dissociation of alumina depends upon the purity both of the alumina and of the electrolytic bath; hence, it is necessary in the Hall and Héroult processes to use alumina as pure as possible. Aluminium electrolytic processes need essentially a source of cheap electrical energy, since an enormous amount of electricity is consumed, and all aluminium reduction plants in the world, with the exception of a few in Germany, consume energy derived from hydro-electric power plants. It is for this reason that aluminium reduction plants are normally situated within easy reach of waterfalls, steam-generated electric power being totally out of the question as a source of energy for economical aluminium production.

In view of the relative scarcity of bauxite the future growth of the aluminium industry, so far as greatly increased output of metal is concerned, depends upon two requisites, *viz.* (1) the discovery of new ores of aluminium, *i.e.*, ore that can be used as a basis for the production of aluminium by the processes at present employed; and (2) the development of methods for the treatment of ores that are not amenable to the Hall and Héroult processes, or similar reduction methods. A commercially feasible process for the production of aluminium from aluminium silicates and the common aluminium minerals is the desideratum at the present time, but while considerable experimental work has been done on this problem, no process other than the one covered by the Hall-Héroult patents is being employed to-day.

The book is divided into 19 chapters dealing with bauxite mining, the production, properties, and uses of aluminium and its alloys, melting practice, losses and defects in aluminium castings, mechanical and heat treatment, and the micrography and electroplating of aluminium. The author deals in considerable detail with the preparation of aluminium alloys, together with their rolling and other mechanical treatment. The soldering and welding of aluminium and aluminium alloys is discussed from the metallurgical standpoint. Aluminium parts can be soldered together, but not with any degree of permanence, due to the metals in the soldering alloy being electronegative to aluminium, and on contact with water, galvanic cells are set up so that the joint disintegrates by auto-corrosion. Autogenous welding by oxy-gas methods is employed extensively in the aluminium industry, for making joints of substantially pure aluminium and of aluminium alloys, and for making repairs and in salvaging castings.

An important part of the volume is the summarised statement of the aluminium productions of the various countries, markets, trade statistics and tariffs, which is remarkably comprehensive and of the greater value in that mere statistics are relieved by comments. A large amount of information is also given on the various patent aluminium alloys; this together with a most complete bibliography renders the compilation of special value.

The author being a practical metallurgist draws considerably from his own practical experience, and gives the manufacturer much valuable advice. Bearing in mind the extent and character of the literature to be dealt with, the author has been remarkably successful in bringing the subject matter up to date and compressing it into reasonable compass, and he has undoubtedly filled a hiatus in the list of books available for the technologist. The book has been edited with great care, is profusely illustrated, and is remarkably free from misprints.

A Text Book of Wireless Telegraphy and Telephony. By W. Greenwood, B.Sc.(Eng.), A.M.I.E.E., A.C.G.I. vii + 265; figs. 201. London: W. B. Clive, University Tutorial Press, Limited. Price, 5s. 6d. net.

In this book the subject is treated as a branch of electrical engineering, in much the same way as other branches of electrical technology are usually dealt with, and it is necessary therefore for the reader to be conversant with the fundamental principles of electricity. The author is careful, however, to avoid any advanced mathematical explanations in the body of the book, but includes at the end a chapter on "A few mathematical investigations," with proofs which the mathematical student is referred to in the appropriate places in the text.

This is a good arrangement, but we are in full agreement with Mr. Greenwood when he says "students of physics, whether pure or applied, cannot realise too early, that a knowledge of the rudiments of the differential and integral calculus and the methods of solution of the simpler differential equations is an essential part of their mental equipment."

The book covers the whole subject of the transmission and reception of wireless messages, the first third of the book dealing mainly with theoretical principles, and the remaining two-thirds with practical applications.

In a book of this sort, where the field is so extensive, the difficulty is to know how little can be said without omitting important matter, and the author has got over this difficulty very well by the avoidance of details combined with a free use of diagrams. The general arrangement, printing, diagrams and index are excellent, and add materially to the ease with which the subject can be studied.

The matter is well up to date, though indeed the allusion to the Imperial Wireless Chain on pages 126 and 140 might well have been omitted, as the scheme of high-power stations alluded to was abandoned a year ago. Some of the information given on important new arrangements such as that on "Mixed Valves" and the "Beam System" is very short and sketchy, but it is impossible in the limits of space available to do more than outline with many aspects of the subject, although they promise great development in the near future, in such special cases the author is always careful to refer the reader to published papers where full details can be obtained.

This is a text book which can be especially recommended to electrical engineers, potential electrical engineers, and students of physics who wish to understand the principles, and the up-to-date practice, of wireless telegraphy and telephony.

Electricity and the Structure of Matter. By L. Southerns, M.A., B.Sc. Pp. iv + 128; figs. 34. London: University Press, Humphrey Milford. Price, 2s. 6d.

The non-scientific person cannot complain of any lack of willingness on the part of physicists to interpret for him the advance of modern theories of the constitution of matter, and the volume before us, Mr. Southerns has attempted to cover a good deal of ground in a small compass, and in spite of the fact that literary excellence is sometimes sacrificed for colloquialism, the book is thoroughly readable, and should assist the non-technical reader to a general idea as to the trend of modern discoveries in molecular physics. The book commences with a historical sketch, followed by a chapter on the rudimentary principles of electricity and magnetism. The author then deals very ably with the subject of radio-activity and the structure of the atom. In this section we find a good account of some of the brilliant experimental work which has been carried out by modern physicists. Electromagnetic waves are next considered, the treatment including an account of wireless telephony that is so brief that we cannot think there are many people at all interested in physical science who will derive much instruction from it. A short chapter on the structure of crystals concludes the book. There is also an index, and a glossary of technical terms.

Intending purchasers of this book, who are electrical engineers, should be warned that a considerable portion is devoted to descriptions of simple electrical apparatus that have no particular bearing on modern theories of the constitution of matter, and on general grounds we think that this might have been somewhat curtailed.

Memorandum on Electric Arc Welding. Second Edition. Issued by Factory Department, Home Office. London: H.M. Stationery Office. Price, 3d. net.

Much practical information and many useful hints are contained in this little book, which should prove of value to operators of electric arc welding equipment. The information is chiefly on precautionary measures which should be taken to safeguard the operator.

The general principle of electric arc welding is dealt with in the introductory chapter. The merits, or otherwise, of both a.c. and d.c. currents are compared, and an outline of the regulations applying to the installation in each case is given.

Work entailing special risks, such as welding on steel and boiler work, is dealt with at length. The concluding chapters deal with injurious effects to the operator, and the cautionary measures, and a special chapter is given to the injurious effects of radiations.

earchlights and Wireless for Motor Lifeboats.

The Equipment of a Cunard Motor Lifeboat.

oard of Trade Merchant Shipping (Life Saving Appli- Rules of 1924, which came into operation on July 1st, tipulate that foreign-going passenger vessels above a size must be provided with one or two motor lifeboats with approved searchlight and wireless-telegraph instal- For this purpose Messrs. Siemens Brothers & Co., f Woolwich, have designed a special searchlight pro- nd a compact and efficient wireless installation. Both e have been approved by the B.O.T. and brief descrip- them will prove of interest.

earchlight projector consists essentially of a sheet brass fitted with an 8-in. glass "Mangin" type mirror re-

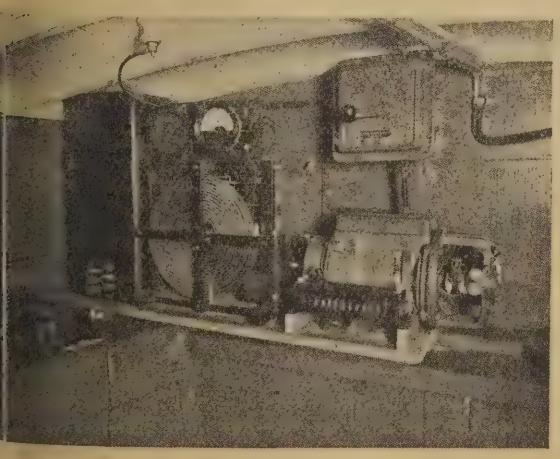


Fig. 1.—A General View of the Searchlight Projector.

and is carried by trunnions on a U-shaped support, in turn is held by a vertical spindle in a tripod pedestal. ral view of the projector is shown in fig. 1.

lamp is of the metal filament gas-filled type and is in a lampholder, which in turn is fixed to a carriage n the bottom of the projector barrel and provided with rsing screw. By means of this screw the lamp can be ii to the focus of the mirror for obtaining the maximum reflection, or out of it in order to obtain dispersion of m when it is desired to illuminate a larger area nearer boat. A vertical adjustment is also provided for. Cur- conveyed to the lamp by a flexible cab-tire covered

2 shows the wireless installation fitted to a motor life- w being built for the Cunard Steamship Co., Ltd. nsmitter is of the quenched-spark type which, with ial tuning inductances, makes a very neat and compact f apparatus. The receiver is of the three-valve type, tter valves being used; there is one high-frequency



ig. 2.—The Wireless Equipment on the Cunard Lifeboat.

one detector valve and one note magnifying valve; a detector is also supplied for emergency working. By of a suitable switching arrangement, reception may be d either on the h.f. and detector valves, on all three or on the crystal only.

ource of power for this installation is in the form of a of accumulators which supplies current to a small enerator, seen in fig. 2. An alternative source of which is supplied by the manufacturers, if preferred) of a petrol motor for driving the wireless alternator.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Charges for Electricity Supply.

I notice a letter from "Stung" in last week's REVIEW, which is rather involved.

The writer complains that he has to pay £2 per annum minimum charge for "juice" of which he only uses 12 units a quarter. If that is the actual load he finds for the supply people, he should pay one shilling per unit, and even then he is not a profitable customer to them. There are several pounds' worth of copper, meter, labour, &c., lying idle, or nearly so, and the best thing for him is to try "Trylites" and cut out electricity.

Next, he refers to his fixed charge as 11s. 8d. per quarter, and immediately afterwards says it is a standing charge of 19s. per quarter.

If "Stung" would cut out coal and gas, and use electricity properly, *i.e.*, for radiators and cooking, he should use at least 2,000 units per annum; his cost would then be 46s. 8d. fixed charge, plus 83s. 4d. for "juice," or a total cost of about ¾d. per unit. He can then cut out any question of cleanliness and convenience and come right down to brass tacks, because he is getting exceedingly good value for his money. In fact, he is buying energy at about cost price and at a price which will compare favourably with gas and coal.

I should like to know of neighbouring towns which sell energy cheaper than Manchester on the Norwich rate.

If "Stung" will *use* electricity, not play at it, he will find it the cheapest thing he ever bought. If he will compare a joint of meat cooked electrically and a similar joint cooked in a poisonous gas, he will find that he gets his electricity for nothing.

E. O. Walker.

Manchester, *August 24th*, 1925.

[The charge of 19s. per quarter was obviously, in round figures, the sum of the fixed charge of 11s. 8d. and the rent of the cooker, 7s. 6d.—EDS. ELEC. REV.]

Is There an Age Limit?

As the original query of the 10th ult. seems to have missed its mark, I venture to offer the following comments:—

To withhold one's true age is folly.

To believe that employers of labour would prefer a man of thirty against a man of forty-five provided each man has gathered equal knowledge day for day seems devoid of method in the madness. For Major Porter to cast back at us, who remained behind, that played-out theory that we were cowards shows truly weakness. Let's stick to age limits.

The difficulty seems to be that somehow or other many employers have got it into their heads that young bloods will succeed where knowledge and the hard knocks of time may fail.

In their over-anxiety to recover trade they forget that De Lesseps was 64 at the time of the building of the Suez Canal; Morse was 40 when he demonstrated the practicability of the telegraph; Stephenson was, I believe, 43, Herschel ditto, Volta 44, and many others could be cited.

Engineering is not imagination, the composition of poems or essays. It is time *v.* intellect plus possibilities. As one of 45 and out I shall not flinch from offering my past experience and fear no man of 30 if given a fair hearing. I know as a late advertiser that much of both answers to and advertisements of those 30 years old and under is false and misleading, as a careful perusal of advertisements and answers will show that the man who has been through the mill of 56 hours' work per week, plus three nights a week at evening technical classes, the rest of his spare time being spent in preparing his lessons, can easily be backed against the modern youth, to whom Sir John Foster Fraser has just appealed in his article, "A Talk to Workshy Youths."

It is not the masters that are to blame. But on the contrary, let us sink this influence, aim at investigation, cause and comparisons, remember that science is measurement. Then and then only will England and the world see, and know, that men of 40 years are not less worthy of engagement than the man of 30, nor short of intellect.

Let those of 40 be true to their colours, remember the war period and keep on trying: "It's for Britain and the British."

"All Ages Need Apply."

(*A reader of* ELEC. REV. *since* 1897.)

August 19th, 1925.

The Motor Repair Shop.

We have read with some interest the article on the above subject in your last issue, and the impression left on our minds is that your correspondent has succeeded in filling more than a column (exclusive of photographs) by describing two attempts at carrying out what is quite an ordinary and every-day repair. It is well known that carbonised mica leads to breakdowns, and that when the destruction of the mica segments has gone to such a depth as the author describes, the only remedy is to replace them.

We were surprised to read that an attempt was made to repair a job by filling in with cement to such a depth as half-an-inch. The result inevitably is the formation of air pockets, with obvious results. Such filling to a very small depth is quite permissible. It is the practice of most first-class repair shops to examine all armatures for shorted commutators before proceeding to any other repairs, and to replace all faulty micas. This can be done in most cases without taking the commutator adrift. Turning up or grinding a commutator with the armature in its own bearing has been considered good practice, where possible, for over a quarter of a century.

We entirely agree with the remarks about the grooving of bearing bushes (referred to as "brushes" in error in the text), and have found by experience that a very large percentage of breakdowns on d.c. armatures is due to commutator trouble arising from oil creepage.

The Midland Electric Power Installation Co.
(H. JOSEPH, *Proprietor.*)

Wolverhampton, *August 22nd*, 1925.

The Development of Short-wave Radio-communication.

In an article which appeared in your issue of July 31st, I notice the following remarkable statement:—

"That attention has in recent times been redirected to short waves, *i.e.*, under 100 metres, is due to amateur experimenters having obtained surprising results over long distances with very small power, and the investigation of the new effects which have been recorded may influence future developments profoundly."

It appears to me that the writer of the article is not quite fair to other and earlier workers in stating that the attention which has been redirected to short waves is due to the work of amateurs, unless indeed he classifies myself, Mr. C. S. Franklin, and other engineers of the principal radiotelegraphic companies of the world as "amateurs."

As far back as June 20th, 1922, in a paper which I read in New York before a joint meeting of the American Institute of Electrical Engineers and the Institute of Radio Engineers, in describing the results which had shortly before been obtained by Mr. Franklin and myself with waves a few metres long, I stated that:—

"The study of short electrical waves, although sadly neglected all through the history of wireless, is still likely to develop in many unexpected directions and open up new fields of profitable research,"

stating also in the same paper how:—

"Some years ago, during the war, I could not help feeling that we had perhaps got into a rut by confining practically all our researches and tests to what I may term long waves or waves of some thousands of feet in length."

This paper was duly printed in the *Journal* of the A.I.E.E., and an extract from it appears in the issue of your REVIEW of August 25th, 1922.

In a paper read before the Royal Society of Arts on July 21st, 1924, I described a great number of tests carried out over world-wide distances by myself and my assistants with waves under 100 metres in length, and I particularly referred to the first radio communications ever established between England, Australia, and South America, by means of such short waves; and in a further address delivered before the same Society on December 11th, 1924, I described how, by means of a 32-metre wave, communication had been maintained with Australia for 23½ hours out of the 24.

Extensive reference to both these papers was made by the ELECTRICAL REVIEW in its issues of July 25th, 1924, and December 19th, 1924, and in one of your Editorial Notes of your issue of December 19th, 1924, you stated:—

"Senatore Marconi took up the systematic study of short waves in 1916, and investigations were carried out on a large scale in 1920-21, but the most important experiments have taken place during the past twelvemonth."

I do not wish in any way to belittle the results obtained by amateurs in this and other countries, whose work of patient research I have always acknowledged, as I also stated in my last lecture before the Royal Society of Arts.

I might add, in conclusion, that all the contracts of over a year ago entered into with the Post Office for the erection of "beam" stations for Imperial Communications contemplated the use of short waves only.

G. Marconi.

London, *August 19th*, 1925.

Fire at Grenoble Exhibition.—According to a *Reuter* message from Grenoble, in the course of a storm on the evening of August 19th, lightning struck one of the buildings at the Hydro-Electric Exhibition. Fire broke out and completely destroyed the building, which contained aeroplanes, motor-cars, small electrical apparatus, &c. The damage is estimated at about ten million francs. The fire was extinguished at midnight. No other building was damaged. An inquiry has established that the lightning struck an electric transformer, set fire to an awning above the roof, and thus caused the flames to spread with extraordinary rapidity.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the specification.
The numbers in parentheses are those under which the specifications printed and abridged, and all subsequent proceedings will be tak

1924.

7,858. "Regulating means for electric circuits." J. Robinson. Mar 1924. (237,538.)
8,057. "Magnetos for internal-combustion engines." D. Y. W March 29th, 1924. (237,634.)
8,493. "Reception apparatus for wireless telephony and the like." A Capon. April 4th, 1924. (237,638.)
10,939. "Means for measuring the flow of electric current in a wire circuit." E. W. Moss (Lincoln Meter Co., Ltd.). May 3rd (237,658.)
11,390. "Telephone instruments for wireless reception and oth poses." I. Raczincki. May 8th, 1924. (237,663.)
11,665. "System of electrical signalling and inter-communication railway signalmen and engine drivers." H. Wallace, L. Wallace, Wallace, and D. McCall. May 12th, 1924. (237,664.)
11,734. "Recording of telegraphic signals transmitted over te lines." A. Engelberg. May 12th, 1924. (237,666.)
12,106. "Inductance coils for use in wireless telegraphy and tele W. S. Shephard. May 16th, 1924. (Cognate application, 13, (237,672.)
12,392. "Variable electric condensers." Sterling Telephone & Elect Ltd., and W. M. Holbeach. May 20th, 1924. (237,677.)
12,675. "Thermionic valves or electron discharge tubes." Mullard Valve Co., Ltd., and S. R. Mullard. May 23rd, 1924. (237,680.)
12,819. "Electrode compositions for electron discharge devices." Thomson-Houston Co., Ltd. July 2nd, 1923. (218,630.)
13,146. "Variable electrical resistance devices." G. W. Hale, L. Holden, and Radio Engineering Co., Ltd. May 28th, 1924. (237,683.)
14,079. "Electric cables." Dr. V. Planer. June 7th, 1923. (217,24
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15,956. "Switches for electrical circuits." Fuller's United Electric Ltd., and A. P. Welch. July 2nd, 1924. (237,705.)
16,019. "Oil-immersed circuit breakers." English Electric Co., Lt F. N. Linstow. July 3rd, 1924. (237,707.)
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16,535. "Electric condensers." P. S. Devereux. July 10th, 1924. (2
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17,266. "Crystal detectors for wireless receiving apparatus and the H. Lister and Metropolitan-Vickers Electrical Co., Ltd. July 18th, (237,721.)
17,279. "Electrical heating apparatus." J. E. Dubois. July 18th, (237,722.)
17,846. "Swivelling head-lamps for motor road vehicles." J. M. and S. Partridge. July 25th, 1924. (237,728.)
17,901. "Electron discharge devices, and circuit arrangements the British Thomson-Houston Co., Ltd. July 27th, 1923. (Addition to 2 (219,705.)
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18,738. "Electrical transformers." Naamlooze Vennootschap Gloeilampenfabrieken. August 10th, 1923. (220,314.)
19,628. "Apparatus for producing high-frequency currents for cure." E. Geissler and Fabrik Chem. Gravuren Luppe & Heilbronne August 19th, 1924. (237,738.)
20,365. "Variable condensers for use in wireless systems." G. A. M August 28th, 1924. (237,742.)
21,015. "Electric batteries." Soc. Anon. Le Carbone. July 12th, (236,884.)
21,301. "Systems of speed control for induction motors." British Th Houston Co., Ltd. September 10th, 1923. (221,805.)
22,082. "Cut-out devices for groups of pneumatically-operated swi G. Meyfarth and Soc. Anon. des Ateliers de Secheron. November 22nd (225,180.)
22,924. "Self-driving electricity-generating plant." F. B. Dehn (Babbitt). September 29th, 1924. (237,759.)
23,092. "Remote-control systems for electrical sub-stations and distribution systems." Metropolitan-Vickers Electrical Co., Ltd. Octob 1923. (222,864.)
24,371. "Variable electric condensers." A. G. St. Clair-Finlay and land Electric Supplies, Ltd. October 14th, 1924. (237,763.)
27,158. "Telephone systems." Siemens & Halske Akt. Ges. No 13th, 1923. (224,908.)
28,881. "Heat-proof and flame-proof insulated conductor." Western tric Co., Ltd. (Western Electric Co., Inc.). December 2nd, 1924. (237,
29,424. "Rotary distributor or timer contact disk for ignition s of internal-combustion engines." E. W. Turner. December 8th, (237,790.)
29,946. "Metallic compound strips." Metropolitan-Vickers Electrica Ltd. January 8th, 1924. (227,424.)
29,987. "Crystal detectors for wireless receiving systems." G. Ed Ltd., and H. Edmonds. November 12th, 1924. (Divided applicati 26,982/24.) (237,793.)
30,786. "Diaphragms, telephones, and the like." G. Lakhovsky. ber 22nd, 1924. (237,798.)

1925.

427. "Devices for obviating the glare of the headlights of mot and other vehicles." F. W. J. Robinson. June 6th, 1925. (237,801.)
927. "Thermally operating electric relays." Metropolitan-Vickers Co., Ltd. January 16th, 1924. (227,829.)
2,623. "Electric switches." British Thomson-Houston Co., Ltd. (G Electric Co.). January 29th, 1925. (237,814.)
3,426. "Electric devices for piercing and cutting metals by fu Soudure Autogene Française. July 23rd, 1924. (237,552.)
3,450. "Telephone exchange systems." Allmanna Telefonaktiebolaget Ericsson. March 21st, 1924. (231,138.)
5,555. "Instruments for the measurement of electric resistance." shed & Vignoles, Ltd., and C. Midworth. February 28th, 1925. (237,82
5,876. "Audible warning devices." R. Bosch Akt. Ges. May 24th, (234,452.)
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The Development of Short-wave Radio Communication.

THE recent decision of the U.S. Navy Department to supply all naval vessels and shore stations with short-wave radio equipment, if its use proves reliable under all conditions, is an event of some significance. The increasing number of tests which are being carried out with waves of a length below the limit of 100 metres points more and more to their superiority over the longer waves for long-distance communication, and there is more than this one merit of greater penetrative power that suggests the desirability of their being utilised. The frequency of the impulses received in the antenna of the receiver increases proportionately as the wavelength decreases, hence much sharper tuning is possible and a greater degree of selectivity is obtained. Then, too, there is the considerable economy of power which can be effected by the use of short waves.

If the short-wave method of transmission were commonly adopted in the shipping services and the coast stations of this country, there would soon be an appreciable smoothing-out of the present chaotic state of affairs which prevails around 600 metres, which is the wavelength most frequently used by ship and coast stations. No one denies now that the 600-metre spark transmitting sets on ships are out of date. The coarse note which they transmit is almost invariably loosely tuned, and its accompanying harmonics are often strong enough to cause interference on the neighbouring wavelengths. It is said that a ship's operator can pick out and follow the particular note which he desires to read only by virtue of his intimate acquaintance with its distinctive pitch or "musical" quality, but such practice as this places too hazardous a reliance upon the skill of the operator, and renders his task unnecessarily difficult.

The objection to the wholesale replacement of ships'

spark transmitters by up-to-date equipment is, of course, the expense which would be involved, and apparently the most that can be hoped for is the gradual replacement of these sets, as they become worn out, by modern c.w. installations, probably designed for operation on short waves. In many of the French coastal stations, the expense has not been allowed to stand in the way of the complete substitution of efficient c.w. transmitters, and it seems to be the intention of the U.S .Navy Department to follow this example, but in the American case, closer attention is to be given to the utilisation of short waves.

It is worthy of note that, just as the very short waves have remarkable power for covering long distances, the long waves, especially those in the neighbourhood of 20,000 metres, have a particular utility in signalling over relatively short distances, a characteristic which probably accounts for the earlier development of the long-wave system, for it is only within comparatively recent years that serious attempts have been made to communicate by means of radio-telegraphy and telephony over really long distances. Last week we were taken to task for being "not quite fair to other and earlier" workers, in stating that the attention which has been re-directed to short waves is due to the work of amateurs. Our use of the word *re*-directed, however, indicated that we were not unmindful of previous professional investigations, but it does seem that either the deductions which followed therefrom must have been faulty, or the long-wave system was deliberately developed in preference; moreover, it is not so long ago since short waves were relegated to the use of amateur operators because they were considered to be of no particular value to anyone else.

Not quite nine months ago, we drew attention to the fact that Senatore G. Marconi "took up the systematic study of short waves in 1916, and investigations were carried out on a large scale in 1920-21, but the most important experiments have taken place during the past twelve months," *i.e.*, in 1924. It will be noted that four years elapsed between the subject being taken up and the carrying-out of large-scale experiments, and that the most important of them took place three years later still, resulting in the comparatively short-wave "beam" station proposal. Amateur workers must therefore be congratulated, not only for boldly utilising very short waves, but also on the success with which their efforts to produce results quickly have been crowned.

The British Association.

The annual "Parliament of Science" has concluded its session at Southampton, one of the most successful in its history from the point of view of the numbers attending. As we stated in our last issue, the meeting compared badly with the Southampton meeting of 1882, so far as electrical matters were concerned, but it has to be remembered that electricity in those days was an infant science with a wide future, presenting a number of problems which have now become history. To-day, although the outlook is still a broad one, electricity is established and the main business is not so much investigation and research (although these are still of the greatest importance), as development and extension. In other words, the business aspect predominates. Consequently, what little there was relating to electricity as a science was mainly concerned with wireless work, *e.g.*, the papers on "The Study of Wireless Wave Fronts by Directional Methods," by Dr. R. L. Smith-Rose and "Some Thermionic Valve Problems," by Prof. E. V. Appleton. The Engineering Section expended a great deal of its time in discussing the question of road transport; one or two mornings, however, were devoted to marine engineering matters with which the president of the Section, Sir Archibald Denny, has had a life-long acquaintance. The only strictly electrical papers were those by Mr. W. G. Turner and Mr. H. Wauchope dealing respectively with the Southampton Corporation electricity undertaking, and the electrical equipment of the docks—both of an eminently practical nature.

The popular Press has again been provided with the usual number of startling headlines—usually mere "asides" in the papers—but it cannot be said that the bulk of the matter was to be comprehended by the layman. It was one of the first principles of the Associ tion that its annual meetings should enlighten the pu lic as to what had been going on in the scientific wor during the preceding year, but there has been a regre able tendency for the past few years to forget thi Many papers are couched in language that can only grasped by experts in the particular branch of scien which is being treated—those who may be considered know all about the subject already. We cannot expe every scientist to have the gift of Sir Oliver Lodge ar other well-known teachers, of imparting abstruse info mation in simple terms, but we think that a greater effo might be made in this direction.

The Lessons of the Japanese Earthquake.

Every trade report which reaches has something to say regarding t necessity for British manufacturers make a close study of, and adapt the methods to, conditions in each partic lar market. Although this general applies merely to normal conditions, there are sever countries in which the probability of the occurrence the abnormal has to be taken into consideration. Jap is an example of this; the severe earthquake of Se tember, 1923, and the slighter subsequent disturban have brought forcibly before the Japanese the fact th all possible measures must be taken to render buildin and plant immune from the effects of these unforese able disasters.

We review in this issue a report prepared by t Japanese Electrotechnical Committee, and presente at the recent Extra-high-pressure Conference in Pari dealing with the effects of the 1923 earthquake up electrical installations, and containing suggestions f meeting the conditions to which Japan stands expose

The stations principally affected by the disturban were hydro-electric undertakings; the steam plants the area, although damaged, were not in use at t time, as most of them act as stand-by stations to t water-power plant. The Hakone system suffered t most, some stations being totally destroyed, whi others took a long time to recover. A considerable pa of the transmission systems was damaged and su stations were put out of action, but these required shorter time for repair. The report deals in son detail with the nature of the damage caused to each cla of building or apparatus, and an outstanding featu is the fact that rotating machinery generally remain undamaged, although in many cases its foundatio were cracked.

The report presents a number of conclusions an suggestions for mitigating the effects of future eart quakes. It is stated that if proper precautions a always taken in interior wiring there is little risk fire, and the service should be resumed immediate after the cessation of the principal vibrations. T transmission systems should be efficiently inte connected to enable the unharmed stations to take ov the supply to consumers connected with destroyed st tions. It has been proved that it is possible to co struct sub-stations and transmission lines almost eart quake-proof; new ones should be built in this wa and steps should be taken to reconstruct existing buil ings and lines to make them earthquake-proof. Speci attention should be paid to the communication circui between generating stations and sub-stations, &c. It thought advisable to construct a loop transmission li around a large city capable of being connected to a incoming transmission lines, so that a source supply will always be available. For public servi buildings, such as water-supply stations, fire station telephone and telegraph buildings, &c., it is recon mended that special, independent earthquake-pro lines should be installed, and emergency communicatio measures should be adopted.

We think that a study of some of the details of t report, particularly those relating to sub-statio

pparatus, transmission equipment, and domestic in-allations, will be of interest and profit to British anufacturers who have business relations with Japan.

Buying a Washer.

Engineers buy many kinds of washers, without thinking it necessary to keep a diary of events, or enlisting the assistance of their wives; but the urchase of an electric washer, of the sort that washes othes, and costs from £45 to £60, is so exceptional a ansaction for an engineer to be engaged in, that a com-ete record of the proceedings, such as that commenced this issue over a well-known pseudonym will be found ell worth perusal. Our contributor's foresight is com-endable; as he points out, once an appliance has been urchased and put into use, one can never regain the oint of view from which the question was originally proached. So he records his investigations and im-ressions from the very start, and they will be found not ly interesting, but useful and suggestive to the maker d the seller, as well as the purchaser of an electric asher.

Many readers will endorse the author's remarks on the gh price of the electric washer; it is certainly difficult believe that the cost of production, even in small mbers, can be more than half the price at which the achines are offered to the public. We are not told hether the washers referred to were of British or reign manufacture, but in view of the enormous mbers in use across the Atlantic, it would seem that e American machines are produced in bulk, and, erefore, should be cheap in comparison with those ade in small numbers in this country—yet we have ver met with a low-priced electric washer. It cannot alleged that the cost of marketing the machines forms large proportion of the price, for no one will contend at they are extensively advertised here—and our con-ibutor's experience strongly suggests that little effort made to induce the public to take an interest in them. pparently the selling staff, in some of the cases he met th, cared little about the matter.

There must, however, be a very large body of poten-al purchasers, who only need convincing of the merits the electric washer to make the plunge, like our con-ibutor, in spite of the high initial cost; and the con-uding portion of his article, in which he demonstrates e remarkable economy effected by the washer, which ys for itself within twelve months, should go far wards that end. It is true that the washer load is of tle value to the supply authority in itself, but the me might be said of the electric iron and the electric ttle, which are well-known to be most effective pro-oters of the domestic load in the aggregate. Similarly, e electric washer, which is emphatically a labour-saver, uld strengthen the case for the electric way in the ouse where it was used, whilst it would also form so uitful a topic for conversation that it would become invaluable advertising medium in the neighbourhood, pecially in view of its rarity in British households at esent. We therefore commend the article to the ttice of our central-station readers who, if they are t interested in the promotion of the domestic load, ght to be.

London Goods Railway.

According to reports in the Press, proposals are under consideration for the construction of a network of underground goods railways, connecting the ndon termini with the docks and with the principal stributing centres. The project is estimated to cost 2,000,000, and a promotion company has been formed obtain the necessary statutory powers.

It can hardly be doubted that such a railway would be immense benefit to the metropolis, in which an enor-ous amount of goods traffic is carried on; not everyone ows that the Port of London is the principal seaport this country, its annual aggregate tonnage entered d cleared exceeding 20,000,000 tons. There is also a st amount of goods traffic between London and the ovinces by land, as well as internal traffic between the rious members of that overgrown agglomerate of cities, which might be most conveniently handled underground, relieving the congested streets of much of their present burden. The scheme includes the construction of a huge central underground station, to serve as a clearing house, which reminds us of the ingenious project put forward by Mr. Gattie years ago; impracticable as a surface proposition, the Gattie scheme might be worthy of consideration in connection with underground goods railways.

If the proposals are carried into effect, the railways will, of course, be operated electrically, and will also offer a considerable demand for electricity for lighting and power. It is interesting to recall that a similar network of railways has for many years been in operation in—or rather under—Chicago; in that case, we believe, the tunnels were already in existence, and thus a considerable economy was effected. The Post Office has also led the way by constructing a tube railway from east to west for its own purposes, which is approaching completion. The scheme certainly appears to be worthy of close examination, and we trust that it may prove capable of solving, at least in part, the perennial problem of London's traffic congestion.

Service and Advice.

We may be excused for turning once more to this subject if we point out that according to the best authorities the success of electricity in the United States, which is constantly held up to us as a model, is mainly due to the way in which the various branches of the electrical industry have hastened to serve consumers' interests and advise upon the best methods to adopt. New phases of the matter are constantly coming to light in the United States, and it may be of interest to mention two of the latest. The first is the cost of electrical service, with particular reference to cookers. The National Electric Light Association recently collected data from a typical central-station company with 4,000 cookers on its system with a view to ascertaining the cost to the company and the benefit to the consumer. This company makes no charge for "servicing" cookers, no matter how old they are, and the approximate cost of this arrangement is about $20,000 per year. In 1923 there were 2,348 cookers in use, and 6,059 complaints (2.5 per cooker) were received and disposed of at the cost of $2.57 per complaint. In 1924 the number of cookers rose to 8,956, and the number of complaints to 3,972; the cost per complaint, however, fell slightly to $2.45. There is a fear that this form of service will ultimately prove very expensive to the company as the appliances in use grow older; unless some sort of charge is made, consumers are apt to be careless in handling their cookers and call in the company's men for the most trifling things.

Another matter which has recently been discussed at considerable length in the United States is the providing of illumination advice to the consumer. In this country a great deal is being done by the Electric Lamp Manufacturers' Association. (It will be understood that free advice is meant, as apart from the engagement of professional consultants.) The view adopted in the United States, however, is that as the supply companies gain most from electric lighting, they should provide most of the free advice to consumers.

The *Electrical World* says that a survey has indicated that less than 10 per cent. of the users of light who actually seek advice go to the electricity supply company for it, although, it is said, 90 per cent. of the cost of lighting is due to the electrical energy consumed. The supply companies should, therefore, supply a similar percentage of the advisory service, but in spite of this, few American companies have lighting departments and fewer still are able to take care of 90 per cent. of those who now seek advice. We would not like to say how far American conditions are on all fours with conditions in this country, but we think that our own supply authorities could do a great deal to improve illumination, and, incidentally, benefit themselves, by advising consumers as to the best methods to adopt. No doubt E.L.M.A. would render assistance to this end.

The Wynau Power Station.

Some Particulars of a New Propeller-Type Turbine.

The capacity of the old power station at Wynau, Switzerland, having become insufficient to meet the electricity requirements of the district, the directors of the Société des Entreprises Electriques de Wynau some time ago decided on the construction on the left bank of the river of an entirely new hydro-electric station of 10,000 h.p. capacity, the power being obtained from the same barrage as the station on the right bank.

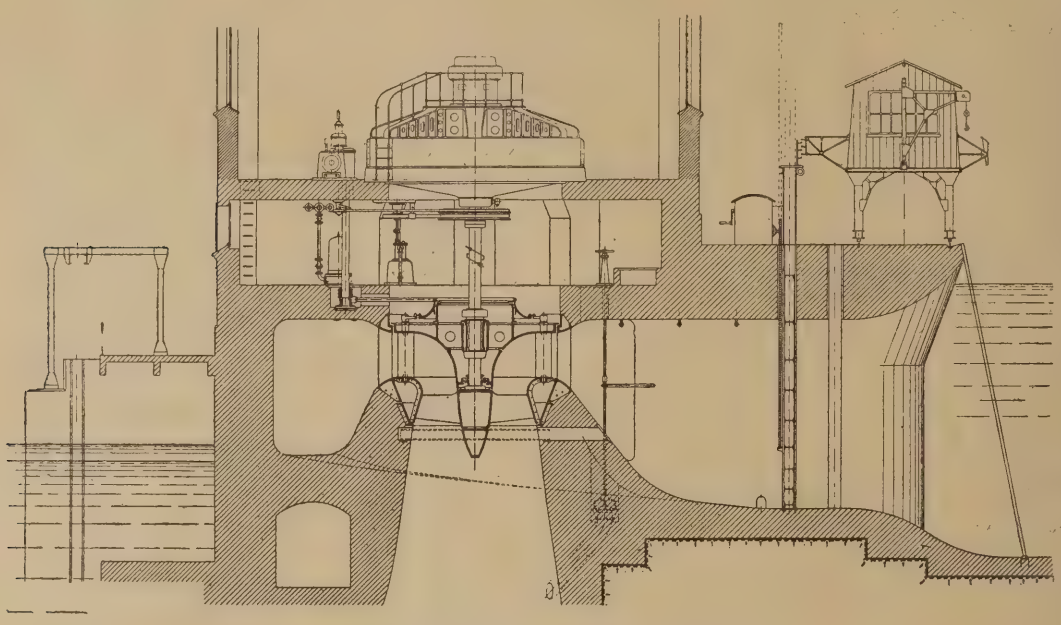


Fig. 1.—Sectional Elevation of one of the Wynau Turbines.

The turbines of the original plant, which develop 860 h.p., drive the alternators through the medium of somewhat large conical bevel gearing. To overcome the drawbacks of this method of driving, it was decided, for the new plant, to take full advantage of the latest turbine practice and to equip it with turbines having wheels in the form of ships' propellers.

The principle of this type of turbine is an old one; the early Jonval turbines, for example, were fitted with impelling wheels, on the periphery of the inner rim of which a series of blades was mounted. The curvature of the blades was mounted somewhat acute, on account of the relatively low peripheral speed possible at that time; not only so, but the water was conveyed to the rotor by an axial distributor not well suited to vane adjustment. As far back as 1860 an American inventor of the name of Traux patented a turbine with a four-blade propeller without an external rim, the water being led to it by a spiral-shaped chamber. Horton, in 1877, and Williams, in 1893, also both designed turbines with impellers of very much the shape of ships' propellers, but provided with subsidiary blades shorter than the circumferential space between two consecutive main blades.

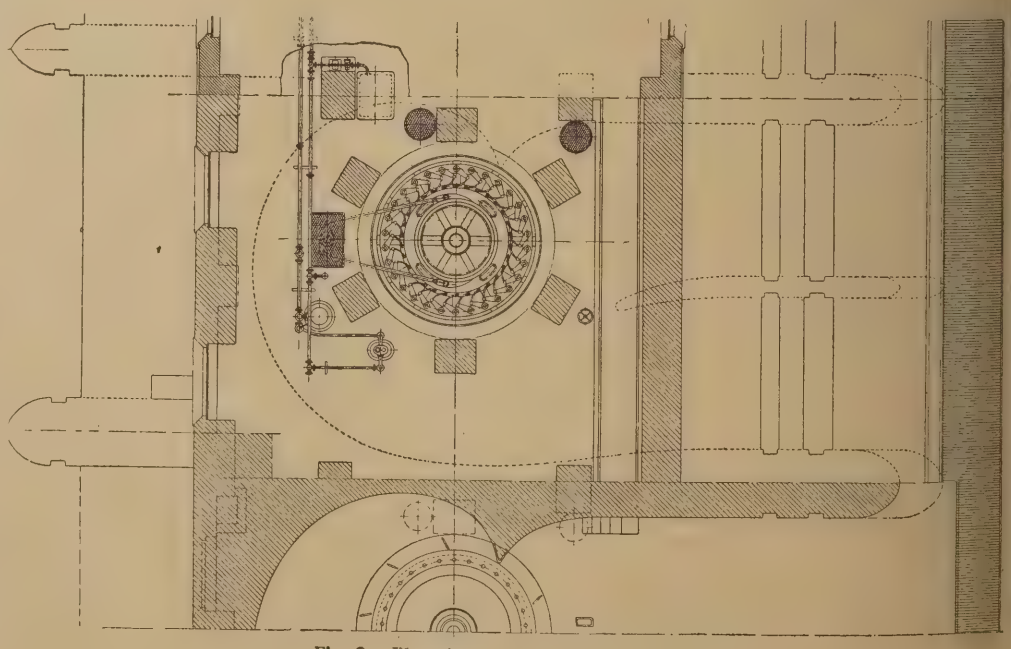


Fig. 2.—Plan of one of the Wynau Turbines.

The development of the Francis turbine with centripet admission and axial outlet led, however, to the abando ment for a time of the propeller turbine.

The object of all propeller-type turbine designers h been to increase the speed in order to permit of t direct coupling of electric generators and so effect reduction of installation costs. In order to dimini the friction due to the higher speeds, the number a length of the blades have been reduced, and to preve any eddies a mo simple and less curve shape was given them. Due, finall to the progressive r duction in the di meter of the disk hu to which the blad are fixed, a retur has been made step b step to the shape ind cated, as mentione above, by Willian and Horton. It mainly to the effor of the American eng neer Nagler, of Mi waukee, and of Pro Dr. Kaplan,* Brunn, that t modern improvemer of this type of turbi is due. Followin the excellent resul secured, and pul lished by Kapla most turbine manufacturers recommenced the constru tion of screw-type turbines. The Société des Ateliers d Constructions Mecaniques, of Vevey, Switzerland, whic for a long period has experimented with high-spee turbines, made some trials in its experimental depar ment with one of these screw wheels of a diameter 380 mm. (practically 15 in.), and it was as an outcom of the results of these tests that the Wynau Co. place an initial contract with the Vevey Co. for two screw-typ turbines designed to work with water at heads varyin

* *See* World Power Conference Paper No. 64, "Historical No on the Kaplan Turbine," by Dr. Ing. S. Kneidl.

om 7¾ to 17 ft., and to develop a maximum of 2,700 p. each at a speed of 107 r.p.m.

Figs. 1 and 2 represent the elevation and plan, and f. 3, is a general view, of one of the Wynau turbines. ch turbo-alternator set is provided with three main arings, of which two are embodied in the alternator. e thrust bearing of the turbine, mounted on the cover the distributor, is of white metal lubricated with circulated by a small pump driven by gearing the turbine shaft. The water is conveyed to the distributor by means of a cement spiral chamber, the inlet which is symmetrically arranged in order to facilitate, the elimination of eddies, the regulation of the ter delivery by means of the usual vane wheel. The me-work of the turbine, which is of heavy construction and consists of two cast-iron rings held together 10 columns cast with them, supports the turbine, the ernator, part of the flooring, and also the load of pivot. The shape to be given to the outlet pipe was subject of much special study by son of the considerable speed possed by the water on emerging m the driving wheel, which corresnds to one-fourth, and even one-rd, of the total energy. A special fuser was finally adopted to enable greater portion of this residual rgy to be recuperated. The driving eel is a single steel casting, and is nposed of a hub with four blades hout a peripheral rim, the shape ng, as indicated in fig. 3, roughly t of a ship's propeller. The diater is, however, slightly greater at exit edge of the blades than at the ry edge; they are relatively long to ilitate the guiding of the liquid eam and to prevent eddies. The eel, which is bolted up to a coupling lk, forged in one with the turbine ft, rotates in a readily dismounte cast-iron casing. When it becomes essary to dis-assemble the alter-or, the wheel, together with the ft, can be supported in channels med in the walls of the cement outlet pipe. The or of the alternator can be supported on a bottom ssbar by means of jacks provided for the purpose.

The water distributor, which is of a type similar to t of the Francis turbine, consists of a bottom ring rying the conical casing of the impelling wheel, a cover and 30 pivoted cast-steel vanes. The turbine mework and distributor are divided axially. The rnals are in one piece with the vanes and work in nze guides. The upper journals pass through the tributor cover and carry at their extremities adjust- levers connected with the sluice-control rings by all bronze connecting rods, the latter being made ible in order to prevent undue wear of the vanes uld any foreign body penetrate between them at the ment they are closed. The pivot of the main shaft unted on the cross member of the alternator supports only the weight of the rotating portion of the turbine alternator, but also the axial thrust of the water on driving wheel, it being possible for the load to reach otal of 82 metric tons. It is of a type patented by Vevey Co., the object being to ensure a uniform divin of the load on all the segments and over their entire lth.

With regard to the control of the turbine, the regula-, mounted in the alternator room, comprises a frame-k which forms an oil reservoir, a servo-motor, and ernal control apparatus. The servo-motor, which has differential piston, acts, on the one hand, on the dery to the pivoted vanes of the distributor, and, on other, by means of a cataract and a system of rods the compensating orifice (pressure regulator) in the mber below the turbine. The servo-motor is conlled by a governor connected with the distribution ve; a small auxiliary servo-motor is also provided so t all that the governor—which is enclosed and driven by belt off the turbine—does, is to move a small adjusting needle. The regulator is also provided with two special fittings, one of which allows the turbine speed to be controlled from the switchboard, while the other enables the speed to be reduced while the turbine is running. Each of the two turbines is provided with a couple of safety devices; one effects the automatic closing of the turbine should the governor of the regulator cease to function owing to seizing or belt troubles; the other consists of a centrifugal regulator fixed on the turbine shaft and so set that should the speed exceed 120 r.p.m. a catch, which is connected with the oil distributor of the regulator, is released, so causing the stoppage of the turbine. The two initial screw turbines at Wynau were put in operation in October, 1923, and were run by the Vevey Co. until the reception tests were carried out in January, 1924, under the direction of the Hydrometrical Bureau of the Swiss State Water Service, the power developed by the alternators being measured by officers of the Testing and Standards Station of the Association Suisse des Electriciens. The tests showed that with a head of 17 ft. a maximum efficieney of 89 per cent. was attained. At a specific speed of 728 r.p.m., and at a specific speed of 862 revolutions with a head of 4 metres (13 ft. 1½ in.) the efficiency was 86 per cent. Although the available head at Wynau ranges between 7¾ and 17 ft., the variations in delivery are only about 8 per cent. With a 16½-ft. head and working at full load, the turbines develop 2,730 h.p. at 86 per cent. efficiency, while at seven-eighths load an efficiency of 87.7 per cent. is attaned.

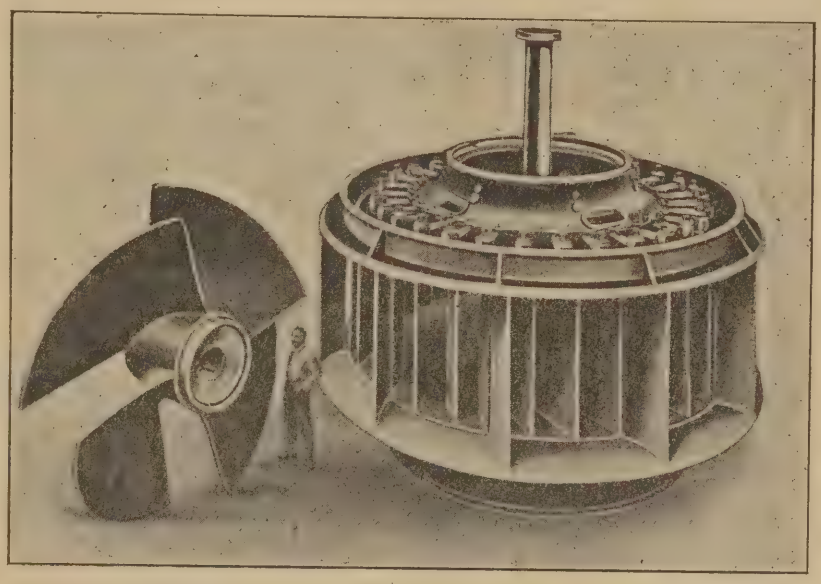


Fig. 3.—General View of one of the Wynau Turbines.

As a result of their satisfactory operation an order for two additional turbines for the Wynau station has recently been placed with the Vevey Company, which summarises the advantages of the propeller turbines as follows: They are particularly well adapted to utilise at a minimum cost the power of rivers in plains, furnishing large volumes under low heads, and also in cases where there is much variation in the head of available water. As compared with the Francis type, higher speeds are possible, reducing the cost and size of the alternators, and also the size of the power station buildings. Not only is the efficiency, when working at from three-quarters to full load, high, but the higher angular speed of the alternators also increases the efficiency of the latter. Finally, owing to the wheel having only four blades and these cast *en bloc* with the hub, it is claimed to be stronger than a Francis wheel.

American Electric Vehicle Exports.—During June last 20 industrial electric vehicles valued at £4,616 were exported from the United States, as compared with only 8 (£1,243) in the corresponding month of 1924.

Choosing and Using an Electric Washer.

Diary of a User's Experience.

By "WREN."

DEPRESSED by the shortage of competent and trustworthy domestic labour—unemployment figures notwithstanding—and alike oppressed and incensed by the charges of, and services rendered by, steam laundries, hand laundries, and their kin, the writer has decided to investigate the possibilities of electric washers. Please note the tense of this announcement! At the time of commencing this article the washer has not been purchased, not even chosen, but it seems evident that if this record is to be of help to others it must be made in the form of a diary. Once a washer—or any other piece of electrical apparatus—has been purchased and used for some time, it is impossible to regain the standpoint which one formerly occupied. However honest one's intentions, notes written after the event must be affected by the lessons of experience. Hence, at the possible expense of other considerations, this record starts with the writer as an interested and hopeful inquirer. How it will end remains to be seen, but, if the Editors of the ELECTRICAL REVIEW will permit it, it shall be published as it stands. Perhaps users of other electrical appliances will present their experiences on the same system. A contemporary record written each day, or week, from the experience of that period must have certain merits attainable by no other means.

The First Step.

To-day, December 8th, 1924, a long series of "Black Mondays" has culminated in one blacker and more fatiguing than usual. Also Christmas and the problem of presents are upon us. Are electric washers really any good and, if so, can we afford one?

A mental review of our acquaintances reveals the fact that none has an electric washer. This looks suspicious, especially as we have noticed machines more or less casually at exhibitions for years past. On the other hand, reliable reports from Canada and the United States say that hundreds of thousands of electric washers are used in those countries, and periodic "washer campaigns" by central station authorities add hundreds of washers a month to the mains.

Evidently there must be something in the washer *per se*, whatever the reason for its rarity in this country. Inquiries from the local electricity offices and from Mr. J. W. Beauchamp, of the Electrical Development Association, bring forth a list of reputable makes and also make clear the probable cause of the fewness of electric washers in British homes. It is a matter of first cost. The energy consumption is a negligible item—less than that of an electric iron—but the initial outlay of forty, fifty, or sixty pounds for a "first-class machine" and of, say, twenty-five pounds for a "mechanical washer fitted with a motor" is rather staggering.

Still, money is cheaper than flesh and blood, so we will proceed, a little less exuberant than before, but still hopeful that, either by outright purchase or some form of "easy payments," we may acquire a machine to perform the most irksome of all domestic duties. A few minutes on the telephone and the good offices of the friends mentioned have given us a start and provided us with information on which to base a tour of inspection.

The local electricity supply office—in a London borough of 100,000 population!—is perfectly courteous in the matter, but has only one copy each of the pamphlets describing three different makes of washers. These are lent to us on the understanding that we will *return them some time when passing!* Evidently anyone else in the neighbourhood who contemplates the purchase of a washer will have to wait till we return the pamphlets. No doubt the makers of the machines would supply a thousand copies of these descriptive leaflets to the electricity department on demand, but, in this district at any rate, it is evidently no one's business to advance the cause of the electric washing machine. The nearest machine on view in an electricity showroom is five miles away, so we are informed. As there seems to be some doubt on this point, we decide to visit the maker's showrooms.

Viewing Machines.

Without mentioning names, for to do so might lead to invidious distinctions, the first firm visited may be termed Messrs. A. Two machines were on view in an admirably-appointed showroom, but neither machine could be seen in action—disappointment No. 1 from our point of view, mistake No. 1 from the seller's point of view. However admirable the verbal explanation, we would have liked to see in action the machine for which we were asked forty-five pounds. Even in the case of the cheaper equipment, costing a mere ten or twelve pounds, a little electricity, a few clothes, and an actual demonstration of what could be done in ten minutes would have been both interesting and convincing.

However, no signs of a demonstration being forthcoming, we proceed to inspect the inanimate machine. The demonstrator appointed to assist us—possibly not the regular demonstrator, but still the person entrusted with the potential sale of an expensive machine—is most courteous and, up to a point, helpful, but does not know: (*a*) Where the emptying cock is—or even if there is one at all! (*b*) What power the machine absorbs. (*c*) What is the purpose of a certain device which, we soon find out for ourselves, is designed to release the pressure on the wringer rollers instantly in case of emergency. (*d*) Whether the wringer can be fixed in any desired position and, if so, how. (*e*) How a certain important pair of gears is lubricated. All of these problems we were able to answer for ourselves, but it ought not to have been necessary for us to do so—mistake No. 2 from the seller's point of view!

Also, though this machine has well-arranged switches and gearing, the demonstrator shows no response to our suggestion that we should like to look inside. If there is any reason why the covers of this particular machine cannot be removed, surely specimen switch and gear boxes could be kept permanently open for inspection? Mistake No. 3 for the seller.

A visit to Messrs. B. reveals another machine similar in many respects to the one first seen, and in this instance there is no hesitancy as to the location or purpose of any part. There is again no demonstration of the machine in action, but—important advance—there is a pressing offer to have the machine demonstrated in our own home. This offer we decline with thanks, feeling that we should be committed to some extent did we accept. Still, we should like a demonstration, and it ought to be on the seller's premises. Electric vacuum cleaners are performing all sorts of marvels over the way, so why cannot the electric washer be dealing with some of the staff laundry?

Messrs. C. bring to our notice a comparatively inexpensive equipment, with no wringer, it is true, but, on the other hand, it washes the clothes and boils them at the same time. This seems to be an advantage, but: (*a*) We have a gas-heated "copper" already, and (*b*) we happen to know that electric heating is rather expensive when gallons of water in an unlagged vessel are concerned—by the way, the demonstrator does not point this out. He ought to do so—it is a fact which could not be concealed once the meter had been read!

In view of the great difference in price between this and the other equipments so far inspected—some £35 *difference*—we do a little mental arithmetic. The expensive machines consume about 200 watts, *i.e.*, half as much as our electric iron, and could be run from a lamp socket. The cheaper outfit consumes 2,000 watts and would involve a power cable; on the other hand, the latter would give us the benefit of the power tariff of 2¼d. per kWh instead of 7d. as for lighting. Per hour of use, the dearer machine would cost 1.20d. and the cheaper one 4½d. for energy alone. This is a considerable difference, but it would take $\frac{35 \times 240}{(4.5-1.2)}$ or 2,550 running-hours—about 16 years at three hours a week—to save, on the energy bill, the extra cost of the dearer machine. Having the advantage of a slow-combustion anthracite stove which provides abundant hot water at the cost of a few pence per day, we could eliminate the use of the electric heater for bringing water up from cold, so that the actual energy bill would not differ so much between the two equipments as would at first sight appear to be the case.

Here, however, the feminine member of our committee of two steps in and asserts that in her opinion—which is, of course, final in such matters—the motor-driven washer will deal with more clothes, and more effectively to boot. Also, it gives the advantage of a motor-driven wringer, which is no small consideration.

Thus ends the first day's inspection—definitely in favour of a motor-driven washer and wringer. From the excellent workmanship of the machines so far seen, and bearing in mind that they embody a first-class ¼-h.p. motor, a substantial washing vessel and cylinder, a first-class wringer, and the requisite gearing and switches for automatic washing and for wringing in either direction from any angle, it is already evident why the first cost is high. The equipment and the facilities offered exceed our expectations, but, more than satisfied though we be on these points, it is evident that electric washers cannot be used extensively in this country until the price is reduced—and if they were in general demand the price would doubtless be lower. Once again the vicious circle of high price and limited demand appears and, as in other cases, its paralysing consequences must be broken by the price being first reduced so as to increase the demand.

From a consideration of the retail prices of the principal components of an electric washer it would appear that the amount charged for these machines could quite well be reduced. The following retail prices have been quoted to the writer to-day:—

¼-h.p., d.c. motor, from £5 15s. to £8 10s.
Wash-tub on stand, from £1 15s. to £2 5s.
12-in. wringer with rubber rollers, £1 10s. to £2.

Doubling the price of the wash-tub to allow for the cylinder of an electric washer, the sum of the above three items is from £10 to £15. The difference between these figures and that of from £45 to £60 asked for complete electric washers is from £35 to £45, surely an excessive amount for the gearing and assembly of the components.

Consumers, as a class, cannot afford the high-priced washers of to-day, but manufacturers can afford a temporary loss—or rather an investment—on bulk production of a low-priced machine of high quality. That an adequate demand would be forthcoming cannot be doubted.

Already, it will be perceived, the writer is an enthusiastic believer in the electric washer. It only remains to decide which machine shall be purchased.

Constructional Faults and Merits.

Since writing the preceding section, several more machines have been seen and several showrooms have been revisited in order to confirm, or correct, first impressions in the light of further experience. As a result, many points have been noted, and it may help potential users to have a summary of constructional faults and merits as seen by the writer and his wife from the engineering point of view and from the standpoint of the user respectively. In stating what, in our opinion, are good features and what weak, mention of specific makes is purposely avoided. No machine seen possesses all the good features, and none all the drawbacks cited.

Desiderata in Electric Washers.—In point of electrical and mechanical safety, all the machines inspected reach a high standard. The risk of shock appears to be definitely eliminated and it is, of course, essential that this should be so in a machine which may be used on damp stone flooring and supplied from 200-250-volt a.c. mains. The motor should be definitely insulated from the frame of the washer by mounting the motor on an insulating base and connecting it to the load through an insulating belt or coupling.

The use of sheet-metal doors to protect the motor completely from splashes of water, whilst eliminating the risk of skirts being caught by rotating shafts, belts, or couplings, is a good feature. Naturally, such doors should give complete and easy access to the motor when desired. Some form of clutch must be embodied between the motor and load, and it appears to matter little whether this is in the form of a friction clutch, or of a belt which serves as a clutch whilst taking the place of part of the speed-reducing gear otherwise required.

The duty to be performed in most of the machines inspected is the oscillation of a relatively heavy cylinder through water, which adds to the inertia to be overcome at the moment of reversal. The nature of this drive, together with the conditions of service and the more or less unskilled manipulation to be expected, makes it desirable that gears, clutches, and other parts of the mechanical transmission should be of relatively heavy construction. The gears must be machine-cut and thoroughly lubricated, otherwise the frictional loss becomes excessive.

A press-button switch on the washer itself (in addition to the wall-plug switch) is desirable in the interests of economy and safety. All mechanical controls should be conveniently situated; easily manipulated when the hands are wet; not liable to be displaced accidentally; and capable of movement without risk to the user or the machine, whatever the position or state of motion of the component parts. Preferably, it should be possible to lock the wringer in any position with regard to the vertical axis round which it swings.

Some place or method for supporting the "lid" of a washing cylinder without dripping on to the floor whilst emptying or filling the machine is an obvious convenience, but one which is not always provided. An indication of the correct water level given inside the washer is much more convenient than the usual filling line marked on the *outside* of the container.

Limitations or Defects Noted in Existing Machines.—The sheet-metal door enclosing the gearing of a certain machine is secured by a catch which is very easily displaced. It is conceivable that this might lead to a nasty accident, especially as the catch must offer temptation to a young child. A limitation common to most of the oscillating-cylinder machines inspected is that no provision is made for fitting the drain cock at the other end of the machine if desired by the user. This is not so trivial an objection as it may sound, for in these days of diminutive houses it is not always easy to move the machine for connecting a hose pipe to the existing outlet.

In one excellent machine the main control handle is distinctly liable to catch the knee or leg of a passer-by; apart from any discomfort thus occasioned, there are the unpleasant possibilities of unexpected starting or stopping of the machine. In another machine the control handles are arranged very neatly, but on attempting to use them the writer found that their clearance was insufficient; a bruised thumb was the result, and had the skin been softened by moisture the mishap would have been more painful.

The press-buttons on the washer (for starting and stopping the motor) are sometimes placed where they might be actuated inadvertently by the user leaning

over the machine. One of the main advantages of press-button control is sacrificed if the buttons are not placed in the most convenient situation.

The method of securing the lid or door of the washing cylinder itself is generally good, but in one machine an extraordinarily primitive device is employed. The consequences of the lid coming off whilst at the bottom point of its revolution can be visualised so easily that there is no excuse for providing an inadequate latch. In some machines the details of the safety pressure-release on the wringer are so much inferior to those of other makes as to be reckoned a defect when making a critical comparison.

Grease cups and grease-packings are used extensively on electric washing machines, and in most cases they ensure satisfactory running for long periods with a minimum of attention, but in several machines there are a few parts which require much more attention than the rest and—this is the point—there is no apparent reason why these parts also should not have been made self-lubricating.

Separate pressure screws at each end of the wringer rollers introduce the risk of applying uneven pressure. A single central device for applying pressure, with equalising bars in the mechanism, would be preferable, provided that it could be combined with reliable means of releasing the pressure instantly in an emergency. A safety device to prevent fingers being trapped by the wringer rollers would presumably be compulsory in any machine with similar risk for use in factories, and there seems to be no reason why it should not be embodied in clothes wringers for domestic use. The risk of such an accident occurring is quite appreciable. Machines which have not a flat top for use as a table during 6½ days of the week are at a definite disadvantage, particularly in the small home where space-sparing is the guiding principle of the architect, and hence, perforce, of the householder. The complete enclosure of the framework or stand of the machine appears to be desirable on grounds of cleanliness. The open lower framework of some machines offers many lodgments for dust and many corners which are difficult to clean. A plain sheet-metal enclosure affords protection in both directions and is easily wiped down.

(To be concluded.)

The Hydro-Electric Exhibition at Grenoble.

By Our Special Correspondent.

An important exhibition was opened in May at Grenoble, in the French Alps, a noted centre of development in connection with hydro-electrical engineering, and a favourite holiday resort, the town being situated in a district of exceptional interest and beauty. A large block of buildings has been devoted to exhibits of water-power plant, in which most of the space has been taken



Fig. 1.—Water-power Section of Grenoble Exhibition.

up by French makers of such machinery and accessories (fig. 1); heavy turbine plant has been installed in an annexe.

The exhibits are to a large extent made up of contour models, photographs, and diagrams, the photographs being, as a rule, very well done. Some of the most interesting exhibits are those of companies in districts where water power is linked up with steam-power stations.

French Water-power Areas.

One can see that, so far as present development and future possibilities in France are concerned, the Rhone, with its numerous tributaries from the Alps, easily takes first place, followed by the Pyrenees and then by the watersheds of rivers having their sources on the southern and western sides of the great Southern Plateau, between the Loire, the Garonne, and the Rhone. The Dordogne, which runs for many miles through a sort of chasm, is one of the rivers which are being utilised in this last district.

Contrary to what one would suppose, there is but little water power on the western side of the Vosges, although on the eastern side there are some important installations, and there is evidence that on the Alsatian side of the Rhine from Strasburg to the Swiss frontier very important developments will take place in the near future in relation to a combined canal and water-power project.

In the northern districts there is very little scope for water power, although development will take place shortly in the valley of the Chevreuse, the pretty rural district near Versailles.

In the Alpine districts of France the glaciers form in many cases natural reservoirs, which tend to reduce the seasonal variations. In the Alpine, Pyrenees, and Central Plateau areas the water has, in many places, cut deep gorges through sound rock, so that large quantities of water can be held up with short dams arched in plan.

The linking-up of the Rhone valley from the Swiss frontier near Geneva to its mouth is going ahead slowly but surely, the canalisation of the river for heavy barge traffic forming part of the scheme; the construction of a tunnel for 1,400-ton barges into the Marseilles docks is one of the most remarkable engineering undertakings going on in Europe at the present time.

If one can judge by photographs and exhibits of steel towers, a number of installations are in progress at from 90,000 to 150,000 volts; it is interesting to note the way in which certain national tendencies influence design, some of the long-span towers being somewhat over-elaborate and expensive in design, whilst others are of the less expensive American type.

Italian Power Companies.

The Italian power companies and manufacturers have made a valuable contribution to the Exhibition, a special building being set apart for their exhibits. At first sight one would think that the water-power developments would be almost confined to the northern Alpine glacier-fed districts, whereas, in fact, great developments have taken place in Southern Italy, Sicily, and Sardinia in districts supposed to be poverty stricken large bodies of water being held up by dams which make artificial lakes, irrigation going hand in hand with the electrical developments. An interesting and ingenious diagram is to be seen in this section. By means of miniature red and white coloured lights to denote steam- or water-power stations, placed on a large scale relief map of Italy, which lamps are switched on in groups, the progress of electricity supply from 1891 to the present day can be seen in five-year steps. The progress of the last few years has been remarkable.

In the same section the firm of Marelli has an interesting stand, on which are to be seen a 2,000-kVA 55,000/6,600-V, 3-phase transformer and a small turbo

generator; a number of table and other fans represent a line of business in which this firm has obtained an important position.

Another firm that has a reputation outside the limits of Italy is that of Richard-Ginori, a concern that has been for many years a manufacturer of high-class porcelain ware, and, like the Frank Haviland Co., of Limoges, has taken up the manufacture of porcelain insulators. This firm exhibits pin insulators for a working pressure of 80,000 volts, although some power concerns in England and elsewhere begin to use suspension insulators at about 30,000 volts. There are also on view several types of suspension insulators by this maker for very high pressures.

Swedish Section.

A wooden building of an artistic character is used to house the Swedish exhibits. A special feature is a panorama of part of the Gellivara Railway, which trans-

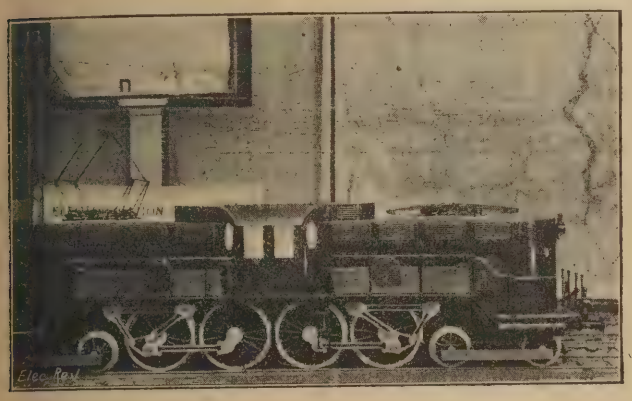


Fig. 2.—Model of Locomotive for the Orleans Railway.

ports iron ore to the ice-free port of Narvic over the Norwegian border. This railway is within the Arctic circle. A large model is exhibited of an articulated locomotive used on the railway; it is equipped with electrical apparatus made by the Swedish General Electric Co. Photographs and diagrams are on view of a number of typical Swedish water-power undertakings, among them Trolhattan and Porjus.

There is also a building devoted to the travel and water-power exhibits of several foreign countries, among them Poland. At first sight one would think that there could be but little water power available in that country. The Germans in East Prussia have developed the several low falls on the basin of the Baltic, and in Poland the same thing is taking place. The south of Poland, which borders on part of the Carpathians, is mountainous, and some high falls are already being utilised. There are some exhibits in the same building in connection with Norway and Germany.

Railway Section.

The section devoted to railways is of considerable interest, several heavy electric locomotives being placed in a wide and lofty building.

At the time of the writer's first visit, some of the locomotives belonging to French railways had not arrived at the Exhibition, although there were two of note—one of the French State railways for working in the Paris western suburban area, and the other of the Midi Railway, which covers the district from Bordeaux to Toulouse and Biarritz and the Spanish frontier. The former is a direct-current, 8-wheel locomotive suitable for 750 or 1,500 volts; it is one of 30 being supplied largely for hauling long-distance and other passenger trains from the Underground Invalides station in Paris to Versailles-Chantiers station. This duty is very similar to that performed by the latest type of Metropolitan Railway electric locomotives, which haul long-distance trains over the electrified section to a point where steam locomotives are attached. The locomotive is fitted with four geared axle-hung auto-ventilated motors each of 275 h.p. on a one-hour rating. The maximum speed is about 70 miles an hour, the maximum tractive effort is 12 metric tons, and the total weight is 62 metric tons. It was made by Messrs. Schneider, working in conjunction with the Jeumont and French Thomson-Houston companies.

The Midi Railway shows one of its high-speed passenger 4-6-4 electric locomotives made by the Constructions Electriques de France, of Tarbes. It is fitted with the "English Electric" system of camshaft control and vertical geared motors. As compared with locomotives with side-rod and crank drive, the Midi locomotive looks less complicated, and as compared with the State Railway locomotive above described, it has the feature of external neatness which would appeal especially to English locomotive engineers.

There are also several interesting locomotive models shown by the Orleans Railway. Fig. 2 shows a model of a type of locomotive being built for this company by Ganz.

Italian Locomotives.

The Italian Government Railway Department exhibits three heavy locomotives. They are made by the Ansaldo, Italian Westinghouse, and Ernesto Breda companies respectively. All three are for use on the three-phase railways in Northern and Central Italy, where long and very heavy gradients and frequent tunnels have to be negotiated. The three locomotives have certain features in common: two large motors each coupled by cranks and side rods and connected to the driving wheels by coupling rods, links, or grooved slots; liquid starting resistances and switchgear in general operated by means of compressed air. They have many points of resemblance to the locomotives developed for the Valtellina Railway about 25 years ago.

The locomotive of the Ansaldo Co. has 10 coupled wheels driven by two three-phase motors of 1,200-1,300 horse-power each, $16\frac{2}{3}$ periods. The two motors can be put in parallel or in cascade; they are connected directly to the line at 3,300 volts. The reversing is carried out by six vertical plungers arranged in a circle making contact with six tubes, the reversing being carried out by dropping and revolving the plungers and then lifting them into contact again, operation being by compressed air. The locomotive has a weight of 75 metric tons and 12 metric tons draw-bar pull. Many of the features of all three locomotives show the influence on design of the six-coupled locomotives first used on the Valtellina line twenty years ago. In order to enable stators of maximum width and power to be placed between the main frames of this locomotive, the slip rings

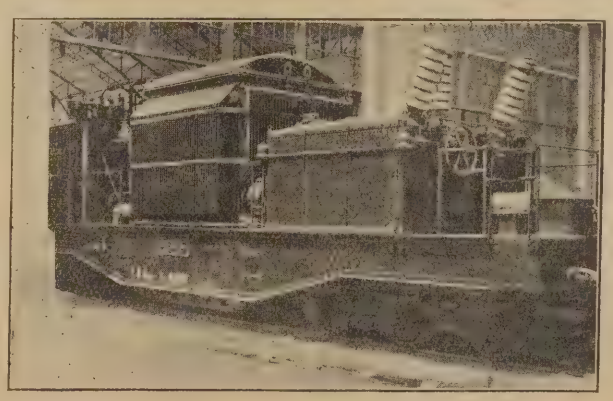


Fig. 3.—Portable Transformer Substation.

are put outside the frame and outside the cranks of the combined rotor and jack shafts; these rings are covered with sheet-steel guard cases and are very accessible. There are two 12-kVA transformers for the supply of low-pressure current for lighting, the operation of air compressors, and other auxiliaries. The resistance for starting consists of a liquid contained in a riveted steel tank with a diaphragm across it; the phases are connected to triangular plates made of an iron alloy. The liquid, which is a mixture of soda and water, is driven up into the resistance chamber and into contact first with the points of the plates and then with the full width, the plates then being automatically short-cir-

cuited. The whole arrangement of the resistance is simple; it forms a striking contrast to the complicated connections and resistances required for some modern d.c. contactor gears.

Considering the great simplicity and operating success of this type of displacement liquid resistance in connection with three-phase motors of large capacity which has now been in use in Italy for 25 years, it is remarkable that so little use has been made of the system in industrial work. Perhaps like the passive opposition which at times took place in official circles during the war to simple contrivances, some people may prefer to fry more expensive fish than is always necessary.

There are 100 locomotives of this type operating heavy goods and "omnibus" trains on sections with heavy gradients up to 1 in 36 near Turin. It is understood that these comparatively simple three-phase locomotives have proved to be efficient in practice and economical in upkeep costs. The motors are ventilated with fan draught.

There is also a 75-ton 6-coupled locomotive made by the Italian Westinghouse Co. of a type which has done good service for some time. It is arranged for four speeds. The motors can be connected up as 8-pole machines with 3-phase windings or as 6-pole with 2-phase windings, the change being made by Scott transformer connections. The locomotive itself is of the 1914 type, but a new kind of link work has been adopted which is lighter than that fitted to the other Italian locomotives on view.

16⅔- and 50-cycle Locomotive.

The third Italian locomotive, that of Ernesto Breda, of Milan, has some novel electrical features. It is designed for regular operation on a three-phase circuit at 10,000 volts, 50 cycles, the supply being from power stations which also carry an industrial load. The locomotives are designed so that they can operate without material loss on a 3,300-volt 16⅔-cycle circuit. T two driving motors, which are of 1,300 h.p. each, a geared to jack shafts by double gearing and connect to the driving wheels by coupling rods. For 10,00 volt circuits a transformer is used.

Travelling Sub-Station.

The Italian State Railway Administration has also view a transformer sub-station on a railway truc fig. 3, for use with three-phase circuits of 102,6 volts, with star connection, or of 59,300 volts when mesh. The secondary pressure is 3,700-4,460 volt A triple-tank, 3-pole circuit breaker, an oil-immers transformer, and a small operating cabin are fitted the truck frame. It is made by the Officine de Savi liano, of Turin.

There is a long building to be devoted to applicatio of electricity, but at the time of the writer's visit thin were not sufficiently far advanced for a very defini opinion to be given as to the value of the exhibits.

There is near the entrance to the Exhibition a tow made of reinforced concrete 270 ft. high, equipped wi an electric lift. From the top of the tower a remarkab view of the Belledonne and Chartreuse mountains ca be seen.

For the convenience of strangers wishing to vis Grenoble for the Exhibition, an office has been opene at the P.L.M. railway station to enable accommodatio to be procured without difficulty or delay.

Since the above was written, information has come hand that one of the Exhibition buildings was struc by lightning on the night of August 19th and burnt the ground; but although it contained a number of sma items of electrical interest, the main electrical exhibi were not damaged at all.

The exhibition is well worth a visit, especially as th cost of accommodation is very reasonable, and the trai service from Paris is convenient.

The Super-Heterodyne Radio Receiver.

A Simple Explanation of the Principles Involved.

By R. ROBERT.

A good deal of attention is being paid at the moment to the methods of securing critical tuning in wireless receivers. With the large number of stations sending out interesting programmes, the broadcatcher has developed a very decided *flair* for distance. He desires at times to cut out his local station and to hear, reasonably free from interference, say, Madrid or Brussels. This has led, naturally, to the evolution of receivers combining range with ultra-selectivity, one of the most popular of such receivers at the present moment being the supersonic-heterodyne.

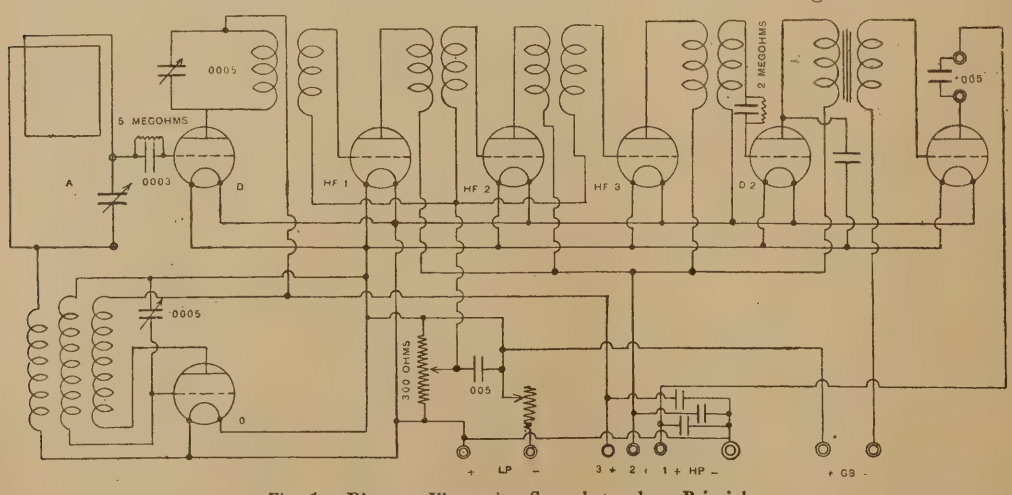


Fig. 1.—Diagram Illustrating Super-heterodyne Principle.

The Heterodyne Principle.—The principle of th exceedingly effective receiver may be roughly gathere from the diagram reproduced in fig. 1. There is, firs the frame aerial—used on account of the extra selectivit obtainable—shunted by the condenser A. The h. oscillations generated in this circuit may be amplifie if desired, by one or tw h.f. valves before bein passed on to the detecto valve D. Superimpose upon the oscillations du to the incoming signa there are the local osci lations generated by th oscillator valve O; th frequency of these oscilla tions is so arranged, b the insertion of suitabl values of capacity an inductance, that it i either slightly higher o lower than the frequenc of the incoming signa the result being that "beat" frequency is s up. To take a concret example: The incoming signal might have a frequenc of 1,000,000 cycles per second (corresponding to 30 metres); the local oscillations might be set at 1,060,00 cycles per sec., in which case the "beat" note woul have a frequency equal to the difference, *i.e.*, 60,00

cycles per second. This beat signal (60,000 cycles corresponds to a wavelength of 5,000 metres) is now rectified and amplified by the three h.f. valves, HF_1, HF_2, and HF_3. The signal is rectified a second time at D_2, whence it may be passed finally through one or two stages of audio-frequency amplification.

Advantages.—The advantage of this arrangement lies in the fact that by "converting" the wavelength of the incoming signal from 300 to 5,000 metres it is more readily amplified (multi-stage h.f. amplification on the short waves is, of course, notoriously difficult). Moreover, a slight change in the frequency of either oscillator or incoming signal will make an enormous difference to the wavelength of the "beat." If, for instance, the wavelength of the incoming signal were increased from 300-305 metres, we should get:

305 metres $= 3 \times 10^8/305 = 983{,}606$ cycles per second.
Heterodyne = 1,060,000 cycles; "beat" frequency = 76,394 cycles.
λ of "beat" $= 3 \times 10^8/76{,}394 = 3{,}926$ metres.

Therefore, the difference created by 5 metres change in the incoming wave = *1,074 metres*! This will, of course, largely explain the super-het.'s quite phenomenal selectivity!

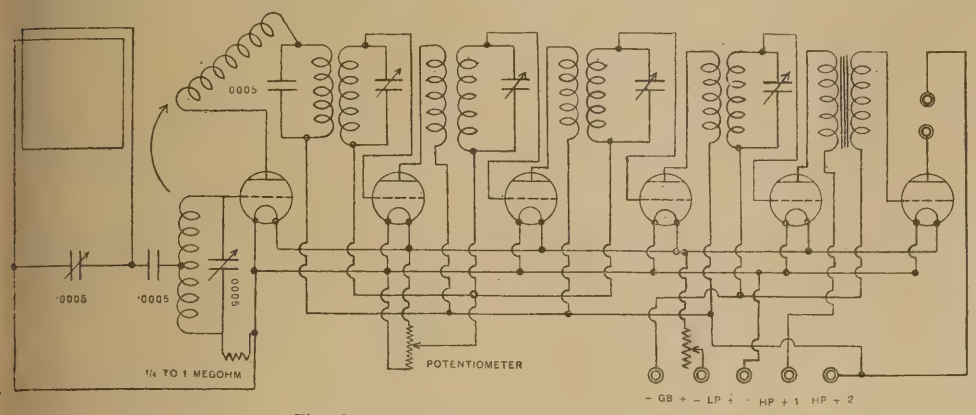


Fig. 2.—Arrangement of Tropodyne Circuit.

Essential Components.—In the case of a super-heterodyne receiver, particular care has to be exercised in the choice of components. The most important items will be the intermediate h.f. transformers and the tuning condensers; the latter should be of the "low loss" pattern, and geared dials are an absolute essential. Matched h.f. transformers suitable for the "super-het." are now freely available on the market, amongst the most efficient, so far as the present writer's experience goes, being an American pattern, the main features of which are the laminated iron cores and the small mica variable condensers by means of which the secondary windings may be tuned; the design, it is claimed, results in high amplification being obtained without in any way affecting selectivity. The oscillator coupler is another essential unit, and several excellent components—of both British and American designs—are now on the market. As it is usual to operate the "super-het." on dull-emitter valves, suitable rheostats must be chosen, though, generally speaking, one rheostat may be made to control the whole of the valves, thus making for simplicity. Finally, in order to ensure freedom from microphonic noises, the valve-holders should preferably be of the anti-phonic" pattern.

The Tropodyne Receiver.—A super-heterodyne set that is particularly interesting on account of the comparatively small number of valves required, is the "Tropodyne." Six valves are used, as against the more customary eight or nine, the arrangement of the circuit being shown in fig. 2. From this it will be seen that all h.f. valves ahead of the first detector have been eliminated; furthermore, by a slight modification of the circuit the first valve is made to act in the dual capacity of detector and local oscillator. The rest of the circuit is straightforward enough—three stages of intermediate h.f. amplification are employed, followed by a second detector and a l.f. stage. A noteworthy feature, however, is the omission of the customary grid leak and condenser for the second detector valve. Rectification is brought about by operating on the bends of the characteristic curve, and a grid bias terminal is provided on the panel for this purpose. It is now possible to obtain complete kits for building up the "tropodyne" receiver quite readily, the kits comprising a suitable oscillator coupler and four intermediate transformers of the type already referred to.

Manipulation.—The ease with which the "super-het." may be operated is the last, though by no means the least, of its many advantages. On a straightforward set there are usually only four controls, *i.e.*, for the filaments, (2) aerial tuning, (3) potentiometer (stabilising the intermediate h.f. amplifier), and (4) oscillator condenser. The procedure of tuning-in is somewhat as follows:—The frame is first rotated so as to be approximately directional for the transmitting station; the oscillator condenser is then moved one or two degrees at a time, each adjustment of this condenser being followed by a complete swing of the aerial-tuning condenser. The long-wave amplifier should be kept just below the oscillating point, a condition which may be brought about by suitable adjustment of the potentiometer. The station will be found to come in at two points on the oscillator condenser, and it is usual to work in that position, which gives greatest freedom from interfering signals. The adjustment of the condensers will be found to be extremely critical, a degree or two either way being usually sufficient to lose the signal. When certain types of transformers with tuned secondary windings are used, they should be carefully tuned to a particular wavelength—say, 5,000 metres—after which they do not require any further attention or adjustment.

Legal.

Colwyn Bay U.D.C. v. Llandudno and Colwyn Bay Electric Railway, Ltd.

IN the Vacation Court on August 26th, Mr. Justice Finlay had again before him the motion by the Colwyn Bay Urban District Council to restrain the defendants until the trial of the action from running tramcars on Sundays in alleged breach of agreement (*vide* our last issue, p. 333).

Mr. G. B. HURST, K.C., for the defendants, contended that the agreement in question was superseded by a Provisional Order of September 30th, 1907, which gave the Council power to regulate the running of the cars by the making of by-laws which would have to be sanctioned by the Board of Trade, before whom the public would have the right to oppose them. He also submitted that the Light Railways Act, 1896, imposed a statutory obligation upon the company to construct, maintain and run the cars which was incompatible with an agreement made with the Council behind the backs of the public. The public had to be considered as well as the Council and the company, and the agreement was against public policy.

Mr. E. W. CAVE, K.C., for the Council, said that the general public were not affected, as the cars were only run for the benefit of the members of a golf club.

Mr. JUSTICE FINLAY said that it was not without some hesitation that he thought he ought to make an order in this case, but in his opinion the object of the agreement was to avoid the necessity of the Council's having to make by-laws preventing the running of the tramcars. He granted the interim injunction asked for.

Hotel Without Bells.—House telephones, which can also be used for outside calls, will take the place of the old-fashioned push bell in the new hotel which is being erected on the steel skeleton which has stood for ten years in Piccadilly. Arrangements have been made for the installation of four hundred telephones. The occupant of any room will be able to call up, on one instrument, any department in the hotel, or any number in the directory; he will be able to talk to his next room neighbour, or to the North of Scotland. Inside calls, of course, will not be charged for.

D

Electricity in Agriculture.

Abstract of I.E.E. Committee's Report.*

THE Committee appointed by the Institution of Electrical Engineers in March, 1923, to consider the use of electricity in agriculture held five meetings, and has summarised the information it obtained in the form of a report under the following headings :—

Uses of Electricity.

Lighting.—Electric light is of considerable assistance to the farmer, and its use permits certain operations which at present are carried out in daylight only to be performed by artificial light. The risk of fire, always serious on the farm, is minimised.

Motive Power.—Electric motors are generally stationary, either attached to the machines they operate, such as chaff-cutting and corn-grinding machinery, or driving by means of shafting a group of machines, as in dairies. Special types of portable motors suited to farm work have been evolved, particularly on the Continent, fitted with suitable reduction gearing for the operation of portable and stationary machines which run too intermittently to justify separate motors. Table 1 may be taken to be a reasonable estimate of use for an average farm, and Table 2 sets out the ascertained figures of use on 33 British farms in a certain supply area.

TABLE 1.

Consumption on a Farm of 150 Acres.

	kWh per annum.
Lighting (house)	100
Lighting (buildings)	150
Motive power, barn and dairy	1,500
Heating and cooking	1,500
	3,250

TABLE 2.

Annual use on Farms in Great Britain.

Motors on each farm, average	1.4	
Average horse-power	10	
Electric lamps per farm house	18	
Electric lamps in buildings	18	
Average consumption per annum—		
Lighting	370	kWh
Heating	470	,,
Power	1,370	,,
Average total consumption per annum	2,210	,,
Average acreage	230	,,
Average consumption per acre per annum	9.5	,,

Statistics of use on Continental farms which have used electricity for several years show a higher consumption than this, averaging 22 kWh per acre. The consumption of electricity per acre of arable land is apparently a function of the fertility of the soil. In a very fertile region in the North-East of Germany the consumption averages (without any electric ploughing) 100 kWh per acre. In accordance with the returns for 34 rural districts in Germany, the consumption per acre was 12.5 to 22.5 kWh for lighting and 27.5 to 42 kWh for power, a total of 40 to 65.5, or an average of 50 kWh per acre.

In the Field.—The principal potential use of electric motors is for ploughing, harrowing, &c., and for thrashing. The application of electricity to ploughing requires motors of from 12 to 125 h.p., and is carried out in one of several ways, those most generally adopted being :—

(i) By means of two stationary motors placed one at each side of the field to be ploughed, with a single steel cable traversing the distance between them, the plough being hauled in one direction by one motor and in the other direction by the other motor.

(ii) By the Howard or Fisken system, which uses a single fixed motor and, by means of ropes with movable anchored pulleys, draws the plough or other implement backwards and forwards on the field.

In general these systems, as in the case of steam-ploughing on the well-known Fowler system, are applicable to large farms, or suitable for employment by contractors who carry out the work on terms for the individual farmer. The problem of electric ploughing, although it is one of the most important on the farm, particularly in view of the growing importance of the sugar-beet industry, which requires deep ploughing, cannot be said to be fully solved. It would be the most important load on the farm from the point of view of the power supply engineer. All the arable land on a farm might well be ploughed twice a year, with a consumption of at least 20 kWh per acre, that is, 40 kWh per acre per year. Cultivation work on similar lines would take about half this amount say, 20 kWh per acre, or a total of 60 kWh per acre; that is, on a farm of 150 acres, half arable, 4,500 kWh for the field operations alone. In the absence of any extended experience of electric ploughing in this country comparative costs are not available.

Cost of Electric Ploughing.

The following (Table 3) prices at which electric ploughing is done in France by contract represent cost and profit, the price being regulated by competition with horse ploughing. The figures are given subject to a caution that comparison between the British and French figures must not be taken too literally as the external and internal values of the franc are very different :—

TABLE 3.

Contractors' Price List.

Depth of Ploughing.	Subsoiling.	Total depth.	Price per acre.	
in.	in.	in.	fr.	s. d.†
10—12	5—6	15—18	137	34 3
8—10	5—6	13—16	130	32 6
12—14	—	12—14	127	32
10—12	—	10—12	120	30
6—8	5—6	11—14	120	30
8—10	—	8—10	93	23
6—8	—	6—8	66	16 6

† At 80 fr. to the £.

The charge for scuffling to a depth of about 4 in. was 40 fr (say, 10s.) per acre. In France it is usually reckoned that 10 fr. (say, 2s. 6d.) per 4 in. of depth is a reasonable charge to pay to contractors for ploughing and subsoiling. In the 1924 season an electric ploughing set ploughed 1,453 acres (588 hectares); scuffling was done at the rate of 49½ acres (20 hectares) per day, while a six-furrow plough accomplished from 16¾ to 19¾ acres (6 to 8 hectares) in the same time, and a four-furrow deep plough did 12¼ acres (5 hectares).

Thrashing by means of portable electric motors is another operation which is frequently done on the Continent through contracting firms, which supply a portable transformer for connecting to the distribution system, a cable drum, and the necessary large portable motor.

Crop Stimulation.

A good deal of isolated and badly co-ordinated experimental work has been done by various observers as to the stimulation of field crops, from which a general impression only can be received; it would appear, however, to be established that it is possible in certain cases to increase considerably the quantity and quality of certain crops. In 1918 a committee was formed by the Government, under Sir John Snell, to investigate this question, and seven reports‡ have been prepared. The results of the field experiments were so conflicting and difficult to reconcile that it has been decided at present to concentrate on pot-culture experiments, with a view to determining as quickly as possible the general conditions of electrification which are favourable, after which field operations will be resumed.

It has been stated in the second report of the Committee referred to, that increase in yield averaging about 30 per cent. has been obtained in field experiments. The matter has reached a stage which is as yet of no very great practical importance, or direct application, owing to lack of commercial data and apparatus suitable for placing in the hands of the farmer. The amount of electricity used for the purpose is insignificant, not amounting to more than about 10 watts per acre, applied for, say, 2 hours a day for one to two months of the growing period.

Capital Outlay.

At the Farm.—Generally, it is probable that as regards the larger field operations the capital outlay is so considerable relative to the amount of use on any particular farm, that except in the case of the largest farms the ploughing and cultivating tackle, as has occurred in the case of steam tackle will be owned by contractors who will do the work for the farmer. On the other hand, the use of electricity in the house, barn, and dairy will be made with machinery and appliances provided by the farmer, and the cost may be estimated as follows :—

	£
Three electric motors, aggregating 10 h.p., with starting and reducing gear	60
Electric light, 36 points in house and building	36
Sundry cable and switchgear, not included in the lighting	20
	116
Sundry household apparatus	40
	£156

There is evidence that farmers will willingly pay for lighting 8d. per kWh, for heat 2d., and for power 4d. (electric ploughing from 1d. to 2d.). It is difficult to put any precise figure on the financial return to the farmer. It is probable that on farms employing five men and upwards where other power has not been installed, at least one man can be saved. On smaller farms the advantage would be rather in reducing the number of hours the farmer and his family would have to

* From the *Journal* of the Institution of Electrical Engineers, August, 1925.

‡ Copies may be obtained from the Ministry of Agriculture

work and reducing the actual manual toil involved, reducing risks of fire, or increasing the output of the farm. There is no doubt also that the provision of good lighting in the mornings and evenings of the winter months contributes to saving of waste of materials and of time lost. In the case of farmers owning a considerable head of poultry, it has been established that by lighting the poultry houses in the winter months morning and evening there is an improvement in the average value of the eggs produced, not so much in an increased total number as in their distribution towards the months when daylight is shortest, with a consequent advantage of about 20 per cent. in their average value. The result of these various factors is that in the case of an ordinary farm it is estimated by the Committee that these outlays will repay themselves in about four years, after which there will be a return, allowing for repairs, of probably 20 per cent. per annum on the money spent on the equipment. Although this is attractive, the fact has to be faced that farmers have lost a large amount of their capital during the last few years, and that it is probable that in the majority of cases some system of furnishing the equipment on hire-purchase terms would be necessary to encourage the adoption of electricity.

On Distribution.—In this question lies the principal problem of the supply of electricity for agricultural purposes. Whatever the future may hold, there is universal agreement that, in the early stages of establishing a network of mains to supply purely agricultural areas with electric power, there will not be a load which will produce a fair return on the expenditure for distributing mains if the development of the uses of electricity is left almost entirely to the initiative of the farmers. The experience in England, France, Italy, Switzerland, Holland, Sweden, and Canada leads to the same conclusion and to the general statement that (1) there must exist other sources of income for the transmission system capable of carrying a large, if not the major, part of the capital charges on the investment during the period required for the natural education of the farmers; or (2) there must be an abnormal economic demand for the energy, rendering possible its sale at an abnormal price; or (3) there must exist an abnormal supply of electrical energy which could not otherwise be sold, rendering economic its sale at a price well below the average cost of production, or (4) there must exist social or political reasons why the supply should be furnished at an uneconomic price on account of other advantages to be gained.

In the first category is Sweden, where the transmission lines from the waterfalls pass along the valleys in which the agricultural areas are situated, and the lines are easily tapped. In Holland lines are put up for distribution to towns and for the driving of drainage pumps throughout the country, which lines are again easily tapped for agricultural purposes. Or, again, in Switzerland, a large number of small towns in which are situated semi-domestic industries are bear costs of the transmission and distribution networks used for agricultural purposes.

In the second category is France, where the shortage of man power stresses the necessity for the supply of motive power, and, in addition, the necessity of maintaining a source of military strength necessitates the maintaining of the agricultural areas at their highest working power and making them as attractive as possible to the population, even at the expense of the State.

The third case is illustrated by Italy, where there is a superabundance of hydraulic power from the Alps in the summer time, the season of the year when the industrial demand is at its lowest and the farming demand at its maximum.

In this country it is probable that the first-mentioned consideration will be the predominating influence, though it is likely that the existence of loads other than those provided by agricultural operations or, alternatively, the establishment of industries providing such loads, will be dominant factors so far as rural electricity supply is concerned. Also, in other countries, notably in Scandinavia, Canada and Italy, financial assistance is given by the State towards the provision of rural distribution lines.

Schemes in Operation.

In some parts of the Continent the supply of electricity is remunerative. When the electrical equipment of railways becomes an accomplished fact there will be a general distribution system in existence which will enable electricity to be carried more widely into the agricultural areas. The towns of Altrincham, Aylesbury, Chester, Hereford, Wolverhampton, &c., have already extended, or decided to extend, their lines into the surrounding districts, while the power supply undertakings in South Wales, Fife, Kilmarnock, &c., are already supplying a number of farmers. With regard to the actual cost of such distributions, for 6,600-volt overhead bare lines on insulators with creosoted poles carrying three conductors, each No. 10 S.W.G., all to comply with the Electricity Commissioners' regulations, the cost would lie between £500 and £600 per mile, and it is probable that cheap underground cable systems could be laid in the open country for about the same figure, but the fact remains that the lines erected in agricultural districts in foreign countries have cost much less—even as low as £100 per mile in Sweden—and it is probable that a study of the best methods of erecting such lines will lead to a figure of £250 to £500 per mile to comply with the regulations necessary in this country. There is little doubt that the single-phase system is cheaper and there is some simplification in transforming and switching gear. On the other hand, the motors are rather larger and more costly, and, so far, whatever installations have been completed have been upon the three-phase system.

In order to summarise this part of the report, it may be well to give the following actual example (in Sweden) obtained by a member of the Committee where conditions were not favourable to a large consumption per acre, as the land was poor. In a rural area of 3,700 acres (of which 1,700 were woodland and waste) about 15 miles of distributors were used to supply 22 farms and 29 other rural customers whose consumption, averaged over several years, was 82,000 kWh per annum. The return on the capital expended (which was heavy, as the work was carried out during the war) was 5 per cent. per annum. The consumption per acre was 22 kWh, or 5,570 kWh per mile of distributor.

Steps Which Might be Taken by the Institution.

Although the actual consumption per acre or per farm appears small, yet the total acreage of farm lands in this country is nearly 27 millions out of the total area of 56,788,366 acres in England, Scotland, and Wales, and the supply of electricity to farms, if carried out, would aggregate a very large total, say, under English conditions, 260 million kWh per annum without electric ploughing or cultivation, and from two to three times this amount if electric ploughing and cultivation as in Continental practice were adopted. The laying out of the work, the construction of the generating plant and cables or overhead lines, and the supply of plant and accessories would form a very important addition to the activities of the electrical industry. This, added to the social and economic betterment arising therefrom, is of such importance that it is recommended that the Institution should use its influence in promoting this object. To this end the following are some of the steps that might be taken:—

(1) The appointment of a permanent Committee, to advise the Council of any development arising which it should take note of, or on which it should take action.

(2) The presentation of a memorandum to the Government pointing out the advantages that would arise from a wide distribution of electricity to agricultural counties, and that this should be taken into consideration in fostering schemes of railway electrification.

(3) That a special recommendation should be made to the Government in connection with the provision of financial assistance, either in the form of direct grants or the provision of finance at specially low rates and repayable over long periods, towards the cost of provision of distribution lines in rural areas in districts where there is a prospect of the undertaking becoming profitable in the course of a few years.

(4) That the Institution should take steps to encourage the design by the leading British manufacturing firms of electrical apparatus especially suited to agricultural conditions.

(5) That in connection therewith the Government should be urged to issue through the Ministry of Agriculture in conjunction with the Electricity Commissioners authoritative leaflets on the subject, showing what has been done and what can and ought to be done by farmers when a supply is available.

(6) That the Institution should offer to co-operate with the Royal Agricultural Society and other agricultural bodies in tests and experimental work, and in formulating a policy for the supply of electricity to the farming population.

(7) That the Institution should take steps to obtain a paper each year on a subject dealing with the applications of electricity to agriculture, and that joint meetings with the Royal Agricultural Society or with one of the other farmers' organisations should be arranged.

(8) That the Institution should take steps to initiate experimental work by, or through, existing bodies:—(*a*) In improving the efficiency of farm implements and machines by redesign to use the new forms of power available. (*b*) In improving the efficiency of methods of crop treatment by means of the new form of power available. (*c*) In carrying out investigations that would provide useful data in relation to the application of electricity to agriculture.

(9) That the Institution should take steps to propose rules for rural distribution networks, overhead and underground, these rules only to apply to distribution to farms, villages, and small industries, leaving other work to be carried out under the existing regulations as at present approved by the Electricity Commissioners.

J.I.E. Library Catalogue.—We have received from the Junior Institution of Engineers a copy of the catalogue of books in the Institution Library, which has been recently compiled and is, we understand, being sent free to all members of the Institution with the September issue of the *Journal*. The material is classified so as to enable one to see at a glance what books on any particular branch of engineering the Institution possesses. The fact that the Institution embraces all branches of engineering naturally means a non-specialised Library; the rapid increase in recent years of the number of books in its possession made it imperative that a comprehensive list should be issued, and much consideration was given to the method in which the books should be catalogued. The blank spaces left at the end of each section are a special feature, designed for the inclusion of new works as these are added to the Library; particulars will be printed on gummed paper and issued quarterly to the members, who will thus be able to maintain their lists up to date.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

On Finding the Right Man and Keeping Him.

I have read with interest the article by Mr. W. Roland Needham in your issue of August 21st, and agree that employers are apt to employ men who have "notable credentials," a bouncing manner, and on paper, "a man who can reel off a most formidable itinerary of service," but who "in fact is a most ignorant person." I myself have had experience of such; one will come in contact with men at work who are absolutely incompetent for the positions they hold. Why? because nine times out of ten, the men under them do the work and these incompetent "officials" get the credit and therefore hold their "jobs." My idea is this: If you have a man who is trustworthy, keen, and intelligent, look after him and encourage him and one day you can offer him that vacant senior position. Grow a man for the job. I know of one works manager who will not employ new labour if he can possibly avoid it, but grows all his men for the vacant responsible positions and he always gets satisfaction. I noticed an advertisement in a technical journal lately to this effect: "Advertiser seeks position, age 23," then a long list of experience in almost every branch of the electrical trade and outside the electrical trade; common sense should tell that no man of 23 has had such experience. To conclude, let the managers, assistant managers, and engineers keep their eyes open amongst the men, and select those to whom they can safely offer senior positions and not go by what they are told, or because "his father or relation is a friend of mine."

Mr. Nervous Man.

Pontypridd, *August 27th*, 1925.

Is There an Age Limit?

The letters on the above subject are really amusing to me, as a unit of the despised working class.

It does not seem credible that persons who have held important positions under the employers as stated are ignorant of the existence of the age limit as a definite law which the workman is confronted with, as of necessity they must have enforced it as efficient servants of Capital.

Your correspondents, if they take the trouble to inquire, will find that all transport concerns, Government departments, and all large establishments, have the age limit strictly enforced, with the solitary exception of the judicial profession, where you could be employed till you were 150. At the present time in the electrical industry the employable age would appear to be from 14 to 30, and after that oblivion.

Thanks to the patriotic efforts of our rulers in enforcing payment of our debts to the profiteers who bled the British people when they were fighting for existence and who are too cowardly to exact payment from their own debtors, the nation is now bankrupt. Of course this statement will be challenged, but the facts remain: A nation's wealth lies in its skilled workmen, and England's have departed or are rotting in the streets.

It appears that in the near future electrical work will be erected with the aid of the paste pot, and the efficiency of the workman will be graded on the merits of his application thereof.

Trades are now recognised as a blind alley, not a living wage when one is out of work four months in the year, and it is a crime to apprentice boys to them. It was stated, I believe, by the man who won the war—the Minister of Munitions—that it was an engineers' war. The only thing to be said is: May the Saints help England in the next, when there are no skilled craftsmen left.

With reference to Major Porter's letter, I would point out that a criminal receives better treatment than an ex-Service man.

Ex-Sapper, Royal Engineers.

August 18th, 1925.

Charges for Electricity Supply.

With reference to the issue of the Electrical Review dated August 28th, 1925, my attention has been drawn to the statement on page 346 dealing with "Charges for Electricity Supply."

I note that your correspondent includes Eccles in a list of undertakings which do not hire-out electric cookers. This statement is not correct, as the Eccles electricity undertaking has had in operation a hiring scheme for electric cookers for over 12 months. The rental charged for the hire of the cooker is at the rate of 7s. 6d. per quarter, and the rate of charge for a supply of electrical energy for cooking purposes is 1d. per unit, plus 12½ per cent., less 5 per cent.

I shall be obliged if you will kindly publish this correction so as to remove the mistaken impression arising from the statement in last week's Electrical Review.

H. W. Angus,
Borough Electrical Engineer.

Eccles Corporation Electricity Works, *August 31st*, 1925.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Electricity in North Wales.—Speaking at a luncheon last week attended by members of the Conway and Colwyn Bay Joint Water Board, Mr. H. J. Jack, managing director of the Aluminium Power Corporation, intimated that an electricity distribution company with a capital of £250,000 would shortly be formed to light with electricity North Wales towns at present without a supply.

Coal Meter Orders.—The Lea Recorder Co., Ltd., has recently received orders for its coal meter from the following electricity supply undertakings, &c.: Barking (24), Liverpool (14), Nottingham (18), Preston (15), Salford (18), Stoke-on-Trent (19), Devonport Dockyard (26), Colenso (Natal) (16), Hong Kong Electric Co. (16), Calcutta Electric Supply Corporation (15), and Copenhagen (4).

Brazil's Wire and Cable Imports.—Statistics published in *Commerce Reports* show that during 1923 Brazil imported 890 metric tons of uninsulated copper wire, 957 tons of insulated copper wire and 1,332 tons of electric cables. The bulk of the total came from the United States, although Great Britain was the principal supplier of electric cables.

Lead Market Report.—Messrs. James Forster & Co., reporting on August 29th, stated:—"Official closing prices yesterday were £39 for August and £36 16s. 3d. for November, showing a fall on the week of 5s. a ton for forward, with August unchanged. The firm tone which set in at the end of last week was continued, and prices by Wednesday had advanced a further 17s. 6d. for August and 11s. 3d. for November, until £39 17s. 6d. and £37 12s. 6d. respectively were touched. On Thursday and Friday there was a reaction of about 16s. 3d. a ton in all positions. The close is steady at £39 2s. 6d. for August, £38 8s. 9d. for September, £37 10s. for October, and £36 16s. 3d. for November. Consumers, particularly cable-makers, have bought heavily this week for September and October delivery. Arrivals this month should total well over 20,000 tons, but in spite of this prompt lead is scarce, the premium over forward now standing at 45s. a ton. The question of future supplies is complicated by the constant friction in the shipping trade in Australia, where steamers are being delayed and lead is accumulating at the ports."

Hungarian Electrical Exports.—According to the *Board of Trade Journal* the exports of electrical machinery and apparatus during the first six months of the current year amounted to 14,932 quintals valued at 5,742,000 kr. (gold). This compares with 18,600 quintals (7,891,000 kr.) in the first half of 192

Boiler Contracts.—Messrs. Yarrow & Co. (1922), Ltd inform us that they have recently secured an order for four of their patent water-tube boilers, with Yarrow superheaters and air heaters, for an important power station in London, each boiler having a maximum output of about 100,000 lb. of steam. They state that this is the third important electric power station in London which has recently introduced their boilers, the others being the County of London Electric Supply Co.'s power station at Barking and the London Electric Supply Corporation's station at Deptford

Trade Announcements.—Mr. S. Crosby, radio engineer, has opened premises at 8, Walton Road, Stockton Heath, near Warrington.

The National Gas Engine Co., Ltd., has removed to its new offices at Australia House, Strand, W.C.2, as from September 1st. The telephone numbers will remain the same as before *viz.*, "Central 7084 and 7085."

Mr. Harold Field, A.M.I.E.E., for the last 10 years engaged as works manager and lately as general manager to the Western Engineering Co., Swansea, has now purchased the whole of the works and premises of that company, and intends to carry on business on his own account at that address. He asks for catalogues of electrical and mechanical plant.

The Z Electric Lamp & Supplies Co., Ltd., has appointed Mr. D. J. Crawford as its Nottingham and district representative in the place of Mr. Thorburn, who has left the company. Mr. R. P. Stewart, 30, Commercial Street, Dundee, has been appointed Dundee and district agent.

Messrs. Morley & Thuey have opened premises at 21a, High Rise, Richmond, Surrey, for the sale of electrical and radio apparatus, and ask for catalogues.

Messrs. F. Winkworth & Co., electrical engineers, have removed from 137, Victoria Street to 82, Victoria Street, S.W. Their new telephone numbers are Victoria 1770 and 1771.

Catalogues and Lists.—METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Descriptive Leaflet No. 783/2-1, containing illustrated particulars of applications of arc welding.

THE EVER READY CO. (GREAT BRITAIN), LTD., Hercules Place, Holloway, N.7.—General catalogue for 1925-26 of dry batteries for radio and general applications; Leclanché cells; pocket lamps and small lighting sets; and accumulators.

THE MULLARD RADIO VALVE CO., LTD., Nightingale Lane, Balham, S.W.12.—An illustrated pamphlet describing the company's publicity scheme for the coming radio season.

THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—The "Benjamin Reflector" for August, dealing with correct illumination, &c. Also an illustrated pamphlet dealing with the "Rodalux" longitudinal street lighting reflector.

MR. ALAN WRIGHT, Sentinel House, Southampton Row, W.C.1.—A folder containing illustrations of "Inventum" toasters, irons, bowl fires, kettles, and other appliances. Priced.

THE LISENIN WIRELESS COMPANY, Connaught House, 1a, Edgware Road, W.2.—An illustrated and priced trade catalogue of radio components and accessories.

MR. GEORGE ELLISON, Perry Barr, Birmingham.—An illustrated booklet, entitled "Starting and Stopping Electric Motors," and containing particulars of the firm's controllers in non-technical language.

THE CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, near Manchester.—An illustrated folder, giving details of an "Exide" publicity "campaign" which is being carried out by the company, together with specimens of showcards, posters, &c., which are being issued in connection with it.

CLEARTRON RADIO, LTD., 1, Charing Cross, W.C.—A price list of "Cleartron" radio valves for various applications.

THE CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1.—A mailing card advertising "Cambridge" automatic temperature regulators.

MESSRS. HENRY POOLEY & SON, LTD., John Bright Street, Birmingham.—Catalogue No. 1,825, dealing with counter scales and scale beams.

MESSRS. HERBERT MORRIS, LTD., Loughborough.—Book 104, containing illustrated particulars of overhead hand-power cranes.

ELECTRO-DYNAMIC CONSTRUCTION CO., LTD., Malt Street, S.E.1.—A price list of variable-speed polyphase commutator shunt motors.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—A priced folder and an illustrated leaflet advertising "Elasta" electric lamps.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—An illustrated pamphlet dealing with a number of street-lighting fittings and appliances which are to be shown at the forthcoming conference of the Institution of Public Lighting Engineers.

JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—Two illustrated and priced leaflets dealing with water-heating apparatus; also a blotter for September.

MESSRS. WOOTTON & CO., LTD., High Street, Ponder's End, Middlesex.—A catalogue of wood fittings for electrical purposes. Illustrated and priced.

MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2.—An illustrated price sheet of "Universal" domestic appliances, including fans, vacuum cleaners, irons, cookers, &c.; and "Silverlite" shop-window reflectors.

MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester.—A well-illustrated price list of radio receiving sets, components, and accessories.

THE ELECTRIC STREET LIGHTING APPARATUS CO., 6, High Street, Canterbury.—A catalogue containing illustrations, details, and polar curves of a number of street-lighting fittings.

THE LEA RECORDER CO., LTD., 28, Deansgate, Manchester.—Two pamphlets, containing the names and opinions of users of "Lea" coal meters.

Bankruptcy Proceedings.—H. WILSON, electrical contractor and decorator, 1057, Grangefield Avenue, Thornbury, Bradford.—Receiving order made August 21st on debtor's own petition. First meeting, September 7th, at the Official Receiver's office, 12, Duke Street, Bradford; public examination, October 5th, at the County Court, Bradford.

M. O. HECKELS, electrical wholesaler and agent, 643, Welbeck Road and Star Buildings, Northumberland Street, Newcastle-on-Tyne.—Trustee, Mr. W. Brittain, 4, Northumberland Street, Newcastle-on-Tyne, released July 13th.

C. BINNS (United Electric Co.), electrical engineer, 55, Low Briggate, Shipley, Yorks.—First and final dividend of 1s. 0¾d. in the £, payable at the Official Receiver's office, 12, Duke Street, Bradford.

W. DUNCAN, electrician, New Road, Dunblane.—Meeting of creditors was called for September 3rd, at County Buildings, Dunblane. Mr. C. H. Urmston, agent, 140, Princes Street, Edinburgh.

F. J. TIZZARD and N. TIZZARD (Tizzard Bros.), electrical engineers and contractors, 27, Dalkeith Street, Barrow-in-Furness, and 121, Market Street, Dalton-in-Furness.—Receiving order made August 26th, on debtors' own petition.

S. G. WILKINSON, electrician, 25, Havelock Road, Harrow, and 16, High Road, Wembley. Trustee, Mr. T. Gourlay, Official Receiver, 29, Russell Square, W.C., released July 23rd.

J. HILLIER, electrical engineer, 58, Trafalgar Terrace, Swansea.—Trustee, Mr. H. Rees, Official Receiver, Government Buildings, St. Mary Street, Swansea, released July 17th.

Company Liquidations.—E. S. COMPANY, LIMITED, electrical and wireless dealers, 233, Tottenham Court Road, London, W. The following are creditors, in addition to those mentioned in our issue of August 14th (p. 257):—

	£
Aldous Campbell, Ltd.	22
Atlas Carbon & Battery Co.	48
Allgood, G. & S.	22
Belling & Co.	69
Berry's Electric, Ltd.	94
Bint & Co.	22
British B.A.G., Ltd.	87
Burndept, Ltd.	50
Bateman & Co.	55
Cooke & Vowles	29
Cables & Electric Supplies Co.	55
Criscuolo, Ltd.	32
Central Cable & Accessories Co.	23
De Garrs & Allen, Ltd.	23
De Maid, Ltd.	53
Dubilier Condenser Co.	21
Electric Accessories Manufacturing Co.	52
Ebonestos Insulators, Ltd.	54
Evans, Stanley	32
Electric Heating & Hardware Co.	64
Ever-Ready Co.	55
Engineering Supplies	23
British L. M. Ericsson Mfg. Co., Ltd.	76
European & General	34
Ehrmann, R.	56
Ego Engineering Co.	45
Falk, Stadelmann & Co.	68
Forward Electric Co.	25
Fuller's United Electric Works	81
Formo Co.	35
Grant, R. C., & Co.	21
General Radio Co.	49
Gothe & Sohne	58
Garnett, Whiteley & Co., Ltd.	44
Holophane, Ltd.	33
Horstmann Gear Co., Ltd.	27
W. T. Henley's Telegraph Works Co., Ltd.	25
Johnsen & Jorgensen	51
Jungbaur, W.	33
Jardine, John	47
London Commercial Electric Co.	32
Leach, S. G., & Co., Ltd.	91
Lowenadler, F. H.	71
London Electric Wire Co. and Smiths, Ltd.	39
Milner, F.	39
Morris, J. R.	26
Middlesbrough Steel Tube Co.	43
Marshall Electric Co.	32
Manchester Radio Co.	48
Northern Radio Co.	37
Preh, J., Junr.	41
Riuso, J.	43
Radio Communication Co., Ltd.	55
Radiobats, Ltd.	149
Siemens Bros. & Co.	52
Simplex Conduits, Ltd.	36
Sanders, W.	65
Scupham & Wood, Ltd.	68
Shanks, D., & Co.	25
Sullivan, H. W., Ltd.	60
Saveker, T.	34
Supra Electric Co.	48
Schaffer Bros. & Berry	53
Sterling Accessories, Ltd.	66
Southgate, Ltd.	64
Shrimpton & Sons	63
Sperryn & Co.	51
Street, G., & Co.	66
Stonham & Sons	25
Siebs, P., & Co.	30
Swiss Insulating Co.	30
Schmahl & Schultz	46
Srangrant Bros., Ltd.	43
Smithers, Ltd.	27
Thursfield & Co.	68
Vincent Switchgear Mfg. Co.	50
Vandervell & Co., Ltd.	22
White, J. C.	31
Wholesale Fittings Co.	68

ROBINS WHOLESALE ELECTRICAL & WIRELESS CO., LTD., Fanny Street, Cardiff.—A meeting of the creditors of the above was held recently at the offices of Messrs. Clarke, Dovey & Co., Cardiff. A statement of affairs was presented, which disclosed liabilities of £4,261, including £3,372 due to trade creditors. In addition, there were fully secured creditors for £11, who held security valued at a like amount. There were debentures for £2,148, with interest accrued amounting to £74. The net assets amounted to £595, leaving a deficiency as regarded the creditors of £3,666. The issued share capital amounted to £999, making the total deficiency £4,665. The company was incorporated on August 7th, 1922, as the Robins Electric & Wireless Depository & Institute, Ltd., for the purpose of dealing in radio requisites, both wholesale and retail. The nominal capital of the company was £1,000. For the purpose of obtaining wholesale terms from members of the N.A.R.M., a separate company was registered in September, 1924, under the name of Robins, Ltd., and the name of the original company was changed to the present title, the intention being to deal in a wholesale way only. The whole of the purchases of Robins, Ltd., had been made from the present company, and the latter had also purchased goods for another small company which was formed in February of this year. The deficiency was attributed to depreciation written off the assets, and loss on trading. At the present time there was a sum of £1,316 due from the retail company for goods supplied. Mr. Robins, who was the debenture holder in respect of cash advanced and machinery, plant and stock, stated that he was willing to take over that debt and credit it against his debenture. A fire took place in October, 1923, and £1,800 was received from the insurance company. In consequence of the company being pressed by creditors, the debenture holder, on April 17th, appointed a receiver, who was now in possession of the assets, and the sum of £300 had been paid off the debenture by the receiver to Mr. Robins. It was decided that a petition should be presented for the compulsory winding-up of the company. The following are creditors:—

	£
Acme Productions Co., Ltd.	50
British Thomson-Houston Co., Ltd.	106
Brown, S. G., Ltd.	80
Brandes, Ltd.	30
Bonnelle, Jos.	36
Claremont, Johnson & Co.	30
Carpax Co., Ltd.	30
Efandem Co., Ltd.	60
Elwell, C. F., Ltd.	60
Ellis & Sons	47
General Electric Co., Ltd.	45
Hough, J. E., Ltd.	30
Hart Accumulator Co., Ltd.	40
Igranic Electric Co., Ltd.	70
Jardine, John, Ltd.	45
Joesbury, W., & Son	36
Lissen, Ltd.	30
London Electric Wire Co. and Smiths, Ltd.	44
McTaggart & Co.	68
Millett, J.	36
Marconiphone Co., Ltd.	135
N.S. Battery Equipment Co., Ltd.	90
Paragon Rubber Co.	76
Pedley, J., & Son, Ltd.	49
Portable Utilities Co., Ltd.	40
Radio Instruments, Ltd.	82
Siemens & English Electric Lamp Co., Ltd.	63
S. Wales Wireless Installation Co., Ltd.	34
Skefko Ball Bearing Co., Ltd.	30
Sterling Telephone & Electric Co., Ltd.	35
Siemens Bros. & Co., Ltd.	120
Wolf, F. (Berlin)	47
Wilding-Cole, S.	33
Webber & Co., Ltd.	40
Wilkinson Wright, Ltd.	63
Western Mail, Ltd.	43
Zeitlin, V., & Sons	30

DIAMOND WIRELESS, LTD., late 184, Oxford Street, W.—A meeting of creditors was held on August 24th, at 16, Fitzroy Street, W., when Mr. C. W. Harman, 80-2, Wardour Street, W.1, the liquidator in the voluntary liquidation of the company, reported that the liabilities amounted to £1,491, of which £680 was due to trade creditors and the balance to Mr. Jones. In addition, there were secured creditors for £12 who held security valued at £20, leaving a surplus of £8. The net assets were £77, leaving a deficiency of £1,414. The

company was incorporated on February 6th, 1924, with a nominal capital of £3,000, to acquire the business previously carried on by Mr. W. Jones, the purchase price being £2,000. With regard to Mr. Jones's claim for £810, it was stated that he would not claim against the estate. Accounts to March 31st last showed that there was a gross loss on the trading of £520. Mr. Jones stated that he was not in a position to make an offer to the creditors. It was decided that the meeting should be adjourned for 14 days with a view to Mr. Jones making an offer of 5s. in the £. The following are creditors :—

	£		£
Robinson, L., & Co.	110	Ross, Courtney & Co., Ltd. ...	20
Barclays Advertising Co.	88	Rothermel	23
Baltic Scandinavian Advertising Co.	88	British Empire Exhibition ...	27
		Batey, E. J.	49
Lighting, Heating & Glass, Ltd.	134		

ELECTROLITE, LTD., 138, Southbridge Road, Croydon.—The winding-up order in this matter was made on a creditor's petition. The statement of affairs shows liabilities of £10,565, and net assets of £1,974, which is insufficient by £8,398 to meet the loans of debenture bonds of £10,372. The issued share capital amounts to £500, so that there is a deficiency as regards the contributories of £11,065. The failure of the company is attributed to the slump in trade, depreciation in value of stock, and bad debts. The company was incorporated in December, 1912, as a private concern, and was formed to acquire as a going concern a lighting sundries business carried on at Croydon. The nominal capital was £1,000, of which £500 was issued between 1913 and 1922 to subscribers for cash. The price paid by the company for goodwill, stock, plant, book debts of the vendor's business was £500, a sum fixed by mutual agreement. Debentures covering all the assets and bearing interest at 5 per cent. are stated to have been issued for £500 in April, 1913, and for £1,500 in August, 1914, against cash advances for similar amounts on or about these dates. In addition, on August 23rd, 1921, a further debenture for £7,500 is stated to have been issued as a covering charge in respect of advances made to the company and liability in respect of guarantees given to third parties. In October, 1924, a creditor commenced an action for damages and an injunction to restrain the company from infringing a copyright; an interim injunction was refused, and the action continued, but on account of the action the holders of the debentures first issued, on February 28th, 1925, appointed a receiver. The Court has made an order appointing the Official Receiver as liquidator with a committee of inspection.

The following are creditors :—

	£		£
Bellamy, E. C., & Co.	20	Fenner, R., & Co. (Beflin) ...	85
Cox, Willcox & Co.	20	Willpnecht, C.	45
Domestic Tinware Manufacturers, Ltd.	20	Cross, W., & Son, Ltd.	35
		Paton, Calvert & Co., Ltd. ...	34
Springett, M. A.	870	*Ironmonger*	25
Export Gesellschaft	290	Frank, J. R., & Co.	25
Innovation Light Co., Ltd. ...	140	Wright, Fairbrother & Steel ...	25
Johnsen & Jorgenson Flint Glass, Ltd.	100	Wolchorer, T.	20
		Acme Tin Stamping Co.	20
Durrant, Mrs. B. A.	120		

ALKUM ELECTRICS, LTD. — First meetings of creditors and contributories, September 2nd, at the County Court House, Halifax.

CARTER & MITCHELL, LTD.—Meeting of creditors at 24, Allsopp Street, Upper Baker Street, N.W., on September 8th. Liquidator, Mr. J. H. Higson, 11, Cheapside, Bradford.

Chinese Tariff Proposals.—*Reuter's Agency* reports that it has received from an authoritative Chinese source an assurance that China does not desire tariff autonomy for the purpose of imposing excessive duties and hampering trade. On the contrary, the proposals are characterised by "extreme moderation."

Conditions in Austria.—The *Monthly Review of Central Europe* published by the Anglo-Austrian Bank, Ltd., states that although unemployment among Austrian commercial employés is on the increase there has been a slight improvement in the metal and machine industries. In the electrical industries the situation is satisfactory as there is a sufficiency of orders to provide employment for some time.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 26th :—

Rogo. No. 460,350. Class 1. An anti-frothing solution used in connection with electric accumulators.—A. W. Creasey and G. S. Coop, trading in co-partnership, 24, Ruskin Avenue, Manor Park, E.12.

Radiac. No. 458,272. Class 8. Apparatus, instruments and accessories for use in radio telegraphy and telephony.—Radio Accessories, Ltd.

Sodium. No. 459,270. Class 8. Thermionic valves.—R. A. Rothermel, Ltd., 24-26, Maddox Street, W.1.

H. A. H. Hunt's (lettering and design). No. 459,510. Class 8. Electric batteries (not medical), induction coils, electric cables and radio-telephonic apparatus.—A. H. Hunt, Ltd., Tunstall Road, Croydon.

Atlas (lettering and design). No. 458,675. Class 8. Electric batteries (not for medical purposes), &c.—O. Ruhl (1922), Ltd., 85, City Road, E.C.2.

Supercision, F. C. H. (lettering and design). No. 460,458. Class 8. Electrical measuring instruments.—F. C. Heayberd & Co., 8 and 9, Talbot Court, Eastcheap, E.C.3.

German Electrical Goods in New Zealand.—The Christchurch (N.Z.) correspondent of the *Daily Mail* states that considerable quantities of German electrical material are getting into use in New Zealand. Most of this is of very inferior quality, and one of the Electric Power Boards has determined to have nothing whatever to do with German goods, even if they are lower in price than similar British manufactures. Instances have been reported where German motors have been sold with the name-plates removed.

A Novel Electric Sign.—A sign of large dimensions and incorporating a novel device has recently been erected for Messrs. Colgate, manufacturers of toilet requisites, between Charing Cross and Westminster Bridge on the south side of the Thames. The sign has an area of about 5,000 sq. ft. and is illuminated by over 4,000 "Osram" lamps. It incorporates a "thermometer" which by electro-mechanical means records the actual atmospheric temperature; this thermometer is 60 ft. in height and it has very legible markings in figures 20 in. high. The sign was designed and erected by Borough Electric Signs.

Salonica International Fair.—The Greek Minister in London informs us that, owing to the very short time that the prospective participants would have for the preparation and dispatch of their exhibits to Salonica to be in time for the opening of the Fair, the organisers have found it necessary to postpone the opening to a later date—probably until the Spring of 1926.

Travelling Exhibits.—The recent report of the Imperial Economic Committee, urging that those within the Empire should buy British goods, has met with response by the four leading railway companies of Great Britain. In order to demonstrate British-made goods to 300 cities and towns in England, Scotland, and Wales, the companies have constructed four exhibition trains of corridor carriages which, stocked with all manner of British commodities, will run over the various systems, making stays of from one to six days in railway station sidings. From outlying districts visitors will be taken to the exhibition trains by local excursions. The travelling displays will be seen free by the trade up to noon and by the public from then until 9 p.m. Salesman-demonstrators will travel with each train, and the displays will include wireless and electrical appliances.

Electricity at a Flower Show.—A flower show held recently at Chertsey gave the Woking Electric Supply Co., Ltd., which supplies energy in the district, an opportunity for a little propaganda work. A special marquee was pitched and a number of electrical appliances were arranged within it for demonstration purposes. In this way visitors to the show were able to gain an idea of the benefits of electric cooking, washing, ironing, &c. The accompanying illustration shows the cooking section in which there were two cookers and a number of smaller appliances as well as a card announcing the rates charged for cooking energy.



Electricity at a Chertsey Flower Show.

Spanish Radio Exhibition.—Plans are under consideration by local agents of radio apparatus manufacturers for the holding of another international radio exhibition in Madrid this year.

British Trade with Esthonia.—In the course of a report upon conditions in Esthonia which he recently forwarded to the Department of Overseas Trade (Stationery Office, 1s. net), Mr. H. Montgomery Grove (British Consul-General at Reval) says that British goods are very popular, and unless their trade competitors' prices are very much lower, the preference is for British goods. The use of electricity is advancing, and the demand for electrical fittings, goods and lamps should increase. It seems fairly certain that the construction of the Narva hydro-electric plant will be commenced this year, and this should lead to a largely increased demand for all electrical goods. This scheme projects the erection of a power station at Narva Waterfall in conjunction with a plant to extract nitrogen from the atmosphere. Should the project be successful, it is anticipated that Esthonia will become self-supporting in the matter of artificial manures. During 1924 the electric railway line between Reval and Nomme (8 km.) was constructed, and the number of passengers carried by it was 2,831,132 (more than double the Republic's population). Actual details of Esthonia's electrical imports are not given in the report, but it is stated that the imports of "machinery (not agricultural) and means of transport" amounted to 7 per cent. of the total; of this from a half to two-thirds came from Germany, then, a long way behind, come the United Kingdom and Sweden. There is no doubt that the difficulty which Germany has in granting credit and the rise in German prices for goods of all sorts did a great deal, during 1924, to assist the imports of British-made goods into Esthonia.

French Interest in Portuguese Scheme.—The North Portugal Waterfall Co., whose head office is in Lisbon, has acquired several concessions for the development of hydro-electric power on the Cavado River and its affluent, the Rabagao, about 45 miles north of Oporto. The banking firm of Pinto and Sotto Mayor, the Portuguese Government, and a group of French financiers are interested. Energy will be distributed in northern Portugal, especially in the city of Oporto. Work was begun on the first station in December, 1924, but only on a small scale. During the current year only preliminary work will be done, but it is hoped that by the summer of 1926 operations on a more extensive scale can be commenced. It is estimated that the completion of the undertaking will require more than five years. The chief problem will be raising the funds necessary to carry out the enterprise.—*Commerce Reports.*

Electrical Apparatus for South African Mines.—According to recently-published statistics showing the values of various classes of goods purchased from abroad by the South African mining companies during 1924, electrical machinery, spares, and fittings to the value of £621,277 were imported during the year.

The Southampton Corporation Electricity Showrooms.—Visitors to the meeting of the British Association could not fail to notice the Corporation Electricity Department's showrooms situated in a prominent position in Above Bar Street, one of the main thoroughfares of Southampton. The attractive display arranged in the windows, which is seen in the accompanying illustration, draws large crowds, both during the daytime and in the evening. In the course of the day demonstrations of electric washing and ironing are given with "Thor" machines; at dusk a special lighting scheme carried out by the General Electric Co., Ltd., comes into play. This consists of batteries of "Gecoray" reflectors fitted with colour screens and controlled by a motor-driven flasher. A wide range of colour changes is produced by this means. Inside the showrooms is a large collection of electrical appliances of all kinds, from irons and other domestic apparatus to battery-charging devices. Jackson cookers are exhibited, this pattern being provided under a hire-purchase scheme which the department has instituted—with success.



The Southampton Corporation Electricity Showrooms.

American Loan for German City.—A loan of 32.5 million marks has been raised in the United States by the municipal authorities of Munich for the purpose of extending the electricity works and tramways in the city, &c.

Great Britain and Argentina.—The *Review of the River Plate*, in referring to the advantage which Great Britain possesses over Germany in her practically limitless credit, says:—"As yet the financial power of Great Britain has not been applied to its fullest extent in the conduct of her foreign trade outside the Empire, but one is inclined to think that this will be done ere many months are past, either by a system of bounties or in the shape of long-term credits granted to those manufacturers who are in a position to employ large numbers of workmen, provided that they can meet the credit needs of their customers. In this respect Argentina offers a very fruitful field, and it would not surprise us to find Great Britain co-operating with this Republic on some such basis before many months are out."

Australian Tariff Decisions.—Among the recent decisions of the Customs Department are the following:—Unmachined castings for the frames of tramcar motors, free under the British preferential tariff; free under the intermediate tariff; 10 per cent. under the general tariff. Transformers 3,000 kVA, 22,000/4,150-V, free; 5 per cent.; 10 per cent.

Electrical Progress in Spain.—In the course of a report upon trade conditions in Spain, *Commerce Reports* says that the new improvements in hydro-electric and municipal electric plants are resulting in a continual use of new electrical equipment.

Dutch Trade in Radio Apparatus.—Official statistics of Holland's foreign trade in apparatus for radio telegraphy and telephony show that the imports in the first half of the current year represented a value of 1,235,000 fl., as compared with 537,000 fl. in the corresponding half of 1924. Great Britain is credited with having supplied goods to the value of 401,000 fl., Germany 385,000 fl., France 175,000 fl., and the United States 163,000 fl. On the other hand, the exports from Holland rose from 137,000 fl. in the first half of 1924 to 378,000 fl. in the first six months of the current year. Of this, goods to the value of 223,000 fl. were sent to Great Britain, 35,000 fl. to Germany, and 67,000 fl. to the Dutch East Indies. The exports of metal-filament lamps, which include valves, declined from 12,002,000 fl. in the first half of 1924 to 10,835,000 fl. in the equivalent period of this year. The imports also declined from 485,000 fl. to 412,000 fl.

Electrical Trades Commercial Travellers' Association.—A general meeting of the Association is to be held this evening (Friday) at the St. Bride Institute. The agenda includes the election of vice-presidents, chairman's and treasurer's reports, &c. An invitation is extended to visitors.

The Future of Wembley.—The Board of the British Empire Exhibition has appointed a committee, with Mr. J. H. Thomas, M.P., as chairman, to consider offers for the disposal of the Exhibition. A syndicate headed by Mr. H. Day, a Socialist Member of Parliament, has already made an offer for the ground and buildings with a view to the formation of a housing estate.

Trade with China.—In the report of the Maritime Customs Board on the Foreign Trade of China for 1924, which has just reached us, it is stated that during the year under review, there was no improvement on the previous year so far as electrical machinery was concerned. The continued state of unrest hampered and retarded the development of this industry, whilst intense international competition depressed prices to such an extent that the year's result is reported to have been far from profitable to those engaged in the trade. Nevertheless, a few important orders were placed for power-plant extensions by the Changchow Electricity Works, the Pei Piao Coal-mining Company, the Soochow Electricity Works, the Chee Hsin Cement Works, and the Amoy Electric Light and Power Company, most of which were secured by manufacturers in Continental Europe. British manufacturers, on the other hand, secured contracts for electrical machinery at Tengchowfu and Lincheng in Shantung, and for plant extensions in Manchuria, Honan, and Fukien. Trade in electrical accessories was much the same as in 1923, with a brisk demand for electric fans. Competition in the latter line of business is also growing very keen, European manufacturers coming well to the front, but the bulk of the trade is still in American hands. The total value of electrical materials and fittings imported into China from abroad was 8.2 million taels in 1924, as compared with 8.1 million in 1923, and the share taken by the principal countries of origin during the past two years was as follows:—

	1923. Value. Taels.	1924. Value. Taels.	Inc. or dec. Taels.
United States	1,322,002	1,215,343	−106,659
Belgium	232,707	315,231	+ 82,524
Germany	2,064,119	2,170,973	+106,854
Great Britain	1,244,519	1,236,112	− 8,407
Holland	219,062	366,836	+147,774
Japan	2,495,131	2,170,844	−324,287

American Electrical Exports. — The official statistics of the foreign trade of the United States during June show that the value of electrical goods and machinery exported was $5,991,636. This compares unfavourably with the total for June, 1924, which was $7,201,223. In the electrical machinery section there were some large decreases, notably in the case of d.c. generators—from $295,557 to $46,652; accessories and parts for generators—from $229,471 to $52,012; transformers—from $459,798 to $222,865; switches and circuit breakers—from $372,749 to $90,826; electric railway locomotives—from $468,680 to no recorded value; and accessories and parts for motors—from $225,985 to $117,384. There were also heavy falls in the exports of telephone switchboards—from $127,549 to $31,444; unspecified electrical apparatus—from $600,063 to $440,562; and bare copper wire—from $227,399 to $114,952. On the other hand, there were a number of important increases, the most prominent of which occurred in the case of radio apparatus, which rose from $307,884 to $670,605. The value of exported a.c. generators rose from $17,795 to $81,532; that of domestic appliances from $156,041 to $204,296; industrial electric furnaces and ovens from $16,744 to $34,015; sparking plugs, magnetos and other ignition apparatus from $178,408 to $394,899; and insulated copper wires and cables from $252,448 to $318,856. Figures for the past fiscal year (ended June 30th last) show that the United States exported

electrical machinery and apparatus of a total value of $66.9 million, as compared with $68.8 million in 1923-24, and only $21.1 million (average) from 1910 to 1914.

Book Notices.—"Aluminium Overhead Conductors." By the British Aluminium Co., Ltd. Pp. xi + 150; fully illustrated. Price 10s. 6d.—Although in the main this little book is a treatise on the use of aluminium as a medium for the transmission of electrical energy, much valuable information is contained therein treating of transmission lines in general. A wealth of data both from calculation and experiment is supported by curves and tables, the latter being prepared to meet the specific requirements of the practical engineer. Among the many illustrations are a number of views depicting notable transmission systems using aluminium conductors in various parts of the world. We understand that the British Aluminium Co., Ltd., 109, Queen Victoria Street, London, E.C.4, will send a copy of the book to any responsible engineer interested in the subject.

"The Fuelling and Lubrication of Heavy Oil Engines."—In this small publication of Messrs. Shell-Mex, Ltd., considerable technical information and many data are given concerning the requirements of heavy oil engines for both fuelling and lubrication. Tables depicting the running conditions of such engines, and comparing the fuel costs for oil, gas and steam engines, make an interesting addition.

"Poppy Day Report, 1924." London: The British Legion. —This contains exhaustive details of the results of the sale of poppies on "Poppy Day," 1924. Mention is also made of a few typical cases assisted during the past year, and particulars are given of wreaths, the sale of which helps the Legion's benevolent fund.

Local Exhibition.—BERMONDSEY.—The Borough Electricity Department is organising an electrical exhibition at the Town Hall for the week commencing September 14th.

New Belgian Companies.—Among the recently-formed Belgian companies are the following:—The "Osram" S.A., with a capital of 500,000 fr., to manufacture and sell electric lamps, &c.; the Cie. Continentale "Trialmo," capital 200,000 fr., to produce radio-telephone apparatus, &c.; Accumulateurs Gaulois, capital 120,000 fr.; and the Chauffage et Electricité, capital 475,000 fr., to deal with central heating and electrical installations.

Lighting and Power Notes.

Australia. — MELBOURNE. — According to the *Industrial Australian and Mining Standard*, the Electric Supply Committee of the City Council has recommended that, owing to the increase in the demand for electricity, tenders should be invited for the supply and delivery of a 5,500-kW turbo-alternator, which is to be substituted for the existing 2,500-kW turbo-alternator at the Council's power station. The old alternator is stated to be obsolete, and insufficient for present requirements. The cost of the new one is estimated at £33,000.

"SERVICE" RENDERED.—The Adelaide Electric Supply Co., of South Australia, has, we learn, lately acquired a fleet of ten "Triumph" motor-cycles to enable its service staff to promptly answer any calls.

Barnsley.—LOAN.—The Town Council has applied for sanction to a loan of £5,230 for cable extensions, including public lighting, for Ardsley Hill.

Barrow-in-Furness.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. H. R. Burnett) for the year ended March 31st last show a total income of £89,113, as compared with £75,647. Working expenses amounted to £58,472, as against £47,765, leaving a gross surplus of £30,641 (£27,882). After providing for capital charges, there was a net surplus of £5,433, as compared with £2,195 in 1923-24. The capital expenditure during the year, which included £10,500 for machinery and plant, and £9,082 for mains, amounted to £23,045. The electrical energy sold increased from 8,494,387 to 11,379,093 kWh, and the load factor from 26.76 to 37.33 per cent. A new water-tube boiler was installed during the year, and three 75-kW generators were replaced by two 750-kW rotary converters. In connection with the proposed hydro-electric station at Backbarrow, a complete survey of the proposed site of the power house has been made by Messrs. Vickers, and plans of the proposed scheme are in course of preparation.

Bury.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer, Mr. J. G. Potts), for the year ended March 31st last, record a total income of £90,563, as compared with £83,294 in the preceding year. Working expenses were £54,693, as against £50,385, leaving a gross profit of £36,239 (£32,909). After payment of capital charges, &c., a net surplus of £2,121 remained, as compared with £1,501 in 1923-24. The capital expenditure during the year, which included £10,969 for plant, amounted to £26,588. The electrical energy sold increased by 457,635 kWh to 18,479,648 kWh and the maximum supply demanded from 7,080 to 7,690 kW. During the year, work was commenced on the change-over of the system of supply from d.c. to a.c. In connection with the bulk supply to Heywood, a new trunk feeder was laid during the year.

Continental.—SWITZERLAND.—The Swiss Government has recently granted a concession for the construction of a dam and the erection of a hydro-electric station to utilise the water power of Lake Wallen.

ITALY.—The Italian Government has recently granted powers for the establishment of a 12,000-V transmission line between Cassano Spinola and Villaro Enagnano by the Società Distribuzioni Elettriche Iria, for a 11,500-V line between Paiseo and Forno Allione (Brescia) by the Società Alti Forni Franchi Gregorini, a 15,000-V line between the Mesce and Gaudarena power stations at Terida, Cuneo, by the Società Elettro Mineraria, and a 30,000-V line between Rimasco and Valsesia (Novara) by the Società Idro-elettrica Valsesia.

FRANCE.—According to the annual report of the Société de Force et Lumière des Pyrenées the company has recently acquired the electricity undertaking at Montgalliard and the Lac Bleu hydro-electric station of the Société de l'Energie Industrielle. In order to meet the increasing demand arrangements are in hand for an extension of the distribution mains in the Upper Pyrenees.

CZECHO-SLOVAKIA.—*Commerce Reports* states that a meeting of representatives of the cities of Uzhorod, Mukacevo, and Berehov has been held and plans made to form a company to construct a municipal hydro-electric power system in that neighbourhood.

BULGARIA.—With the assistance of the Government and local authorities, a syndicate in Sofia is erecting several hydro-electric plants in the Rhodopege mountains, all of which will be connected up to a central distribution station.

Earby.—ELECTRICITY SCHEME.—At a meeting of the Urban District Council, on August 20th, a resolution was passed stating that it was desirable that the supply and distribution of electricity in the district should be developed under the control of local authorities. It was decided to request the Electricity Commissioners to prepare a scheme for the guidance of local authorities concerned.

East Preston (Sussex).—INQUIRY.—In response to a communication from the local Council, the Electricity Commissioners have intimated their decision to hold an inquiry into the applications of the East Preston Rural District Council and the Worthing Corporation for Special Orders to supply electricity in the area.

Glasgow.—WIRING OF SMALL HOUSES.—In connection with the wiring of private premises it was reported to the Corporation Electricity Committee that 31 houses were added in July, making the total to date 1,099, while 52 applications were made for the hire of domestic appliances, the total to date being 7,284.

MAINS EXTENSIONS.—The Committee has recommended that the manager be authorised to proceed with the extension of mains during the winter at a cost of £90,140, and that application be made to the Unemployment Grants Committee for a grant towards the cost of the work.

LOAN.—The engineer has reported that for the purchase of heating and cooking apparatus to be let out on hire, for the cost of showroom premises already purchased, and the extension of offices, a sum of £160,000 will be required for the next three years. The Electricity Committee has recommended that application be made for sanction to the borrowing of this amount.

India.—ELECTRICAL DEVELOPMENT IN MYSORE.—The total electric power that is now being generated at Sivasamudram is about 32,000 h.p., the whole of which has already been taken up. The demand for additional power likely to be required during the next three years, including that for small industries, fans and other domestic purposes, is estimated at 12,800 h.p. After a careful investigation of the various schemes for the generation of the additional power required, the Government has sanctioned necessary estimates for a seventh installation, providing for the generation of an additional 14,000 h.p. at Sivasamudram generating station at a total approximate cost of Rs. 45½ lacs, including subsidiary works for the transmission and distribution of the power. The development of the Krishnarajasagara station is deferred for the present.—*Indian Engineering.*

Irish Free State.—DALKEY (CO. DUBLIN).—At a recent meeting of the Urban District Council a committee was appointed to ascertain whether the Urban District Council of Kingstown would be willing to undertake the electric lighting of the town, and if so the probable cost of the scheme.

Mid-Cheshire.—NEW ELECTRICITY CHARGES.—The Mid-Cheshire Electricity Supply Co. announces the following new scale of charges for electricity as from October 1st next:—Flat rate: Lighting, 9½d. per kWh. Heating: 2d. per kWh. Power: First 100 kWh per quarter per h.p. connected, 3½d., next 100 kWh 2½d., beyond, 1½d. Combined lighting, heating, cooking and domestic power contract system: A fixed charge per quarter dependent upon the connections plus a charge of 2d. per kWh for the first 200 kWh, and 1d. beyond for the winter quarters, and 1d. per kWh per quarter for all electricity consumed in the summer quarters.

North Wales.—ELECTRICITY SUPPLY.—The Merioneth County Council has granted the North Wales Power Co., Ltd., permission to carry overhead transmission lines from Llanfrothen to Maentwrog, and from Maentwrog to Blaenau Festiniog.

(Continued on page 383.)

A Scottish Colliery Power Station.

The Fife Coal Company's Electricity Generating Plant.

The supply of electrical energy to collieries is beset with difficulties which prevent any hard and fast rules being laid down as to the mode of deriving the supply. Providing the conditions, however, are suitable to enable a central station to operate efficiently, then there is no doubt about the economies which will result from the utilisation of such a source of electrical energy—an example being the Fife Coal Co.'s Kelty station, adjacent to the Aitken pit, which generates the whole of the electricity used by the company at its numerous pits in the Kelty and Cowdenbeath districts as already explained.*

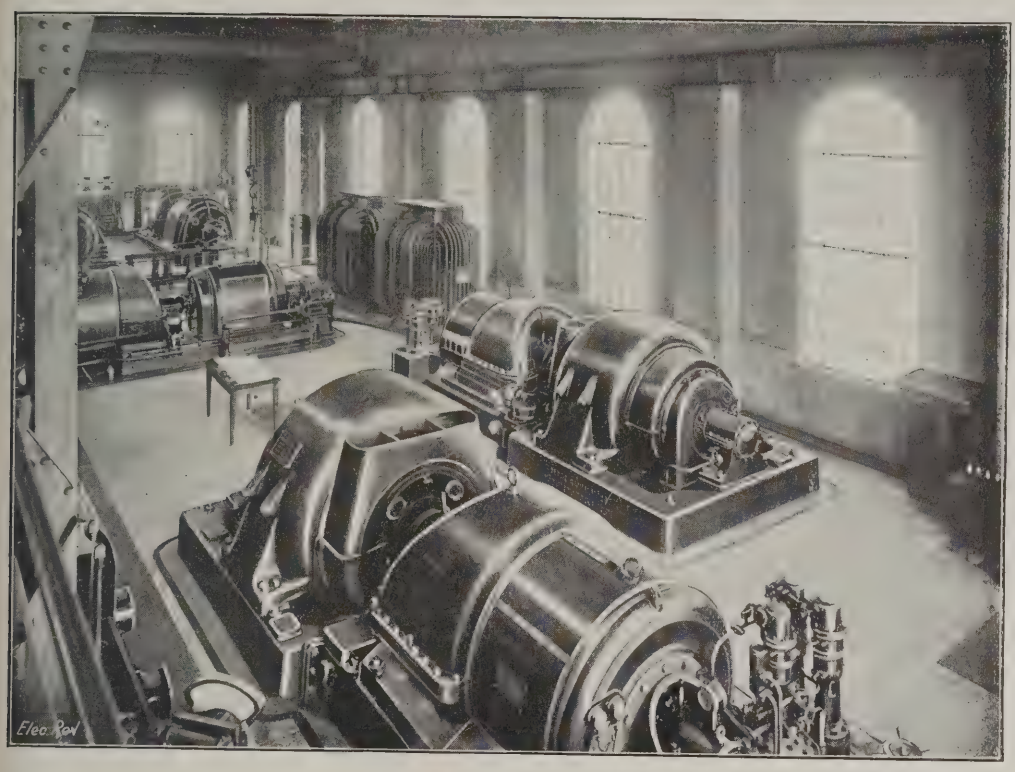


Fig. 1.—Turbo-generator House, Kelty Power Station.

The company utilises electricity for all purposes on the surface and underground; it is transmitted from the power house to the 14 pits already electrified by means of transmission lines, part of which is in the form of a ring main, of a total length of 17 miles, the pressure of 12 miles of line being 3,000 volts, while the remaining five miles of line is operated at 6,600 volts, at which voltage all future extensions are to be carried out. Except at certain railway and road crossings, where short lengths of cable are used, the whole of the lines are carried overhead on wood poles.

Practically all colliery power stations have been evolved from small beginnings, their capacity having been gradually built up as confidence in the application of electrical methods to mining processes was increased. In view of the facts that some years must elapse before the capital expenditure necessary at the commencement can be economically utilised, and that the final power requirements can only be guessed at, the problem of determining the source, or method, of supplying power to a new colliery undertaking is extremely complicated. It is accordingly not surprising that colliery companies prefer to develop gradually by the use of steam winding engines, generally the largest individual units of a colliery plant, in conjunction with mixed-pressure turbo-generators to carry the auxiliary load, notwithstanding the lower efficiency of such a scheme as a whole, as compared with the all-electric method. Nevertheless, there is a good deal of misconception with regard to such a scheme, for it is at the best but a compromise. The exhaust-steam turbine is strictly nothing but a utiliser of steam that would otherwise be wasted in connection with existing plant, and its adoption in the case of a new colliery undertaking depends on the relative proportion of the available exhaust steam to the auxiliary power requirements. In the case of the undertaking under consideration, however, the fourteen collieries have been completely electrified, including the winding engines, and consequently the whole of the boilers and steam plant at these pits have been discarded and removed. The 16,500-kW Kelty power house, the turbine room of which is illustrated in fig. 1, contains six turbo-alternators, the total capacity of which is 22,000 kVA; a mixed-pressure British Thomson-Houston turbo-generator was placed in commission in October, 1919, to utilise the steam exhausted by the winding engine at the adjacent Aitken pit. The turbo-alternator comprises one mixed-pressure set of 1,500 kW capacity and the turbine is of the three-stage horizontal Curtis type, running at 3,000 r.p.m.; it is coupled direct to

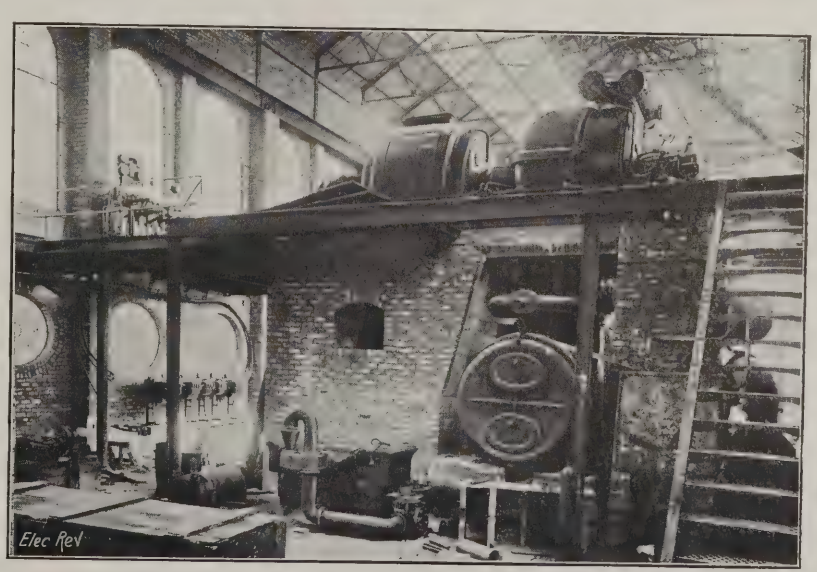


Fig. 2.—Re-erection of 3,000-kW Generator in New Turbine House.

* Elec. Rev., May 15th, 1925; pp. 779-81.

an alternator designed to give a normal output of 1,875 kVA at 80 per cent. power factor, 3,300 volts, three-phase, 50 cycles, the overload capacity being 25 per cent. for two hours. The steam conditions are: High pressure, 200 lb. per sq. in. gauge, superheated 200 deg. F., and the vacuum at full load is 28 in.; low pressure, 16 lb. per sq. in. absolute. This machine is working in conjunction with jet condensing plant of the "Korting" type supplied by Messrs. Samuel Bullock and Co., and a steam-driven exciting set, which can also be used for station lighting purposes, is located in the condenser basement, as shown in fig. 5, although the mixed-pressure set is a self-excited machine. Means are

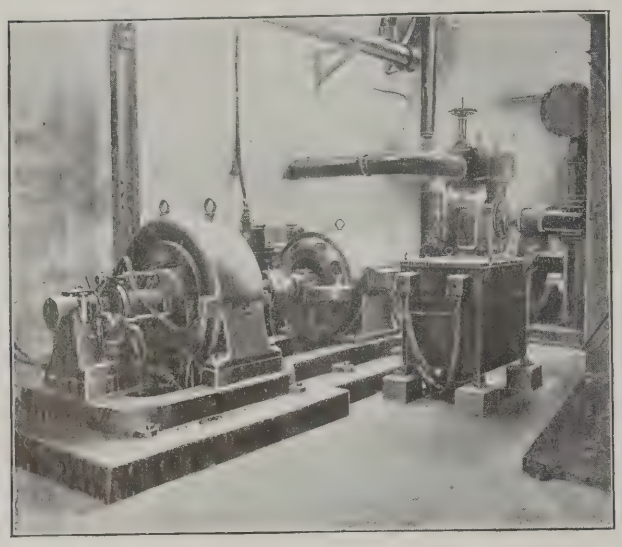


Fig. 3.—Motor-driven Exciter Set.

thus provided of starting the generating station after a shut down with steam obtainable from an independent external source. The main generating plant consists of three Fraser & Chalmers-General Electric Co. 50-cycle, 3-phase, 3,300-volt steam turbo-alternators running at a speed of 3,000 r.p.m. and of a capacity of 3,000 kW each. The turbine room also contains a British Thomson-Houston 50-cycle, 3-phase, 3,000-r.p.m. turbo-generator, while a duplicate machine was, on the occasion of our visit, being re-erected in an extension of the power house. These two sets were originally built by the B.T.-H. Co. to the order of the Ministry of Munitions, having been installed in 1916 at the Gretna Government munition factory. They were later purchased by the Fife Coal Co. and, together with their auxiliary plant, were dismantled, removed to Kelty, and re-erected by the Coal Co.'s engineering staff without outside assistance. Fig. 2 is a view of one of these machines during the course of its re-erection at Kelty. The steam conditions for the whole plant are a gauge pressure of 200 lb. per sq. in., superheated 200 deg. F., and the B.T.-H. sets were designed to give a normal output of 4,000 kVA at 75 per cent. power factor, 6,600 volts. Their overload capacity is 25 per cent. for two hours.

The condensing plant for both these sets is of the surface type manufactured by Messrs. Cole, Marchent and Morley, each being designed to deal with 43,000 lb. of exhaust steam per hour and capable of maintaining a vacuum of 28-in. mercury when supplied with 260,000 gallons of cooling water per hour at a temperature of 75 deg. F. Each air pump, which are of the Edwards three-throw type, is driven by a 17-h.p., 440-volt, three-phase, 50-cycle B.T.-H. motor, whilst each circulating pump is driven by a 100-h.p. B.T.-H. motor. The three G.E.C. turbines have Bullock condensers of the Korting jet type, one of which is illustrated in fig. 4, a somewhat unusual feature; this is, of course, pre-war plant, and it has operated quite satisfactorily. The condenser auxiliary plant consists of two sets of Platt 4,080-gallon, 40 ft. head, 550-r.p.m. pumps, driven by

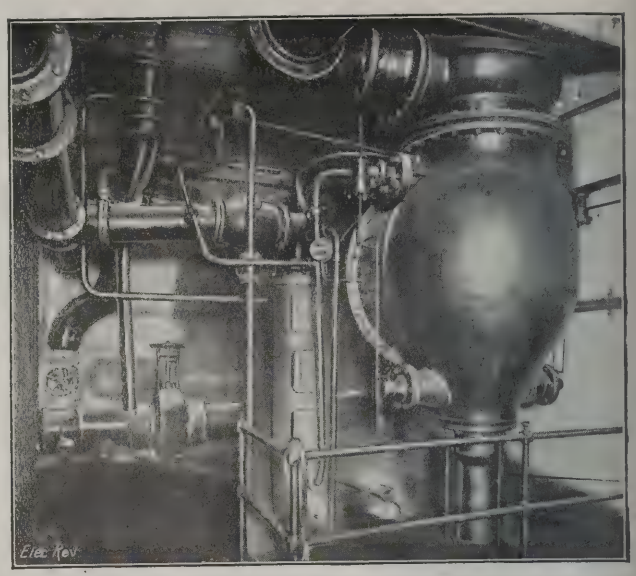


Fig. 4.—A Korting-type Bullock Jet Condenser.

Belliss & Morcom 3-cylinder steam engines; and two W. H. Allen sets, each comprising two pumps on one shaft driven direct by a G.E.C. 3-phase, 50-cycle, 730-r.p.m., 3,000-volt, 120-h.p. motor with G.E.C. switchgear, as shown in figs. 3 and 5.

In conjunction with an electrically-driven Weir water pump and a spray filter, a "Sirocco" fan draws outside air into the basement, whence it passes up through the G.E.C. alternators, whilst the two latest B.T.-H. generators are each provided with a Heenan & Froude

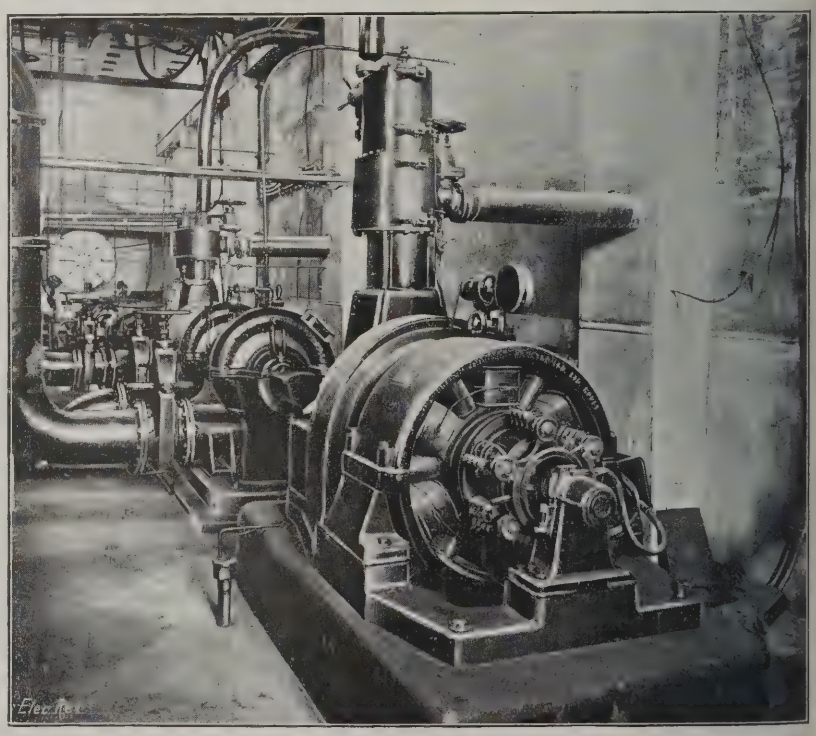


Fig. 5.—Steam-driven Exciter and Condenser Pumps.

air washer with B.T.-H. motors. In the basement there is a Fox oil filter, the station cranes being by Anderson, Grice & Co., Ltd.; they are of 30 tons capacity, and are electrically operated.

Although the three main B.T.-H. turbo-generators are provided with exciters mounted as usual on shaft extensions, the G.E.C. machines are not self-excited. Accordingly, three separate exciting machines have been provided: two of them are G.E.C. sets, each consisting of

a 69-kW, 50-116-volt, 225-r.p.m. d.c. generator coupled direct to a 130-h.p., 3,000-V, 50-cycle motor as shown in fig. 3, while the third (which has already been referred to, fig. 5) is a 46-kW, 6-pole, 115-volt, B.T.-H. d.c. generator driven direct by a verticle single-cylinder Belliss & Morcom steam engine at 480 r.p.m. Thus a very flexible means is available of exciting any one, or all, of the main generating sets through the separate switchboard illustrated in fig. 7 with B.T.-H. control, which is arranged to trip the main generator switch and break the field circuit in the event of a fault developing.

To form a link between the two 6,600- and the four 3,000-volt generating sets and the respective portions of the transmission system, two Johnson and Phillips 1,500-kVA, three-phase, 50-cycle transformers have been provided, their h.p. windings being connected in star and the l.p. sides delta connected. At present they are temporarily situated in the turbine house, as shown in fig. 1, and their switch panels are of the Reyrolle draw-out metal-clad type, each of 300 amp. capacity, with overload protection and the middle pole of the overload relay arranged for earth-leakage protection. Synchronising equipment is mounted on a swinging frame at the right-hand end of the board, two other panels of which control two 6,600-V feeders to the Nos. 1 and 2 Kirkford pits, being provided with overload protection, and the third is a 600-amp. generator panel having Merz-Price mid-point protection and an instrument bracket mounted on the top of the bus-bar chamber. These panels will be moved into the new turbine house when completed and added to similar Reyrolle gear for the other B.T.-H. generator. The 3,000-volt switchgear consists of 15 complete sets of generator and feeder equipment of the remote mechanically-operated B.T.-H. type. The isolators, bus-bars, and oil switches are housed in moulded stone cells on a gallery, the control panels being on the engine-room floor below, as shown in fig. 6; there are duplicate bus-bars throughout, and each set can be divided in two sections by means of bus-sectionalising equipment.

The fuel burned is in the form of slack coal (3/16 mesh), with a 25 per cent. ash content and a calorific value of anything from 7,000 to 10,000 B.th.u.; it is conveyed from the adjacent Aitken pit screening plant to the boiler-house dumping pit, fig. 9, which also shows the Babcock & Wilcox suction ash plant hopper, by means of an electrically-driven underground belt conveyor, by the Blantyre Engineering Co., with Reyrolle switchgear. Thence the coal is elevated by bucket conveyors to the boiler bunkers.

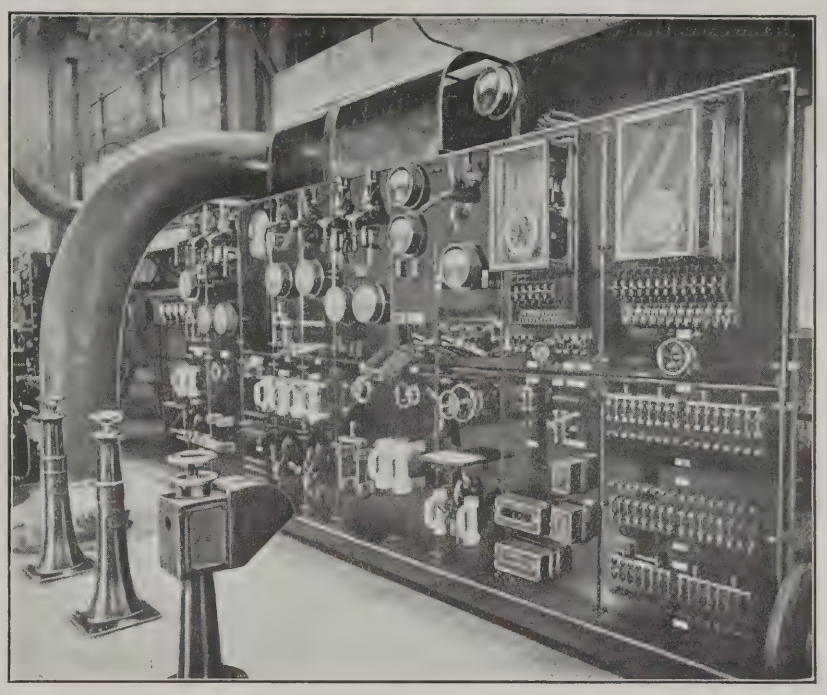


Fig. 7.—Main Generator Exciting Switchboard.

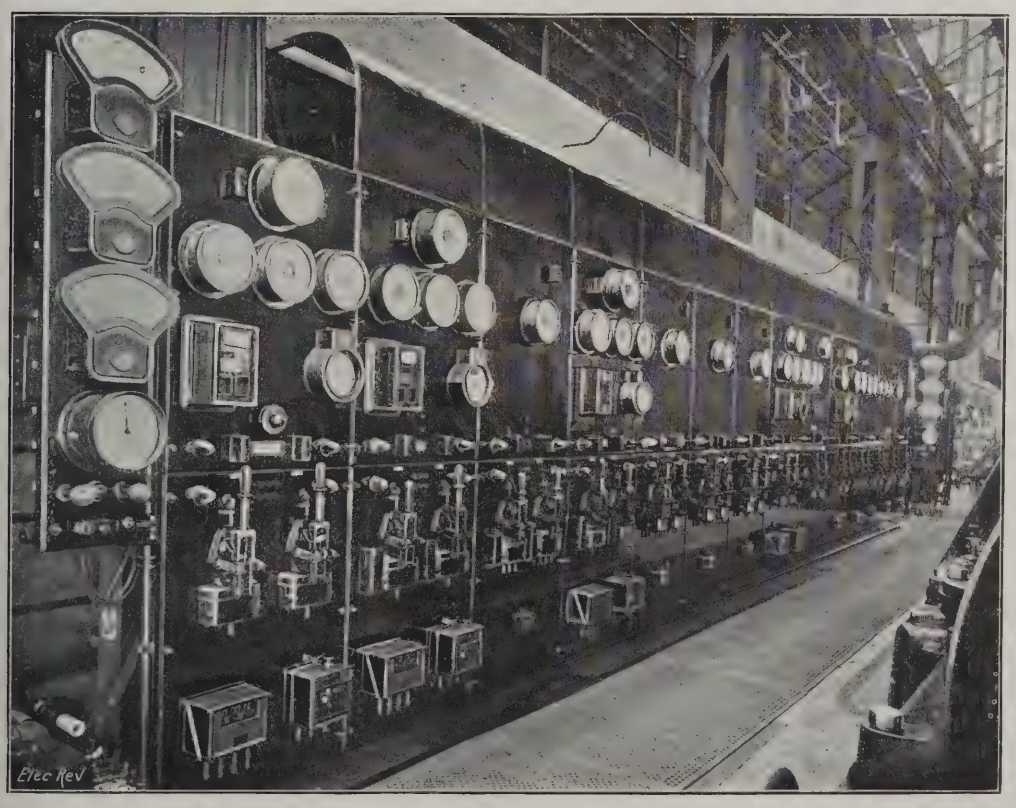


Fig. 6.—Main 3,000-V Generator and Feeder Control Board.

The present boiler house, a section of which is illustrated in fig. 8, contains two Babcock & Wilcox 18,000-lb. per hour boilers and three 27,000-lb. and three 30,000-lb. Stirling boilers. Five of them are equipped with Erith-Riley self-cleaning underfeed stokers, and the others with Erith-Roe stokers, which are driven by drip-proof 10-h.p. commutator motors of the a.c., 50-cycle, variable-speed (450- to 1,350-r.p.m.) B.T.-H. type. Steam is generated at a pressure of 200 lb. per sq. in. and superheated to a total temperature of 600 deg. F. A 35-h.p. electrically-driven forced-draught fan is provided for each boiler, and three "Sirocco" induced-draught fans are also available, but were not being used at the time of our visit; the single 215-ft. high steel chimney creates a draught equivalent to 1 in. of water. Economisers are not used at present, but will be installed in the new boiler house. The four Weir steam-driven reciprocating boiler feed-

water pumps each have a 9-in. bucket, 12-in. piston, and a 24-in. stroke; Crosby double-feed regulators and an Erith feed heater are installed with water-softening and oil-separating plant, the main and auxiliary steam ranges and feed water mains being arranged on the ring principle.

All the auxiliary plant which is electrically driven, with the exception of the 3,000-V pump motors mentioned earlier, are fed through a 500-volt a.c. ring main, the motor starters being of the Ellison and Reyrolle types. The source of supply, as shown in fig. 10, is one 460-kVA and two 202.5-kVA Brush, 50-cycle, 3-phase, oil-cooled, 3,000/500-V transformers, with B.T.-H. switchgear on



Fig. 8.—Section of the Existing Boiler House.

the l.p. side and Reyrolle switches on h.p. side; one 6,600/500-V transformer is capable of being changed over or of operating in parallel with the others, while two 25-kVA Johnson & Phillips 3-phase, 50-cycle, 500/100-V transformers are delta connected on their h.p. side and in star on their l.p. side to supply the lighting circuits. It is of interest to note that in case of accident any rotor of any of the main G.E.C. machines can be replaced immediately, for a spare turbine rotor and a spare generator armature are available in the station.

In conclusion, it may be mentioned that the station extensions, as already indicated, will consist of a new turbo-generator house (in which the machine shown in fig. 2 has been re-erected) and a parallel boiler house, both at right angles to the old turbine room, which is 125 ft. 6 in. long by 51 ft. 5 in. wide. The new turbine room is 140 ft. 4 in. long and 54 ft. 6 in. wide, and will accommodate, besides the machine shown in fig. 2, three 6,000-kW turbo-alternators and six transformers. The company has generating plant of 7,500 kW capacity installed at collieries in other districts, Mr. J. R. Copping, the Fife Coal Co.'s chief electrical and mechanical engineer, being responsible for the whole of the plant, together with the laying out of the extensions. We have to thank him for the facilities placed at our disposal on the occasion of our visit to the Fifeshire coalfield. The total output of the generating station six months ago was 1,045,000 kWh per week.

Technical Information.

How to Make Use of it.

By W. R. N.

There is no doubt that most engineers worthy of the name have read much valuable matter. How many men, however, say a month later, are able to recall salient points, or to lay hands upon any particular article which they have mentally noted and approved? Some few are able to do so, though not many without having recourse to mechanical means for aiding the memory. The pre-

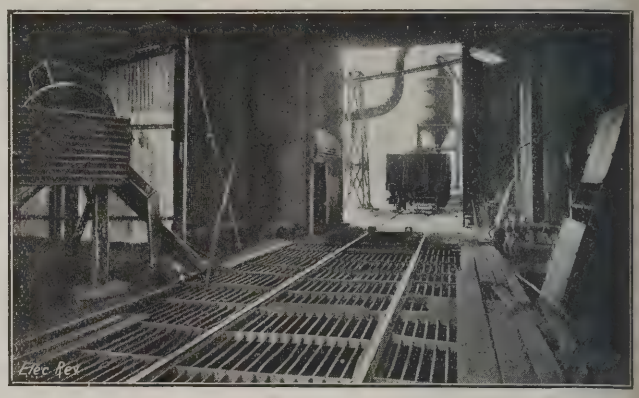


Fig. 9.—Coal Elevator Pit and Ash Hopper.

sent writer finds it necessary to keep a note book wherein he makes his entries of technical treasure trove.

An excellent plan is to use a sectionalised note book. This reduces the manual labour involved, in that it largely cuts out the work of classification and cross indexing. The subjects take their own copy at the initial entry. All that is necessary is to book the work up intelligently. Not the least important aid is the provision of a special column to cover actual location of article. It may not always be an easy matter to procure a copy other than the one which has been read. Actually where that copy finds a home is, therefore, of some consequence. The following table, dealing with the subject of metallurgy, exemplifies what is meant:—

C.—Metallurgy and Micrography.

Ref.	Title of Article &c.	Author.	Source.	Location.
1	Non-ferrous Metals	D. P. Cowell	Engineering Era	L. Arundel & Co.'s staff library
2	Duralumin	Dr. D. C. Roper	Metal World	K. Burton.
3	Micrography of Stainless Steels	R. Malone, B.Sc.	Proc. Eng. Inst.	Lideman's library

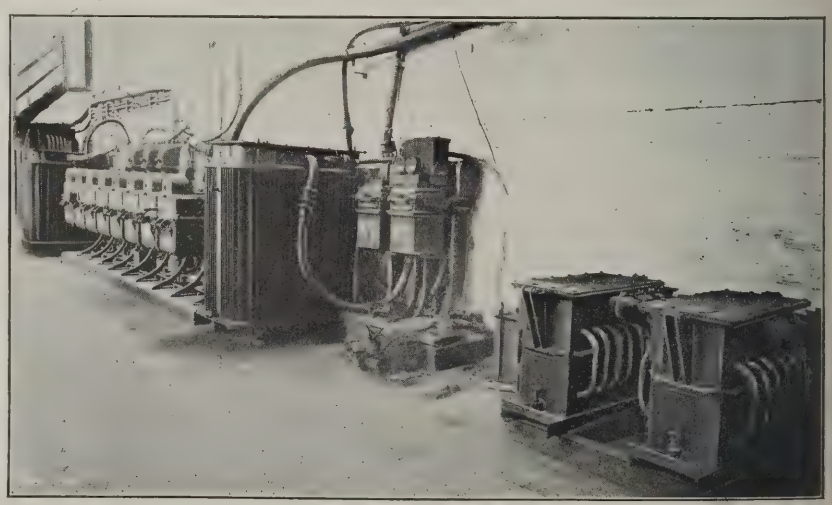


Fig. 10.—Station Auxiliary Transformers and Switchgear.

The existing machinery of technical journal clubs can usually be made use of. The necessary innovation is such that in most cases it would affect the working very little; and it need not interfere with the ordinary routine at all. The members would be asked to note down in some convenient form such articles as arrested their attention and seemed worthy of serious consideration. Exactly *how* the notes are made, or what form

they take, is of secondary importance. The table given below illustrates one method. Doubtless something much better suited to existing conditions will suggest itself to those interested. The blank but ruled form would be pasted on every magazine or journal issued. Roneo-ed copies of the form prove admirable for the purpose.

THE "ENGINEERS' REVIEW," JANUARY, 1924.

Name.	Date received.	Useful articles.	Page.
M. Panter	2/2/'24	Turbine Disks	112
		Lubrication of Gearing	128
T. Bird.	5/2/'24	The Engineer as Organiser	142
A. K. Sylvester	10/2/'24	Electrification of Railways	135
P. Brant	12/2/'24	Water *v.* Steam Power	138

Finally, if the periodicals concerned are kept in a staff library it may repay the members if they arrange that an indexed register—either book or card index—be kept of such entries. Either one person may take on the work or different members in rotation for stated periods.

Lighting and Power Notes.

(*Continued from page 378.*)

Oldham.—YEAR'S WORKING.—The report of the borough electrical engineer, Mr. F. L. Ogden, on the working of the Corporation electricity undertaking for the year ended March 31st last, shows a total revenue of £233,448, and working expenditure of £145,949, leaving a gross profit of £87,498. The previous year's figures were: Income, £205,439; working expenses, £113,130; gross profit, £92,309. To the gross profit was added a balance of £18,956 from the past year's account, a Government grant of £500 in respect of relief work, and interest on loans £7,759, making a total of £114,714. After deducting capital charges, &c., transferring £10,955 to reserve fund, and £8,000 to plant insurance fund, a balance of £21,652 was carried forward. During the year, £59,320 was spent on capital acount, the chief items being £31,975 for mains, and £18,536 for buildings, machinery and plant. The sales of electrical energy increased from 34,576,979 to 41,444,810 kWh, and the maximum supply demanded from 19,484 to 22,043 kW. The average price per kWh obtained fell from 1.426d. to 1.352d. A new 6,000 kW turbo-alternator and additional e.h.p. switchgear were installed during the year, and a scheme was submitted to the Electricity Commissioners for the erection of a new power station at Chadderton. Sanction was received to the change-over of the system of supply from d.c. to a.c.

Padiham.—ELECTRICITY SUPPLY.—Representatives of the Town Council have interviewed representatives of the Lancashire Electric Power Co., to discuss the terms on which the company will distribute electricity in Padiham area. The manager of the company stated that it was proceeding with the work of supplying Clitheroe and places *en route*, and it would be eight months before Padiham could be supplied.

Plympton. — ELECTRICITY COMMISSIONERS' DECISION. — The decision of the Electricity Commissioners on the applications of the Plymouth Corporation, Plympton Rural District Council, and Messrs. Heath & Co. for power to supply electricity in the Plympton rural district, which was the subject of an inquiry which concluded in London on May 9th, was made known to the authorities concerned on August 21st. The Commissioners have rejected the applications of the Plymouth Corporation and Messrs. Heath & Co., and granted the application of the Plympton Rural District Council for a Special Order to supply electricity in the whole of the rural district. The Plympton Rural District Council has come to an agreement to purchase the Plympton undertaking of Messrs. Heath and Co. for £7,000, and proposes to take all its supply from Plymouth, distributing it by means of sub-stations in the chief centres of population.

Salford.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer, Mr. S. J. Watson) for the year ended March 31st last, records a total revenue of £281,595, as compared with £269,169 in 1923-24. The working costs, including bulk supply purchased, were £171,173, as against £156,388, leaving a gross profit of £110,422 £112,781). Interest and sinking fund charges accounted for £83,361, and there was a net profit of £27,061, as compared with £41,015 in the preceding year. Of this amount £10,000 was contributed to the district fund, and the balance is to be transferred to the reserve and renewals fund. The capital expenditure during the year amounted to £263,315, the chief item being £205,979 for plant, &c., at Agecroft power station. The sales of electrical energy increased from 38,746,444 to 44,744,494 kWh, of which 4,736,012 kWh was purchased from Manchester Corporation. The average price per kWh obtained fell from 1.65d. to 1.49d., and the maximum supply demanded rose from 17,094 to 18,647 kW. The agreement with the Manchester Corporation for the supply of electricity in bulk expired on March 31st last, and negotiations are pending between the two Corporations for an agreement for reciprocal, emergency, and week-end supplies. During the year 12 additional transformer sub-stations were connected up to the 6,600-V system, making a total of 50 sub-stations.

South Shields.—LOANS.—The Electricity Committee is applying for sanction to loans of £30,000 for services, £40,000 for mains extensions, £10,000 for meters, and £2,000 for transformers.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Prestatyn Urban District Council to supply electricity in its area.

The County of London Electric Supply Co., Ltd., has applied for a Special Order for the supply of electricity in the parish of Merstham.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—According to *Power* the Muscle Shoals Hydro-Electric Co. has applied to the Federal Power Commission for a licence to construct a 54-ft. dam with a power house immediately below it, on the Tennessee River, in Lauderdale and Colbert Counties, Ala. The proposed installation will have a total primary capacity of 60,000 h.p. The Mississippi Power Co. has also applied to the Commission for a licence to construct a dam and power house in the Tennessee River in Tichomingo Co., Miss., and Lauderdale County, Ala. The proposed installation will have a total primary capacity of 66,000 h.p. The electrical energy generated at these stations will be used for public utility purposes.

Whitehaven.—LOAN.—The Rural District Council has decided to apply for sanction to a loan of £2,600 for lighting the Council houses and streets at Thornhill by electricity. The Council proposes to take a supply of electricity from the Cumberland Waste Heat Co.

Tramway and Railway Notes.

Argentina.—BUENOS AIRES.—A *Reuter* message from New York states that a technical commission has favourably reported on the tube scheme put forward by the Anglo-Argentine Tramway Co., and an *ad referendum* agreement was signed by the company's manager and the Mayor of Buenos Aires, but before any contract is finally accepted it must be passed by a number of municipal bodies. The actual sum involved in the contract is estimated at £10,000,000 sterling, but any expenditure will necessarily be spread over a period of years. It is further stated that the Argentine Post and Telegraph Department will spend 500,000 pesos for the construction of an underground system of cable tubes.

Ashton-under-Lyne.—RAILLESS CARS.—A railless car service between Ashton and Oldham was inaugurated on August 26th. The route extends for over three miles, and the cost of the scheme, including the purchase of ten cars, was £30,000.

Australia.—NEW SOUTH WALES RAILWAY ELECTRIFICATION.—The work of widening the tracks and providing electrical equipment is proceeding rapidly. The *Industrial Australian and Mining Standard* states that four sub-stations are now under construction at Sydney Station Yard (Prince Alfred Park), Sydenham (Meeks Road), Hurstville, and Sutherland, and are to be completed in readiness for the opening of the Illawarra section which has been scheduled for January 1st, 1926. At these sub-stations the h.p. a.c. supply from the White Bay power house will be converted to 1,500-V d.c. and supplied by feeders to the overhead wire. At Prince Alfred sub-station, the equipment will consist of three 4,500-kW rotary converters with automatic starters, and with electrically-operated remote control switches for operating the feeder circuits. Meeks Road sub-station will be equipped with three 3,000-kW double-unit converters, each consisting of two 1,500-kW machines in series. The other features will be similar to those at Prince Alfred sub-station. In addition, this station will function as feeder to those at Hurstville and Sutherland, and for this purpose two 5,400-kVA transformer banks are being installed. The h.p. supply from the power house will be stepped up to 33,000 V for transmission to Hurstville and Sutherland, the whole of this equipment being of the outdoor type. Hurstville sub-station will be equipped with one 3,000-kW and two 1,500-kW converters. At Sutherland sub-station the equipment will consist of two double-unit 1,500-kW converters. The converters and switchgear are being supplied by the Australian General Electric Co. and Metropolitan-Vickers, Ltd.

Brazil.—NEW ELECTRIC RAILWAYS.—It is reported that an agreement is about to be entered into between the Government and a German group of financiers, who propose the construction of a new network of railways consisting of four lines, all to be electrically operated. The whole of the necessary material will be supplied from Germany, and German engineers alone will be employed on the work of construction.—*Reuter's Trade Service* (Rio de Janeiro).

Continental.—CZECHO-SLOVAKIA.—Orders for the first electric locomotives required in connection with the electrification of the Czecho-Slovakian State Railways have recently been placed. The Skoda Works, of Pilsen, is to supply three express and two shunting engines, the Ceskomoravska Kolben Works, Prague, five goods locomotives, the Krizik Co., Prague, two passenger engines, and the Adamstal Co. and Siemens Co. each two shunting locomotives.

AUSTRIA.—The first section of the electrified Vienna Metropolitan railway—that between Hutteldorf-Haiking and Alserstrasse—was recently opened for traffic. The total

length of the line to be electrified is 16½ miles, along which there are 25 stations or stopping places. The line is on the overhead system with double conductors, and was installed by the Austrian Siemens Schuckertwerke, of Vienna. The cars are each provided with two motors of 90-100 h.p. The necessary current for the operation of the line is supplied from the Vienna municipal central station, this being converted to 750 V d.c. by means of four mercury rectifiers. A feature of the installation is the provision of a travelling rectifying station to meet occasional heavy demands for energy. This was built by the "Elin" Gesellschaft für Elektrische Industrie, Vienna, and comprises a 750-V oil-transformer and a 700-kW, 750-V, d.c. rectifier, together with the necessary switches and measuring gear. The transformer car can be run to any desired point, provision being made at various places for connecting up both to the 5,000-V a.c. mains and to the line conductors.

HOLLAND.—ONE-MAN CARS.—A number of one-man controlled tramcars have recently been put in service on the municipal tramway system in Amsterdam. The vehicles are operated on the system of the Bergmann Elektricitatswerke Gesellschaft, Berlin. One man acts as both driver and conductor; all passengers enter by a door at the front end of the car and dismount by one at the rear, the doors being electro-mechanically opened and closed.

Cuba.—HAVANA.—A concession for the construction of the subways in the city of Havana was granted by the Cuban Government seven years ago, but the world sugar crisis of 1920 affected the economic condition of Cuba so greatly that the project has been held in abeyance. With the return of more favourable conditions in that country, the Cuba North and Southern Railroad Co., which holds the concession, is taking steps to carry out its programme. The present plans of the company call for tubes similar to the East and North River subway tubes of New York. These will extend under Havana harbour, and will connect the city with rapidly developing suburbs. The subways are expected to involve an eventual expenditure of hundreds of millions of dollars.—*Electric Traction.*

Leicester.—NEW ROUTE.—The Corporation proposes to construct a new tramway from Uppingham Road to the Coleman Road estate. A portion of the track will be laid on sleepers with crossings at various places for ordinary traffic. The cost of the scheme is estimated at £12,500.

London.—PROPOSED "GOODS" TUBE.—According to the daily Press an Anglo-American company proposes to construct an underground electric goods railway for London. The scheme would link all the principal railway termini and serve all the principal markets and trade centres. About 69 miles of track would be laid, and work would be provided for 55,000 men for three years. The estimated capital cost of the scheme is £32,000,000.

NEW "UNDERGROUND" PLANT.—Additional strain upon the present electricity supply of the London underground railways will shortly be caused by the opening of several new stations and escalators. To ease it new sub-stations will be built at South Wimbledon and Balham, and a semi-automatic station at Lambeth North. The last will have two 1,500-kW rotary converters. A new 2,000-kW rotary converter will be placed in Victoria sub-station, and another of 1,500 kW in Baker Street sub-station. A new 15,000-kW turbo-generator is to be installed at Lot's Road power station.

METROPOLITAN DISTRICT RAILWAY ORDER.—The Minister of Transport has approved an application of the Metropolitan District Railway Co. for an Order authorising it to acquire land in the borough of Westminster for works in connection with its undertaking.

South Shields.—PROPOSED NEW ROUTE.—The Corporation has asked the borough engineer and tramway manager to report on the question of extending the tramway along Sea Road.

Telegraph and Telephone Notes.

Australia.—TELEGRAPH AND TELEPHONE SERVICES.—The result of the year's working of the Postmaster-General's department for the twelve months ended June 30th, 1924, shows a telegraph income of £1,481,455 and a telephone revenue of £3,601,023, while radio receipts amounted to £15,599. In the telephone service, says the Melbourne *Herald*, many exchanges were placed in continuous day and night service, resulting in a considerable increase of staff. Last year 47,000 miles of new aerial wires were brought into service, for 46,624 net new telephone subscribers. The aerial mileage showed an increase of 20.8 per cent., making a total of 272,000 miles, and the percentage increase of new instruments was 14.6 on a total number of 318,000. The 46,624 new instruments cost an average of £60 each for apparatus and fixing. The capital expenditure from loan money on new telephone and telegraph works was £3,980,000. At the end of June, 1924, the outstanding number of applicants for telephone service was 12,341. By June this year this number had been reduced to 8,500, despite a progressive increasing demand of 5,000 a month. Amongst the causes of the financial balance being on the wrong side of the ledger were reductions of £80,000 through alteration of trunk call charges, and of £18,000 through reduced cable rates.

China.—TELEGRAPH SERVICE.—According to a report recently issued by the Chinese Government Bureau of Economic Information, there are now 84,837 miles of telegraph lines in operation in China.

International Telegraph Conference.—PARIS MEETING.—Mr. Stanley J. Goddard, vice-president, and Admiral C. P. R. Coode, C.B., D.S.O., general manager in Europe, of the Western Union Telegraph Co., left for Paris on August 31st, to represent the company at the International Telegraph Conference, which is meeting there this week after, says *The Times*, an interval in its gatherings of not much less than 20 years. The British Post Office was to be represented by six delegates. The union deals with international telegraph regulations, and was to have before it over 1,100 propositions, coming from most of the countries in the world, mainly of a detailed technical kind. The union comprises practically all the countries of the world, with the exception of the United States and Canada.

New Zealand.—SHIPS' RADIO REGULATIONS.—New regulations governing the installation of radio apparatus on vessels registered in New Zealand have been gazetted. They are intended to minimise the danger of coastal voyages, and the date of their operation is January 1st, 1926. A full explanatory statement has been issued by the Minister for Marine (Mr. G. J. Anderson), who states that every ship which carries more than 25 persons will be required to carry radio apparatus, although certain exemptions are provided for.

Radio-Telephony at Sea.—LIGHTSHIPS AND LIGHTHOUSES.—The Port Director of Basrah, Mesopotamia, has ordered three further Marconi radio telegraph and telephone installations of the YB1 type, similar to those recently installed on the dredgers *Liger* and *Tigre* at Basrah. Similar sets of equipment are being fitted by Marconi's Wireless Telegraph Co. for the Northern Lighthouse Board, in the Sule Skerry and Monach lighthouses, and also at Stromness. A third group of Trinity House stations, based on Yarmouth, is being equipped also with YB1 telephone apparatus. Groups previously fitted with this apparatus are the light vessels based on Ramsgate (the Goodwins) and Harwich. The steam vessel *Argus*, belonging to Trinity House and based on Yarmouth, will also carry the same type of equipment, together with a wireless call bell, which device is already carried by the *Alert* of the London group. These installations will make a total of 31 British lightships, lightvessels, and harbour authority offices fitted with Marconi radio telephone equipment. The YB1 installation needs a power supply of 100 watts, and has an approximate range of 50 miles for telephony and about 130 miles for continuous-wave telegraphy. The sets are designed for use as portable and semi-portable stations.

Radio Notes.

Australia.—LICENCES.—The number of licences granted in the various States are, according to the *Electrical Engineer* of Australia and New Zealand, as follows:—New South Wales, 33,964; Victoria, 19,481; Queensland, 1,211; South Australia, 2,895; Western Australia, 3,427; and Tasmania, 540. A sum of £113,658 has been collected in licence fees, and the amounts paid to the various broadcasting companies are said to be as under: 2 FC, £34,629; 2 BL, £12,018; 3 LO, £14,444; 3 AR, £4,090; and 6 WF, £4,220.

Broadcasting Development.—PER CAPITA STATIONS.—Our French contemporary, *Radio Electricité*, points out that the United States has now 5.1 broadcasting stations for each million of the population. Sweden follows with 2.2 stations for a similar number, South Africa 1, Holland 0.78, Great Britain 0.49, Norway 0.45, Belgium 0.3, Rumania 0.17, Germany 0.14, Spain 0.087, and France 0.077. It should be remembered, however, that the figures do not form a true guide to the development of the broadcasting movement in the respective countries as the transmitting power of the stations, and consequently the number of listeners served, varies considerably.

Copyright.—A B.B.C. INJUNCTION.—In the Vacation Court, on August 26th, before Mr. Justice Finlay, motion was made by Mr. Jenkins, K.C., on behalf of the British Broadcasting Co., Ltd., for an injunction to restrain the Wireless League Gazette Publishing Co., Ltd., from infringing the copyright in programmes printed in its weekly, *Radio Times*, by reproducing them in *The Wireless League Gazette*, the defendants' weekly organ. Mr. Jenkins explained that the programmes were prepared six weeks in advance, and submitted that they were compilations coming within the protection of the Copyright Act, 1911. Mr. Macgillivray, for the defendants, contended that there was no copyright in programmes which were simply records of arrangements made; alternatively, if there was copyright, it was of so flimsy a character that what the defendants had done did not amount to infringement. The amount of skill required in a compilation protected by copyright was absent. Counsel further argued that the partial reproduction of the programmes came within the exceptions to the operation of copyright law as being "fair dealing for the purposes of newspaper summary." His Lordship said 35 per cent. of the programmes in the *Radio Times* had been copied. He was satisfied that there was a real question to be argued at trial. He would make no order on the motion, and there would be liberty to apply for speedy trial of the action.—*Daily Telegraph.*

Jugo-Slavia.—NEW STATION.—Apparatus for the broadcasting station near Zagreb has, says *Commerce Reports*, been ordered from Germany on reparations account and will be installed by Jugoslavenski Siemens, the local representatives of the Siemens-Schuckert Werke. The station is to be used solely by the State, but it is hoped that later it will be released for general use. There are now 145 receiving sets in Zagreb.

Manchester Wireless Society.—TEST TRANSMISSION.—From September 2nd the testing station G6MX of the Manchester Wireless Society will transmit regularly on the following wavelengths at the times stated:—On Saturdays from 6.30 to 7 p.m., G.m.t., on 45 metres; on Sundays from 7 to 7.30 p.m., G.m.t., on 90 metres; and on Wednesdays from 5 to 6 a.m., G.m.t., on 25 metres. Reports should be sent to the hon. secretary, Mr. Y. W. P. Evans, 66, Oxford Road, Manchester. Special tests can be arranged, and members of the Society are prepared to report on reception from any part of the world, while experimenters willing to co-operate in tests on 3 to 5 metres should notify the secretary as early as possible. The Society is prepared to try any commercial apparatus in its various short-wave tests, the apparatus being returned on completion of the test with a full report.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Adwick-le-Street.—Urban District Council. September 14th. Internal wiring for electric lighting of Council houses. (August 21st.)

Australia.—MELBOURNE.—October 7th. Victorian Government Railways. Two electric transporters complete. (AX.2303.)*

Electricity Commission of Victoria. 6,600-V and l.p., lead-covered and armoured cable. (See this issue.)

Commonwealth. October 27th. Timing clocks and calculagraphs. (August 21st.)

P.M.G.'s Department. October 27th. Telephone transmitters and parts.*

November 10th. Telephone receivers and parts.

Belgium.—September 23rd. Ministry of War. 4,500 km. of field telephone cable.*

Birkenhead.—September 17th. Mersey Railway Co. Stores, *viz.*:—Electrical sundries, &c., and metallic and carbon filament lamps and fittings. Form of tender from Mr. J. Shaw, general manager and secretary, Central Station, Birkenhead.

Brentford.—September 22nd. Board of Guardians. Electric wiring, &c., at the Institution, Warkworth House, Isleworth. (See this issue.)

Devizes.—September 10th. Corporation. Installing electric lighting in Town Hall. (See this issue.)

Edinburgh.—September 7th. Electricity Supply Department. Electric lighting installations at 288 houses under the Gorgie housing scheme. Specifications from engineer's office.

Egypt.—CAIRO.—September 15th. Director-General, Mechanical Department, P.W.M., Cairo. Six generating sets for steamers for the Government workshops, Bulag.

Gainsborough.—October 17th. Urban District Council. Generating plant, mains, transformers, and meters. (See this issue.)

India. — September 15th. Madras and Southern Mahratta Railway Co., Ltd. Telegraph line materials, copper wire, &c. (August 21st.)

India Stores Department. Accumulator and alkaline cells. (See this issue.)

London.—H.M. OFFICE OF WORKS.—September 15th. Supply of electrical and mechanical engineering labour-in-daywork in Cardiff. (August 28th.)

September 24th. Electric wiring installation at the White Wing, British Museum. (See this issue.)

BERMONDSEY.—September 9th. Board of Guardians. Six months' supplies of electric lamps. Forms of tender from Mr. H. H. Reeve, Clerk to the Guardians, 283, Tooley Street, S.E.1.

WESTMINSTER.—September 9th. Board of Guardians. Electric lamps, fitting, &c. Forms of tender from Mr. W. J. Leckley, Clerk to the Guardians, Guardians' Offices, Princes Row, S.W.1.

METROPOLITAN ASYLUMS BOARD.—October 7th. Installation of a fire-alarm system at Tooting Bec Hospital. (See this issue.)

ISLINGTON.—September 17th. St. Mary's Board of Guardians. Electrical supplies for six months. Mr. A. King, clerk, St. John's Road, N.19.

Newport (Mon.).—September 7th. Electricity Department. Induced draught plant, extension of flues, &c. (August 21st.)

New Zealand.—CHRISTCHURCH.—January 5th, 1926. Drainage Board. Three electric sewage pumps. (AX.2349.)*

Spain.—BILBAO.—Ministero de Fomento. Eight electric cranes for the port of Bilbao. Particulars from the Junta de Obras del Puerto de Bilbao, Bilbao.—*Reuter's Trade Service* (Madrid).

Stoke-on-Trent.—Town Council. E.h.p. testing equipment. (August 21st.)

South Africa.—JOHANNESBURG.—S.A. Railways. October 15th. Incandescent lamps.*

Warrington.—September 7th. Electricity Department. Twelve months' supply of earthenware conduits. (August 21st.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—MELBOURNE.—City Council. Accepted:—

6,000 100-c.p. metal filament lamps (£619).—J. Danks & Son Pty., Ltd.

Lead-covered, multi-core cables.—(£767) Enfield Cable Works (Australia), Ltd.; (£103) B.I. & H. Cables, Ltd.; (£1,956) Noyes Bros. (Melbourne), Pty., Ltd.

Single-core cables.—(£10,424) Enfield Cable Works (Australia), Ltd.; (£3,013) Metropolitan-Vickers Electrical Co., Ltd.; (£3,013) Noyes Bros. (Melbourne) Pty., Ltd.; (£314) Johnson & Phillips, Ltd.

H.p. and l.p. switchgear (£4,335).—Metropolitan-Vickers Electrical Co., Ltd.

SYDNEY.—Electric Supply Committee. Recommended:—

Bare copper cables (£13,356).—B.I. & H. Cables, Ltd.

House fuse boxes and fuses (£7,250).—B.W. Electric Co., Ltd.

Conversion of existing meters to high capacity (£737).—Electricity Meter Manufacturing Co., Ltd.

Federal Capital Commission. Accepted:—

Two motor generator sets for lifts (£1,011).—Siemens Bros. & Co. —*TENDERS.*

Dover.—Electricity Committee. Recommended:—

Cable.—Siemens Bros. & Co., Ltd.

Dundee.—Electricity Committee. Accepted:—

Piping and feed pumps, &c., in connection with new turbo-alternator at Carolina Port (£4,537).—Aiton & Co., Ltd.

Lamp Contracts.—EDISON SWAN ELECTRIC CO., LTD., has received contracts for gasfilled, vacuum, and carbon filament lamps from the Admiralty, and for inert cells from the Air Ministry.

METRO-VICK SUPPLIES, LTD., has received from the Admiralty a part-contract for Cosmos vacuum type, ordinary type, and gasfilled electric lamps.

Halifax.—Tramways and Electricity Committee. Accepted:—

Four 2,500-kVA transformers for Halifax-Huddersfield linking up scheme (£5,610).—British Electric Transformer Co., Ltd.

Heckmondwike.—Urban Council. Accepted:—

Installing electric light at 46 houses.—Urban Council Electricity Department.

Leeds.—Finance Committee. Accepted:—

Installation of electric light at premises in Park Lane (£570).—T. M. West.

Tramways Committee. Accepted:—

Feeder and telephone cables (£3,029).—W. T. Henley's Telegraph Works Co., Ltd.

60 gear wheels (£431).—National Steel Foundry Co. (1914), Ltd.

Electricity Committee. Accepted:—

Cable (£1,045), Enfield Cable Works Ltd.; (£5,523) W. T. Henley's Telegraph Works Co., Ltd.

Leyton.—Urban District Council. Accepted:—

1,700 time switches for street lighting.—Venner Time Switches, Ltd.

Northampton.—Corporation. Accepted:—

Electric lighting and central heating installation at Cedar Road School (£809).—Lowke & Sons, Ltd.

Salford.—Tramways Committee. Accepted:—

200 B.S.S. steel rails (£1,982).—Cargo Fleet Iron Co., Ltd.

Coal for six months for the Electricity Department. 2,500 tons Astley 2-in. dry slack, at 18s. per ton, delivered at Agecroft Power Station. 1,500 tons Newtown 2-in. dry slack, at 15s. 9d. per ton, delivered at Agecroft Power Station.—Clifton & Kersley Coal Co., Ltd.;

2,500 tons Agecroft dry slack, at 15s. 9d. per ton at the pit. 5,000 tons Agecroft washed fine slack, at 11s. per ton at the pit.—Andrew Knowles & Sons, Ltd.

2,500 tons No. 1 washed slack, at 16s. 8d. per ton at Pendlebury Wharf.—Bridgewater Wharves, Ltd.

2,000 tons Swan Lane washed pea slack, at 16s. 4d. per ton at Brindle Heath railway sidings.—J. B. Scholes & Sons, Ltd.

1,500 tons Starkie (Westhoughton) rough slack, at 18s. 9d. per ton delivered at Agecroft Power Station.—Peter Andrew.

2,500 tons Wilton best Cannel coal slack, at 17s. 3d. per ton, delivered at Agecroft Power Station.—Brynn Hall Colliery Co., Ltd.

South Africa.—CAPE TOWN.—Electricity Committee. Recommended:—

The following tenders are recommended for acceptance in connection with a scheme for improving the lighting of the city:—

Street lamp fittings, &c.—(£3,800 and £173) South African General Electric Co., Ltd.; (£3,932 and £183) H. Davies & Co., Ltd.

Bare copper wire.—1½ tons (£192), G. Findlay & Co., Ltd.; 1 ton (£82), A. J. North & Co., Ltd.; ½ ton (£57), Wilson & Herd, Ltd.; 10 tons (£886), Telegraph Manufacturing Co., Ltd.; 32 tons (£2,822), British General Electric Co., Ltd.; 20 tons (£1,633), W. T. Henley's Telegraph Works Co., Ltd.

Forthcoming Event.

Municipal Tramways Association.—September 9th to 11th. At Brighton. Annual Congress.

N.A.R.M.A.T. Wireless Exhibition.—Royal Albert Hall, London, S.W. September 12th-23rd.

Notes.

Educational.—We have received calendars for the day and evening classes of the Brighton Technical College for the 1925-26 session which commences on September 14th. In the day classes of the electrical engineering department, preparation courses are provided for the London University B.Sc., the college diploma, &c. Ordinary and higher certificate courses are included in the evening class syllabus. Well equipped engineering laboratories are provided. It is interesting to note that since 1922, 25 students have obtained B.Sc. degrees, including five first class and 12 second class honours, all of whom have taken two or more electrical subjects.

THE POLYTECHNIC, REGENT STREET, W.—*Electrical Engineering Department.*—The 1925-6 session will open on September 28th. Enrolments will commence on September 16th. Full particulars and prospectus can be obtained from the Director of Education. (See our advertisement pages to-day.)

Large-scale Industrial Heating.—The idea is widely held that although electricity is excellent for small furnaces, drying ovens, and other industrial heating applications, it is better to use some other agent for larger purposes. That this is erroneous is proved by many existing installations. For example, an oven measuring 10 ft. long, 6 ft. wide, and 6 ft. high is used by an American company for tempering bed springs. The oven, which was made by the Westinghouse Electric & Manufacturing Co., is of sturdy construction; it has a total loading of 60 kW and four inches of insulation to keep the heat inside. When fully loaded the oven contains about 1,800 lb. of spiral springs. Starting from cold, and fully loaded, the oven comes up to about 475 deg. F., the operating temperature, in about two hours. When empty it will reach the temperature in about 1¼ hours. Due to the efficiency of the insulation, very little heat is lost by radiation; at 275 deg. the outside is cold, while at the operating temperature it is only moderately warm. The springs are by this means very efficiently and uniformly tempered.

Inquiry into a Pit Explosion.—At the resumed inquest at Wallsend-on-Tyne on August 24th into the circumstances of an explosion at Willington Square (Edward) Pit, by which five men lost their lives, Peter Turner, a coal-cutter, said in the course of his evidence, that before the explosion he had detected gas by his lamp, but it was the end of his shift, the current was off, and he did not report it. At the time of the accident he felt a rush of air and received an electric shock. No men on his machine had been supplied with rubber gloves. He had once seen sparking when the control-box joint opened a little owing to the screws working loose with the running of the machine. Charles Lyons, a repairer, said he had received a shock from a worn, faulty cable. Some wrapping was put round the cable, which was used to the end of witness's shift. John Mayne, another miner, said he had found gas on three occasions, but had not reported it. Charles Carr, also engaged on a coal-cutter, questioned about the machine, said that on seven or eight occasions since June there had been faults found in trailing cables and the cables had been taken to bank. He had never received a severe shock. The inquiry was again resumed on August 26th. William Donald Lauder, another machine man, said that he went down the pit on the morning of the accident and received a shock while getting his machine ready. At the same instant he heard a muffled report, something struck him in the back, and he fell beside his machine. He had had shocks before but they were not similar to the one he got that morning. He had only seen his machine spark once, and that was when a stone fell on the cable and struck it. There were rubber gloves on the machine. Considerable evidence was given as to the presence of gas in the pit, which men stated they had not at times reported, and as to the examination of the pit after the explosion, also as to ventilation. A. D. Nutman, chief officer of the Houghton-le-Spring Rescue Brigade, spoke to finding the body of a machine worker named Coxon. The flesh was almost raw from severe burns. A rubber glove was on one hand and the other glove was clasped in the deceased's hand. E. Nutley, manager of Edward Pit, said that prior to the accident they had no cognisance of gas in the place. In reply to a question from the Coroner as to the cause of the explosion, witness said that in his opinion there was certainly a light from some source or other. It was something attributable to the machine, and there must have been some small accumulation of gas somewhere. In answer to a further question, witness admitted that it was dangerous to use electric coal-cutting machines where there was gas. William Toward, asked if he had seen any sparking on the machine, said "I have seen flames on the machines, never mind sparking." George Harrison, electrical engineer, said that when he examined Coxon's machine he found that the plug at the end showed slight signs of burning. He had never received any reports as to sparking on the machines. At the conclusion of the evidence, the jury returned an open verdict, stating that the cause of the explosion had not been proved.

"Wired Wireless" in Canada.—The City of London, Canada, is the first municipality served by the Hydro-Electric Power Commission of Ontario to use radio equipment for emergency communication between its transformer sub-stations. The Commission's laboratories installed, according to the H.E.P.C. *Bulletin*, during the early part of May this year three complete guided-radio sets for the Public Utilities Commission of London in the two sub-stations at Horton and Ridout Streets, and on Cabell Street, respectively, and a third set was installed in the pumping station in Springbank Park, about four miles west of the city. The stations can communicate with each other in any of the three combinations desired, the voice signals being very pure and exceptionally loud. This "channel" does not use the telephone lines, and therefore is entirely independent of faults occurring on those circuits.

The equipment is as simple as possible; there are only two adjustments on the transmitter, namely, the filament rheostat and the grid inductance, or regeneration control, whereas the receiver has adjustable removable coils, variable condensers, and filament rheostats, to render it as flexible as possible and to allow of sharp tuning.

The transmitter and receiver are connected together through a switching system whereby either the aerial or telephone lines may be selected as the channel of communication and a transmit-receive switch is thrown alternately from one side to the other during conversation. The aerials are placed closed to the 13,200-volt power lines and are quite short. The capacity effect of the aerials to the power lines is approximately 0.001 microfarad. The one-way system has advantageous features; since it is usual on power systems to give instructions from one central point, the one-way system allows complete instructions to be sent without interruption from the station receiving the transmission. The receiving operator will listen more intently when he knows he cannot ask questions during the issuing of orders. The tuning, particularly when operating over single sections of the lines, is very broad, and signals are very loud; in consequence, the operator will receive messages clearly when only roughly tuned to the transmitting station. This radio system is supplementary to the existing telephone circuits, and both may be used at the same time, without any interference of one circuit with the other; all induced charges are drained to ground and do not produce audible sounds in the receivers.

Motor-car Battery Standardisation.—The Society of Motor Manufacturers and Traders has lately issued a data sheet, No. 123, giving dimensions for motor-car accumulators, cases, or moulded containers and for terminal posts and cable connectors. The data have been collected after many meetings of the sub-committee, and it is anticipated that the adoption of the dimensions recommended will result in considerable advantage both to the trade and the user. So far as the latter is concerned, it will mean less loss of time and expense in dealing with battery replacements and repairs. The new standards are intended to become operative on January 1st, 1926.

Institute of Metals.—For the autumn lecture, delivered at the meeting of the Institute on Tuesday last, Sir John Dewrance, K.B.E., vice-president, took the subjects of "Education, Research, and Standardisation." He reviewed the great discoveries of the century that has elapsed since railways were introduced, expressing the view that the next century would witness even greater progress, and laid stress on the importance of stimulating originality in the minds of students in order to produce discoverers. For this purpose he considered that the practice of giving advanced students research work was on the right lines. Much benefit had been derived from the formation of the Department of Scientific and Industrial Research, not only by the direct financial assistance given to research associations, but also by its bringing before the directors of industrial concerns the necessity for research and discovery. Sir John also reviewed the work of the National Physical Laboratory, and the special researches carried on by the Admiralty, the War Office, and the Royal Air Force. He held that the field for research was unlimited, and cited numerous instances in which success had been attained by this means. Standardisation, he said, was akin to research, and often research was necessary before standards could be fixed. The British Engineering Standards Association, with its 400 voluntary committees, had effected great national economies.

Very gradually the nation was raising the status of the discoverer and research worker, but many such workers were insufficiently rewarded for their labours. The object of the lecture was, by reciting what had been done, to hasten the process. The human race was in need of further education by the attainment of new knowledge and standards, and this country could not afford to fall behind others in doing its share. All who had benefited by knowledge should feel it a duty to do something for the acquisition of further knowledge.

Electricity Report of the Minister of Transport.—We have received a report respecting the proceedings of the Minister of Transport under the Electricity (Supply) Acts, for the year ended March 31st last. The report contains confirmations of the Electricity District Orders and the Special Orders made during the year. Particulars of special cases which the Minister referred to the Electricity Commissioners for their advice are also given; and a list of Orders, &c., revoked by the Minister is included. A lengthy list is given of cases where consent has been given to the erection of overhead lines.

The Minister approved an estimate submitted by the Electricity Commissioners of their receipts and expenditure during the year. This amounted to £67,000, compared with £75,000 for the previous year, comprising £43,550 in respect of the net administrative expenses of the Commissioners and £23,450 in respect of the repayment to H.M. Treasury of the third and final instalment on the advances made to meet the expenses of the Commissioners during the first two years after the passing of the Act of 1919.

Consent was given to the establishment of 12 new generating stations, the extension of 103 existing generating stations and to the establishment of main transmission lines in respect of 47 applications. The new stations sanctioned represent an initial installation of 16,700 kW of generating plant, and the extensions represent about 463,200 kW of plant

596 applications were received from local authority undertakers for sanction to the borrowing of money, and at the beginning of the year there were 101 applications which had not been disposed of. Sanctions were granted in respect of 562 applications, and 28 were transferred to other departments or withdrawn. The total amount of the loans sanctioned was £13,364,181. At the commencement of the year 74 applications for Special Orders were before the Commissioners and 88 more were made during the year. In 66 cases orders were submitted to the Minister for confirmation, 10 applications were refused and 7 withdrawn; the remainder were under consideration when the report was made. The Commissioners approved in 26 cases of agreements being entered into between authorised undertakers for mutual assistance or for the taking of bulk supplies. Two Orders authorising undertakers to give bulk supplies to other undertakers were made and also 80 Orders permitting authorised undertakers to supply electricity to specific premises situated outside their authorised areas of supply. The Commissioners have also in 25 cases consented to the alteration of the system and/or pressure at which electricity is supplied to consumers.

Electricity and Prosperity.—Under this heading, in the *Gloucester Journal* of August 22nd, Mr. R. C. Hill, R.N.R. (ret.), criticises the fashionable advocacy of "National Electricity Supply" as the sovereign remedy for all our industrial ills, on economic grounds. He says the optimists "ignore the experience of the North-East Coast. There, as every electricity supply engineer knows, the ideal system (held up as the model for the national scheme) has been in operation for some years. 'Super-stations,' 'ring-mains,' 'linking-up,' all the familiar hackneyed terms so dear to the propagandists, are there to be found in actuality. Not only so, but the bulk of the large power users are most advantageously situated in relation to the generating stations. And yet there is no locality plunged more deeply in the morass of industrial depression at the present time than Tyneside and Cleveland on the North-East Coast.

"Then, again, the fact is overlooked that the majority of large manufacturing centres throughout the country are already adequately supplied with electrical power at rates as cheap as any obtainable under a 'national scheme.' Those districts—mainly rural—which at present have little or no supply of electricity would certainly benefit, but this would not help matters at all in the larger centres where the slump is most keenly felt; in fact, it is quite conceivable that the former would benefit at the expense of the latter, rural electrification being, at the best, a very controversial subject. . . .

"It may be argued that the State electrification schemes in progress on the Continent justify us in pushing ahead with ours. The conditions, however, are totally dissimilar, the Continental schemes being based upon harnessing huge reserves of water power, which we do not possess. . . .

"A final but very important point against a huge linked-up network is its vulnerability in times of internal or external strife. This, with the seriousness of its possibilities, is self-evident."

In conclusion, Mr. Hill says: "We must realise that the present situation is not due to a lack of cheap power in the centres of industry, but to post-war economic conditions, over many of which we have no direct control. 'National Electricity' may be a very excellent slogan, but do not let us expect it to achieve that which is not within its legitimate province."

Fatalities.—What appears to have been a practical joke ended in the death of Charles Hughes, 20, of Glasgow, employed by Messrs. Brown, Macfarlane & Co., Ltd., metal merchants, of Tollcross. During the meal hour, it is alleged, someone connected a wire from an electric light switch to the handle of a door, and when Hughes grasped the handle to open the door he received a shock which ended fatally 15 minutes later.

A lad named George Ernest Taylor was recently killed by electricity. The boy climbed one of the poles bearing a h.p. line from the Hereford Corporation electricity works to Lyde, and, coming into contact with the wires, received a severe shock and burns.

A Substitute for Brazing Spelter.—A note on "Zinc-Cadmium Alloys: Their Shear Strengths as Solders," was presented by Mr. R. B. Deeley, A.R.S.M., B.Sc., at the annual autumn meeting of the Institute of Metals, held in Glasgow, on Wednesday last. The material of this note formed part of an investigation, taken up by the British Motor-Cycle and Cyclecar Research Association, on the possibility of producing a satisfactory substitute for brazing spelter. The limits of the melting range were fixed by the fact that the working temperature of the substitute solder had to be below that likely to promote coarse crystallisation of the hard-drawn steel tubing of the frame, and further, that the melting point must be sufficiently above the enamel stoving temperature (about 180 deg. C.) for joints made with the alloy not to fail during the enamelling process. Tests of zinc-cadmium alloys in pure shear showed the strongest alloy to be near the eutectic composition. This alloy was considerably stronger than tinman's solder, 8 tons/sq. in. of alloy in shear being an average value compared with 4 tons/sq. in. for lead-tin solder in a similar joint. At a temperature of 235 deg. C., the alloy had a strength in shear of 48 lb./sq. in., and at 200 deg. C. of more than 112 lb./sq. in.

Appointments Vacant.—Cable jointer for the Eccles Corporation Electricity Department. Electrical engineering draughtsman (£315) (temporary) for the Metropolitan Asylums Board. (See our advertisement pages to-day.)

The Kent Coalfield.—In view of the prospect that the Kent coalfield will be further developed and that industries will grow up in its neighbourhood, a conference of local authorities has prepared a regional town planning scheme to ensure that the amenities of the county shall not suffer. It is anticipated that about a score of pits will be sunk, and that the annual output will be 13½ million tons of coal, and that iron and steel production will be commenced, involving an increase of population of about 400,000 persons. The scheme is drawn up with the intention of facilitating the development of mineral resources whilst preserving the agricultural activities and the natural attractions of the country side, and it is held that the new industries can be accommodated in the rural areas near Eastry and Dover, which are at present sparsely populated. An essential feature of the scheme is the generation of electricity on a large scale near the colliery, for transmission to the Metropolitan area.

The Wing-Rotor.—An interesting account appeared in *The Engineer* of August 21st of a new type of wind motor invented by Engineer-Captain Sigurd J. Savonius, of Helsingfors, and called by him the "wing-rotor." It is stated that extended trials of the device have been made, with remarkable results. The rotor resembles the two halves of a vertical cylinder attached to a vertical spindle in such a way that the inner edge of each lies in the axis of curvature of the other, and the spindle is half way between those axes. It was found that if the two inner edges coincided with the spindle, forming a letter S in plan, and the rotor was allowed to run light, the peripheral speed was equal to the speed of the wind, and if the two wings were moved farther apart, leaving a space between them, the speed was reduced. But when the overlapping arrangement above described was adopted, the air current striking the concave side of one cylinder was deflected on to the concave side of the other, the torque being thereby increased to three times that of the S-shaped rotor, and the peripheral speed rising to 1.7 times the speed of the wind. The efficiency was improved by fitting end-plates to the half-cylinders.

It is claimed that the "wing-rotor" is well adapted for driving pumps, &c., having fewer working parts than an ordinary windmill, less frictional loss, and no directing vanes. Its speed can be varied between wide limits by altering the ratio of diameter to length, and it can be made self-regulating.

Two such motors were mounted on a small boat, each wing-rotor having a width of 67 cm. and a height of 280 cm. In a breeze of 15 to 20 miles per hour, the power developed for propelling the boat was from 3 to 4 horse-power. Evidently the wing-rotor would be suitable for driving a dynamo, and should cost less than a windmill both to purchase and to maintain. It is stated that the device has been patented.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Miss Wormald has been appointed welfare superintendent at the Bedford works of the Igranic Electric Co., Ltd.

It is announced that Mr. F. C. Hibberd has resigned the position of managing director of Messrs. G. D. Peters & Co., and has retired from the board of that company and its associated companies.

Major G. G. Mallinson, T.D., has been appointed assistant branch engineer at Messrs. Johnson & Phillips's Newcastle office, succeeding Lt.-Col. A. P. Pyne, who has been promoted to an appointment at Charlton. Major Mallinson has been associated with Vickers, Ltd., Barrow; Siemens Bros. Dynamo Works, Ltd., Stafford; and Palmer's Shipbuilding & Iron Co., Ltd. During the war he served in France and commanded a heavy battery, and he was for some time on the artillery staff of the French Army. He has the Cross of the Legion of Honour and was mentioned in dispatches.

The marriage took place on August 26th, at the Parish Church, Ashton, of Mr. Wilfred Moody, who is engaged with Messrs. Mirrlees, Bickerton & Day, Hazelgrove, near Stockport, and Miss Hilda Andrew, of Ashton. Mr. Moody, before taking up his present position, was for 6½ years assistant superintendent at the Colombo (Ceylon) power station.

The Halifax Transport Committee has appointed Mr. A. E. Boyer, of Wembley, as manager of the Transport Department, at a salary of £500 per annum.

One of the Citizens' Lectures at this week's British Association meeting at Southampton was delivered by Capt. P. P. Eckersley, the Chief Engineer of the British Broadcasting Co., Ltd., whose portrait accompanies this note. Capt. Eckersley, by virtue of his position and the success which the company has attained, due in no small measure to his efforts, is well known to the British public. He was born in Mexico in 1892, and left that country, after attending the Bedales School, to go to Manchester University, from which institution he obtained a certificate of technology. He then served an apprenticeship with Messrs. Mather & Platt, Ltd., and the Lancashire Dynamo & Motor Co., Ltd. In 1915 Capt. Eckersley joined the Royal Flying Corps as wireless equipment officer and served in the Middle East, Egypt, and Salonica. He was invalided home in 1916, and was appointed officer in charge of wireless training in the Southern Brigade. Later, in 1917, he proceeded to France as brigade wireless officer, but being again invalided home he joined the wireless

experimental establishment at Biggin Hill where he was responsible for experimental work in duplex telephony on aircraft. In 1919, Capt. Eckersley joined the Marconi Company as head of the experimental section of the Aircraft Department. While in this post he designed the Croydon ground station transmitter and was jointly responsible for the design of the radio-telephone set used on all modern British aircraft. He was appointed head of the experimental section of the Aircraft Department in 1921, and it was during this period that he



London] [*Maurice Beck and Helen Macgrégor.*

Capt. P. P. Eckersley, M.I.E.E., F.Inst.R.E.,
Chief Engineer of the British Broadcasting Co., Ltd.

carried out the first regular broadcasting in England, from Writtle (2 MT.). Upon the formation of the British Broadcasting Company in 1923, Capt. Eckersley was appointed to his present post. He is a member of the Institution of Electrical Engineers and a Fellow of the Institute of Radio Engineers. He has been a prolific writer for the technical and popular Press and has published two excellent books for beginners in radio work. He informs us that he has no recreations and we think that we can understand why.

Obituary.—Ald. W. Bruce.—The death has occurred at Sunderland of Alderman William Bruce, J.P., who was chairman of the Sunderland Corporation Electricity Committee from its inception, for 16 years until 1919, when he resigned owing to ill-health. It was due to Ald. Bruce's business acumen and steadfastness of purpose that the Corporation's electricity undertaking was able to develop in face of much adverse criticism.

Wills.—The late Mr. Matthew W. W. Mackie, of Surbiton, principal of Messrs. W. Mackie & Co., civil and electrical engineers, left £51,268 gross and £36,279 net personalty.

Mr. George Crighton, late London manager of the Western Cable Co., left £766.

New Companies Registered.

Consulting and Radio Service, Ltd. (13,790).— Private company. Registered in Edinburgh August 19th. Capital, £3,150 in 3,000 preference shares of £1 and 3,000 ordinary shares of 1s. each. Objects:—To carry on the business of consultants and advisers in relation to the erection, installation, and use of all wireless, telegraphic and telephonic, electrical, magnetic, radio-active, hydraulic, mechanical, and other instruments, &c. The subscribers (each with one shilling share) are:—G. Beveridge, 49, Keir Street, Pollokshields, Glasgow, C.A.; and Marion B. Finlay, 186, Henderson Street, Glasgow. The first directors are not named. Solicitors: Baird Smith, Clapperton & Co., 205, St. Vincent Street, Glasgow.

Vulco Dry Battery Co., Ltd. (208,026).—Private company. Registered August 22nd. Capital, £5,500 in 1,500 6 per cent. cumulative preference shares and 4,000 ordinary shares of £1 each. Objects:—To carry on the business of manufacturers of, and dealers in dry and electric batteries and all kinds of electrical appliances, &c. The permanent directors are:—W. E. Chantrill (chairman), "Aberfoyle," Keynsham, near Bristol; and G. B. Atkinson, Burwood Cottage, Hersham, Walton-on-Thames. Qualification, 100 fully-paid shares. Solicitors: Freeman, Haynes & Co., 11, Great James Street, W.C.1. Registered office: 56, Marlborough Road, Holloway, N.

Pagets Radio Components, Ltd. (208,046).—Private company. Registered August 24th. Capital, £1,000 in £1 shares (100 8 per cent. cumulative preference and 900 ordinary). Objects:—To acquire the business of manufacturing and selling machines, apparatus and articles in connection with wireless signalling, electrical, scientific and mechanical devices at present carried on by G. Paget-Usher at 4, Leysfield Road, Shepherd's Bush, and at Orchard Works, Coleville Road, Bollo Lane, Acton, together with the benefit of provisional applications filed by the said G. Paget-Usher for patent No. 30,021 of 1924 for improvements in or relating to holders for electrical coils, and patent No. 30,023 of 1924 for improvements in or relating to crystal detectors for radio apparatus, and the benefit of all designs and inventions which may be made by him in connection with wireless signalling apparatus or any electrical apparatus or device during such time as he shall be in the service of the company. The first directors are:—G. Paget-Usher (chairman), 32, Glenthorne Road, Hammersmith, W.6; and H. Vieler, 31, Seaside Road, Eastbourne, Sussex. Qualification, 10 shares. Secretary: H. Vieler. Solicitors: Watson, Sons & Room, 16, Hammersmith Bridge Road, W.6. Registered office: Orchard Works, Coleville Road, Bollo Lane, Acton, Middlesex.

Baker & Co. (Doncaster), Ltd. (207,990).—Private company. Registered August 21st. Capital, £2,000 in £1 shares. Objects: To acquire the business of an electrical and mechanical engineer, manufacturer of the Baker patent piston removers and Baker patent ring compressors, and anti-dazzle devices now carried on by E. Baker at Chequer Road, Doncaster, as the "Baker Patent Piston Ring Remover Co.," and to acquire English patent No. 115,930-1917, and American patent No. 1,283,620-1918, owned by the said E. Baker, and to carry on the business of motor, mechanical, electrical and general engineers, &c. The first directors are:—Dr. E. J. Chambers, 19, South Parade, Doncaster; E. Baker, 50, Beckett Road, Doncaster; and A. Baker, 15, Glyn Avenue, Doncaster. The first two named are permanent. Qualification, £100 shares. Remuneration as fixed by the company. Solicitor: A. Loy, 3a, Hall Gate, Doncaster. Registered office: 27, High Street, Doncaster.

Reactone, Ltd. (208,013).—Private company. Registered August 22nd. Capital, £500 in £1 shares. Objects: To acquire the business of manufacturers of wireless appliances now carried on at 88/90, Chancery Lane, W.C., by F. L. Harding and R. G. E. Spawforth as "Lewis Harforth and Co.," together with the exclusive rights to use the name "Reactone," &c. The permanent directors are:—F. L. Harding, 34, Mackenzie Street, Slough; R. G. E. Spawforth, "St. Denys," The Drive, Wembley Park. Qualification, 1 share. Registered office: 88/90, Chancery Lane, W.C.2.

William Curran & Son, Ltd. (1,269).—Private company. Registered August 20th in Belfast. Capital, £4,000 in £1 shares. Objects: To acquire the business of a sanitary and electrical engineer carried on by William Curran at 58, Antrim Road, Belfast. The first directors are:—W. J. Curran, Cub-ban, Innisfayle Road, Belfast, plumber and electrical engineer; Mrs. Agnes Curran, Cub-ban, Innisfayle Road, Belfast; T. Curran, Cub-ban, Innisfayle Road, Belfast, plumber and electrical engineer. W. J. Curran shall be governing director so long as he holds 1,000 shares. Registered office: 58, Antrim Road, Belfast.

G. Lawrence & Co., Ltd. (208,106).—Private company. Registered August 28th. Capital, £2,000 in £1 shares. Objects: To acquire the business of a radio and electrical engineer now carried on at 10, New Bridge Street, Truro, Cornwall, as "George Lawrence & Co." The directors are:—G. Lawrence, 10, New Bridge Street, Truro; P. H. Tonkin, 2, Devonshire Terrace (both permanent, subject to holding 200 shares each). Qualification of ordinary directors, 100 shares. Remuneration (except managing directors, if any) as fixed by the company. Solicitors: Nalder & Son, Truro.

Wireless Listeners League, Ltd. (208,125).—Registered as a private company August 28th with a nominal capital of £5,000 in £1 shares. Objects: To carry on the business of the Wireless League, to express the views and protect and advance the legitimate interests of users of wireless communication, to formulate suggestions and schemes for the improvement of and to organise broadcasting and other wireless programmes, &c. The subscribers (each with one share) are:—G. Russell, 37, Norfolk Street, Strand, W.C.2, solicitor; A. M. Low, 1, Woodstock Road, W.4. The first directors are not named. Solicitors: Charles Russell & Co., 37, Norfolk Street, Strand, W.C.2.

Malay and Eastern Power Development, Ltd. (208,113).—Registered as a private company on August 28th with a nominal capital of £40,000 in 10,000 "A" preference, 29,000 "B" preference, and 1,000 ordinary shares of £1 each. The objects are:—To acquire, develop and turn to account any concessions, grants, decrees, rights and powers relating to electrical or other undertakings in the F.M.S. or elsewhere. The subscribers (each with one "A" preference share) are:—Hon. Gideon Murray (Master of Elibank), 38-39, Parliament Street, S.W.1 (director of Armstrong, Whitworth (Jugo-Slavia), Ltd.); B. C. Lockhart Jervis, A.M.I.C.E., 38-39, Parliament Street, S.W.1, H. Stokes Waite, 38-39, Parliament Street, S.W.1, civil engineer. The first directors are not named. Secretary: D. C. Brook. Solicitors: Withers & Co., 4, Arundel Street, W.C.2. Registered office: 11, Ironmonger Lane, E.C.1.

Official Returns of Electrical Companies.

Will Smith, Ltd.—R. D. French, of 21, North John Street, Liverpool, was appointed receiver on August 21st, 1925, under powers contained in debenture dated May 29th, 1925.

Whitfield Electrical Co., Ltd.—Satisfaction in full on June 5th, 1925, of debenture dated March 17th, 1924, securing £2,000.

Morgan Weston, Ltd.—Satisfaction in full on July 22nd, 1925, of debenture dated December 9th, 1924, securing £400.

London and Provincial Radio Co., Ltd.—Particulars filed of £1,000 debentures authorised August 18th, 1925, charged on the company's undertaking and property, present and future, including unpaid capital, the whole amount being now issued.

Rely-A-Bell Burglar and Fire Alarm Co., Ltd. — Particulars filed of £1,000 debentures authorised July 29th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

W. J. Tough & Partners, Ltd.—Debenture dated August 4th, 1925, to secure £200, charged on the company's property, present and future, including uncalled capital. Holders: J. Wright, "Throxenby," South Heath, Bucks.; and A. E. Perkins, 81, Leagrave Road, Luton.

Petersfield Electric Light and Power Co., Ltd.—Further debenture charged on the company's property and assets, including uncalled capital and goodwill, dated August 4th, 1925, to secure all moneys due or to become due from the company to the Westminster Bank, Ltd.

Premier Accumulator Co. (1921), Ltd. (178,158).—Capital, £40,000 in £1 shares. Return dated July 6th, 1925. All shares taken up. £18,749 paid (£1 per share on 11,249 and 15s. per share on 10,000). 18,751 shares considered as fully paid. Mortgages and charges, nil.

Gas and Electricity Development Co., Ltd. (181,648).—Capital, £2,000 in £1 shares. Return dated December 31st, 1924 (filed July 28th, 1925). All shares taken up. £2,000 paid. Mortgages and charges, nil.

Teignmouth Electric Lighting Co., Ltd. (179,116).—Capital, £20,000 in 7,500 7 per cent. cumulative preference and 12,500 ordinary shares of £1 each. Return dated July 15th, 1925. 1,977 preference and 7,500 ordinary shares taken up. £9,537 paid. Mortgages and charges, £12,854.

Tisbury Electric Supply Co., Ltd. (176,539).—Capital, £6,000 in £1 shares. Return dated May 21st, 1925. 5,000 shares taken up. £5,000 paid. Mortgages and charges, nil.

Electrical Power Engineering Co. (Birmingham), Ltd. (138,377).—Capital, £5,000 in £1 shares. Return dated November 4th, 1924 (filed June 23rd, 1925). 2,445 shares taken up. £1,100 paid. £1,345 considered as paid. Mortgages and charges, nil.

D. P. Battery Co., Ltd. (44,084).—Capital, £100,000 in £1 shares. Return dated August 1st, 1925. All shares taken up. £28,000 paid. £72,000 considered as paid. Mortgages and charges, nil.

Lancashire Electric Light and Power Co., Ltd. (77,202).—Capital, £2,071,415 in 571,415 first preference, 750,000 7 per cent. preference, and 750,000 ordinary shares of £1 each. Return dated May 29th (filed August 13th), 1925. 511,440 first preference, 562,500 7 per cent. preference, and 628,560 ordinary shares taken up. £1,700,100 paid on 511,440 first preference, 562,500 7 per cent. preference, and 626,100 ordinary shares. £2,400 considered as paid on 2,400 ordinary shares. Mortgages and charges, nil.

Northern Counties Electricity Supply Co., Ltd. (67,924).—Capital, £200,000 in £1 shares. Return dated April 3rd, 1925. 149,990 shares taken up. £145,991 5s. paid (including £1 5s. on 10 forfeited shares). £4,000 considered as paid. Mortgages and charges, £188,460.

Key Engineering Co., Ltd. (76,459).—Capital, £5,000 in 4,993 ordinary and 7 deferred shares of £1 each. Return dated April 17th, 1925. 4,070 ordinary and 7 deferred shares taken up. £4,077 paid. Mortgages and charges, £5,000.

Vickers, Ltd. (3,543).—Capital, £26,500,000 in 18,000,000 ordinary, 7,000,000 cum. preference, and 750,000 5 per cent. preference shares of £1 each, and £750,000 preferred 5 per cent. stock. Return dated April 29th, 1925. Issued: 12,315,483 ordinary, 6,883,807 cum. preference, and 750,000 5 per cent. preference shares and £750,000 preferred 5 per cent. stock. Total paid and considered as paid, £20,679,290. Mortgages and charges, £1,250,000 5 per cent. first mortgage debenture stock; £2,000,000 5½ per cent. ditto, ditto; £102,122 11s. 1d. houses and land at Erith; £31,639 16s. 2d. houses and land at Crayford; £61,072 18s. 6d. houses and land at Barrow.

Avon Agricultural Co., Ltd.—Mortgage on certain land and buildings at Stratford-on-Avon, dated August 12th, 1925, to secure £1,500. Holder:—Dr. J. G. Clegg, F.R.C.S., Ashmount, Heaton Mersey.

Delhi Electric Tramways and Lighting Co., Ltd. (88,758).—Return dated July 14th, 1925. Capital, £170,000 in 140,000 preferred and participating and 30,000 ordinary shares of £1 each. 100,000 preferred and participating and 29,000 ordinary shares taken up. £100,000 paid. £29,000 considered as paid. Mortgages and charges, £36,000.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

German Companies.

The *Emag Electricity Company*, of Frankfort-on-Main, records a loss of 45,000 marks for 1924. A great improvement in the turnover has taken place this year; the orders will provide activity until December, and prices are profitable.

The *Continental Company for Electrical Undertakings*, of Nuremberg, reports net profits of 320,000 marks for 1924-25. It is proposed to pay a dividend at the rate of 6 per cent. on the 1922 preference shares and 4 per cent. on those of 1907, the ordinary shares, which are few in number, receiving nothing.

The *Contact Company* (makers of special electrotechnical articles), of Frankfort-Rodelheim, reports a loss of 150,000 marks for 1924, most of which has been covered by an appropriation from the reserve fund. Business is now reported to show an improvement, and the turnover in the first seven months of 1925 far exceeded that in the whole of 1924.

The *Rhenish Electricity Company*, of Mannheim, states that competition in electrical constructional and installation work in 1924 became so keen that the level of prices in part fell below that in 1913. The accounts show net profits of 1,020,000 marks, permitting of the payment of a dividend at the rate of 6 per cent. on the preference, and 7 per cent. on the ordinary shares.

Belgian Companies.—The *Lampe Belge* concern proposes to double its present capital of five million francs.

La Société d'Electricité du Bassin de Charleroi has increased its capital from 14 to 15 million francs.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159, and they have been ordered to be officially quoted:—

Torquay Tramways Co., Ltd.—30,000 ordinary shares of £1 each, fully paid, Nos. 120,001 to 150,000.

Pennsylvania Water and Power Co.—A dividend of $2 per share has been declared upon the common shares for the quarter ending September 30th.

Clarke, Chapman & Co., Ltd.—An interim dividend of 2½ per cent. has been declared on the ordinary shares.

Oxford Electric Co., Ltd. — An interim dividend at the rate of 5 per cent. per annum has been declared on the ordinary shares in respect of the past half-year.

Hightown Gas and Electricity Co.—An extraordinary meeting is to be held on September 15th for the purpose of considering resolutions agreeing to the transfer of the company's undertaking to the Liverpool Corporation on agreed terms.

Davis & Timmins, Ltd.—It is proposed to pay the dividend on the 6 per cent. preference shares, and an interim dividend at the rate of 6 per cent., free of tax, on the ordinary shares in respect of the half-year to June 30th last.

Northern Mexico Power and Development Co.—A dividend of 7 per cent. has been declared on the preference shares in respect of 1924.

Brazilian Traction, Light and Power Co., Ltd.—A quarterly dividend of 1½ per cent. has been declared on the preference shares.

Stocks and Shares.

MONDAY EVENING.

THE long-expected recognition of Mexico by the British Government is at length to be accomplished. Diplomatic relations will be resumed at once. The United States "recognised" Mexico two years ago, but there was some difficulty in the way of Great Britain following suit. However, all is now declared to be well. Mexican Government, City, utility, industrial and mining issues are substantially higher in consequence. Mexican Light & Power first mortgage bonds have risen 4 points. The others are all up, though to a smaller extent. It has been more of a task, this week, to buy Mexican stock than it was to sell the same stock a month ago. The chastened tone that breathed through the recently-issued annual reports of the Mexico Tramways and the Mexican Light and Power Companies is forgotten in the newborn hopes engendered by the magic word "Recognition."

Foreign stocks and bonds are better in various cases. Brazilian Tractions have gained 4¼ points at 70½, thanks to the previously-mentioned anticipations of an increase to 5 per cent. in the dividend. Anglo-Argentine Trams have further spurted on the impression that the company is almost certain to be given the power to build subways, &c., by the Buenos Aires Municipality. British Columbia deferred stock rose 3 upon a demand of which part came from Canada. Mexicans are, as just mentioned, several points higher.

The London railway and traction group is glum by contrast with the brightness shown by the foreign section. Metropolitan Consolidated slipped back to 68. Central London Assented stock is easier, on balance, at 66 ex dividend, though Underground Electric Railways stocks are rather better.

London electricity shares make a good showing. A number of prices in this section were quoted ex the interim dividends last Thursday, and in various instances, these were recovered, either partially or altogether. Westminsters strengthened to 44s. Metropolitans are 1s. 6d. higher at 39s. 6d. City "Lights" at 48s. 3d. have gained 1s. 9d., allowing for the dividend, and Charing Cross again are better, at 49s. 6d.

Investment is turning money into the shares of the provincial power and lighting companies, on the assumption that these offer scope for appreciation as business will extend in the future. Lancashire Electrics at 26s. 6d. are 1s. 6d. up. Isle of Thanet Electrics are better at 17s. Midland Counties remain at 23s. 3d. Newcastle 7 per cent. preference picked up to 25s.

Speculation is rife as to what shape new issues are likely to assume in the London electricity companies when the capital re-organisations are completed. It is thought that future emissions of stock—after this year—may be in some company, or public body, that will act as a common corporation for the financing of the principal concerns. Possibly there may, it is surmised, be two distinct corporations, dealing with the two groups into which the London companies became divided by the Parliamentary Bills. Any such stock, or stocks, would doubtless be endowed with all the character of a gilt-edged security. Such speculation may appear to be a case, now, of beating the air, but it probably possesses a basis of shrewd and intelligent anticipation.

Cable, telephone and wireless issues are uninteresting by reason of the quietude of their quotations. Oriental Telephones are 2s. 6d. lower at 2. Automatic Telephones rose to two guineas. Great Northerns at 31¾ are 5s. better, and the Eastern group exhibits no change. Marconis can be bought at 25s. and the debenture stock is 103. Canadian Marconis have not moved from 4s. 6d. Radio Common are 10⅝, the preferred shares 9¾. But the manufacturing section keeps very hard. The feature this week is a rise of 3s. 9d. in British Aluminiums, the price spurting to 35s. upon dividend anticipations which, in some quarters, are put down at 12½ per cent.; in others, at 15 per cent. In the last completed year, the company paid 10 per cent. Johnson & Phillips, after a very brief reaction, put on a florin, to 49s. 6d.

Edison Swans are up to 8s. again. English Electrics at 19s. 6d. are 9d. higher on the week. General Electric 6½ per cent. "A" preference can be sold at the middle price of 23s. 6d. The ordinary advanced 2s. to 28s.; a modest demand found the market to be short of shares. Brush are better at 23s. 3d. Siemens hold their rise at 30s. The iron, steel and engineering section is still disposed to dulness. Rubber shares have further hardened in consequence of the strength displayed by the raw material. People are very sensibly buying shares, where these can be obtained, of the better-class £1 variety: there is not so much of the striving-for-threepences as there was in the madness of six weeks ago.

Share List of Electrical Companies

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Aug. 31, 1925.	Rise or fall.	Yield. p.c.
Home Electricity Companies.						
Bournemouth and Poole	1	13	14	3	—	4 13 4
Brompton Ordinary	1	10	10	1⅜xd	+1/-	*5 14 8
Charing Cross Ordinary	1	14½	15	49/3	+9d.	6 1 8
do. do. 4½ Pref.	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	12	1⅞	—	6 8 0
City of London	1	15	15	48/3xd	+1/9	6 4 4
do. do. 6% Pref.	1	6	6	23/-xd	+6d.	5 4 4
Clyde Valley	1	8	8	29/6	—	5 8 6
County of London	1	15	15	58/9	—	5 2 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	+1/-	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12⅝	—	5 18 8
Lancs. Light and Power	1	7½	7½	26/6	+1/6	5 15 5
London Electric	1	10	10	35/6xd	+1/6	5 12 2
do. do. 6% Pref.	5	6	6	5⅛xd	+⅛	5 7 10
Metropolitan	1	10	11	39/6	+⅛	5 11 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	23/3	—	5 4 4
Newcastle-on-Tyne Ordinary	1	6	7	23/8	+£d.	6 0 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	25/-	+6d.	5 12 0
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	14⅛	+⅛	6 3 11
South London	1	15	15	2½	—	6 0 0
South Metropolitan Pref.	1	7	7	1¼xd	+£d.	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref.	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/-	+6d.	6 16 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/-	—	5 10 6
Home Rails.						
Central London Ord. Assented	Stock	4	4	66xd	—	6 1 3
Metropolitan	,,	4	5	63	—½	7 7 1
do. District	,,	3½	3½	44½	—	7 17 4
Underground Electric Ordinary	10	Nil	Nil	2⅛	+⅛	Nil
do. do. "A"	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds	6	6	93	+1	*6 1 3	
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	108½	—	5 15 11
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	3	6	42/-	+9	2 17 2
Chili Telephone	5	6	5	5½	—	*4 11 0
Cuba Sub. Ord.	10	5	5	6½	—	7 8 2
Eastern Extension	10	10	10	17½	—	*5 15 11
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 15 11
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 14 1
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	22	31⅜	+⅛	6 18 6
Indo-European	25	7	8½	41½	—1	*5 2 5
Marconi	1	10	10	1½	—	8 0 0
Marconi Marine	1	10	7½	17/6	—	8 11 6
Oriental Telephone Ord.	1	12	12	2	—⅛	*6 0 0
United R. Plate Tel.	5	8	8	7⅜	—	5 8 6
Western Telegraph	10	10	10	16½	—	*6 3 1
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3 7/16	+1/16	8 0 0
do. do. 2nd Pref.	5	6	6	8⅜	+⅛	8 17 10
do. do. 5% Deb.	Stock	5	5	75½	+2	6 12 5
British Electric Traction Ord.	,,	6	6	114	+1	5 5 3
do. do. 6% Pref.	,,	6	6	105	—	5 14 3
Brazil Traction	100	4	4	70½	+4½	5 13 6
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	88½	—	5 11 9
do. do. Preferred	,,	96/-	96/-	85½	—	*5 12 6
do. do. Deferred	,,	129/5	129/5	109½	+3½	*5 18 3
do. do. Deb.	,,	4½	4½	77½	—	5 9 8
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	64	+1	8 1 3
Mexican Light Common	100	Nil	Nil	27	+2	Nil
do. Pref.	100	Nil	Nil	57	+1	Nil
do. 1st Bonds	—	5	5	65½	+4	7 12 8
Yorkshire (West Riding)	1	5	—	18/9	+1/16	5 6 8
Manufacturing Companies.						
Babcock & Wilcox	1	12	12	2 7/16	—	*4 13 4
British Aluminium Ord.	1	5	10	1⅝	+1/16	5 14 3
British Elec. Transformer Pref.	1	Nil	7	17/6	—	—
British Insulated Ord.	1	15	15	3½	—	4 12 4
Brush Ord.	1	10	10	23/3	+9d.	8 12 0
Callenders	1	15	15	3¼	—	4 9 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅝	—	... ...
Edison-Swan	4/-	10	10	1/-	+6d.	5 0 0
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	30/6	—	6 11 2
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	19/6	+9d.	5 2 7
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	5	7½	28/-	+2/-	5 7 2
Henley	1	15	16	3½	—	4 18 6
do. 4½% Pref.	5	4½	4½	4½xd	—	5 6 0
India-Rubber	1	5	5	22/-	—6d.	*4 10 11
Johnson & Phillips	1	10	10	49/6	+2/-	3 14 9
Met-Vickers, Ord.	1	8	8	24/-	—	6 10 8
do. Pref.	2	8	8	2¾	—	6 14 9
Siemens Ord.	1	—	7½	1½	+ 1/16	5 0 0
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price September 1st.	Fortnight's Inc. or dec.
a Acid, Oxalic per lb.	5¾d.	...
a Ammoniac, Sal per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ,,	...	...
a Borax ,,	£25	...
a Copper Sulphate ,,	£25 10s.	...
a Potash, Chlorate per lb.	4d. to 4½d.	...
a ,, Perchlorate ,,	5½d.	...
a Shellac per cwt.	£15 15s.	...
a Sulphur, Commercial ,,	£7 15s.	...
a ,, Roll ,,	£7 15s.	...
a Soda, Chlorate per lb.	3¼d. to 3½d.	...
a ,, Crystals per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots per ton	£120 to £125	...
b ,, Wire per lb.	1/9 to 2/6*	...
b ,, Sheet ,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I per ton net	£229	£10 dec.
Grade II ,,	£164	£5 dec.
Grade III ,,	£95	...
c Brass (rolled metal 2" to 12" basis) per lb.	9 7/16d.	...
c ,, Tubes (solid drawn) ,,	1/- to 1/0½	...
c ,, Wire, basis ,,	10⅜d.	...
c Copper Tubes (solid drawn) ,,	1/1½	...
c ,, Bars (best selected) per ton	£92	£1 dec.
c ,, Sheet ,,	£92	£1 dec.
c ,, Rod ,,	£92	£1 dec.
d ,, (Electrolytic) Bars ,,	£67 10s.	5s. dec.
d ,, ,, Sheets ,,	£143 10s.	...
d ,, ,, Wire Rods ,,	£77 10s.	5s. dec.
d ,, ,, H.C. Wire per lb.	9 1/16d.	1/16d. dec.
f Ebonite Rod ,,	2/3 to 2/4	...
f ,, Sheet ,,	2 3to 2/6	...
n German Silver Wire ,,	2/8	...
h Gutta-percha, fine ,,	8/9	...
h India-rubber, Para fine ,,	3/1 to 3/2	...
i Iron Pig (Cleveland Warrants) per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g Lead, English Pig ,,	£40	£1 inc.
g Mercury per bot.	£13 10s. to £13 15s.	2s. 6d. dec.
e Mica (in original cases) small per lb.	3d. to 8/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/9½	...
p ,, ,, wire ,,	1/8½	...
o Platinum per oz.	£26	...
d Silicium Bronze Wire per lb.	1/0½	...
r Steel, Magnet, in bars ,,	7½d.	...
a Tin, Block (English) per ton.	£250 0s. to £250 15s.	£6 10s. dec.
,, Wire, Nos. 1 to 16 per lb.	3/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

The London Electrical Engineers.—27th A.A. Battalion, R.E. (T.A.).—Honorary Colonel: Col. R. E. B. Crompton, C.B.; Officer Commanding, Lieut.-Col. C. H. S. Evans, O.B.E., A.M.I.E.E. The following orders have been issued for September:—

304th Company (Major W. H. Merrett, T.D., A.M.I.E.E.).—Mondays, 7 p.m. to 9-30 p.m. Completion of training for the year ending October 31st, 1925.

305th Company (Major A. W. Mawby, O.B.E., A.M.I.E.E.).—Tuesdays, 7 p.m. to 9.30 p.m., from September 15th, for completion of training.

306th Company (Major F. C. Clarke, A.M.I.E.E.).—Fridays, 7 p.m. to 9.30 p.m., from September 18th, for completion of training.

The battalion finishes the annual camp on September 13th. The 304th Company left Watchett on Sunday, August 30th, after a fortnight of very indifferent weather; much valuable work was done, but with four stations manned only, the camp duties were unusually heavy, owing to the small numbers in camp with only one company. It is earnestly hoped that many of those who enjoyed camp, despite the weather and heavy work, will bring along recruits to the unit, which will largely ease up the duties when in camp in future. Twelve lights will be manned by the Battalion at the British Empire Exhibition, Wembley, throughout the month.

Headquarters, at 46, Regency Street, London, S.W.1, will be open until 8 p.m. on weekdays and 1 p.m. on Saturdays. The address of the officers' mess will be at headquarters from September 13th.

The Reorganisation of Krupps.—The Berlin correspondent of the *Financial Times* says that the Friedrich Krupp A.G., Essen, is negotiating for the sale of certain assets, including the electrotechnical building department, the fine mechanical workshops and the textile-spinning machine factories, all of which have proved unremunerative in their present form. The remaining works are again to be reorganised.

The British Association.—II.

The Southampton Meeting.

The opening of the proceedings of the Association was accompanied by variable weather, but this did not deter visitors from proceeding on the interesting itinerary which had been arranged for them. There was a very large attendance at the inaugural meeting to hear Dr. Lamb's presidential address, and it was announced that the Association had definitely decided to accept the invitation to meet in Oxford next year with the Prince of Wales as president.

Dr. Lamb prefaced his address with a few remarks upon the nature and purpose of science in general. He claimed that it was disinterested investigation and the arrangement of facts into an intelligible scheme. If the material effects of any discoveries were such as to work harm to the human race, or if they did not produce anticipated benefits, science could not be held responsible.

The proceedings on August 27th were outlined in our last issue. Taking advantage of a lack of matter of electrical interest in the morning, a visit was paid to the Pirelli-General Cable Works, which are situated conveniently near the heart of the town. Here were seen many interesting processes, some of which we hope to describe and illustrate in a subsequent issue. On the afternoon of the same day, a visit was paid by members from the Engineering Section to the Southampton Docks. Particular attention was paid to the electricity supply and electrical equipment there which formed the subject of a paper by Mr. H. Wauchope, the Southern Railway Co.'s electrical engineer at the docks, which was presented to the Engineering Section on the following day. Other papers read before this Section on the same day were "The Quay Walls of Southampton," by Mr. F. E. Wentworth Shields, O.B.E. ; and "The Electrical Power Station at Southampton," by Mr. W. G. Turner, the Borough Electrical Engineer. There was also a joint discussion with Section B.—Chemistry—upon the ignition of gases, to which Prof. H. B. Dixon, F.R.S., Prof. W. T. David, and Dr. O. C. de C. Ellis contributed. Prof. Dixon described a number of experiments carried out for the Safety in Mines Research Board. In the Mathematical and Physical Science Section, Prof. A. E. Kennelly read a paper upon "Some New Properties of Hyperbolic Functions and Integral Series of Numbers, with Applications to Electrical Engineering." The president of Section F —Economical Science and Statistics—(Miss Lynda Grier) delivered her address, dealing with "The Meaning of Wages." In this the vexed question of "fair wages" was discussed and the effect of low wages upon the community considered. In the same Section, Mr. R. F. Harrod read a paper on "The Trade Cycle and the Theory of Distribution," showing that where there were fluctuations in the system of distribution of products among the factors of production, the volume of production would probably fluctuate also, causing periods of prosperity or depression.

On Saturday evening a Citizens' Lecture was delivered at the Avenue Hall by Prof. E. V. Appleton, who dealt with "The Rôle of the Atmosphere in Wireless Telegraphy." The week end proved fine, and a number of excursions to places of recreation and interest, of which there are many within easy reach of Southampton, were arranged. On Monday last a paper on "High Efficiency Steam Installations for Ship Propulsion" was presented to the Engineering Section by Mr. S. S. Cook. This paper made special reference to the use of auxiliary machinery, four classes being dealt with, *viz.*, steam-driven, steam-electric, Diesel-electric, and mechanically-driven from the main engine. On the same morning Mr. C. le Maistre read a paper upon "Engineering Standardisation," emphasising its importance and reporting upon progress. In the Chemistry Section, Mr. J. A. V. Butler read a paper on "The Seat of the Electromotive Force of the Galvanic Cell," and Mr. E. A. Ollard presented another describing experiments upon electro-deposited chromium to determine its resistance to corrosion. On the evening of the same day Capt. P. P. Eckersley, whose portrait appears in our "Personal" column, delivered a Citizens' Lecture upon "Some Technical Problems of Broadcasting."

On Tuesday last Prof. H. Bateman, in the Mathematics and Physics Section, read a paper entitled "The Force on a Spinning Electron." Two papers on radio matters were presented before the same Section, "Some Thermionic Valve Problems," by Prof. E. V. Appleton, and "The Study of Wireless Wave Fronts by Directional Methods," by Dr. R. L. Smith Rose. Prof. J. J. Nolan dealt with "Atmospheric Ionisation." The only matter of electrical or allied interest which was raised on the concluding day (Wednesday) was a demonstration by Prof. J. G. Gray of gyroscopic apparatus for the use of engineering students.

During the meeting an invitation to Leeds in 1927 was received and accepted by the Council. The 1928 meeting will probably be held in Glasgow.

The Southampton Electricity Undertaking.

By W. G. Turner, A.M.I.E.E.

(*Abstract of Paper read before Section G.—Engineering.*)

Electricity was first supplied to Southampton in 1891 by the Southampton Electric Light and Power Co., Ltd., which obtained a Provisional Order in 1895, the area being the county borough as then constituted. In 1896 the Southampton Corporation purchased the undertaking, and the power station, in the centre of the town area, was re-built and extended. This station, by reason of the limitations of the site, could not be extended sufficiently to deal with the rapidly growing demand, and, moreover, was unsuitable for the economical generation of power, there being no railway or water facilities. Consequently, a site of about four acres of mudlands on the foreshore of the River Test, was reclaimed, and in 1903-04 a large new station was built on piled foundations. This station is close to the centre of the load, has an adequate supply of cooling water for condensing purposes, a railway siding connecting it to the Southern Railway over which coal is obtained, together with ample room for the disposal of ashes, and has been gradually extended in size until in 1920 it contained generating plant of 9,060-kW capacity. Since then it has been modernised and enlarged. Three machines aggregating 1,300 kW, and practically obsolete, were removed, and two machines aggregating 11,000 kW substituted, making the present generating plant capacity 18,760 kW. The station as now laid out, is capable of accommodating plant of upwards of 65,500-kW capacity. The size of the boiler house which is arranged parallel to the longitudinal axis of the engine room, has been doubled by adding an additional row of boilers parallel with the existing row, there being a common firing floor between the two rows. Its ultimate size is 275 feet long by 114 feet wide. Already a machine of 10,000-kW normal capacity, the first of five machines of this size, to be placed in the extended engine room, is on order for installation next year; this will make the station the largest in the Southern Counties. All machines recently installed have their shafts at right angles to the longitudinal axis of the building, as will also future machines (see fig. 1). A 50-ton electrically operated overhead travelling crane is to be installed.

The coal consumption is now upwards of 33,000 tons per annum, and is rapidly increasing. Coal wagons are hauled from the Southern Railway Company's Southampton West Station sidings by the Corporation's electric locomotive, and are unloaded by means of a grab, capable of lifting half a ton, operated from an electric jib railway crane. The grab delivers the coal into a receiving hopper provided with a chute from which it gravitates through an automatic filler to an endless chain gravity bucket travelling conveyor capable of handling about 20 tons of small coal per hour. Some of this plant will shortly be inadequate and is to be replaced by an electrically-rotated wagon tippler with hand operated clamping gear, capable of dealing with from 12 to 15 wagons per hour each carrying 12 tons. The coal will be delivered into a receiving hopper provided with a chute leading to the automatic filler of an endless chain gravity bucket conveyor capable of handling 80 tons of small coal per hour, and a chain speed of from 55 to 60 feet per minute. The whole of the new plant

is being supplied by Babcock & Wilcox, Limited. The old coal bunkers are being removed, and new and more capacious bunkers erected. The ashes are removed in small wagons mechanically hauled along a narrow gauge track to an ash tip where they are dumped, and later they are sold.

There are five boiler feed pumps, three of which are Weir's direct acting reciprocating type, and two Weir's turbine driven rotary type. Together they are capable of delivering a total of 43,500 gallons of feed water per hour. A further turbine driven rotary type pump capable of delivering 20,000 gallons of feed water per hour is on order from J. P. Hall and Company. The water treatment plant consists of an oil eliminator and filter for dealing with the oily condensate from the reciprocating engines, and a water softener and filter.

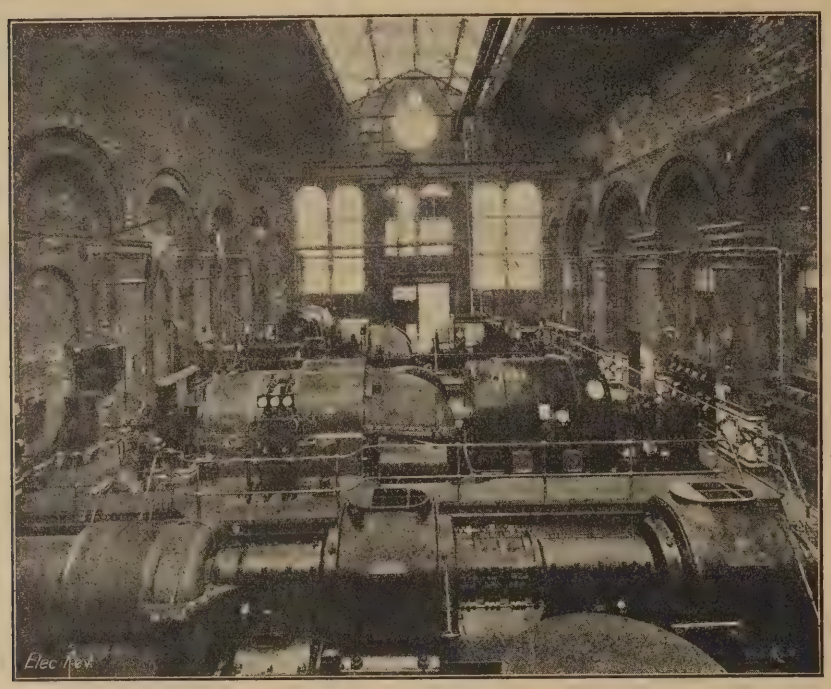


Fig. 1.—Interior of the Southampton Power Station.

There are at present installed in the boiler house, eight Babcock & Wilcox water tube type boilers suitable for a working pressure of 200 lb. per square inch above atmosphere, and having a total equivalent evaporative capacity of 274,418 lb. of water per hour. They are all fitted with integral superheaters capable of imparting a superheat of 150 deg. F. to the steam, making the total temperature 538 deg. F. The automatic stokers are all of the travelling chain grate type, one being of the Underfeed Stoker Company's make, and most of the remainder of Babcock & Wilcox double lap intersecting link type. Four boilers are fitted direct with economisers, and the remaining four discharge through a common economiser. Six of these boilers are connected to the original brick chimney. The two boilers most recently installed, discharge through separate Green's economisers behind the boilers, into a common Prat steel chimney. Each of these two boilers, in common with two previously installed and two more shortly to be erected, has a total active heating surface of 9,273 square feet, a total grate area in two grates per boiler, of 210 square feet, and an equivalent evaporative capacity of 46,780 lb. of water per hour when burning 10,500-B.th.u. bituminous coal. The total heating surface of each superheater on these boilers is 2,200 sq. ft. The economisers on each of the two boilers recently installed and the two shortly to be erected are Green's vertical cast-iron type, each with 320 pipes, capable of raising the temperature of the feed water from 90 deg. F. to 195 deg. F. at boiler pressure. Thus the temperature of the flue gases leaving the boiler is reduced from 500 deg. F. to 350 deg. F. The combined efficiency of the boiler plant on the above bases is 82 per cent. The Prat chimney works on the ejector principle. It has been decided to fit a "Cyclone" dust collector to the steel chimney for the boilers shortly to be erected.

Ultimately the boiler house will be capable of accommodating 18 large boilers with a total equivalent evaporative capacity of 842,000 lb. of water per hour, or sufficient after allowing for spares, to steam upwards of 55,000 kW of plant. Each of the boilers at present installed is provided with the usual mountings and instruments, including a CO_2 indicator. The two boilers shortly to be installed are each to be provided with a panel bearing all the necessary indicating instruments. They will also be provided with automatic feed water regulators, volumetric Lea coal meters, a combined temperature and electrical CO_2 recording apparatus for recording the flue gas temperature at the economiser outlet and the percentage of CO_2 in the boiler exit gases, a multi-point electrical distance thermometer for indicating various temperatures of boilers and economisers, and various local gauges and thermometers. It is proposed to increase the steam temperature in two stages. The decrease in steam consumption of the turbine plant with the higher temperature, will be from 12 to 15 per cent.

The station also houses a Willans and Robinson reaction type condensing steam turbine driving tandem 565/630-kW Brown-Boveri a.c. 440/530-V generators, running at 1,800 r.p.m.; two Cole, Marchent & Morley vertical triple expansion drop Corliss valve gear condensing steam engines, each driving a 1,000-kW Dick, Kerr d.c., 450/550-V generator, running at 110 r.p.m.; two B.T.-H. impulse type (Curtis) condensing steam turbo-alternator sets of 1,500-kW and 3,000-kW capacity respectively, two-phase, 2,200 V between each phase and the common return at 50 cycles per second; one Metropolitan-Vickers impulse type condensing steam turbo-alternator set of 5,000-kW capacity, three-phase, 6,600 V between phases, 50 cycles; and one Parsons reaction type condensing steam turbo-alternator set of 6,000-kW capacity as above. The whole of the plant has an overload capacity of 25 per cent. for two hours, and the alternators will give their full output at 80 per cent. power factor. The 5,000-kW turbine has an integral surface feed water heater located in the exhaust end which raises the temperature of the hotwell water coming from the main condenser, from 71 deg. to 150 deg. F. The 6,000-kW turbine already installed and the 10,000-kW machine on order, are similarly equipped. Closed-circuit cooling is employed. The 6,000-kW turbine is fitted with "end-tightened" blading in the high-pressure portion. The minimum radial clearance of this portion is about 3/16 in., whilst the radial clearance in the remainder of the blading ranges from ⅛ in. up to ¼ in. The danger of very fine radial running clearances is thus eliminated.

Each of the three-phase turbo-alternator sets is provided, in addition to various local instruments, with panels having suitable instruments mounted thereon to indicate all conditions. The condensers are also provided with Kent's "Venturi" water meters to measure and record the amount of condensate. A turbo-alternator efficiency indicator designed by the author and made by Nalder Brothers & Thompson, Ltd., is combined with the water meter on the 6,000-kW set. This instrument, without having recourse to highly organised simultaneous readings made by at least two observers, of various instruments situated usually in different places, and subsequent reference to the "Willans line" of the machine, indicates simultaneously the load on the alternator, and the actual as against the guaranteed total steam consumption of the turbine at that load on one instrument in the hands of one observer only. Causes of high steam consumption which might otherwise have continued unnoticed for a considerable period can thus be rectified without unnecessary and costly delay and the risk of possibly a serious breakdown can be obviated. The readings can be logged as part of the regular station routine and thus provide a continuous check on any deterioration from the guaranteed efficiency and incidentally show any improvement in the running. It has been decided to fit a similar instrument to the 10,000-kW turbo-alternator set now on order. The latter set, representing the latest practice, is of particular interest. The steam turbine is being made by Fraser & Chalmers Engineering Works and embodies improvements made as a result of the Reports of the Steam Nozzles Research Committee formed by the Institution of Mechanical Engineers and the British Electrical & Allied Manufacturers' Association. For a number of technical reasons the makers of the machine decided to apply the low steam velocity in the high-pressure part of the turbine, and the high steam velocity in the low-pressure part of the turbine. In the new design the velocity compound wheel has a small diameter and utilises a very moderate drop. As a result its steam flow efficiency is substantially higher than in the older design with a larger velocity wheel utilising a large pressure drop. Then follow a large number of small diameter single impulse stages utilising low steam velocities, instead of a small number of large diameter stages as previously. The low pressure part of the turbine is designed on similar lines to the older design, and consists of a number of large-diameter single impulse stages, except that the large mean diameter is now applied right through the low pressure part instead of in the last few stages only, in order to obtain a high steam flow efficiency in all the low pressure stages. Stages of medium diameter, which would incur medium steam velocities with lower efficiency, are entirely eliminated from the design. All the high and low pressure stages are housed in one casing, the length of the turbine being slightly increased when compared with the length of the older design. The alternator, which is being made by the General Electric Co., Ltd., and has combined axial and tangential ventilation with an external fan, will have a continuous output of 12,500 kVA, and an overload output, for two hours, of 15,625 kVA. The condenser is being made by Hick, Hargreaves & Co., Ltd., and is designed for a flow of 12,100 gallons of circulating water per minute; it will have a cooling surface of 11,800 square feet. The plant with a vacuum of 28.5 inches Hg (barometer 30 in.) will have a steam consumption at full load of 11.22 lb. per kWh, which will be reduced to 10.29 lb. when the steam temperature at the turbine stop valve is increased to 700 deg. F.

These figures include the power required for driving the alternator ventilating fan but are exclusive of feed heating and all steam and power for the condenser auxiliaries. As the "heat drop" under the more favourable conditions is 432.2 B.th.u. per lb., the thermal efficiency of the turbo-alternator from steam input to electrical output is 76.8 per cent.

The condenser circulating water system is not without interest. As the River Test recedes from the quay wall at low water by about 1,000 yd., a cooling pond capable of holding about 2,000,000 gal. was constructed adjacent to the station. This pond is replenished at each high water, and as there is a second high water two hours after the first, with only a small fall of the tide, high water lasts in effect for nearly four hours at each tide, *i.e.*, twice in every twenty-four hours.

The switch and control rooms are adjacent to the engine room on the side opposite to the boiler house. The switch room contains British Thomson-Houston e.h.p. three-phase switchgear in moulded stone cell structures. The rupturing capacity of the original oil switches is 150,000 kVA, but as this will shortly be insufficient special arrangements will be made to safeguard them. The new oil switches have a rupturing capacity of 300,000 kVA.

The control room is equipped with four main switchboards for the d.c. three-wire power and lighting system; the d.c. traction system; the two- and single-phase a.c. system; and the three-phase system.

The number of consumers connected in 1925 was 8,455, this being an increase of 182 per cent. over 1914. The total sales to private consumers were 13,542,401 kWh, an increase of 220 per cent., and the total sales to all consumers 17,909,256 kWh, an increase of 150 per cent. The total load connected was 25,664 kW, an increase of 255 per cent. There are a number of very large private consumers, including the Docks.

The Resistance to Corrosion of Electro-deposited Chromium.

By E. A. OLLARD.

(*Abstract of paper read before Section B.—Chemistry.*)

Chromium, since it was first deposited by Bunsen in 1854, has been considered as a possible metal for plating purposes. With the advent of stainless steel, a good deal of attention has been drawn to the non-tarnishable properties of chromium and chromium alloys. The chief properties of chromium are its hardness and its resistance to corrosion by the atmosphere and certain acids. It is, however, readily attacked by hydrochloric acid, and is also easily corroded when it forms the anode of an electrolytic circuit. A good deal of technical difficulty, however, was experienced in the early attempts to electroplate chromium on to other metals, and it is only within the last few years that processes have been evolved which have been satisfactory on an industrial scale. The test pieces and other objects mentioned in the paper were plated by Dr. Liebreich's process, which is being used commercially in Germany and France, and appears to give quite satisfactory results.

The object of the work described was to investigate the properties of chromium-plated material and discover for what purpose it is specially suitable. This investigation has chiefly taken the form of a comparison with other plating processes. Sufficient time has not yet elapsed for conclusive results, but it is thought that a summary of the factors or data obtained so far may prove interesting.

A number of steel test pieces were cut from a bright steel strip and a hole bored in one end to suspend them by. These test pieces were then plated in groups of nine with different metals or combinations of metals. Of these groups, three were exposed to atmospheric corrosion on the roof of a chemical laboratory, three were placed in a boiler and exposed to the action of steam, two were placed in salt spray, and one was heated in the presence of air. While chromium will not protect steel from rusting when plated on it directly, it was thought probable that if an underlying metal such as nickel or copper were first plated on the steel it might be possible to prevent it from rusting, and at the same time obtain the advantageous properties of the chromium plating. Groups of test pieces were therefore plated in the following manner:—Group 1: One hour deposited in a cadmium cyanide bath; Group 2: 3 hours deposited in a nickel sulphate bath; Group 3: 1 hour deposited in cadmium cyanide bath and 1 hour in nickel sulphate bath; Group 4: 1 hour in nickel sulphate bath and 1 hour in cadmium cyanide bath; Group 6: 1 hour in nickel sulphate bath, 1 hour in copper sulphate bath, then buffed and plated, ½ hour in nickel sulphate bath; Group 7: ½ hour in chromium bath; Group 8: ½ hour in copper cyanide bath followed by ½ hour in chromium bath; Group 9: 1 hour in cadmium cyanide bath followed by ½ hour in chromium bath; Group 10: 1 hour in nickel bath followed by ½ hour in chromium bath; Group 11: ½ hour in copper cyanide bath followed by 1 hour in copper sulphate bath; Group 12: 2 hours in nickel bath followed by ½ hour in chromium bath.

The test pieces plated in this manner were then tested as described above. They were all measured and weighed before and after the tests, and the loss of weight per unit area was calculated. Notes of the appearance of the test pieces were also kept and specimens of one of each of the groups exposed on the roof. These examinations are recorded in tables appended to the paper.

The specimens were hung from a frame on the roof of the laboratory, suspended directly above a trough of water and exposed to the Trafford Park atmosphere. The time allowed for this test was 768 hours. The nickel plated specimens were readily attacked, and showed a greenish deposit on the surface. The cadmium specimen stood fairly well, but appeared to be evenly attacked. The copper specimen was very much tarnished, and also lost a good deal of weight. In the case of the chromium deposited directly on the steel, the chromium plating was almost entirely removed, having apparently been thrown off by the corrosion of the steel underneath it. The chromium deposits, however, which had been made on copper and nickel stood quite satisfactorily, with only slight traces of local rusting. Chromium deposited on to cadmium stood remarkably well, but in some places the chromium flaked away from the cadmium coating. The chromium plating does not appear to adhere well to the cadmium and, especially in the subsequent tests which involved temperature rise, the chromium plating was almost entirely removed from the cadmium. The most satisfactory specimen from the point of view of loss in weight was that in which the steel was first coppered and then chromium plated, although those with nickel as an underlying metal also stood very well.

In the boiler test, the specimens were suspended in the steam space of a small boiler. In this case the chromium with underlying nickel proved the most satisfactory, while the nickel plating stood fairly well. The cadmium protected the steel fairly satisfactorily from rust, but lost weight, and would have been removed in time.

As chromium is attacked very violently by hydrochloric acid, it was thought that the conditions prevailing in the salt spray would corrode it very rapidly. It was found, however, that the salt spray had very much less action on the chromium plating than was anticipated. In this test the most satisfactory platings were those consisting of both nickel and cadmium. The chromium plating with nickel as an underlying metal, however, stood quite satisfactorily, losing about the same weight as the nickel plated specimens and less than the cadmium plated specimen. The copper plated specimen was very badly corroded.

One specimen of each group was heated intermittently in an oven at about 400—420 deg. C. for 150 hours of actual heating. In this case, again, the cadmium plated samples were badly attacked, and also the chromium plating on cadmium. In the latter case the chromium was almost entirely thrown off. The other chromium-plated samples all seem to stand fairly well, the surface of the plating, however, oxidising slightly. The nickel plated specimen also stood well. Another test piece of steel was made which was plated first with nickel for about an hour, then immersed for an hour in the copper sulphate bath, then re-plated with nickel for half an hour, polished and finally chromium-plated for half an hour. This specimen was exposed on the roof of the chemical laboratory for about two months, and at the end of this time was still quite bright, showing no apparent sign of rusting.

Besides the laboratory tests described above, a number of articles were chromium-plated and put into service under different conditions. As tests of this nature require a fairly lengthy period of time before any conclusion can be reached, it is not possible at present to give the results of many of these. Some of them, however, are worth mentioning. The bracket holding the wind screen mirror on a car was plated, and this has kept bright much better than the nickel plating on the rest of the car. Another important application for chromium plating has been in the protection of die casting moulds. This application was suggested by the British Non-Ferrous Metals Research Association, and a small steel pin from one of these moulds was plated with chromium. These pins are made of expensive special steel, and it is hoped that an ordinary steel, chromium plated, could be substituted for this. The pin in question has now made some 5,000 castings, and no difference in size can as yet be detected with the micrometer. A chromium-plated terminal was also exposed in Sheffield for two months under conditions where a nickel-plated terminal rapidly tarnished. At the end of this exposure the terminal was still bright and just as good as when it was first exposed. A large number of articles are being plated and placed in service under different conditions, but it will be some time before the results of these tests can be collected.

From these tests it appears that the most satisfactory plating for all round purposes is chromium with nickel as an underlying metal. Steel plated first with cadmium and then with chromium appears to stand very well against atmospheric corrosion, but has the difficulty that the chromium has a very strong tendency to strip from the cadmium. Also chromium plated on cadmium will not take a high polish. Steel articles plated first with nickel and then with chromium, especially if a layer of copper is put in between, will stand atmospheric corrosion extremely well. Composite platings of this nature may be objected to commercially on the grounds of cost. One of the chief costs of plating an article, however, lies in the setting up, cleaning and pickling processes. In the case of plating a specimen with a series of different metals, it is usually only necessary to swill the specimen and transfer it to the next bath and, therefore, the cost of the operation is not increased as much as might be expected. It seems probable that certain important applications will be found for this process in industrial practice. The test made on the die casting pin seemed to show that the process may have a big future in this industry, and it is by no means unlikely that platings of this description may find applications in chemical plant, &c.

The above tests are merely preliminary work on this subject, and it is hoped to continue tests on a more extensive scale, both in the laboratory and in service. The work was carried out in the Research Department of the Metropolitan-Vickers Electrical Co., Ltd., and the author acknowledges the assistance of Messrs. Pollitt and Mather, of the Chemical Section.

Earthquakes and Electrical Installations.

Observations of the Damage done to Electrical Plant in Japan by the 1923 Earthquake.

ALTHOUGH, of course, it was inevitable that the electrical installations in Japan could not escape damage from the great earthquake of 1923, in which over 150,000 lives were lost and 500,000 houses destroyed, little has been known till now of the extent of the injuries. An outline of a report on the investigations made by a joint committee organised by the Institute of Electrical Engineers of Japan, the Japanese Electrotechnical Committee, and the Electrical Association of Japan into the effects of the earthquake and fire, which we have received, throws some light upon the subject. The object of the report was to examine into and record the general conditions of the damage done, and to obtain data for instituting precautionary

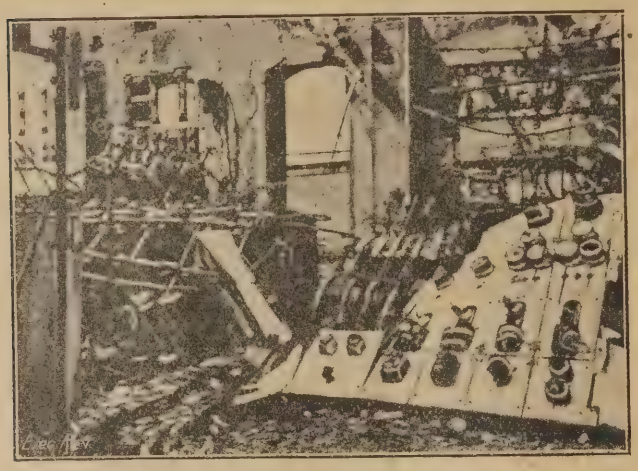


Fig. 1.—Eirakucho Sub-station, after Fire.

measures, it having been decided that if such measures had been taken, much of the loss and devastation could probably have been avoided.

It is generally known that the severity of an earthquake and its effect upon any locality depend upon the distance from the origin, the general contour of the land and its geological formation; but it is extremely difficult to record its effects precisely. Fig. 4 is a map divided into three districts, each denoting by the depth of shading the intensity of the shock, which will help in following the observations made in the report.

The injuries to the hydro-electric installations were the result of either the earthquake directly or the consequent landslides therefrom. The intake constructions were, in general, not heavily damaged; but there were a few cases where the concrete piers of the head and sand gates were cracked at the bottom. In the Katsuragawa system, where the earthquake was not severe, the only damage done to those constructions was some slight cracks in the piers, most of the other parts escaping any damage. Of the earth-fill dams, the case of the Ono reservoir in the Katsuragawa system is very interesting. The dam is 125 ft. high by 900 ft. long. The slopes are 2 to 1 inside, and 3 to 1 outside, having a puddle core at the centre. Many longitudinal cracks appeared running parallel with the dam, and reached generally vertically downward to a distance of about 50-70 ft., their width gradually diminishing and finally reduced to a hair crack. They were afterwards examined very carefully by boring in the dam, but were found to be not of any serious nature. Repairs were done by filling with a mixture of clay, sand and water as in ordinary mortar. The reservoir was then gradually filled and thereafter worked with no trouble. It is a matter of conjecture, however, what would have been the extent of the damage if the dam had been located in the more severely affected area. It may be inferred that the strength of earth-fill dams against heavy earthquakes is worthy of further investigation. Head tanks and penstocks are usually necessarily placed on mountain slopes at a very steep angle. It was natural, therefore, that the pipe lines should suffer considerable damage from landslides. In the Katsuragawa district, however, damage was less than in the Hakone district, but in one case where the side wall of the head tank had large cracks as above mentioned, pipe lines and anchorage blocks were also dislocated. Thus water gushed out from the pipe and washed away the surface of the slope and flowed into the power station.

Practically all injuries sustained by the machinery in the steam and gas power stations were the results of the sinking of foundations, the collapse of buildings or the falling of chimneys, &c. The principal reason for the severity of damage caused to the stations is that they are located near the sea shore or river banks, where the soil formation is less suitable for installing heavy machinery, for the purpose of getting better facilities for fuel handling and water supply. Boilers as a rule suffered no serious damage from the earthquake direct, but many injuries were caused by the collapse of the buildings or chimneys, &c. Two Erie-City boilers installed on Tsurumi reclaimed land, although their upper drums were situated very high and therefore seemed rather susceptible to earthquakes, were intact, due probably to the effectiveness of the struts used in the supports.

At the time of the earthquake most of the reserve plants were not in operation. In the Akabane steam power plant of the Imperial Government Railways, however, one 6,000-kW horizontal Westinghouse-Parsons type steam turbine was in operation. At the first shock the machine was stopped immediately. Oil for the bearings was supplied by an auxiliary pump. When the machine was later examined it was found that many of the turbine blades were bent, but there was no damage to the bearings. Another turbine of the same type, which was uncovered for inspection, was also damaged in a similar manner. This phenomenon may be attributed to the fact that the direction of the earthquake vibrations was along that of the machine shaft. A 7,500-kW General Electric steam turbine in the Kanagawa power station of the Tokyo Electric Light Co. was running at no load for drying the armature at the time of the earthquake. It was also immediately stopped and was found afterwards to have sustained no damage whatever.

In the Kanagawa power station, in which were installed many sets of economisers within a flue of brick construction, the flue was totally destroyed and the economisers, therein contained, were all toppled over. The economisers in the Akabane power station were placed directly behind the boilers upon a solid foundation and were contained within reinforced concrete flues, and the only damage sustained by them was a slight leak. The former installation was somewhat out-of-date, and the latter was of a new earthquake-proof type.

The pipe systems in the steam power stations almost entirely escaped damage due to their being flexibly installed. All the steam pipes, which were of steel, came out unharmed, but in some of the water piping, where cast iron was used, many cracks in the flanges and some complete ruptures occurred. In the Kanagawa station the upper part of the flange of a 20-in. suction pipe, installed for the condenser circulating pump, was broken at the neck, so that service was completely interrupted. This occurred not at the time of the great earthquake on September 1st, but during one of less intensity on January 15th, 1924. The turbine was running and the pipes were filled with water in the latter case, while in the former case the pipes were empty; the water column in the pipes might have caused the breakage. From this the necessity of supporting such pipes by stays, &c., was learned.

Considerable damage was done to the chimneys of the generating stations, and from a table summarising the injuries in this direction it is noted that of 10 reinforced concrete chimneys used in thermal power stations, only one remained undamaged, while all the steel chimneys suffered no damage.

The damage to the electrical installations in most of the generating stations and sub-stations was less, being caused mainly by the failure of buildings and other structures. The

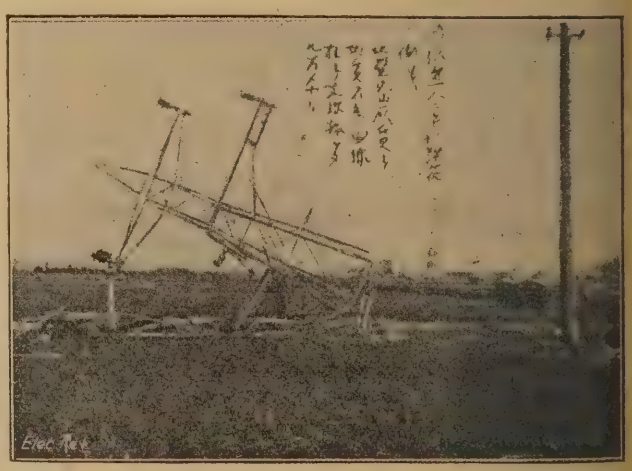


Fig. 2.—Angle Tower Overthrown by Earthquake.

foundations of the rotating machinery were generally built on solid rocks or otherwise very strong pile-work, as a result of which the machinery was not very much damaged. In some rare cases slight cracks were observed in the foundations, probably due to unsatisfactory workmanship, but in all cases these slight injuries did not prevent the machinery from operating.

In the case of the Yamura water-power station, where the building sustained somewhat severe damage, the generators and the water turbines were not affected in the least, although the generating sets were of the vertical type with shafts about 70 ft. long. No difficulty was experienced afterwards in resuming the operation of these units. Fig. 1 is a view of the

Eirakucho sub-station of the Imperial Government Railways, which was burnt down. It is interesting to note that almost all of the generating sets and water turbines in the affected area remained undamaged.

Owing to the fact that transformers are usually equipped with small rollers or wheels and that in the case of the outdoor-type they are placed on rather less solid foundations, they were more or less affected. Of the transformers installed in the Oku sub-station, 15 single-phase units, 6,000 V, 3,500 kVA, were found to have moved 9 or 10 in., although the direction of the vibration was at right angles to that of wheel movement. This was probably due to the fact that the wheels were of the flat type without any flanges. In the transformers of the Tabata sub-station, the porcelain bushes were cracked, due to the transformer leads being installed without slack.



Fig. 3.—Curiously Distorted Tramway Lines.

Four 3,500-kVA transformers in the Kawasaki outdoor sub-station were tilted due to uneven settling of the foundation, thereby breaking the suspension type insulators supporting the high-pressure leads. It is also to be noted that in many cases the failure of oil and water piping caused much inconvenience in resuming the service. From these instances it should be noted that precautions should be taken to prevent any movement of transformers in the case of an earthquake.

It would require much space to describe in detail the effect of the earthquake upon oil circuit breakers, disconnecting switches and switchgear in general. In short, where the buildings containing these appliances were of the earthquake-proof type, the damage was very slight, if any, and attention must be given to the selection of a proper type of supporting material, such as fittings, insulators, bushings, &c. It is also necessary to add that some margin in slackness must be given to all leads.

It can be said in connection with installations of storage batteries that no attention has heretofore been given to providing against earthquakes, and consequently practically all the batteries installed in the affected area were disabled. Some were either overturned, dislocated or short-circuited, while others were completely destroyed, and only a very few could be immediately used for resuming the service.

Inasmuch as the immediate cause of the damage occasioned to transmission lines was landslides of the ground upon which the supporting poles or towers stood, it is needless to say that the physical conditions of the country traversed by the transmission lines should be studied carefully. Towers placed upon mountain slopes were affected in such a manner that their legs on one side slid down, and thereby caused complete collapse. But those constructed on the mountain ridges escaped any serious damage in spite of the fact that along the sides of the mountains many landslides had occurred.

The steel towers which had foundation blocks of small taper were lifted up from the ground by the vibrations of the wires, where the soil was not hard enough to hold them. Those to which a horizontal cross beam was attached at the base of the tower seem to have withstood the shocks creditably. If that part of the foot of the tower between the ground line and the cross beam was too long, it usually caused distortion and then collapse of the tower. Moreover, the earthquake shocks exposed the negligence of the workmen during construction, such as incomplete tightening of nuts, improperly prepared fittings, &c. Generally speaking, reinforced concrete poles suffered most on account of their heavy weight and lack of foundation strength. It is evident that a concrete pole once inclined is very difficult to restore to its former position because of its weight. A view of an angle tower, after the earthquake, on the Hakone system is shown in fig. 2.

All over Japan, even in the large cities, wooden poles are generally used for the purpose of supporting distribution lines, and it was found that the injuries sustained by these wooden poles were mostly the result of damage to the nearby buildings. Even in the Kanagawa and Chiba prefectures, where the earthquake shocks were severe, the direct cause of the damage was as mentioned above, except where a few poles which had rotted at the base broke off. This shows that in most cases if all buildings had been made earthquake-proof wooden poles would have suffered little damage. The high-pressure distributing line conductors (generally 3,300 V) in the affected areas failed mainly by their swaying and the consequent short-circuiting. No trouble occurred with any of the low-pressure distributing lines (210 or 105 V). Many pole transformers dropped down from their supports, but it was found that in almost all cases the transformers had neither been properly supported nor fastened. With service wires the principal difficulty seems to have been the failure of small auxiliary poles fixed to the buildings. The best way to resume the service in case of an earthquake is to disconnect immediately the faulty wires so that energy can be supplied to the unaffected consumers, and it is important that operating electric companies or corporations should train their men in ordinary times so that in any emergency proper measures shall be taken.

Tokio and Yokohama were the only cities within the affected area where underground electric cables were used; these were mostly direct-laid and very few are in ducts. In practically all cases the injuries sustained were caused either by slipping of surrounding soil or by damage to bridges supporting them. In Tokio there were no serious injuries done to the cable except in a few cases where the conductors were disjointed in the joint boxes. Manholes are generally constructed of brick work, and they all suffered more or less from cracks in the walls.

The underground transformer chambers are constructed of either steel plates or brick masonry. The steel boxes withstood the shocks but failed under the intense heat of the fire, and the brick ones nearly all developed cracks as the result of the shocks.

It is reasonable to assume that the extent of damage done to buildings is also a measure of damage done to the interior wiring. The essential condition for the protection of all interior wiring and fixtures is to build all structures earthquake-proof. To provide for emergencies in case of a great earthquake, every consumer should be taught to cut off the circuit by the incoming switch as soon as possible. In some cases it may be necessary to construct special distributing mains with underground cables to certain consumers to whom electricity supply is indispensable. It is estimated that over 1.5 million electric lamps were destroyed.

Much damage, of course, was caused by fire, and it is reported that in over 80 places fires started in the city of Tokio soon after the first shocks of the great earthquake. Whether any of these fires were the result of damage to electrical installations is a matter of great importance. From experience gained by emergency measures taken after the disaster, it was found that fires due to electricity were very rare. The first measure was to provide lighting in order to quieten the alarmed populace. On the afternoon of September 3rd, power was supplied to the reserve pump motors of the City's waterworks. The plan of action taken by the Bureau of Electricity, Ministry of Communications, in this direction was as follows:—To disconnect all service wires from the demolished and leaning houses; to supply electricity at first for street lighting and then for the unaffected private residences; and to proclaim to all consumers the necessity of economising in the use of electricity.

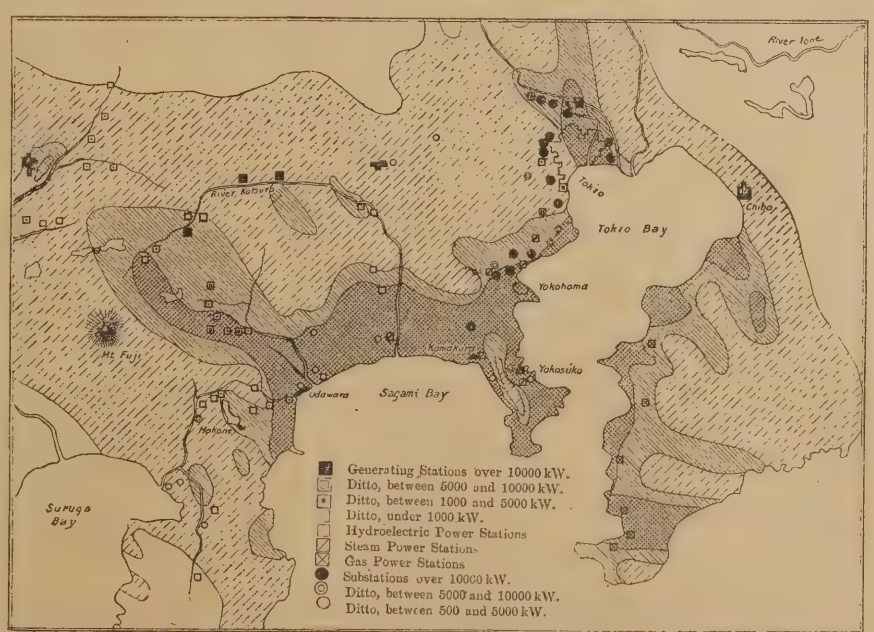


Fig. 4.—Affected Area; Depth of Shading Indicates Severity of Shock.

Simple minor injuries to the service wires and house wiring were repaired as soon as they were discovered, but owing to the chaotic conditions which prevailed at the time, there were many instances where the service wires of damaged houses were not cut, and consequently many consumers whose houses should have been cut off received a supply.

The chief troubles to the electric railways were brought about by the sinking of the road beds, &c. The most severely affected part was between the Hamamatsucho and Tamachi stations of the Government Railways, where the bed sank several feet. In Odawara, where the shocks were extremely severe, the road beds were so displaced that the tracks became wavelike in some places. These movements of the beds naturally resulted in movement of the poles and lines. In some instances railway feeders were loosened from their binding wires; but in general the injuries sustained by the aerial line were comparatively slight, so that they were all restored by the time the tracks and road beds were put in order.

A view of a deformed track in Yokohama is shown in fig. 3.

In closing the report the writer, M. Shibusawa, president of the Japanese Electrotechnical Committee and chairman of the Special Joint Committee, records the following conclusions drawn from the report:—

(1) That fire hazards from electricity can be avoided with little difficulty, if proper precautions are always taken in interior wiring and in installing appliances.

(2) Proper precautionary measures should be taken in ordinary times to interconnect the transmission systems so that in case of an emergency in one station, service can immediately be supplied from the others which are not affected.

(3) It is possible to construct sub-stations and transmission lines almost earthquake-proof. Therefore new ones should be built so, and those already built should be made earthquake-proof as soon as possible.

(4) It will be necessary to construct all communication circuits between generating stations, sub-stations, and the headquarters, earthquake-proof.

(5) It would be advisable, in the case of a large city, to construct a loop transmission line around the city, capable of being connected to all incoming transmission lines, so that in case of emergency in one incoming line others can immediately take its place.

(6) For consumers' interior wiring it is recommended to provide precautionary measures.

(7) For water supply stations, public telephone and telegraph stations, fire stations, and other public utilities which require specially quick reinstatement, independent earthquake-proof distribution lines (underground cables) are recommended.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A New Range of Oil Circuit Breakers.

We are informed by Messrs. George Ellison, Perry Barr, Birmingham, that they have recently marketed a new range of oil circuit breakers of the draw-out type. This switchgear is designed for use on a.c. circuits of up to 1,360-kVA carrying capacity, with a 72,000-kVA breaking capacity at 660 V, 3-phase. The draw-out feature has been adopted because it permits of quick and complete isolation and removal of the breaker from the busbars if desired and is especially useful where incoming units are installed side by side. It is also considered more economical in floor space than the "draw-out" truck type. The insulation is of specially manufactured reinforced synthetic resin which, it is claimed, will stand up to all atmospheric changes, chemical fumes, hot oils, and heating up to 350 deg. F. The breaker is of the free handle type and can be fitted with any of the usual automatic features; contact is made with the busbars by laminated sliding knife-switch type jaws. These contacts are shrouded so that there is no open space between the breaker and the busbar chamber when the circuit breaker is withdrawn. It is mounted on substantial slides bolted to the busbar chamber along which the breaker is moved by means of screws, the outward travel being limited by means of a nut which can be unfastened if it is required to completely remove the breaker. Mechanical interlocks are provided to ensure that the breaker is in the "off" position before it can be withdrawn or screwed home, and that it must be in the extreme position either way before it can be closed. The oil tank is also interlocked so that it cannot be lowered unless the breaker is withdrawn, and so that the breaker cannot be screwed home unless the oil tank is in position. The breaker lid is also interlocked with the tank so that it cannot be raised unless the tank is in the lowered position. The cable arrangements are such as to make the wireman's work as simple as possible. The usual instruments can be fitted. Fig. 1 shows an 800-A breaker drawn out from the busbars and with the oil tank lowered.

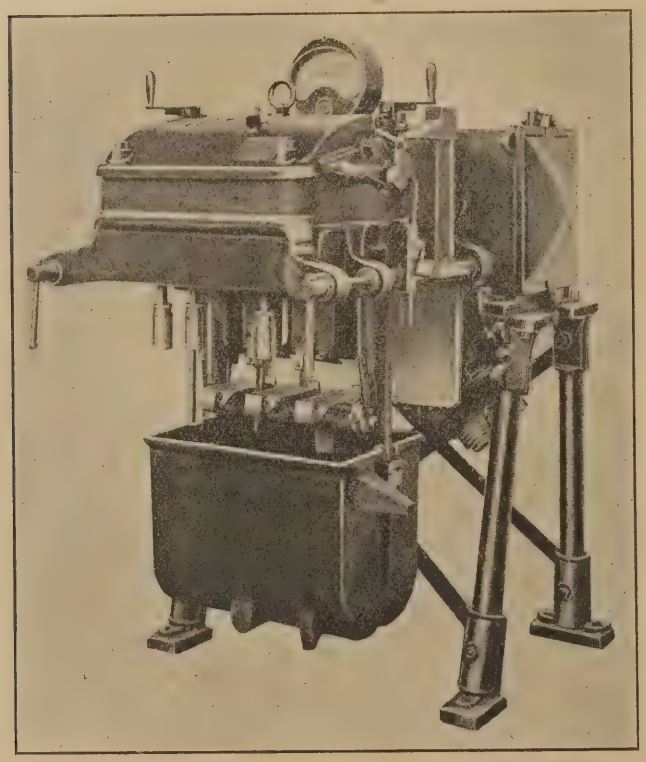


Fig. 1.—800-A Ellison Breaker.

A New Design of Small Fuse.

One of the latest products of Messrs. Edward Wilcox and Co., Ltd., Cross Street Works, Lloyd Street, Hulme, Manchester, is the "Slydlok" fuse, shown in fig. 2. It is a self-contained unit designed for use in positions where abnormal vibration is experienced, the feature being a novel sliding and interlocking contact. The base contacts are of solid cylindrical form, around which the semi-cylindrical hollow holder contacts make a close fit. The holder is placed in position by inserting the contacts in the wider parts of the "T" shaped apertures in the base and pressing downwards, the holder contacts thereby sliding over the base contacts, the side walls and interior face of the base acting as guides. Curved recesses in the fuse cover allow the gases generated by a fuse rupture to escape readily. The terminal ends permit the entry of the conductors from either the ends or the back of the base, grub screws being provided for the entry holes in the terminals not in use. The contact sleeves are cut from a special extruded metal rod, afterwards subjected to a reamering process to ensure alignment and perfect contact faces.

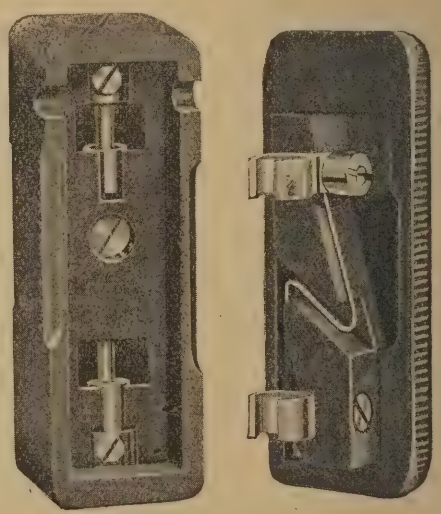


Fig. 2.—The "Slydlok" Fuse.

The fuse is made in a standard size, 10-15 A, 250-500 V. Its overall dimensions are 2⅞ in. long by 1 in. wide by 1¼ in. deep. All the parts are interchangeable, and spare parts can be provided. The conductors can enter either at the back or the ends of the base; plugs are supplied for the holes at the ends, which can be used as bushes in the latter case. They can be supplied either projecting or flush with the ends of the box.

A Drilling Machine with Four Radial Spindles.

The accompanying illustration (fig. 3) is of a product of the Avey Drilling Machine Co., Cincinnati, U.S.A., recently described in *Machinery*. It is a drilling machine with four radial spindles, spaced 90 deg. apart, each being driven by a separate electric motor, which can be fed simultaneously by hand by merely operating one lever A, which is mounted on the same shaft as the pinion which drives the large ring gear B. Each head is provided with a similar pinion C engaging the teeth of the ring gear; hence a movement of this gear feeds all four pinions by an equal amount. The shafts on which

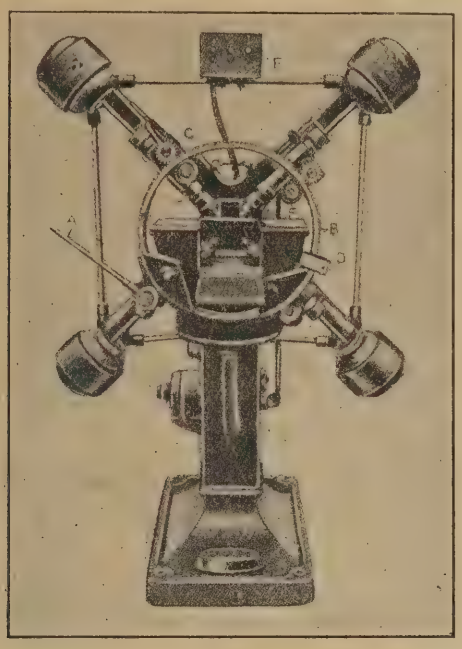


Fig. 3.—A Drilling Machine with Four Spindles.

these pinions are mounted each carry a second pinion driving the drill spindle through a rack. The forward feed of the spindles is governed by the setting of block D, while the return is controlled by a collar on one of the spindles striking the spindle head.

Two of the buttons on the upper control panel E control the individual spindle motors, each button controlling two of the motors. This arrangement allows the machine to be used in a number of ways. If six holes are to be drilled in a piece, the fixture can be indexed three times and only two holes drilled at each indexing. Each button controls the opposing spindles and the button governs the operation of the pump motor. The thrust of the pinions C on the ring gear is taken by a double-row ball bearing placed opposite each pinion as shown at F. The lower drill spindles are equipped with guards which prevent chips from getting into the spindle bearings or oil running into the motor bearings. The oil drains into a tank located between these two spindles from which it is drawn by the pump. The rotor of each motor is mounted directly on a sleeve in which the spindle slides so as to obtain a drive without intermediate gears. Two ball bearings are provided for the sleeve and one for the spindle.

Russian Electrical Notes.

Proposed Station for the Ukraine.—It is proposed to construct a new generating station to serve the needs of the industrial region of Kharkoff, the capital of the Ukraine and the centre of a big industrial district. Three schemes have been put forward, the expenditure for one being estimated at about 13,000,000 roubles. The electrical section of the State Planning Commission has decided that it is necessary to proceed with the erection of a station and has resolved that a provisional credit of 4,500,000 roubles for the purpose shall be included in the budget for 1925-26.

New Radio Station.—It is announced from Novonikolaevsk that a new Soviet radio station is being constructed at Chuguchak in Western China for meeting in the first place the requirements of the Soviet trading organisations and the Consuls.

Large Turbines. — The Leningrad Machine Trust has begun the construction of steam turbines of a pressure of 30 atmospheres, machines of this pressure not having been previously built in Russia.

The Trust has entered into a contract with the Ural Platinum Trust for the delivery to the latter of two 5,000-kW turbo-generators. These machines, it is said, will be the first of this size to be constructed at Russian works.

Electrical Extensions. — The Electric Planning Commission is applying to the State authorities for a loan for the construction of a new steam generating station, at a cost of 2,300,000 roubles, in the town of Kieff; a loan of 150,000 roubles for the erection of a new 3,000-kW turbo-generator at Archangel; and 169,000 roubles for works at Novgorod.

The Commission has also decided that a loan of 143,000 roubles shall be granted for the erection of a new 1,600-kW turbo-generator at the Omsk station; 200,000 roubles for extensions at the Krasnodarsk station; 210,000 roubles for Novonikolaieff; 200,000 roubles for the Poltoratska station; and 120,000 roubles for the Leninsk station.

Amalgamation of Trusts. — The Council of Labour and Defence has decided that the Central Electrical Trust and the Leningrad Electrical Machine Trust shall be amalgamated into a single trust. In accordance with this decision the General Electrical Commission is making arrangements with the trusts for the combination of their productive programme for 1925-26.

White Russia.—The White Russia section of the General Electric Commission is preparing information concerning the electrification of this region for submission to the Commission. In the meantime the Commission has granted out of the electrical estimates for 1925-26 a loan of 100,000 roubles to Minsk, 360,000 roubles to Vitebsk, and 200,000 roubles to the Shklovsk Spartan paper mill for electrification works.

Co-operation with Foreign Works. — With the object of utilising the experience and technical knowledge of foreign machinery works the General Metal Commission has acknowledged that it would be advantageous for the trusts and works in the metallurgical industries to secure the co-operation of well-known foreign firms. The Commission has, therefore, asked the trusts and works for information as to the kinds of production with regard to which they consider it would be appropriate to enter into relations with foreign firms, for the acquisition of drawings, projects, patents, &c.

Generator Trial.—The first large generator constructed by the Leningrad Electrical Machine Trust for the Volkhoff station was given a trial run with complete success at the station on August 4th. In all eight generators will be erected at this station, four of which have been ordered in Sweden and four in Leningrad.

Peat Fuel Station.—A trial run of the generating station at Nischni Novgorod was made on August 5th, and the station is expected to be put in operation in October. The boiler furnaces are fired with peat; the first turbo-generator is of 10,000-kW capacity, and the station will be connected with the 110,000-V line of the Electric Transmission undertaking.

A Large English Turbine.—According to the Berlin correspondent of a Moscow newspaper, the Soviet Trading Delegation in Berlin has recently had occasion to place two orders for turbines of 22,000 h.p. and 41,000 h.p. respectively, the latter being intended for the first State generating station in Leningrad. Applications were made to the largest firms in Europe for tenders for the 41,000-h.p. machine, and the decisive factor was the conditions of payment. German firms are said to have been unable to compete with English firms in this respect, and the order has consequently been given to an English works which has granted more favourable conditions, the length of the credit being stated to be five years.

Railway Electrification.—The question of the electrification of certain railways by way of a beginning is now reaching a mature stage, as the State Planning Commission, after hearing a report on the growth of the traffic on the Moscow suburban lines, which is impeding the longer distance services, has decided that it is necessary to proceed with the conversion of the Northern and Kazan lines, the White Russia-Baltic lines, and the Moscow-Kursk-Nischni Novgorod lines. With the object of making a start, the Commission, which ranks next to the supreme authority represented by the Council of Labour and Defence, has resolved to make provision in the 1925-26 budget for an allotment of 6,225,000 roubles to the Commissariat for Ways and Communications, of which the sum of 4,500,000 roubles has been assigned to the electrification of the Northern lines, and an instalment for the Kazan lines, while the balance is for preparatory works in connection with the other lines mentioned. The Commissariat for Railways has been requested to present within a month to the Planning Commission, for transmission to the Council of Labour and Defence, a plan of proposed works of conversion extending over five years in the particular order in which it is considered that the works should be carried out. Moreover, the Railway Commission has been provisionally authorised to place orders abroad for the delivery of the first series of motor cars for the Moscow region, electric locomotives for the Suram summit, and other parts of the electrical equipment. The further orders for motor cars are to be allotted to Russian works.

The Supreme Council of National Economy has presented a report to the Council of Labour and Defence, urging the necessity for the conversion without delay of the Moscow railways to electric traction and the inclusion of the requisite funds in the budget estimates for 1925-26. It is stated that it would be possible to obtain the energy from the general network of Moscow, although a further source is considered to lie in the construction of hydro-electric works on the river Malke or Bansane, which could be completed in two years.

An Improved Electric Clock System.

The "Inducta" Clock of the Stonebridge Electrical Co., Ltd.

Electric clock installations may be divided into two main classes, one in which the secondary clocks rely upon an outside source of energy (battery or supply) for their operation, and the other in which the operating energy for the secondary clocks is generated in the master clock itself. The general principle involved in the magneto clock, that employed in the latter class, is probably familiar to our readers. A magneto-

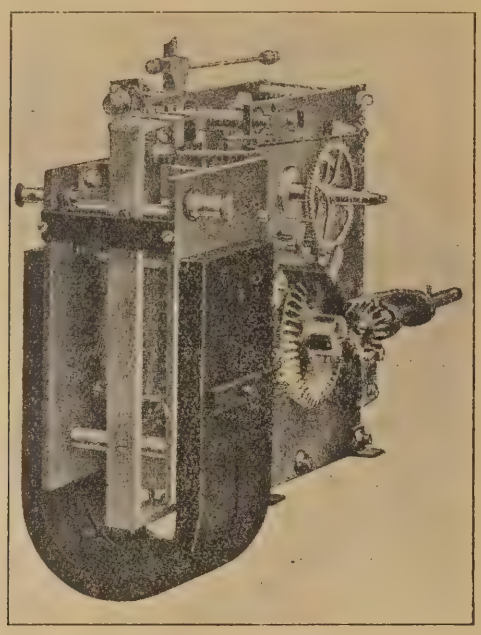


Fig. 1.—The Master Clock Magneto Element.

generator is installed in the master clock and is operated by its mechanism so that an impulse is generated at regular intervals (usually one minute), which operates the secondary clocks through suitable relays.

We were recently enabled to see some of the improvements introduced into the design of this type of electric clock by the Stonebridge Electrical Co., Ltd., resulting in the



Fig. 2.—A Tower Clock.

"Inducta" clock system. The principal advance made by the company in this direction lies probably in the introduction of the sub-master clock. This device acts as a secondary to the "master," but has installed an identical magneto-generator, enabling it to control secondary clocks in precisely the same manner. Thus by using these "sub-masters" to govern secondary circuits, any number of clocks may be included in one installation. The magneto element of the master clock is illustrated in fig. 1; the controlling element in the secondary clock is of similar construction.

A further improvement introduced into the "Inducta" clock is an automatic winding device. This operation is effected by a small electric motor, the shaft of which is connected through suitable train gear to the spindle of the winding equipment. The motor is propelled by energy from the supply mains and is controlled by means of switchgear which is brought into operation by a detent lever on the winding mechanism.

The makers standardise on the squirrel-cage motor for this automatic equipment, but will undertake to supply d.c. motors where so desired.

Another ingenious introduction is an automatic time regulating device. This is designed principally for operation on a system of recording instruments in which the recorder clocks retain their own pendulum movement, but are adjusted to accurate time at regular intervals. The sub-clocks are regulated so as to gain slightly on the master clock, and as soon as the gain exceeds a certain limit, usually two seconds, the recorder mechanism is "held up" until the clock is once more in step with the main clock. This operation is effected by the introduction of a synchronised relay into each recorder clock. A detent lever on the relay engages with the clock

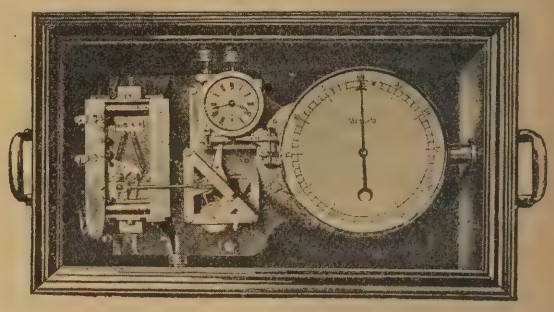


Fig. 3.—The Marine Master-Clock.

mechanism so as to arrest its movement when the limit of gain has been reached, and remains engaged until synchronism is once more obtained.

Another interesting feature is the regulating device employed in the "Inducta" marine-type master clock for use on ocean-going liners, rendering the necessary corrections, due to changes of longitude, to be made quickly by a simple adjustment. The secondary clocks are advanced by tripping the inductor of the controlling instrument, and are retarded by means of a pilot dial on the "master." By setting the period on the pilot dial, the installation is stopped for that time automatically, and upon the expiration of the period, the instruments are automatically started again. The secondary circuits can be either sub-divided or all the clocks put in series. Fig. 3 shows a marine-type master clock designed to control 50 secondary clocks.

It is evident that the possible uses of this system of electric clocks cover a wide field. One interesting application is that of the tower clock, fig. 2, which can be equipped with the inductor regulation from the ground level, and it has sometimes been found advisable to make the tower clock itself a master clock, in which case it can control additional circuits of secondary clocks.

The Late Sir Adam Beck and Canadian Water Power.—In a message to a convention of the Ontario Municipal Electrical Association and the Association of Municipal Electrical Utilities, held in June, Sir Adam Beck, whose death was announced a fortnight ago, referred to the vital importance of developing as required hydro-electric energy from the remaining water powers available in the Province of Ontario. He said: "On all sides there is a growing and more intelligent appreciation of the basic and intrinsic value that attaches to low-cost hydro-electrical energy. Control of this energy is coveted by many who would like to see it exported to the United States. One can hardly find fault with our neighbours to the South for desiring to have such a valuable commodity to aid in building up their industries and communities, but it is scarcely to be expected that Ontario citizens can be induced to part with a commodity so essential to their own necessities and welfare. What the municipalities of Ontario have accomplished through the Hydro-Electric Power Commission is so clear a demonstration of what can be accomplished by means of low-cost electrical energy that no justification exists for giving consideration to any proposal that would deprive the municipalities of electrical energy that could be utilised for the building up of the cities, towns, villages and rural communities of our own country."

Conditions in Jugo-Slavia.

A REPORT upon the economic and industrial conditions in the Serb-Croat-Slovene Kingdom (Jugo-Slavia) has been forwarded to the Department of Overseas Trade by Capt. Murray Harvey, O.B.E., M.C., British Commercial Secretary at Belgrade.*

This report says that 1924 was a bad year for industry, upon the whole. Manufacturers attribute their difficulties to a number of causes. The deflation policy of the Ministry of Finance is blamed for much of the trouble, and industrialists point out that the tariff devised for Serbia, a non-industrial country, has been adopted for Jugo-Slavia, whose needs are entirely different. Manufacturers complain that nearly all their expenses are higher than those of their foreign competitors. Money is dearer; machinery must be purchased abroad and in case of breakdowns it is sometimes months before replacements can be obtained; raw materials, fuels and other things necessary in manufacturing must be imported and stocked in large quantities; and there is a lack of skilled supervision and the Government does not encourage the immigration of skilled foremen.

Foreign Trade.

The foreign trade statistics for 1924 showed, for the first time, a good balance in favour of Jugo-Slavia. Trade with Great Britain continued to increase, this country being fourth in the list of exporters to Jugo-Slavia (after Italy, Czecho-Slovakia and Austria), having provided 10.63 per cent. of the imports during 1924. In the list of purchasing countries Great Britain is tenth, and there was a very substantial balance to this country's credit. The import statistics include electrical goods, 3,886 tons valued at 107.3 million dinars (about £357,000), and the report shows that Germany supplied electrotechnical goods to the value of 33.7 million dinars, Austria being credited with a value of 10.2 million dinars. The quantity of machines and apparatus imported is given as 15,441 tons, valued at 267.5 million dinars; of this Germany's share was 92.9 million dinars, Austria's was 68.4 million, and Hungary's 22.5 million.

The exports of Jugo-Slavia during the past year included 1,270,689 kg. of pig lead, 9,370,105 kg. of sheet lead, and 7,604,636 kg. of crude copper.

Electrical and Radio Developments.

In the province of Slovenia there is a spirit of optimism and enterprise that is lacking in other parts of the country, and much has been done towards preparing for large developments of hydro-electric schemes at Ljubljana, Fala, Ptuj, Kranj, and Maribor; it is an open secret that German industrial groups regard the province as the future manufacturing centre of Jugo-Slavia. In the Skoplje district, after keen competition, a Budapest firm has obtained the contract for the construction of a power station of 2,500-h.p. capacity at Tetovo. This station will primarily supply the lighting needs of the towns of Tetovo and Skoplje, but there will be a margin available for industry. During the year a contract was awarded (it is not stated to whom) for the electrification of Osijek (Slavonia). Considerable improvements were carried out at the port of Gruz (Gravosa). A new transit warehouse was completed and electric cranes and elevators were installed. It is stated, however, that the electrical generating plant has not yet been installed.

In the body of the report it is stated that radio-telephony cannot be said to have made great progress in Jugo-Slavia, only about 450 sets being in use. The use of private receiving sets was sanctioned in 1924 and this stimulated public interest. The majority of the sets in use are of the cheaper Austrian and German makes, but there is a certain market for English apparatus of higher quality. In an annexed report by the British Consul at Zagreb (Mr. G. T. Maclean) it is said that radio-telephony is making slow but sure progress, although the lack of a broadcasting station in Jugo-Slavia excludes the use of crystal and other simple sets. German and Swiss manufacturers carry on active propaganda, but British firms do not appear to have done much in this respect.

Trade Conditions.

In considering Jugo-Slavia as a market for manufactured goods, the comparatively low earning power of the greater part of the population, who are agriculturists, must not be overlooked. The principal demand is for goods of the cheaper qualities. The view is taken in the country that it will be to the advantage of Jugo-Slavia's economic development to eliminate Budapest and Vienna as intermediaries for foreign trade, and much has been written on the subject of establishing direct relations with countries like Great Britain with which no such relations previously existed.

Mr. Maclean says that among the methods adopted to initiate trade with Jugo-Slavia which have proved practically valueless are the sending of catalogues in English, with English weights and prices; inquiring for a representative without giving any idea as to the price of the article or the terms offered; and insisting on payment in cash against documents.

* Stationery Office. 1s. 6d.

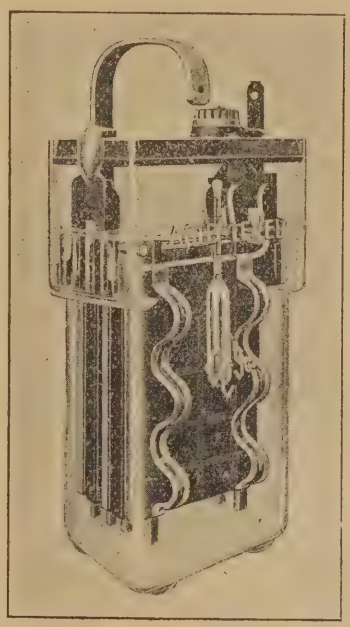
A Storage Cell of New Pattern.

The Chloride DBG and DSG Cells.

AN accumulator cell in which a number of new features are embodied is being put on the market this week by the Chloride Electrical Storage Co., Ltd. It is illustrated herewith, and from the figure it will be seen that the cell is of the glass box type, for stationary use. The purpose of the designer has been to secure simplicity of erection and of putting into service, and to facilitate the renewal of parts, besides lengthening the useful life of the cell and eliminating sources of trouble.

In the first place, separate insulators have been dispensed with, by casting feet on the glass box itself, and the box is so shaped that it is easy to carry and to set up in position on the stand (the capacity of the cells concerned ranges from 50 to 180 ampere-hours). Platforms are provided at the sides of the box, from which all the plates are suspended by lugs cast on, and glass partitions are cast in the box which definitely separate plates of opposite polarity, these partitions being high enough to do away with any risk of short-circuiting by the deposit of sludge. Provision is also made in the moulding of the box for sealing the cover.

The positive plates of the Planté type are exceptionally stout, and the negatives are of the box type; pure lead is used for the plates, and a hard lead alloy for the lugs, which, as will be seen, are dissimilar, and are so designed that it is practically impossible to connect the cells with the wrong polarity. Special consideration has been devoted to the question of assembly on site, the groups of plates being so constructed that they go together in their right places with ease and certainty, and a novel feature of the design is that the wood separators can be put in or withdrawn without in any way disturbing any of the plates. It is claimed that this object has not previously been attained in cells suitable for sealing. The groups of plates are supplied in a specially treated condition, so that the first charge need only last about 15 hours, instead of the 45 or 50 hours formerly required.



New Chloride Cell, Types DBG and DSG, from 50 to 180 Ah.

The cells, however, can be supplied in a fully charged condition, the boxes being filled with acid, and the lids sealed in place to prevent spillage of acid in transit; in this case the cells only need a freshening charge after erection, and are then ready for service.

The lids are moulded of a flexible material, and are provided with a hole for the admission of a special hydrometer, one being supplied with each battery. This instrument is of the standard shape, but the scale is marked with coloured bands, so as to indicate clearly the state of charge or discharge. The aperture in the cover is closed with a vent plug. The wood separators are prevented from rising by transverse rods which are easily secured in place.

Patents have been applied for, covering the new features, which will undoubtedly be welcomed by battery users.

A Successful Athlete.—Mr. G. R. Goodwin, of the Anchor Cable Co., Ltd., and a member of the Surrey Walking Club, has had a successful season. For the fourth year he has gained the Surrey 10-mile and 2-mile championships, and for the third year the English 2-mile championship, in addition to performing many other feats. On August 22nd he won the 3-mile inter-county walking championship of Surrey.

Electrical Trade Statistics.

THE Board of Trade has published a volume containing the latest available statistics of the external trade of a number of foreign countries and British Dominions. The periods covered vary, as do the classifications, but we have been able to extract the following information :—

Russia.—The imports of electrical machinery for the five months ended February last were valued at 756,000 gold roubles, as compared with 326,000 roubles in the equivalent period of 1923-24.

Lithuania.—The value of imported "electrical and other apparatus" for the three months ended March last was 633,000 litai, as against 765,000 litai.

Finland.—Electrical machinery imported during the first four months of the year was valued at 4,717,000 marks (6,118,000 marks).

Sweden.—Imports for the first four months of the year of copper wires and cables, sheathed with lead or other metal, 187 metric tons (610 tons). Exports of electric dynamos, motors, &c., were valued at 4,700,000 kronor (5,684,000 kr.), and of telephone and telegraph apparatus at 1,962,000 kr. (2,343,000 kr.).

Germany.—Exports during the first four months of the year :—Electric cables, 915,500 kg. (707,600 kg.); metal filament lamps (number), 7,898,000 (6,896,000).

Netherlands.—Imports for first four months of the year :—Instruments, dynamos, &c., 5,248,000 guldens (4,433,000 gld.); insulated wire and cable, 1,783,000 gld. (1,808,000 gld.). Exports of metal filament lamps were valued at 7,692,000 gld. (8,419,000 gld.).

France.—The value of electrical machinery and apparatus imported during January—April was 35,796,000 fr. (36,169,000 fr.).

Switzerland.—Exports during the first four months of 1925 :—Galvanometers, 4,207,000 fr. (3,210,000 fr.); electric dynamos, 8,723,000 fr. (7,468,000 fr.).

Spain.—Imports during the latter half of 1924 :—Dynamos, electric motors, &c., 4,014,800 kg. (2,865,500 kg.); electric wire and cables, 302,400 kg. (144,500 kg.); telegraphic apparatus, meters, &c., 156,500 kg. (83,700 kg.).

Italy.—Exports of electric wire and cable :—During 1924, 19,838,000 lire (as against 17,212,000 lire in 1923); during the first quarter of 1925, 5,482,000 lire (2,642,000 lire).

Hungary.—Trade in electrotechnical apparatus during 1924 :—Imports, 3,692,000 crowns; exports, 17,399,000 crowns.

Czecho-Slovakia.—The value of electrotechnical machinery and apparatus imported during the first three months of 1925 was 29,029,000 korunė (28,314,000 korunė).

Siam.—Electrical goods to the value of 251,000 ticals were imported during the first quarter of the year (as against 432,000 ticals).

India.—Imports during April last :—Electrical machinery, 14,69,000 rupees (19,49,000 rs.); electric wires and cables, 7,91,000 rs. (3,10,000 rs.).

Australia.—Imports during the nine months ended March last :—Covered cable and wire, £1,112,000 (£865,000); other electrical machinery and appliances, £3,696,000 (£2,736,000).

New Zealand.—The value of electrical machinery and equipment imported during 1924 was £2,056,000, as compared with £1,449,000 in 1923. The figure for the first two months of the current year was £440,000.

South Africa.—Imports during 1924 :—Cable and wire, £374,000 (£368,000); motors and parts, £175,000 (£234,000); other electrical material and machinery, £1,071,000 (£949,000).

Canada.—Imports during the first four months of the year :—Dynamos and generators, $201,000 ($469,000); electric motors, $568,000 ($697,000); incandescent electric lamps, $117,000 ($144,000).

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

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11,430. "Apparatus for the reception and transmission of sound." G. Lakhovsky. November 29th, 1923. (225,502.)

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15,793. "Electric switches." British Thomson-Houston Co., Ltd. July 3rd, 1923. (218,653.)

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26,617. "Electron discharge devices." British Thomson-Houston Co., Ltd. March 3rd, 1924. (230,011.)

27,019. "Adjustable electric resistance." S. Sokal (Wohlmuth Akt. Ges.). November 12th, 1924. (238,103.)

27,539. "Methods of cleaning up residual gases in evacuated containers and/or activating electron-emitting electrodes therein also applicable for the purification of rare gases." Westinghouse Lamp Co. December 8th, 1923. (225,838.)

28,132. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. November 23rd, 1923. (225,244.)

29,413. "Contacts for electric heating-rods." S. Sokal (C. Conradty (firm of). December 8th, 1924. (238,114.)

29,565. "Reciprocating electromagnetic motors." N. Japolsky and M. Kostenko. December 9th, 1924. (Addition to 214,393.) (238,116.)

29,913. "Circuit arrangements employing thermionic valves for the production of alternating currents." British Thomson-Houston Co., Ltd. December 14th, 1923. (226,216.)

30,526. "Thermionic triodes." General Electric Co., Ltd., and C. J. Smithells. December 18th, 1924. (238,123.)

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289. "Electrodes for electric furnaces." Norske Aktieselskab for Elektrokemisk Industri Norsk Industri-Hypotekbank. January 17th, 1924. (227,822.)

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4,054. "Electrical resistance." C. E. Scott. February 13th, 1925. (238,140.)

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10,279. "Sound connecting and transmitting devices for dictation machines and other apparatus embodying speaking-tubes or similar devices." Dictaphone Corporation. May 29th, 1924. (234,786.)

10,609. "Electric clocks." C. J. V. Fery. April 23rd, 1924. (232,975.)

10,963. "Dynamo-electric machines." O. Kraus. April 27th, 1925. (238,160.)

12,417. "Electric condensers." Wilkins & Wright, Ltd., and J. H. Hewitt. May 13th, 1925. (238,162.)

17,275. "Electric motors." Lancashire Dynamo & Motor Co., Ltd., R. S. McLeod, G. E. Mason, and W. Stansfield. March 5th, 1924. (Divided application on 236,609.) (238,169.)

Electric Smelting in Norway.—After experiments extending over some years, the Norwegian iron works, A/S Norsk Staal, has developed a new electric smelting process which, according to the Press, bids fair to lead to a revival of Norway's iron and steel industry, especially because of the abundance of cheap hydro-electric power in Norway. The share capital of the company is being increased from 900,000 to 1,350,000 crowns, of which amount 410,000 crowns has already been subscribed in Norway and in foreign countries.—*Commerce Reports.*

The

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Rural Electricity Supply.

OUR recent comments on existing and prospective regulations in respect of overhead lines in rural areas have drawn an interesting letter from Mr. R. Borlase Matthews, who was a member of the I.E.E. Committee on Electricity in Agriculture. He instances two estimates of the cost of tapping high-pressure mains which surely are outside figures in both directions; we should imagine that the lower one represents the influence of the rate of exchange, and that in order to obtain a correct impression of the cost to an Italian undertaking it should be multiplied by four. Even then it would be a modest figure.

As Mr. Matthews remarks, in this country we need some intermediate value between £300 and £14; and we hope it will be found in the neighbourhood of £50. We believe this can be done—provided that common sense is permitted to have its way, and that the alarmists are held in check. It is a constant source of wonder to us that electrical engineers, who provide the public with the finest commodity ever produced, should go out of their way to deter prospective consumers from deriving the utmost benefit from it, by hedging it about with vexatious conditions—not only with regard to the sale of electrical energy under incomprehensible and complicated tariffs, but also with regard to its subsequent use in private households; and upon the suppliers themselves is laid the burden of maintaining a standard of construction of overhead lines which can only be regarded as luxurious in these days of high prices and dear labour. Hence, when it is suggested that no rules have yet been formulated for the use of electricity on farms, and that an opportunity therefore offers itself to draw up a new and unwanted code of regulations to cover this virgin field, we fear the worst. Only one thing would set our minds at rest—an assurance that such rules would be put forward with a view to simplifying and moderating the rigour of the high-class standards at present in force. Whilst there are many thousands of farms to electrify, there is little capital available for luxuries.

It should not be forgotten that farmers have a very practical alternative to taking a high-priced supply from public mains—at a moderate outlay they can provide themselves with electric power. Oil-engine-driven sets are now so cheap, so easily operated, and so reliable, that they put up no negligible competition with public supply, and a farmer might well be excused for preferring to have plant of his own rather than enter into onerous agreements and considerable outlay which he cannot recover. With his own plant installed, he could snap his fingers at regulations. But the adoption of private plant would by no means suit the plans of the

Electricity Commissioners, who will naturally be solicitous for the load factor of the public supply; much of the farmer's work being a daylight load, and at a minimum in the winter months, its diversity would be of value to the central station. That is an additional reason for avoiding any policy which tends to impede the development of the agricultural demand on the public supply service. Moreover, the installation of small private plant would tend to restrict the development of the uses of electricity on the farm.

Turning to a different aspect of rural electricity supply, the time is now approaching when the reorganisation work of the Commissioners will bear fruit. Most of the Electricity Districts have been definitely constituted, and although only one Joint Electricity Authority has begun to function, the constitution of others is far advanced, and several Advisory Boards and Committees have been established. When they settle down to work, the conditions of electricity supply in their respective Districts will be profoundly modified. For one thing, it will be their business to see that areas at present without a supply of electricity shall be provided with it as soon as may be practicable; and, on the other hand, distributing authorities will have a right to call upon the J.E.A. to furnish them with a bulk supply of electricity, should they desire it. Thus the path will be smoothed for local authorities and companies in the areas not yet covered by statutory powers, as they will not have to face the capital cost and running cares of small generating stations; they need only lay down a distributing network, which, so far as we can foretell, will not be liable to become obsolete like generating plant—not for many years, at any rate. Capital will be readily forthcoming on such good security; certainly there will be no need for State subsidies for electricity supply, to which we are as sincerely opposed as our friends of the gas world. It is true that the extension of mains into areas which offer little prospect of an immediate remunerative return is not likely to make much progress without State aid, and the same applies to the erection of long main transmission lines interconnecting large generating stations; in these cases, following the precedent of the trunk telephone lines, the State, or the Joint Electricity Authorities, may own the mains. But that will not affect the local distribution undertakers, and we anticipate that a considerable number of applications for Special Orders will be lodged with the Commissioners as the new Authorities get into their stride.

A Directive Wireless "Lighthouse."

The new short-wave direction-giving wireless installation which has been erected by Marconi's Wireless Telegraph Company at the South Foreland Lighthouse, and of which a description appears elsewhere in this issue, is a noteworthy development of the "beam" system of radiation, for which the credit attaches to Senatore Marconi and his expert staff. The idea arose out of the experiments which he commenced in Italy in 1916 for military purposes, using waves two or three metres in length, with parabolic wire reflectors; these investigations were continued at Carnarvon, and in 1920 an experimental revolving reflector was erected on the isle of Inchkeith, with a 4-metre wave, to act as a "wireless lighthouse." Two years later an improved reflector was installed, of which an illustrated description was given in the Electrical Review of September 21st, 1923, and the South Foreland installation embodies the improvements which experience has shown to be desirable. In particular, the method of reflection adopted is quite different from that employed at Inchkeith, as will be gathered from our article, and appears to be highly efficient in confining the bulk of the radiation to a narrow beam or sector. The use of Morse letters to identify the sector of the chart in which the receiver happens to be is similar to the method adopted at Inchkeith.

On Friday last we attended an interesting demonstration of the working of the system, voyaging from Dover to Southend in the *Elettra*, and found that the signals (which on this occasion were reproduced with a loud-speaker) could be heard and identified with the greatest ease, even when they passed over many miles of land surface. With the aid of a large chart it was easy to ascertain the directional position of the yacht to a high degree of accuracy, and if a second transmitter had been in operation the exact position of the ship could have been fixed. A material advantage of the system is that signals reach the vessel every two minutes, so long as she is within a range of 100 miles (over water), so that her progress is constantly under observation.

Our congratulations are due to Senatore Marconi and his associates on the success of the demonstration, which may prove to be the forerunner of far-reaching changes in lighthouse practice.

Central American Markets.

We review in this issue an article by Mr. R. A. Lundquist, Chief of the Electrical Equipment Division, United States Department of Commerce, upon electrical conditions in the Central American Republics as he found them in the course of a recent tour.

With the exception of Mexico, and perhaps Guatemala, very little electrical progress appears to have been made, and upon the whole even this has not been on very sound lines. Although as regards population these countries are small, they are comparatively very rich in mineral resources, particularly oil, and it would therefore appear that a high standard of life is possible. It may be that the Latin temperament retards progress, but what is being done in Spain may eventually have its repercussion in the former Spanish settlements. If and when this happens there should be numerous opportunities for sellers of electrical machinery and appliances. In Mexico, however, owing probably to the influence of the foreign capital invested in the country, much greater development has taken place. Due to its proximity, the United States has secured the bulk of the electrical business there; in 1920 American electrical exports to Mexico were valued at $4,298,223, while in 1924 the figure rose to $6,173,755. German penetration is mentioned by Mr. Lundquist, low prices and attractive credit terms being Germany's principal methods of securing orders. Sweden and Holland are also said to be doing a fair trade, the former in transformers and the latter in motors.

In the whole of the report there is no mention of Great Britain, although British capital, as well as American, has been invested in most of these countries. Nevertheless, British traders may glean information of value from Mr. Lundquist's notes, which is our object in reviewing them.

Transmission at Very High Pressure.

In a leading article in our issue of January 23rd last, referring to the paper which Major A. M. Taylor had just read before the Junior Institution of Engineers, we commented upon the high dielectric losses of his 150,000-volt cable as described in that paper. Major Taylor has since pointed out to us that at the date of reading that paper he was occupied with demonstrating the extremely high dielectric strength tests which the cable had stood up to, and the impracticability of 3-core (non-concentric) cables for pressures above 66,000 V on account of thermal considerations, rather than dealing with the dielectric losses.

We understand that Major Taylor now claims that the dielectric losses with "intersheath" cables are no greater, for a given high transmission voltage and for a given power transmitted, than they would be with single-core, or with 3-core cables.

It will be remembered that Messrs. Clark and Shanklin, in their paper of 1919 on "Single-Conductor Cables," predicted that the contrary would be found to be the case; but, in view of the actual tests which have now been very extensively conducted on a working size of "intersheath" cable, Major Taylor suggests that their inference would certainly appear to be mistaken.

Overhead Electric Power Transmission Line Spans.

A Simple, Practical Method of Computing Sag and Tension.

By Wm. T. TAYLOR, M.Inst.C.E., M.I.E.E.

THERE is a proper ratio between the permissible span length and the size of conductor; and, for a given material, the size of conductor has more of a determining effect upon the possible length of span than any other condition. The *most economical* span length depends not only upon the material, size, and arrangement of the conductors, the weather conditions, the factor of safety, and other factors, but it also depends upon the type, height, strength, and cost of the line supports and the cost and quality of insulators.

Long spans will usually produce relatively less damaging strain than short spans. It has been the tendency for a number of years to employ long spans. This tendency came about with the employment of higher line voltages. As the insulator is the weakest part of a high-voltage line, the fewer the insulators the fewer will be the number of supports and number of points of hazard as regards both the line supports and insulators; hence there is greater economy for a given quality.

The first step in laying out a transmission span is to determine the allowable tension in the conductor. The more common problem is to determine the minimum sag at various temperatures and under normal conditions of loading to which the conductors may be strung, so that, when they are subjected to an extreme load at datum temperature, the total tension will not exceed the ultimate strength of the conductor *divided* by the factor of safety. For high-voltage power transmission lines the Regulations (in this country) specify that the factor of safety shall be 2·0; that this value shall be based on the breaking load and shall be calculated on the assumption that the live conductors are at a temperature of 22° F. and have a covering of ice to a radial thickness of ½ inch; and that they are simultaneously subjected to a wind of 50 miles per hour at right angles to the line, this wind to be taken as exerting a pressure equivalent to 8 lb. per sq. ft. calculated on the whole of the projected area of the ice-covered line conductors; the weight of ice to be taken as 57 lb. per cu. ft.

At the present time several methods are in use for computing sag and tension. The fundamental factors involved are :—

Quantity of ice per ft. of length—$0{\cdot}0218[d_1(d + d_1)]$ cu. ft.

Total vertical weight of conductor per ft. of length—

$$w_{II} = w + 57 \times {\cdot}0218 d_1(d + d_1) \text{ lb.}$$

Load due to wind pressure— $w_{III} = 0{\cdot}666\ (d + 2d_1)$ lb.

Total resultant load per ft. of length—

$$W = \sqrt{[(w + w_1)^2 + (w_{III})^2]} = \sqrt{[(w_{II})^2 + (w_{III})^2]}$$

Total maximum allowable tension— $P = A p$ lb.

Modulus of elasticity— $E = 18{,}000{,}000$ (copper)
$= 10{,}000{,}000$ (aluminium)

Coefficient of expansion per °F—$\alpha = 0{\cdot}0000096$ (copper)
$= 0{\cdot}0000133$ (aluminium)

Weight per ft. of length per sq. inch section—
3·935 (copper) lb.
1·195 (aluminium) lb.

where d = diameter of bare conductor, in inch.
d_1 = thickness of ice covering, in inch.
w = weight of bare conductor per ft., in lb.
A = sectional area of conductor, in sq. inch.
p = lb. per sq. inch in conductor under maximum tension.
w_1 = weight of ice per ft., in lb.

Let us take an example* and solve by means of two distinct methods to see how the final results compare with regard to tension and sag. *Example* :—A 7/·174-inch aluminium conductor is to be erected with a 300-ft. span length (supports practically on a level) to conform to the I.E.E. proposals (½ an inch ice, 13·5 lb. per sq. ft. wind-pressure, temperature 22° F., factor of safety 2·0). It is required to find the tension and sag which occur in still air at 120° F., also the sag under the ice load condition at the lower temperature.

CONSTANTS.

A = ·167 sq. in.	d = ·522 in.	$d + 2d_1$ = 1·522 in.
w = ·199 lb.	w_{II} = ·636 lb.	W = 1·324 lb.
l = 300 ft.	P = 2,71 lb.	E = 10,000,000 sq. in.
t = 120° − 22° = 98° F.	α = 0·00133 per °F.	w_{III} = 1·028 lb.

METHOD NO. 1 (*Theoretical*).

Wherein $P_d^3 + P_d^2 [(l^2 W^2 A E/24 P^2) - P] - l^2 w_{II}^2 A E/24 = 0$ ... (1)

and $P_t^3 + P_t^2 [(l^2 W^2 A E/24P^2) - P + \alpha t A E] - l^2 w^2 A E/24 = 0$ ... (2)

and $P_g^3 + P_g^2 [(l^2 W^2 A E/24 P^2) - P] - l^2 w^2 A E 24 = 0$ ... (3)

where: P_d = tension at datum temperature under ice loading, w_{II} *only* (no wind);
P_t = tension at a temperature, t, above datum (no wind);
P_g = tension at datum temperature, for the bare conductor, w *only*.

The sag in feet under the total loading, W, (ice and wind-pressure) is expressed :—

$$D_{limit} = l^2 W/8P = 300^2 \times 1{\cdot}324/8 + 2{\cdot}171 = 6{\cdot}861 \text{ ft.} \quad (4)$$

It can be shown—but is purposely avoided here—that in developing from the equation of the *catenary*, the first few terms of the series are sufficient to give values close enough for the closest practical working. In fact, by limiting these calculations to the second member of the series, the error in a span of 1,000 ft. is no greater than 0·0062, or 0·00062%.

Solving for P_d we have—

$$P_d = \sqrt[3]{\{2183185781 - 53^3 + \sqrt{(4366371562 [1091592890 - 53^3])}\}} + \sqrt[3]{\{2183185781 - 53^3 - \sqrt{(4366371562 [1091592890 - 53^3])}\}} - 53$$

and

$$P_t = \sqrt{\{124000631 - 778^3 + \sqrt{(248001262 [62000315 - 778^3])}\}} + \sqrt{\{124000631 - 778^3 + \sqrt{(248001262 [62000315 - 778^3])}\}} - 778$$

P_d = 1581 and $D_d = l^2 w_{II}/8P_d$ = 5·941 ft.

P_t = 305 and $P_t = l^2 w/8P_t$ = 7·340 ft.

These results check with those given by the British Aluminium Co., Ltd.; that is to say, the maximum limit of sag (from formula 4) is 6·861 ft., and the required sag (from equation 2) is 7·24 ft. However, the expression which they give for K is not a *constant*, because the values l and q are variable.

METHOD NO. 2 (*Practical*).—If no great accuracy is required, then, assuming that the difference due to ignoring the modulus of elasticity (E) is equal to $l_{max}\ (P - P_t)/AE$ = 1 (almost), we may write

$$D = \sqrt{D_k^2 + \tfrac{3}{8} \alpha t l^2} \text{ where } \sqrt{D^2_{limit}} = D_{limit} = l^2 W/8 P = 6{\cdot}861 \text{ ft.}$$

wherein D_k = sag depending upon the loading conditions; D_{limit} = sag for *maximum* loading.

Therefore, we may write for this case—

$$D_d = l^2 w_{II}/8P = 300^2 \times {\cdot}855/8 \times 2171 = 4{\cdot}327$$

hence—

$$D_t = \sqrt{(D_d^2 + \tfrac{3}{8} \alpha t l^2)} = \sqrt{62{\cdot}712679} = 7{\cdot}918 \text{ ft.}$$

* Using a different method to those given herein, this example is found on page 18 of the brochure "Economic Electric Power Transmission" produced by the British Aluminium Co., Ltd., London. By their method of calculation, sag D_d = 6·9 ft. and sag D_t = 7·34 ft.

For any material and sectional area of conductor, the *minimum* sag is expressed

$$D_{min.\ (limit)} = l^2\, w/8\, P = l^2\, \delta A/8\, AP = l^2\, \delta/8P\ ;$$

where $\delta = 1{\cdot}198$, and $P = 13{,}000$.

For aluminium stranded conductor this may be written: $0{\cdot}0000114 l^2$; for this case we have—

$$D_{min.\ (limit)} = 0{\cdot}0000114 \times 300^2 = 1{\cdot}026 \text{ ft.}$$

From the values of sag obtained by this simple practical method we see that the required sag checks close enough to warrant its employment. It is a method largely used in this country, and as within fair practical accuracy provided the temperature range is kept within about 60° F., which value approximates the usual stringing temperature. For the higher temperatures and for certain problems, the value of D as obtained by this method cannot be relied upon. Method No. 1 gives results to a high degree of accuracy.

The value D_t given by the British Aluminium Co., Ltd., is obtained from the stress A_{p_1} (lb. per sq. in.), in which the loading is Q_1 is found from the equation:

$$P_1 - l^2\, Q_1{}^2\, \delta^2\, E/24\, (P_1)^2 = P - [l^2\, Q^2\, \delta^2\, E/24\, (P)^2] - a\, t\, E$$

$$D_t = l^2\, \delta\, Q_1/8\, P_1$$

Wherein $P = P/A$; $Q = W/w$; $\delta = 1{\cdot}198$ for aluminium.

The Design of Squirrel-Cage Motor Starters.

Suggestions for Alterations Necessary to Meet Heavier Load Conditions.

By J. O. KNOWLES, M.A.

A RECENT article in these columns (ELECTRICAL REVIEW, May 22nd, page 805, "Motor Starting Equipment," by F. W. Davies) suggested that "finality had not yet been attained" in the design and standardisation of a.c. starting gear. The writer feels, however, that the remarks made in that article on the design of three-phase starters could be considerably amplified, and that the increasing use and possibilities of large squirrel-cage motors call for increased attention to the design of large squirrel-cage starters. The objections to the use of large squirrel-cage motors are disappearing as the power reserves immediately behind the supply mains are also increasing. The surges of current that, in a small feeder circuit, would cause such a fall in pressure as to trip the neighbouring circuit breakers and cause all the lights to flicker, will make little disturbance in a feeder of ample dimensions near a sub-station of large capacity. On the other hand, the same reason that enables squirrel-cage motors of large horse-power to be used makes the duty of the starter more severe. Not only must a large current be interrupted on the starter contacts, but the energy in the interrupted circuit is supported by a large reserve of power in the feeder and the sub-station behind it.

It would be a pity if the use of squirrel-cage motors for increasingly large horse-powers were retarded by backwardness in the design of squirrel-cage starters, for the simplicity and cheapness of their design reduces the cost of electric power and so benefits, among others, the electrical industry itself. Yet there is a considerable prejudice against the squirrel-cage motor, not among the smaller engineers who are apt to regard maintenance expenses as "all in the day's work," but among engineers responsible for large installations, who cannot afford to tinker with inefficient apparatus.

Remembering, then, that the troubles that are annoying in small squirrel-cage starters are likely to be serious in installations of large size and of large horse-powers, it is only reasonable to expect that the design of squirrel-cage starters will improve up to a higher standard.

What then are the weakest features of the present designs which are likely to give trouble under severer conditions? No attempt is made in what follows to arrange these weak points in order of importance, as the order would vary for different makes of starters. Neither need any mention be made of those obvious features which are commonly found in the good makes at present.

Consider first, however, the damage that an unskilled operator can do. He cannot start a star-delta starter in delta without passing through the starting position, but some men have such a wholesome fear of electrical gear that they are half-afraid of a starter that lets the motor speed up with a rush. These and others, more cautious if less fearful, attempt "inching" the starter to make sure that everything is all right. In other cases "inching" may be really desirable at the commencement of the process, but a squirrel-cage motor may have been supplied, and the operator acquires a certain amount of "skill" in "inching" on the squirrel-cage starter, to the detriment of the contacts. A control-gear maker must expect that his starters will sometimes be operated by clumsy and ignorant labourers and sometimes by over-'cute mechanics. He can, of course, say that it is not his fault if his starters break down under such usage, but it is better for his reputation if his starters are designed to resist or prevent such ill-treatment. Unlike high-pressure switchgear, motor starters are operated by all classes of labour, from the lowest upwards, and as the control-gear maker is probably a sub-sub-contractor, his knowledge of the conditions under which his starters will be used is probably even less than that of the sub-contractor who decides the placing of the order for the starters. Is it not, therefore, desirable to have a quick-make action in the starting position of squirrel-cage motors? There is considerable scope for variation in the design of this feature, inasmuch as few, if any, makers now provide it. A nearly perfect form is a cam with a steep rise or a strong star-wheel action, either of these forms compelling a considerable pressure on the handle, which pressure is naturally maintained for the necessary instant after the restraining pressure is replaced by the resistance of the contact springs, so that a decisive closing of the contacts is almost inevitable. An alternative is the use of a separate contactor type of circuit breaker operated electrically from the starter. This scheme, although it provides both free-handle action and a quick make, is expensive in small and medium sizes. Fortunately, however, the larger sizes are those in which the necessity for a quick make is likely to become more prominent in the near future. Apart from electrically-operated contactors, it is possible to ensure a quick make by compressing a spring which, when released, closes the switch, but in this case the switch handle should necessarily in the larger sizes follow up the action of the spring so as to ensure a good contact.

The change-over from "start" to "run" should be similarly a quick-make-and-break action independent of the operator. This movement should be designed primarily for the auto-transformer type of starter, as the severity of the break will then be greatest. The upper limits of size for which the drug type of switch is suitable can best be tested on these change-over contacts by repeatedly switching on the motor through the transformer and by changing over with insufficient intervals of time. That there *are* limits to the drum-type change-over switch will then be tested, and this

is generally agreed, but the limit of suitability is still largely a matter of opinion. For large currents, however, as for high pressures, the drop-switch form is easier to construct in a sound manner, *i.e.*, with ample head of oil deepening as the break increases. The contacts themselves may be formed as wedges (see fig. 1), in which case the arcing point of the wedge should not be in contact when the switch is "on," or butt contacts

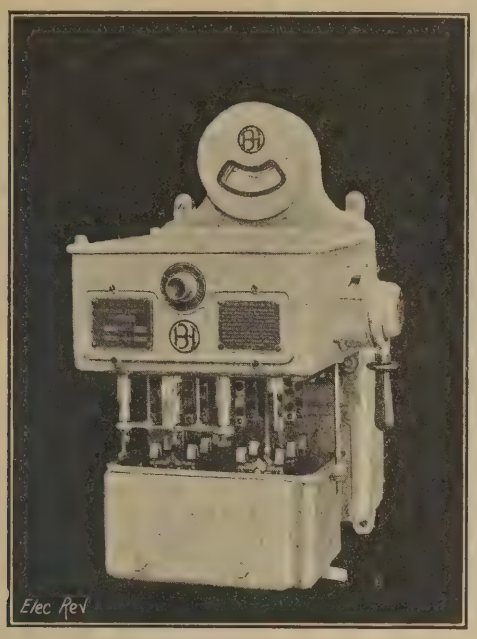


Fig. 1.—A Brookhirst Drop Switch Straight-on Starter for Medium Horse-powers—Wedge Contacts.

(see fig. 2) may be used in conjunction with a drop-switch action.

Again, the matter of no-volt and over-load protection becomes of increasing importance with the increase in the size of units. The burn-out of a small motor because of some trivial failure in the protective features is annoying, but a similar failure in a 100-h.p. or a 200-h.p. motor through a trivial detail is more than annoying—it may be so costly as to give the user a prejudice against the manufacturer of the faulty starter for years or for ever, while a stoppage due to a burnt-out no-volt coil may cost more than the value of the starter.

Consider first the no-volt feature. The ordinary requirements in a good design are that the plunger should always move home without sticking, that the no-volt catch should be sensitive without being either so weak as to open under vibration or so strong as to fail to open when required, and that the coil itself should not get so hot as to burn out or warp the plunger guide. In future, however, there will be more need of a no-volt release which will not operate if the pressure dies down momentarily to, say, 33 per cent., or even 25 per cent., of the normal voltage due to a heavy short circuit in some adjacent part of the system. Otherwise a breakdown of one supply may throw out of action a whole sequence of motors in another section (*e.g.*, the auxiliaries of a boiler house or of a paper-making plant), and restarting may cost money and be very inconvenient. It is not a bad idea to be generous in giving space to the no-volt coil frame so that unusual specifications such as the above can be met without an excessive temperature rise.

The adjustment of over-load releases becomes a more serious matter as the horse-power of the motor increases. In spite of the robustness of the modern motor, it is not immortal; repeated overheating for prolonged periods eventually breaks down the insulation. Speaking of the squirrel-cage motor only, the starting peak current is fairly innocuous. On the other hand, there are many applications where the motor can be run for considerable periods (intermittently) to 25 per cent. or 50 per cent. over-load without the knowledge of the electrical engineer, who is then likely to blame the motor maker. The latter should blame the starter manufacturers more often than he does. There is still too great a tendency to regard the robustness of the squirrel-cage motor as an excuse for poor over-load protection; thus over-load releases are provided with time lags which, in hot weather, will only hold them down during starting by screwing down the overload calibrator to trip at a high figure. Then the motor has inadequate protection during running, and might be overloaded for long periods without anyone being the wiser—till repair bills began to mount up. In some circumstances such long period over-load conditions are, of course, impossible, in others improbable, but, as before mentioned, the control-gear maker must standardise on a design which will stand up to conditions which may reasonably be expected in a fair proportion of cases where this standard design is to be used.

Again, it is too usual to cut the overload releases out of circuit in the starting position. If there is one time when a short circuit is likely to occur, it is at starting up. The sudden rush of current during starting completes the insidious breakdown of insulation, or the usual "accidental" short circuit or crossed connection in connecting up, or even a spanner dropped in the wrong place—all these faults are discovered when restarting. If the overload releases are cut out of action during starting, there is either an expensive firework display while the operator continues to hold the starter handle in the "start" position, or the main fuses or main breakers open and other plant is also shut down.

A simple solution of the over-load problem is to lower the over-load cores during starting and until the running kick has died down. In this way the overload release will act on 400 per cent. to 500 per cent. overload during starting; but without fitting any dashpots at all, the releases can be set to trip even as low as 25 per cent. above normal current during running conditions. If this lowering of the over-load cores is done automatically from the starter handle, the device is made foolproof (see fig. 1).

There used to be a "rule of thumb" that read "straight-on starting to 3 h.p., star delta to 25 h.p.,

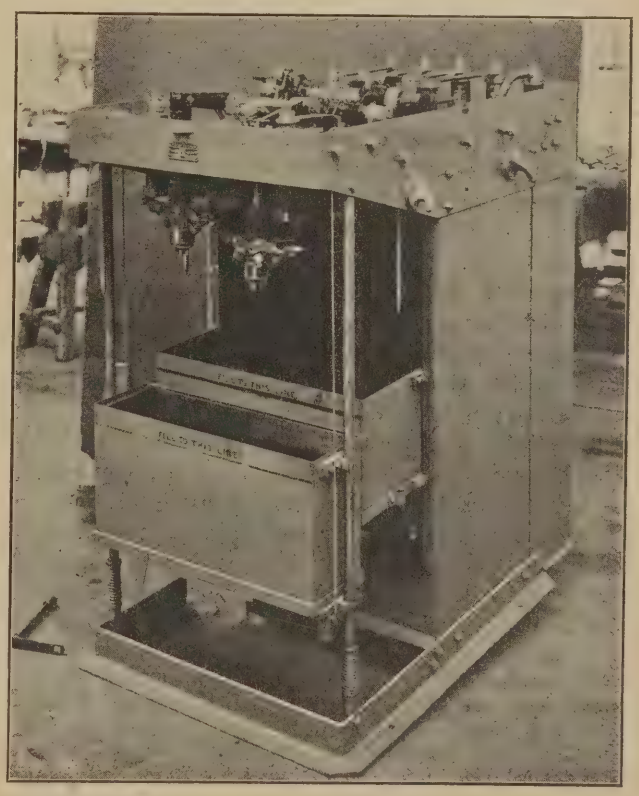


Fig. 2.—A Transformer Regulating Switch—Butt Contacts.

auto-transformer to 50 h.p., and wound rotor motors above 50-100 h.p." Like most time-honoured rules, it is not a bad guide, but times are changing—and designs. Perhaps the most important development of squirrel-cage motors is the adoption of high-resistance rotors, so as to increase the rotor resistance during

starting. This has been done in various ways by different motor manufacturers, but the result is just what is wanted to improve the starting conditions in the squirrel-cage motors.

The efficiency in running is usually slightly less than in the normal motor (granted that this slight difference means money if the motor is run continuously day and night). Here, then, is a squirrel-cage motor which can be started by a simple starter, but which gives a good starting torque without excessive current kicks. The reactance effect can be designed for different conditions. If frequent starting is required against heavy torque, the reactance effect is made full use of at a loss in efficiency which makes this type truly economical only for motors on somewhat intermittent duty. If the starting torque required is not so severe the efficiency can be improved.

Here at least is an avenue for improvement which will also call for improved designs in large squirrel-cage starters. For intermittent work a simple straight-on starter will be required for larger powers than at present, and such starters will lend themselves easily to automatic control. Thus a float switch, push button or tappet switch may operate a simple contactor, air-break or oil immersed, with over-load releases for protection, the latter having a restraining device similar to that above described, to allow for the surge in starting. For reversing work a quick-make-and-break hand-operated reverser with a separate protective panel or a combination of contactors with master switch may be used, as a motor having this automatic starting reactance can be reversed even at full speed without electrical injury.

Then again there is the matter of speed control for which wound-rotor motors with wasteful expensive rotor regulating resistances have been used of necessity and not of choice. Consider a fan drive, for instance. To a certain extent the draught can be throttled down mechanically, using a constant speed motor.

For greater speed variation, why not use a two-speed motor with two stator windings and a squirrel-cage rotor? Such a motor can be started by straight-on, star-delta or auto-transformer starting on the lower speed and then switched over for the higher speed. By using also simple pole changing, three or four speeds can be obtained. By using the drop-switch type of starter the whole of the starting equipment can be made into a compact unit, including circuit breaker protection, correct-sequence operation, and automatic over-load restraining while switching, the over-load calibrations being adjusted, where the powers vary on the different speeds, to suit the capacities of the two stator windings.

Such are some at least of the possibilities of the squirrel-cage motor of the future. Other features may be invented to fill up the gaps in the applications of the types mentioned, especially if the supply authorities take a broad-minded view. At the same time the control gear must keep pace with these improvements so that the repeated complaint that at least a third of the motor breakdowns are caused by defective starters may be made less and not more true as the duty of the starters becomes more severe.

Choosing and Using an Electric Washer.

Diary of a User's Experience.

By "WREN."

(*Concluded from page* 368.)

The Washing Action.

The actual process of washing clothes, by whatever means, consists—or should consist—of sluicing warm soapy water through the fibres to loosen and remove all dirt. Rough treatment is destructive, and any tendency to close packing of the clothes obstructs the washing action described above. In the machine washer the requisite movement of the clothes through the water is obtained *either* by a "dolly" with a reversing rotary motion about a vertical axis, the clothes being loose in the tub and dragged to and fro by the dolly; *or* by placing the clothes in a perforated cylinder which has a reversing rotary motion about its own axis, this being horizontal. The relative merits of the two systems are a matter of personal opinion, the writer's view being that the "dolly" is somewhat rougher and more local in its action than the cylinder.

The cylinder, being provided internally with radial battens, is supposed to engage sufficiently with the clothes to pull them through and lift them from the water, then letting them fall back into the latter from the upper part of the cylinder as the drum rotates. This action, we were told, could be observed in a machine fitted with glass drum and container ends. It would surely be an effective piece of salesmanship to have a demonstration machine thus equipped in every showroom.* Given this facility the prospective purchaser would be convinced at once of the efficacy, or otherwise, of the washing action, and he (or she) would be able to decide whether the principle of six revolutions forward and six reverse is better, or worse, than that of reversal at every revolution—a point, by the way, on which the writer has been unable to obtain convincing evidence or opinion. From first principles it would seem that reversal at each revolution gives maximum sluicing action and does not permit any "packing" of clothes by centrifugal force.

In some cylinder machines the oscillating drum is made of wood, and in other cases metal is employed. Here, again, it is largely a matter of personal preference, and it would be good policy for makers to supply either a metal or a wooden drum according to the purchaser's desire. Only in one or two instances has the writer been given this option.

The points to be looked for in any washer-cylinder are strength, balance, smoothness, and adequate perforation. If possible, a demonstration machine which has seen a fair amount of service should be examined. Wooden cylinders should be inspected for any signs of warping, and the method of attaching the side-pieces (*i.e.*, the cylinder walls) to the ends of the drum should be examined carefully to make sure that there is no tendency for the drum to come to pieces. The holes in metal cylinders are generally, but not always, guarded against sharp edges by counter-sinking and/or some form of beading. Any sharp edge, roughness, or projecting screw, &c., has disastrous consequences. A liberal provision of perforations is desirable to secure a free flow of water into and from the cylinder. Any tendency to form scum or slime on the cylinder parts should be regarded with suspicion. There should be no parts in the container or cylinder which can rust.

* Since these lines were written, the writer has found one demonstration machine fitted with glass windows to allow the internal action to be observed. Such machines are not, however, generally available. The maker of every electric washer should surely arrange that all his demonstration machines can be seen inside and out whilst in motion.

Six Months' Experience.

After concluding the preceding paragraph a machine was purchased, and it has now been in use for over six months, to our entire satisfaction. In the words of the writer's wife, we "would not part with the machine for anything." Not the slightest mechanical or electrical trouble has been experienced, and on several occasions during the spring a day's washing at least three times as heavy as could have been done by hand was accomplished with less fatigue than that entailed by an "ordinary wash-day" before the advent of the electrical machine.

The only mishap has been the blowing of a fuse owing to clothes sticking to the rollers of the wringer and "winding in." The rubber rollers, working under high mechanical pressure and at high speed, compared with a manual wringer, are very apt to carry round a few threads of frayed material, or a tape, and once the strands re-enter the front of the rollers the whole of the material follows and the safety pressure-release must be tripped promptly to prevent jamming. If jamming occurs, the only consequence (with our machine) is that the fuse is blown. Replacing the fuse is less trouble than extracting the wound-on clothes, if the latter be jammed tightly. On the only occasion when this occurred with our machine, a large piece of rough canvas with many loose ends was being washed; it jammed between the bottom roller and the frame so tightly that it had to be cut and picked out piecemeal. Obviously it is as well to practise the use of the wringer with some material of no value!

No trouble has been experienced with the washer itself, and the only attention required has been occasional lubrication. This is, of course, essential and must be done periodically and with suitable oil. The gears are grease-packed, but there are half a dozen bearings with small oil cups which need attention every fortnight or so.

During the damp weather an unpleasant mould grew on the wooden battens of the washer drum during the week owing to the wood being shut up, whilst damp, in a confined space. In summer time the wood dries completely in a couple of hours, if the drum be stood out of doors, but no method has been found for avoiding the mould in winter save by leaving the cover off the machine. Possibly hinged brackets which would hold the cover open 2 inches or so would provide sufficient ventilation to keep the wood sweet, whilst still permitting the cover to be used as a table. The tendency for mould to grow on wood seems to be a distinct argument in favour of all-metal drums.

Comparison of Costs.—The following comparison of costs is a thoroughly representative one, made after the machine had been in use for three months. The articles washed included household linen of all kinds—everything that requires washing in a household of five persons, with the exception of starched collars. Price schedules were obtained from four laundries, and it was found that the minimum charge for the articles in this wash would have been £1 4s.; at two of the laundries the charge would have been considerably higher.

The actual total cost of the wash when using the electric washer and an electric iron was 2s. 0½d., made up as follows:—Soap, 1s.; starch, 2d.; hot water, 2d.; electricity for washing machine, 3d.; electricity for electric iron, 5½d. To these items must be added the capital charges on the machine; allowing 5 per cent. interest and 10 per cent. depreciation on £50 (the first cost of the machine), we arrive at £7 10s. per annum or, say, 3s. per week. On this basis the above-mentioned wash would cost, at home, 5s. 0½d. per week—a saving of 19s. a week as compared with laundry charges, so that the first cost of the machine would be saved in $50 \times 20/19$ or 53 weeks. If no allowance be made for the capital charges, and it is hardly necessary to do so when the whole outlay is recovered so quickly, the first cost of the machine is saved in $50 \times 20/22$ or 45½ weeks.

In order to meet any possible criticism of the cost items stated above, the following explanations are added: Plenty of soap is essential for satisfactory results; the amount of water in the machine is small, but it must be very "sudsy" if the best and quickest washing is to be obtained. The allowance of 2d. for hot water may appear to be low; actually it is ample. The writer has an anthracite stove which costs 1s. 5d. per 24 hours (coal at 85s. per ton), so that the total cost of fuel for three hours, *i.e.*, the duration of the wash considered, equals 2.1d. By charging 2d. to the washing bill, we are on the safe side, because during this period two radiators were in full operation, and waste heat from the stove was helping to warm a cooking oven. The actual consumption of electricity by the machine during three hours was 0.425 kWh, costing 2.975d. at 7d. a kWh. A 400-watt electric iron used for two hours consumed 0.8 kWh, costing 5.6d.

The amount of dirt extracted from clothes the first time they are put through the electric washer will be gratifying, or humiliating, according to the way one regards it! In making the above comparisons of cost, no allowance has been made for the fact that clothes last much longer and are a much better colour when washed at home than when sent to a laundry, but this is a consideration of real importance. Clearly the electric washer, even at £50, is a splendid investment, but it is not everyone who can afford the initial outlay. To meet their case there is surely a sound argument for the sale of electric washers on easy payment terms. The amount saved on the laundry bill is so considerable that the instalments needed to pay for the machine in, say, two years still leave a net reduction in the weekly expenditure of the household.

In preparing these notes the writer started with an open mind and has endeavoured to preserve an unbiased attitude throughout. That he is now an enthusiastic believer in the electric washer goes without saying, and it is hoped that these notes will induce others to invest in these machines. The central station engineer who omits to encourage electric washers by every means in his power will be losing a valuable opportunity for, whilst the actual energy consumption per week is less than that of a 40-watt lamp used five hours a day, invaluable service is rendered by the washer in advancing the cause of electricity in the home. Prospective users of electric washers may have every confidence in the utility of these machines, and the writer's experience may assist them in their choice. Perhaps, too, actual and prospective makers of electric washers will not consider these notes unworthy of consideration.

Low-Temperature Coal Carbonisation Installation.—What will be, according to *Power*, the first low-temperature coal distillation system of its kind to be installed in America, is to be erected at the Lakeside plant of the International Combustion Engineering Co. of New York. It is said to have been perfected after more than two years of experimentation at the Lakeside power station. The initial plant will provide for the treatment of at least 210 tons of coal per day, or about one-fifth of the plant's present requirements. The coal is pulverised before being heat treated, and the oils, gas and other residuals are recovered under low temperature. This leaves the coke in such a form that it can be readily burned in a pulverised-fuel furnace, and, it is claimed, with certain advantages over the burning of pulverised raw coal.

A description of the process appears on pp. 412-3 of this issue.

Thawing Meat Electrically.—A demonstration of an Australian electrical invention for accelerating the defrosting of imported meat took place recently at the Poplar electricity works, when Australian beef was defrosted in 23 hours. The inventor, Mr. A. U. Alcock, of Melbourne, explaining the process to a *Daily Mail* reporter, is reported to have said: "The beef is hung from a hook which carries the controlling device for securing a uniform flow of electricity through the whole piece of meat, so that in less than 24 hours the temperature can be carried from 20 deg. to 35 deg. F. at the bone, thus eliminating all ice from the meat. At present, defrosting in the ordinary atmosphere takes three days in summer and six days in winter, so that the butcher has to order a long way in advance and wait for the meat to thaw. With the new device he simply turns on the ordinary alternating current in his shop and the process is complete in 24 hours at a cost of 6d. for hindquarters of beef and in 8 hours at a cost of 2d. for mutton." It is claimed that under the electrical treatment the meat retains the original flavour and weight much better than under the atmospheric method, and that the quickness of the process has many advantages in cleanliness and economy for both the butcher and the consumer.

Pilot-Wire Control for Street Lighting.

By A. C. JOHNSON.

In his paper on "Street Lighting," read at the Brighton Convention of the I.M.E.A., Mr. Haydn Harrison points out that scientific lighting has recently made great strides, and that further improvements must be looked for in a decrease of the capital and operating costs incurred in switching, which costs—at any rate in side-street lighting—form such a large proportion of the total costs.

Even after making allowances for extra current and lamp renewals, hand switching still holds its own and remains generally a cheaper method of control, and certainly a more reliable one, than time switches the use of which is often confined to isolated districts and scattered lamps.

The only capital outlay for hand switching is that of the switchgear, and the annual costs per 100-watt lamp are approximately as follows, depending on local conditions and wages, *viz.* :—

Loan charges on switchgear—10 per cent. of 17s. 6d.	£0 1 9
Labour on switching	0 12 6
Extra lamp renewals due to additional 456 hours over schedule lighting hours	0 1 9
Extra energy—46 units at 1½d. ...	0 5 9
	£1 1 9

The loan charges on time switches are often taken at 20 per cent. In the following comparison with hand switching, I have assumed that the time switch has an average life of 10 years:—

Loan charges on time switch—13 per cent. of 65s.	£0 8 5
Loan charges on switch casting and fuse—10 per cent. of 17s.	0 1 8
Winding, attendance, and minor repairs on site	0 8 0
Repairs and overhauling	0 3 0
Extra lamp renewals due to additional 270 hours over schedule lighting hours	0 1 0
Extra energy—27 units at 1½d. ...	0 3 4½
	£1 5 5½

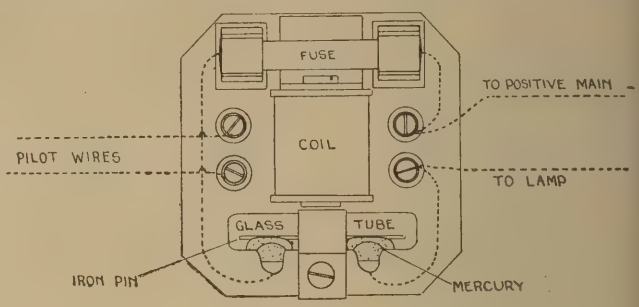
The pilot-wire control has many advantages over other systems of control. It is perfectly reliable in that a fault on the pilot wire automatically lights up the street lamps and cannot, therefore, plunge the streets into darkness. The lamps being controlled from one control station situated anywhere on the network can be switched on at exact schedule lighting hours and there is no waste of either current or lamps. In the event of fog or storm, the lamps can easily be switched on before schedule time. Time switches entail extra burning hours of from 40 to 60 minutes per day for various reasons, amongst which the following may be mentioned, *viz.* :—

1. The vagaries of clocks.
2. Allowance for occasional dull weather and storms.
3. The clock is usually wound once a fortnight, during which time the lighting hours vary as much as half an hour at night and half an hour in the morning, but light must be provided for the longest night.

A description of the pilot control system will be found in the Electrical Review dated April 24th, 1925, and the accompanying figure shows a simple and weatherproof combined relay switch and fuse constructed so that it can be inserted in any standard street-lighting switch casting provided, of course, that the hand switchgear has been previously removed; therefore, a change-over from hand to pilot control does not entail a heavy expenditure on switch castings.

Further, the relay illustrated only entails an annual consumption of about 1 kWh.

The cost of installing the pilot system of remote control depends largely on the cost of the pilot wires laid in the ground. When new service mains are laid, a pilot wire can be incorporated with the lighting cable at a small extra cost of approximately £3 per 1,000 yards. Overhead wires on traction poles and wires drawn into existing underground ducts can also be laid



Combined Relay and Fuse.

at a small cost. If, however, there are no ducts and special armoured cables have to be laid, the cost is higher, but as loans for cables are generally borrowed for a period of 25 years, the total annual charges are still lower than with hand switches even when the cable is laid under made-up paths.

100-watt Lamps (40 Yards Apart).

—	One or two wires.	Cost of pilot wire laid.	Cost of relay switch fuse and switch casting.	Loan charges on cable at 7½ %.	Loan charges on switchgear at 10 %.	Repairs and maintenance of cables and switchgear.	Total per lamp per annum.
		£ s. d.	£ s. d.	s. d.	s. d.	d.	s. d.
New lighting mains laid & 1/18 S.W.G. pilot incorporated	One	7 6	1 0 0	7	2 0	6	3 1
	Two	10 0	1 0 0	9	2 0	6	3 3
Armoured pilot laid direct in ground in open trenches	One	2 15 0	1 0 0	3 11	2 0	6	6 5
	Two	4 7 0	1 0 0	6 2	2 0	6	8 8
Armoured pilot laid direct in ground in unmade paths	One	4 5 0	1 0 0	6 1	2 0	6	8 7
	Two	5 17 0	1 0 0	8 4	2 0	6	10 10
Armoured pilot laid direct in ground in slabbed paths	One	7 5 0	1 0 0	10 4	2 0	6	12 10
	Two	8 17 0	1 0 0	12 7	2 0	6	15 0

The accompanying schedule gives the approximate annual costs incurred by the pilot control system, assuming 100-watt side-street lamps situated 40 yards apart.

Laying C.T.S. Cables Underground.—The use of C.T.S. cables has been extended in some cases to underground mains. Owing to the comparatively high cost of C.T.S. this is not a general practice, but it is sometimes convenient for connections between houses, stables, &c. Trouble has occasionally been reported on C.T.S. cables laid underground, which, while it has been put down to the cab tire sheathing being affected by the action of the soil, has, on inspection, in every case been found to be due to sharp stones, &c., being driven through the C.T.S. by the use of the usual heavy earth rammer used for consolidating the trench. After such experiences it has sometimes been arranged to lay boards, tiles, or bricks over the cable, but this is an expensive measure. One method of effectively protecting such cables at the minimum of cost consits of cutting out a small rebate at the side of the trench, and pushing the cable into it; the usual filling-in and ramming process can then be carried on without any fear of damage to the cable, as it is effectively protected from the rammer in its little cave. It is claimed that earth does not affect C.T.S., and the claim is based on many years' experience of such cables laid in a rose garden, which, of course, is well manured land.

Some Notes on Individually-Driven Textile Machinery.

The Importance of Low Rating and High Starting Torque.

By A. HAIGH, B.Sc.

The question of "Individual electric driving of textile machinery" *versus* either electrical group driving or engine-driven mills has received a large amount of attention, and most of the advantages and disadvantages are now generally understood. The two chief advantages of individually-driven machinery are absence of cyclic variation and reduced risk of a complete "shut down." The former means a more uniform quality of material produced, and in such machines as ring spinning frames fewer breakages of yarn. These advantages are easily understood by mill owners, but in many cases the question of first cost weighs very heavily against individual driving. It cannot be disputed that in every case the first cost of individual motors is more than for group driving, and unless it can be clearly demonstrated that this additional outlay justifies itself, manufacturers cannot be expected to scrap existing systems in favour of an individual motor for each machine. The purpose of this article is to show how the initial expenditure on an individually-driven installation may be kept low, and also justify its use in low running costs and improved production. The statements made are essentially applicable to a cotton preparation and spinning mill, though they can equally be applied with small modifications to any other textile processes.

If the cost of an installation is to be kept low, the motors used must have a rated output as low as possible consistent with efficient running. This fact would at first sight appear so obvious as not to deserve any consideration, but in many installations, motors with rated outputs of anything up to 50 per cent. in excess of normal requirements are used for various reasons which will be discussed later. Textile machines, particularly ring spinning frames, require a starting effort greatly in excess of full-load torque to ensure reasonably quick and steady acceleration to full speed. This is particularly the case on Monday mornings in winter, when the frames have been standing all the week-end and the viscosity of the oil is rather high. The starting torque required is in the neighbourhood of from two to two and a half times full-load torque. To overcome this difficulty, one of two methods is usually employed, and quite often both. These are the installation of motors of a higher rating than is required for normal running, and the use of centrifugal couplings to allow the motor to run partly up to speed before taking the load from the frame. Both of these methods are costly, and they are not necessary.

The extra cost of centrifugal couplings over the standard leather disk flexible type is in the neighbourhood of £4, while the increased cost of motors of higher ratings than necessary may be anything from £5 to £10. Ring spinning frames of average length require from 4 to 5 h.p. to drive them, but the starting effort is between 10 and 12 h.p. If therefore standard motors capable of accelerating against a load of about 1½ times full load are installed, they will require to be at least 7½-h.p. machines. They will then be running for most of the time at two-thirds full load with a power factor and efficiency much below their performance on full load. If this method of overcoming the difficulties of starting is employed, not only is the initial expenditure higher than need be, but the running costs are also considerably increased. The only objection to centrifugal couplings is their cost. It must be admitted that they perform their duty quite well.

The first requirement therefore for textile motors is high starting torque. All motors up to 10 h.p. should be capable of exerting a starting torque of 2½ times full-load torque. This can be achieved without any undue sacrifice of power factor, efficiency, or speed, as will be shown later by tests on actual motors. If motors possessing this characteristic are employed, they will not require to be of a higher rated output than the average power required to drive the machine. Furthermore, flexible couplings of the type already described can be used in place of centrifugal couplings. Under these conditions the breakages of ends will not be found to be in any way excessive when starting the frames, provided the rings are always moving in a downward direction, as is usual. It must, however, be admitted that the strain on the rotor joints on starting is greatly increased, but if due precautions are taken in the mechanical design of the rotor, no trouble will be experienced. The necessity of textile motors having high starting torques cannot be over-emphasised, and sufficient attention has not been paid to this point by many motor manufacturers.

The second requirement of textile motors is low temperature rise. Enclosed ventilated machines with perforated covers over openings are not entirely satisfactory, as there is a tendency for the openings to be seriously contracted due to "fly" adhering to the perforations. There is no doubt that totally enclosed machines are preferable for this class of work, but often their increased cost prevents their use. There are, however, on the market, types of motors which, though their windings are totally enclosed, yet have a system of cooling not unlike surface condensers. This keeps down the size of the motors, and the price is not greatly in excess of that of enclosed ventilated machines. Though their first cost may be higher, the running cost is reduced, as they do not require cleaning more often than about every two years, whereas protected type machines have to be cleaned about every six months. This saving can easily amount to ten shillings per motor per year. From the point of view of upkeep charges, ball and roller bearings require far less attention than ring lubricated sleeve bearings, and for this reason alone they are preferable.

For individual motors to compete with group driving in keeping down running costs, they must have high power factors and efficiencies. The improved quality of electrical steel, and the use of ball and roller bearings, have made it possible to obtain performances which at one time would have been thought impossible. The accompanying table gives performances obtained on test

Rated output of motor B.H.P.	Full load.			Starting torque. % of full load torque.
	P.F.	Efficiency.	R.P.M.	
1·0	·85	84%	960	260%
1·5	·88	87%	970	290%
2·5	·89	89%	970	300%
4·0	·89	90%	970	270%
5·0	·89	90%	970	260%
10·0	·90	90%	975	255%

Actual performances of squirrel-cage induction motors, 3-phase, 500 volt, 50 cycles, 1,000 r.p.m. (syn.).

on a number of small induction motors. In each case they are 3-phase, 500-volt, 50-cycle, 6-pole machines. It will be noticed that these motors have an average power factor about 4 per cent. greater than most commercial machines, while their average efficiency is about 5 per cent. higher. The saving in power by their use is considerable and well worth the extra first cost entailed. The money value of increased power factor is

difficult to determine, as, if power is bought in bulk, there may or may not be a penalty and bonus clause relating to power factor. On the other hand, the power may be obtained from a generating station at the mill. It can safely be assumed that the 4 per cent. increase in power factor is equivalent to 1 per cent. gain in efficiency in most cases. The total gain by using high performance machines is then in the neighbourhood of 6 per cent. in efficiency. On 1,000 h.p. of motors, working at full load for, say, 2,200 hours per year, with energy at one penny per unit, the saving is over £60 per annum. The cost of high performance machines is about 5 per cent. greater than that of ordinary motors. Therefore if the latter cost, say, £5,000, the additional outlay for high performance machines would be £250, and would bring in a return of £60 per annum or nearly 25 per cent. The above estimate has been made out on a conservative basis, and the saving possible is probably much greater. For reasons already stated, if ordinary motors were employed, they would be working well down their characteristic curves owing to the high torque required on starting, and consequently their performances would be much worse than those taken for the above estimate. It may here be pointed out that textile motors must be designed so that their characteristic curves are as flat as possible, as the load varies somewhat between empty bobbin and full bobbin.

Finally the question of speed requires consideration. Many motor manufacturers do not realise the importance of the fact that duplicate machines should have the same full-load speed. It is practically impossible for this to be achieved within 0.75 per cent., but in many cases the variation is much greater than this. If textile machines for the same process vary considerably in speed, labour troubles have a tendency to occur, due to one machine running faster than its neighbour, particularly if "piece work" is being done.

The next item of expenditure to consider is the driving gear between the motor and the machine. It has previously been shown how the centrifugal coupling may be replaced by a cheaper flexible type. In the case of ring frames, where only one spindle speed is required, the motor can in most instances be coupled direct to the tin roller shaft by means of a flexible coupling. If, however, various spindle speeds are required due to the spinning of different classes of yarn on the same frame, direct coupling is not permissible, and some other means of driving is required. One of the cheapest methods is to mount the motor on the top of the frame end with or without a spring cradle, and drive on to the tin roller shaft by means of a leather belt and pulleys. In this way, by changing the pulleys, different speeds can be obtained. This method, while fulfilling all reasonable requirements, is not æsthetic, and cannot be compared with chain driving from an appearance point of view. The disadvantages of chain driving, however, are high first cost, high upkeep charges, and the necessity of a gear case with oil bath which is difficult to make absolutely oil tight. For this class of drive there is room for experimental work on the part of makers of leather belts, such as are used for driving the air circulating fans on motor cars. A satisfactory flexible leather belt which would transmit 5 h.p. without undue slip, and with pulley centres between 1 ft. 6 in. and 2 ft. apart, would provide a cheap method of driving machines under the above conditions. Such belts would require to have a reasonably long life, and to contain no metal fastenings which would fly off as the belt became worn, and thus be a danger to workers in the vicinity. Another type of belt that might be used is of the kind used to transmit the power from the engine to the rear wheel of a motor cycle. So far, however, neither of these types can be said to be absolutely satisfactory, chiefly owing to their short life and to the danger of parts flying off. But it should not be beyond the power of manufacturers to produce a satisfactory belt on the lines suggested. In some cases, gearing may be used to transmit power from the motor to the machine, but unless the speed reduction required is great, gears are too expensive to be used as a standard drive.

The last item of equipment deserving consideration is the switchgear. In many installations this part is far too elaborate and costly. For all motors up to 10 h.p. in reasonably large installations a straight "throw-on" switch without any trip coils or fuses meets with requirements. This does not mean that each motor should not be protected by fuses, but that the fuses should all be grouped together on distribution boards and the circuits run straight from these boards to the motor switches. The danger of taking excessive currents from the line on starting can be obviated by starting up the motors in each room one after the other. If this is done, the power supply company will usually waive their requirements as to the use of star-delta starters. The switchgear should be of the quick-make and break, air-break, ironclad type, and reasonably easy to operate. It should not be forgotten that in most cases young girls perform the duty of starting and stopping the motors, and some switches are far too heavy for such people to operate with ease. The operating handle should be mounted on the outside of the case, and not brought through the cover, so that no flash can be seen when breaking the circuit, as girls are apt to become somewhat frightened if they are able to see a flash on operating a switch. For very small motors, some money may be saved in wiring by having a fusebox for each motor located on the floor, and looping, say, four such motors on to one circuit of the main distribution board. The advantage of having the motor fuses in a separate box from the switch is that the fusebox can be fixed underneath the frame out of the way, and the switch case is kept smaller in size.

In conclusion, the whole electrical equipment should be small in size, and whenever possible incorporated inside the machine. In this way motor bedplates can often be dispensed with, as the motor can be mounted on some part of the frame. This method also economises floor space, and allows a larger number of machines to be installed on a given area, thus reducing overhead charges. When deciding on the position of a motor, due regard must be paid to accessibility, as it is false economy to have practically to dismantle a frame to release the motor in the case of a breakdown.

From the above remarks it will be seen that individually-driven machinery can be made to operate at high efficiencies, with a reasonably low initial expenditure, and if due regard is paid to the driving equipment, the additional cost entailed over group driving is more than compensated by the advantages that such a system offers.

The Future of Electricity Supply in France.—Among a series of articles now being published in a French industrial newspaper concerning the possible situation of French industries in a period of 25 years from the present time is one by M. Jean Tribot-Laspière, general secretary of the Union des Syndicats de l'Electricité, who expresses the view that by 1950 the thousands of small generating stations will have long disappeared and the wastage of coal and heavy oils will have ceased. These small stations will be replaced by large stations, some of which will have a capacity of 500,000 kW each. At present there are 110 central stations of 10,000 kW and over; this capacity will be considered very small in 25 years and the total number of works will perhaps not exceed 100. The large stations will no longer be isolated, but be interconnected by means of high-pressure lines which will ensure the regularity and security of generation. These h.p. lines will constitute a national network and will probably be operated at 220,000 V, permitting the producing companies to transmit and interchange considerable quantities of energy. It is also considered that the electrification of the rural districts will have been solved by 1950 and that 40,000 French communes will then have a supply of energy as compared with the 10,000 at the present time. Electric power will have replaced domestic servants or reduced their labours, and factories and workshops will all be electrically equipped. M. Tribot-Laspière foresees that all the railways will have followed the example of the Orleans, the Southern and the Paris, Lyons and Mediterranean railways, and have substituted electric for steam traction. Moreover, a great future is held out for electrical vehicles when garages and charging stations exist all over the country and accumulators will have been standardised and spare sets rendered available for placing on vehicles in a few minutes.

Electric Trucks for Peru.—It is reported that the Central Railway Co., of Peru, has recently ordered from England a number of electric platform trucks for use at the Desamparados station in Lima. This is the first instance of such trucks being used in Peru.

The Revolving Short-Wave Beam System.

The South Foreland Experimental Direction-giving Installation.

The probability of a great advance upon the present lighthouse system of guidance for ships at sea may be inferred from the success which the latest developments of Marconi's Wireless Telegraph Co., Ltd., have met in the experimental stages. These developments, the revolving short-wave beam wireless system, and the experimental installation which has recently been erected on the cliff at South Foreland, were successfully demonstrated on Friday last to a party of Government, shipping and Press representatives in which we participated. An eight-hours' cruise was undertaken on Senatore Marconi's yacht the *Elettra* from Dover, round the East Goodwins, to Southend. Signals were sent out by the transmitting station and picked up aboard the *Elettra* continuously throughout the cruise. Senatore G. Marconi himself welcomed the visitors, and his assistant, Mr. C. S. Franklin, conducted the demonstration.

The Marconi revolving beam is a special application of the principles of directional wireless transmission to the purposes of navigation. Signals are projected in a narrow beam of, say, 15 deg., and a different Morse signal is transmitted as the beam points successively to different selected points of the compass. The observing officer on the ship listens through the medium of a simple form of receiver and hears a series of perhaps five or more Morse letters as the beam sweeps slowly past the ship. The Morse letters which he hears tell him, by reference to a chart similar to the one illustrated in fig. 4, the direction in which the beam is pointing at that instant, and therefore the bearing corresponding to the middle letter of the series of letters heard gives him his exact bearing in relation to the transmitter. The navigator is able to take any number of bearings at short intervals, and by co-ordinating these observations with the speed and course of the vessel he may determine his exact position by ordinary methods of triangulation.

The principal features of the rotating-beam system of direction-giving are as follows:—

It is quite independent of the weather conditions. The signals are transmitted on a very short wavelength; they do not, therefore, interfere with the working of any of the commercial wireless stations in the vicinity, nor are they jammed by such stations. The signals are received by the observer on an instrument which can be set in operation by merely closing a switch, and which requires no adjustment other than turning a handle to reduce its sensitiveness should the vessel be too close to the beam transmitter. No technical knowledge or skill is required in its use. The receiver can be installed in any convenient position in the chart house, enabling the navigator to make his own observations whenever he requires them. Each signal consists of a single Morse letter sent at a speed of about 10 words per minute, therefore only a very elementary knowledge of the Morse code is necessary to interpret an observation. The freedom of the signals from any kind of interference is a great advantage in this respect. The receiving apparatus is entirely independent of any other wireless installation with which the vessel may be equipped. All the expensive and complicated part of the system is centralised in the transmitting station on land. The simplicity and consequent low cost of the receiving apparatus brings the system within reach of all classes of vessels, large and small. Even small tugs and fishing trawlers can therefore take advantage of the great assistance to navigation offered by the system.

These characteristics make the rotating-beam system of direction-giving particularly suitable for use in congested waters near points of danger to shipping and near the approaches to harbours. Its range of action is approximately the same as that of a lighthouse, but, being unaffected by conditions of visibility, it becomes an invaluable auxiliary in time of fog and storm.

The transmitting apparatus located at the South Foreland Lighthouse comprises a valve transmitter which with the necessary generating machines and auxiliaries is housed in a small hut, and a unidirectional aerial system mounted on a revolving steel framework. The energy for the transmitter and for revolving the aerial is supplied from the Dover electricity undertaking. The valve transmitter operates on a 6-metre wave, the high-pressure supply to the anode of the valve being about 280 W, and a high-frequency supply is conducted from the transmitter to the revolving aerial through insulated wires in an earthed metal conduit. The unidirectional aerial system, shown in fig. 1, comprises a number of energised aerials in a straight-line formation, together with a number of reflecting aerials arranged in a line parallel to the line of the energised aerials, the plane containing the reflecting aerials being approximately one quarter-wavelength distant from the plane containing the energised aerials. All the aerials are vertical, and are approximately one wavelength in height. Special arrangements are provided for ensuring that the currents induced in all the energised aerials are in phase with one another, and also that the phases in the top and bottom sections of these energised aerials are the same. The width of the aerial system is nearly four wavelengths, so that the plane area of this aerial system is nearly four square wavelengths.

The measured polar curve of radiation from the aerial system in the horizontal plane is shown in fig. 2, and measurements show that the energy sent out in the line of maximum radiation in the horizontal plane is between thirty and forty times that which can be obtained from a simple broadcasting aerial receiving the same amount of energy. The aerial structure is arranged to rotate continuously, and to send distinctive signals which

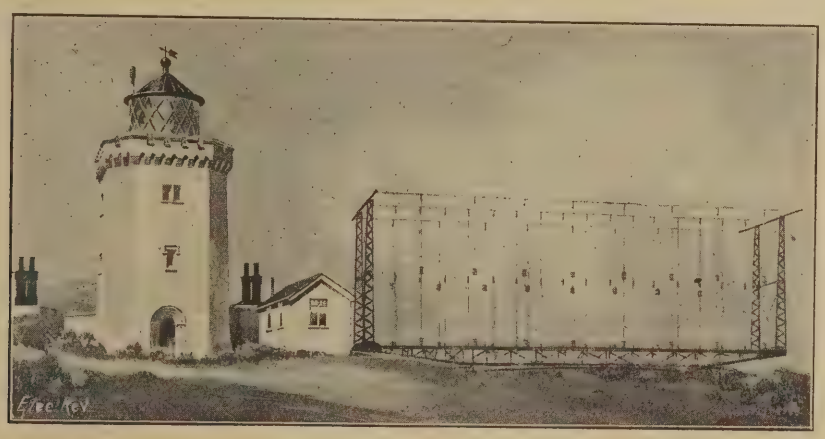


Fig. 1.—Transmitting Aerial at South Foreland Lighthouse.



Fig. 2.—Polar Curve of Radiation.

indicate the direction at which the aerial is pointed at that moment. On the chart a number of lines are set out radiating from the South Foreland, and when the aerial is pointing midway between any two of these lines, the sign marked on the chart is being sent.

The direction of maximum radiation is at right angles to the plane of the energised aerials, and in the direction away from the reflecting aerials. The transmission of the distinctive signs is arranged automatically by means of plates representing the Morse characters, mounted on a large ring carried by the revolving structure (fig. 3), which actuate a contact mechanism as the structure revolves, and so control the operation of the transmitter, thus ensuring that the signal transmitted depends upon the direction in which the aerial is pointing. The

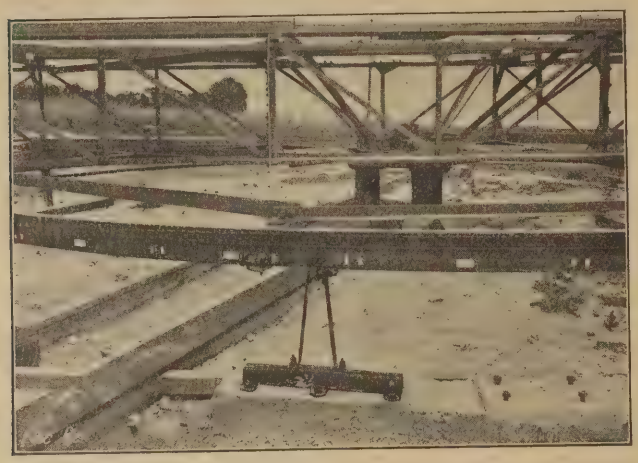


Fig. 3.—Base of Revolving Frame, showing contact mechanism.

wooden superstructure at present supporting the aerials, shown in fig. 1, is experimental, and in future practice the aerials would be supported from steel towers mounted at each end of the structure.

On the *Elettra* two receiving aerials are employed, mounted one at each end of the bridge. Connection is made to each aerial by means of a lead-covered cable, which is led into the chart house, and either can be connected to the receiver located there. This arrangement ensures against the aerial being screened too much by the ship itself for the longer ranges. The operation of determining the direction of the ship relative to the South Foreland is simple. At intervals of about two minutes three or four strong signals are heard in the receiver. By noting what these signals are, a glance at the chart, fig. 4, will at once show in which sector the ship lies. For instance, if the letters I X I T are heard, then the ship will be approximately on the line between X and I sectors (that is to say, exactly between the extreme I and T sectors.) Should the receiver be too sensitive, so that more than three or four signals are heard, the controls are adjusted to reduce the sensitiveness, and eliminate the weaker signals, leaving the stronger signals of the beam audible. The weak signals are produced by the small loops shown on the polar diagram of radiation, and are what are known in optics as "diffraction fringes." The main beam signals are always very prominent, but if the range is short the signals produced by these diffraction loops may be strong enough to blur the bearing, unless the receiver is adjusted so that they are

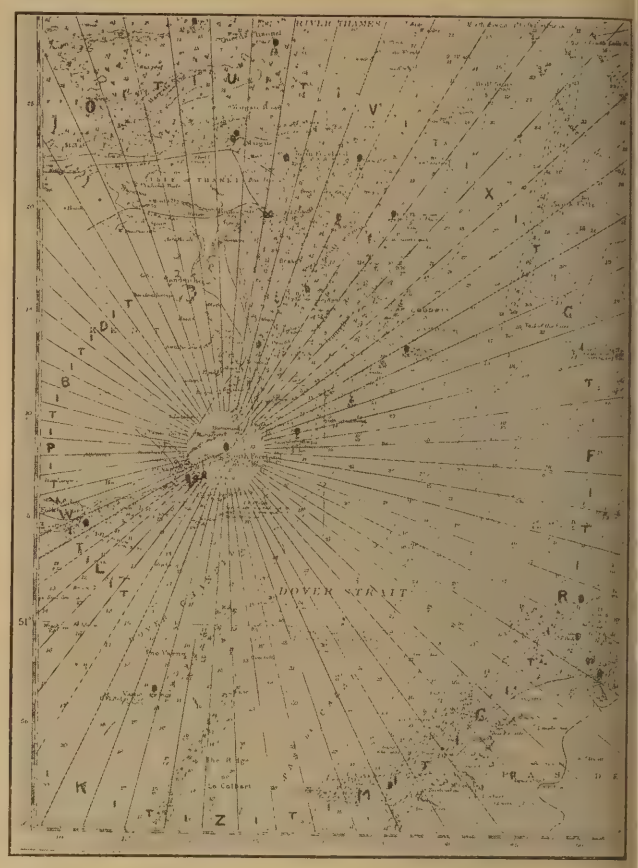


Fig. 4.—Chart of Area Covered from South Foreland.

eliminated, or made very weak. The receiver now being used on the *Elettra* is not in its commercial form. This will comprise two cases: one, the receiver proper, which will be provided with a single control handle, whilst the other will contain the necessary batteries, which can be located in any convenient position.

The South Foreland installation has been tested, and has given signals to the *Elettra* up to 100 miles over sea. During the latter part of the voyage of the *Elettra* from Dover to Southend, the transmission from South Foreland to the *Elettra* took place, of course, mostly over land, affording an opportunity of noting that the effects of land, as regards both strength of signals and directional errors with these very short waves, were unimportant.

The Carbonisation of Pulverised Fuel.

The McEwen-Runge Low-Temperature Process.

WE recently drew attention to the advantages to be derived from the carbonisation of pulverised fuel by a process which at the same time strips the coal of its valuable volatile constituents and yields a solid fuel in the form of pulverised semi-coke, which is well adapted for immediate combustion in boiler furnaces. We have now received particulars of the process in question, from the inventor, Mr. S. McEwen, A.R.S.M., A.I.M.M., of which an abstract follows.

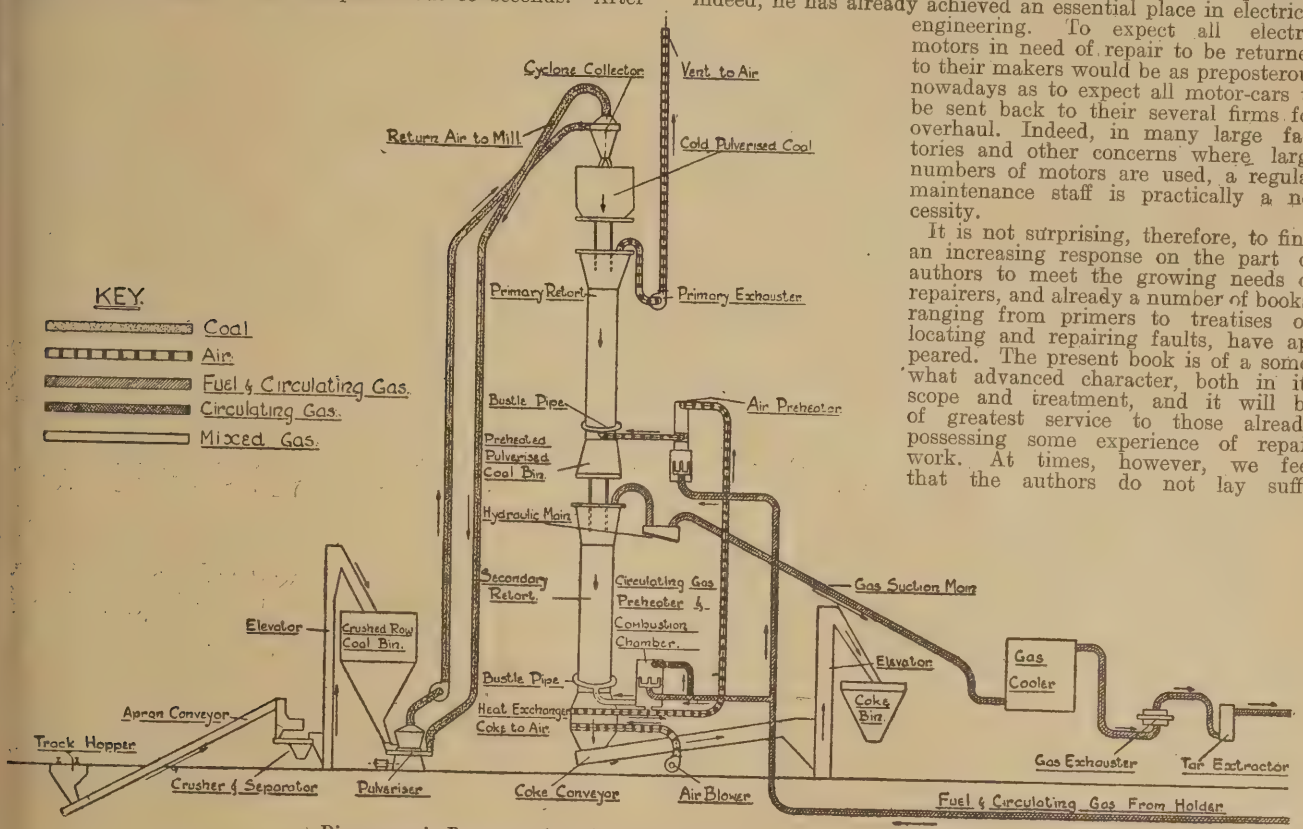
We may premise that many attempts have been, and are being, made to develop a satisfactory process for carbonising coal at low temperature and that the Fuel Research Board has not only carried on experimental investigations in its laboratories at Greenwich but has also offered facilities for testing processes devised by inventors unconnected with the Department. Hitherto, whilst one or two concerns have succeeded in placing semi-coke on the market, low-temperature carbonisation has been more or less under a cloud, except in political propaganda, where it has been utilised—on paper—with remarkable optimism. Two adverse factors have been mainly responsible for the delay in attaining commercial success—namely, the long time required to carbonise coal at low temperature, necessitating the use of retorts of small capacity; and the friability of the resulting semi-coke, which rendered it unsuitable for transportation. The new process overcomes the first difficulty by dispensing with retorts, and the other objection is removed by the increasing use of powdered coal in boiler furnaces. In fact, it is entirely due to the latter development that the carbonisation of pulverised fuel at low temperature has become commercially practicable. Obviously powdered fuel is useless for domestic purposes, and therefore the McEwen process can only be considered in connection with industrial applications.

Briefly, the McEwen-Runge process consists in the pulverisation of the coal and its elevation to the top of a tower, down which it falls in the form of a cloud, passing through a counter-current of hot inert gases. The enormous extent of surface presented to the hot gases by the powdered fuel ensures a rapid interchange of heat, so that carbonisation is effected by the time the fuel reaches the bottom of the tower. The process is extremely simple, and is continuous, the finely

divided semi-coke being withdrawn from the foot of the tower and delivered to the furnaces, whilst the gases carrying the volatile constituents of the coal pass away at the top to treatment plant of the usual description.

It is stated that the process may be operated in a variety of ways, to produce either a very rich gas or a low-grade gas, according to local requirements. It may be either a single-stage or a two-stage process; the latter has the higher thermal efficiency, and is better suited to a wide range of fuels. In the first stage moisture, CO_2, and gases of no heating value are eliminated, and in the second stage a higher temperature is employed, carbonising the fuel. The heat required for the first stage is extracted from the carbonised fuel semi-coke by a heat exchanger, thus recuperating the sensible heat of the semi-coke and securing a very high thermal efficiency.

The two stages are carried out in steel towers lined with refractory material, one above the other, about 30 feet in height and 6 feet in diameter. For the preheating stage air is used, heated by the semi-coke (without contact with it), and passing off into the atmosphere at a temperature of 500 deg. F. In the second stage the temperature of the gas at admission is about 1,500 deg. F., and it leaves the top of the tower at about 600 deg. F.; this gas can be heated by the combustion of about one-third of the gas that is manufactured. The treatment of the powder in each tower occupies about 35 seconds. After



Diagrammatic Representation of the McEwen-Runge Coal Carbonisation Plant.

treatment in the first stage the powder passes into a hopper, whence it is conveyed to the second tower; the whole process occupies about 6 minutes, and the through-put per day is stated to be 210 tons per unit of plant. The accompanying illustration shows diagrammatically the arrangement of the plant, omitting the gas-holder. The carbonising current of heated gases may consist of preheated permanent gas, or products of combustion either introduced into the tower or generated within it by the admission of a suitable quantity of hot air.

It is claimed that the powdered semi-coke is superior to pulverised coal for burning in furnaces, being less dense and presenting a greatly increased surface per unit of weight, so that combustion is very rapid. It can be transported to the consumer in tank cars, and may be treated as a fluid, being pumped through pipes, &c., like oil fuel. As it is dry, the cost of carriage per ton of combustible is less than that of coal, which always contains moisture, and the calorific value of the semi-coke is higher per pound than that of coal. A much greater quantity of tar is produced per ton of coal carbonised at low temperature than in the case of high temperature carbonisation, and from it can be obtained a variety of light and heavy oils and other products. The gas obtained is also of greater heating value than that produced at high temperatures—approximately 750 B.th.u. per cubic foot—and contains benzene. The particles of semi-coke neither agglomerate nor adhere to the sides of the towers; the powder does not cake when stored, nor is it liable to spontaneous combustion.

The process is being developed by International Combustion, Ltd.

Electric Launches for Italian Postal Service.—The Italian postal authorities are now using a number of electric launches fitted with Tudor batteries in connection with the postal service in Venice.

Reviews.

Connecting and Testing Direct-current Machines. By F. A. ANNETT, M.A.I.E.E., and A. C. ROE. Pp. x+237; figs. 172. London: McGraw-Hill Publishing Co., Ltd. Price 12s. 6d. net.

In informing the reader that most of the material in this book has already appeared in *Power*, the interesting revelation is made that the articles on "Locating Faults in Direct-current Armatures" appeared under the name of B.A. Briggs, who in real life is F. A. Annett, assistant editor of *Power*. The experience of the second author, Mr. Roe, would seem to qualify him as an author on repairing and testing electric machines.

The contents of the book are fairly well described in the preface, namely, reconnecting direct-current machines for a change in voltage, speed, or both; and locating and remedying faults in direct-current machines. Considering the great and increasing number of electrical machines in all countries, there is no need to emphasise the importance of the repairer—indeed, he has already achieved an essential place in electrical engineering. To expect all electric motors in need of repair to be returned to their makers would be as preposterous nowadays as to expect all motor-cars to be sent back to their several firms for overhaul. Indeed, in many large factories and other concerns where large numbers of motors are used, a regular maintenance staff is practically a necessity.

It is not surprising, therefore, to find an increasing response on the part of authors to meet the growing needs of repairers, and already a number of books, ranging from primers to treatises on locating and repairing faults, have appeared. The present book is of a somewhat advanced character, both in its scope and treatment, and it will be of greatest service to those already possessing some experience of repair work. At times, however, we feel that the authors do not lay sufficient stress on the difference between temporary makeshifts and sound repair. For example, when changing from lap to wave winding, the reader is told that "the extra bar may be eliminated by connecting two together and using them as a single bar." This is not good practice. Also it should be emphasised that cutting out armature coils is a temporary expedient. There are other points which do not rouse our admiration. "Changing coil pitch" is introduced thus: "In many cases when an armature is being rewound the coils are made up, and when they are being put into the slots it is discovered that in some manner they have been made shorter than those in the old winding. . . ." This strange indictment of repairers is followed by a technical discussion on fractional-pitch windings. Further, we do not see what good is served by illustrating and describing a winding having alternate two- and three-turn coils. More space might be devoted to methods of overcoming difficulties in accommodating other sizes of wire—for example, the use of small wires in parallel might be mentioned.

Also in the second part of the book some of the methods described savour of the makeshift. The various methods of locating faults in armatures and in field windings are dealt with in detail, and the information in these chapters is some of the best in the book.

Elements of Electrical Engineering. By ARTHUR L. COOK. Pp. viii+568; figs. 365. London: Chapman & Hall, Ltd. Price 20s. net.

This is an American text-book comprising four main divisions, covering respectively: direct current and magnetic circuits, direct current machinery, alternating currents, and alternating current machinery. In the first part we notice that the subject of direct current and resistance measurements which usually finds a prominent place in elementary d.c. theory, is

hardly touched upon, whilst the short chapter on electrostatics and condensers is somewhat meagre. The second part is more satisfactory, the treatment of direct current generators and motors being very clear and thorough. Short chapters on primary and secondary batteries, and d.c. transmission and distribution, are included in this section. In the third part the author has endeavoured to develop the elementary theory of a.c. circuits for the non-mathematical student, and considerable care has been devoted to a very complete consideration of polyphase circuits. The fourth part deals in considerable detail with transformers, alternators, a.c. motors of the induction and synchronous types, and rotary converters. The treatment is elementary, but thorough. The chapters on single-phase motors, a.c. rectifiers, and switchgear and protective devices are more superficial. The concluding chapter deals briefly with lighting and illumination. The chapter on the application of a.c. and d.c. motors is a very good one, and recapitulates the characteristics of these machines with reference to varied industrial requirements in a very practical fashion. In neither of the two parts dealing with a.c. working are there any but passing references to alternating current instruments or measurements. We note a slip on p. 423, where the constant 2.22 in the formula for the voltage of an alternator is said to be the form factor of a sine wave.

The impression received from a perusal of this book is that the author has been somewhat too eager to follow the prevailing American fashion of avoiding mathematics in elementary text books, and that the solidity of the foundational work has been considerably impaired. Fundamental theorems and formulas are given without, in many cases, any attempt to give an elementary proof. Whilst it is quite possible for students to acquire a sound knowledge of elementary a.c. theory without a knowledge of the methods of the calculus, we question whether any real progress will be made with the paucity of mathematical knowledge assumed by the author of this book. In the third section it would appear, therefore, that a detailed consideration of the properties of the sine function would have been of more real use to the average student than some of the rather superficial descriptive matter which is found in other parts of the book.

A large number of examples are given at the end of each chapter, the answers to which are not found in the book. The diagrams and the get-up of the book are both excellent.

Practical Handbook on Electroplating. Pp. xiv+269; illustrated. Ninth Edition. Birmingham: W. Canning & Co., Ltd. Price 4s. 6d. post free.

As stated in the introduction, the aim of this handbook is to "present in the simplest and most direct language the actual detailed operations, in such a way that the employer or foreman may gauge the materials to be employed, and the operator may intelligently grasp the essential details of the work." It is a compliment to Messrs. Canning that their book should run into nine editions, the first having appeared in 1889. The present edition has been entirely rewritten.

The book is divided into four sections, dealing respectively with grinding and polishing; cleansing and dipping; electroplating; and bronzing, lacquering and enamelling. Considerable attention is given to nickel plating, as it is of great commercial importance as well as a typical plating operation. The electrodeposition of other metals is also dealt with, *viz.*, cobalt, copper, brass, silver, gold, tin, zinc, lead, cadmium, chromium, and platinum. Several tables are given at the end of the volume, tabulating the current densities of the metals, voltage required for still plating, and the copper deposited from solutions at given current densities, together with comparisons of thermometric and hydrometric scales.

The volume contains a fair amount of propaganda work for the products of Messrs. Canning, which are kept well to the fore throughout the publication.

Practical D.C. Armature Winding. By L. Wollison. Pp. xii+228; figs. 152. London: Sir Isaac Pitman and Sons, Ltd. Price 7s. 6d. net.

This book is written from the practical winder's point of view, and is intended to provide in a small space all the information that is really necessary to the practical man. Some of the information comes within the scope of the designer and the draughtsman, and is usually given to the winder in the form of instructions, but we agree that the more thoroughly the winder understands his work, the better job he will make of it.

The author is the foreman of the winding departments of Messrs. Bruce Peebles, and also a lecturer in armature winding at the Leith Technical College. His practical experience is obvious throughout the book. The following extracts will make this clear. "In every instance, experience, commonsense, and continuous care are essential to the production of reliable winding. . . . Probably in armature winding, more than in any other trade, good workmanship at all stages is of the greatest importance. . . . The life and successful working of an electrical machine, and, incidentally, the reputation of its producer, may therefore depend in large measure on the careful workmanship of the armature winder. . . . 'Prevention is better than cure.'"

The first part of the book deals with the theoretical aspect, explaining how to arrive at the winding-spans, &c. The author's lecturing experience has enabled him to make his explanations very clear, but we wish to criticise some of the terms and symbols. For example, a single coil is called a "unit," which appears to be a very good name. A number of units grouped together to occupy a slot is, however, called a "coil." This name does not seem a happy choice, because it is not a coil, but a group of coils. Again, the number of slots spanned by a coil is called the "core-pitch." This term does not convey its meaning at first sight, and we suggest that "slot-span" might be better. Generally speaking, the word "pitch" could be replaced with advantage by "span," but in this the author only follows the usual practice of other writers. With regard to the symbols, R is used both for the number of equalising rings and for the degree of re-entrancy, while M denotes the number of pairs of paths, instead of the recognised *a*. Apart from these criticisms of minor details, the explanations are very clear, especially those of multiplex windings.

The second part deals with modern practice. It is, of course, impossible to deal with all the various methods which are in common use, but the author describes typical methods and points out concisely what is required to make a good job. Testing is gone into very thoroughly, it being recognised how important it is that a winding should not break down after it has been put into service. All the various faults which can occur are pointed out and the methods by which they can be detected are explained.

The diagrams are very clear, but it would have been an advantage to add a title to each one. The book will certainly be of use to the student as well as to the practical winder.

The Story of Electricity. By W. F. F. Shearcroft, B.Sc., Hons., Lond., A.I.C. Pp. 73; figs. 3. London: Ernest Benn, Ltd. Price 2s. 6d. net.

Although the title of this little book is probably not altogether suggestive of the contents, the work is certainly a story, fascinating, and well written in non-technical language which renders it readable by any intelligent person. It contains a survey of the theories of electricity which have been advanced from the time of Thales' observation of the peculiar property of amber up to the present day when our modern scientists are occupied with applications of the quantum theory, &c. The concluding chapters, in dealing with the construction of the electrons and protons, draw a picture which will give a clear idea of the fundamentals of matter and its close relationship to electricity to the person of non-technical mind. Its reading will not be a waste of time to any who pick up this little volume.

Relativity: A Very Elementary Exposition. By Sir Oliver Lodge, F.R.S. Pp. 41. London: Methuen & Co., Ltd. Price 1s. net.

This is a lecture delivered to the Literary and Philosophical Society of Liverpool in 1921, and it is well worth reading by those who have neglected to acquire a nodding acquaintance with the subject. There are three reasons why it is worth their while. First, because Prof. Lodge has a happy gift for exposition which makes the book a pleasure to read; secondly, because it is short and, as the sub-title most truthfully declares, easy to understand; thirdly, because it is well that those who have neglected to acquire even a slight acquaintance with the subject should avail themselves of a good opportunity for doing so. This last reason will be made the more manifest by a perusal of the book, for therein it will be seen with what reluctance the world of science allowed itself to be convinced of the importance of this subject.

At first sight the theory of relativity appears to any practical man mystical and visionary. His natural inclination is to dismiss it from his mind as void of all practical significance. This attitude was shared by almost all the lights of science up to the beginning of this century. It was only by sheer force of cumulative evidence that a change in that attitude was brought about. In the little book before us it can be seen how the weight of that evidence grew and began to tell, until now the whole field of physical science is embraced in it, and the veil of metaphysics seems to settle over all.

Thus the book closes with a quotation from Eddington: "We have found a strange footprint on the shores of the unknown. We have devised profound theories to account for its origin. At length we have constructed the creature that made the footprint, and lo! the footprint is our own."

Fifty years ago one who picked up a little book which ended with a paragraph like that would suppose he had got hold of a religious tract of some kind.

New American Plant in Service.—According to *Power*, the Bureau of Power and Light of Los Angeles placed the first 4,000-h.p. unit of its Big Pine power plant in operation on July 31st. Work on the installation was speeded up in order to be able to furnish an emergency service to a number of mines and industrial plants in the Owens Valley region, which were temporarily without power because of damage done to the feeder lines of the Southern Sierras Power Co. during a violent electric storm and cloudburst. Power from the Big Pine plant is to be used in pumping water from approximately 300 wells in Owens Valley into the aqueduct for the water department of the city of Los Angeles.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Cycle and Motor Cycle Show.—This show, which is to be held at Olympia, will be opened by Mr. L. C. M. S. Amery, P.C., M.P., Secretary of State for Dominion Affairs and the Colonies, on September 21st.

The Coal Inquiry.—The Royal Commission appointed to inquire into the coal industry is composed as follows:—Sir Herbert L. Samuel, G.B.E. (chairman), Sir William H. Beveridge, K.C.B., General Sir H. A. Lawrence, K.C.B., and Mr. Kenneth Lee. The following expert advisers have been appointed to assist the Commission:—The Rt. Hon. William Brace, Chief Labour Adviser to the Mines Department; Dr. Walcot Gibson, F.R.S., formerly an assistant to the Director of the Geological Survey of Great Britain; Major H. M. Hudspeth, D.S.O., Divisional Inspector of Mines; and Dr. C. H. Lander, Director of the Fuel Research Department of the Department of Scientific and Industrial Research. Mr. C. S. Hurst, O.B.E., of the Mines Department, will act as secretary. The terms of reference to the Commission are: "To inquire into and report upon the economic position of the coal industry and the conditions affecting it, and to make any recommendations for the improvement thereof."

A London Company's Hiring Scheme.—The WESTMINSTER ELECTRIC SUPPLY CORPORATION, LTD., has sent us a copy of a booklet which it is issuing to its consumers. This contains illustrations and particulars of charges and running costs of the appliances which can be hired from the company. Included in the list are cookers, fires, boiling rings, irons, &c. The cooking and heating rate is reasonable, as are the hiring charges, although we think that the payment of the latter in advance may act as a deterrent to many potential users.

Lighting Propaganda.—Preparations are now being made for the coming winter—another lighting season—and the lamp manufacturers have produced attractive schemes for the education and enlightenment of the public. The BRITISH THOMSON-HOUSTON CO., LTD., has sent us a selection of the pamphlets, &c., which it is issuing to contractors and others. A special window display employing and advertising "Mazda" lamps is offered and the price lists and other publications have been produced in an attractive style.

We have also received similar matter from the GENERAL ELECTRIC CO., LTD., but in this case the whole of the details of the company's campaign to popularise "Osram" lamps are contained in a large brochure which is copiously illustrated. Advice is given on window dressing and interior displays, the training of salesmen, postal and newspaper advertising, &c. The "Osram Baby" appears in a new design.

Another leading company which has also produced a special scheme is the SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD. The matter sent us includes a number of illustrated pamphlets and other publications, and the "Siemens Wizard Electric" game. A special feature is a design which is being used on posters and showcards—a nude figure silhouetted against the light from a "Siemens" lamp. The company's scheme also includes extensive newspaper and hoarding advertising.

Electric Lamp Trade Competition in South Africa.—In commenting upon the increased competition from foreign electric lamps in South Africa, the *British and South African Export Gazette* states that the Johannesburg Corporation Finance Committee, after examining certain tenders, reported that the lowest-priced lamps offered were of Continental manufacture, but that the Corporation had had practically no experience of that particular make. It was added that lamps which were of perfectly good appearance did not always prove suitable for street-lighting purposes, but might burn out in a short time, and though low in price, prove exceedingly expensive in use. Our contemporary urges British manufacturers to make greater efforts to keep the merits of British lamps constantly before municipal buyers, and adds:—"Additional propaganda work here, and also among the importing houses and their shipping connections in the United Kingdom, will go a long way towards restoring the British share of the trade to its former greatness, and will also ensure participation by the United Kingdom in the certain future expansion of the business."

New Municipal Showrooms.—The Salford Corporation proposes to purchase the premises of Messrs. W. H. Sutton and Sons, in Chapel Street and Bexley Square, for the purpose of showrooms for electrical appliances.

Lead.—Reporting on September 5th, Messrs. James Forster & Co. stated:—"Consumption is still very big, particularly in the electrical trades, but it must be remembered that the extensive buying by cable makers recently will probably mean that they will be out of the market for some weeks, and in order to prevent prices sagging further, other buying must take its place. Meanwhile, there is an acute shortage of early lead, particularly of good brands, owing to the shipping strike in Australia. This should be only temporary, however, as the lead which is being delayed will come forward in larger quantities later on. The outlook is rather obscure, and we think calls for a certain amount of caution on the part of consumers."

Hackney Publicity.—In preparation for the opening of its new showrooms and offices, which were described in our issue of June 13th, 1924 (p. 952), the Hackney Electricity Department is issuing a poster produced in conjunction with the British Electrical Development Association. This depicts a very imposing edifice of rather severe outlines bearing the Hackney coat of arms above the entrance. The building promises to be a veritable "Temple of electricity."

D.O.T. Advisory Committee Appointments.—The Parliamentary Secretary to the Department of Overseas Trade has recently appointed a number of additional members to his Advisory Committee, among whom are Col. F. V. Willey, C.M.G., president of the F.B.I., Sir Arthur Balfour, K.B.E., Sir William Larke, K.B.E., Sir Charles Mandleberg, Mr. J. T. Brownlie, Mr. P. J. Pybus, C.B.E., and Sir Max Muspratt, Bart.

Correction.—In the advertisement of HACKBRIDGE ELECTRIC CONSTRUCTION CO., LTD., appearing in our last issue (Supplement p. 2) an error occurred in the preparation of the copy. The third paragraph on the right-hand side referring to "Over Potential Test" should read as follows: "The overpotential test consists of the application—across the winding of twice the rated pressure for a period of 15 minutes. (The B.E.S.A. specification calls for a period of one minute only.)"

Annual Sports.—The annual sports of the staff and employés of the Metropolitan-Vickers Electrical Co., Ltd., were held at the Belle Vue Grounds, Manchester, recently. There was a large and enthusiastic attendance. The accompanying picture shows Mrs. J. C. Whitmoyer presenting prizes to the successful competitors. Supporting her (from left to right)



Metro-Vic. Sports at Manchester.

are Mr. Baxendale, hon. secretary of the Sports Committee, Mr. Fraser, superintendent of the Large Machine Department, Mr. Walmsley, superintendent of labour, Mrs. G. E. Bailey, Mr. G. E. Bailey, and Mr. A. E. du Pasquier, manager of the Publicity Department.

A Works Dental Clinic.—As an addition to the arrangements made by the CHLORIDE ELECTRICAL STORAGE CO., LTD., for the welfare of its employés, a dental clinic was recently opened at the Clifton Junction works. The clinic consists of a dental surgery, a rest room, and a waiting room, and is in charge of a fully-qualified dental surgeon assisted by an experienced nurse.

For Sale.—Carlisle Corporation electricity department has for disposal surplus transformers, h.p. fuses, isolating switches, &c. (See our advertisement pages to-day.)

Trade Announcements.—MESSRS. RADIO INSTRUMENTS, LTD., are appointing Mr. H. Patrick, 246a, Corporation Street, Birmingham, as their representative for Birmingham and the Midland Counties, and he will hold stocks at the above address. He will continue to act as agent for Messrs. H. Hunt.

MESSRS. ALLEN-LIVERSIDGE, LTD., have taken over the sole selling agency for Great Britain and Ireland of the electric welding products of Messrs. Buckley, Saunders & Co., Ltd., including "Pontelec" welders and rivet heaters.

New premises have been opened by Messrs. HILL, UPTON AND CO., electrical engineers, at "Radiant House," George Street, Oxford.

MR. H. FEATHERSTONE, electrical and radio engineer, of Tunbridge Wells, has opened a branch business in High Street, Wadhurst, Sussex.

THE AMPLION CORPORATION OF CANADA, LTD., 130, Richmond Street West, Toronto, Ontario, has been formed to import, assemble, and/or manufacture, and sell the products of Messrs. Alfred Graham & Co. in Canada. Hitherto Amplion business was administered, as general agents, by Messrs. Burndept of Canada, Ltd., who will continue, for the time being, to act as wholesale distributors for the Amplion Corporation. Messrs. Graham have also just opened a new Amplion showroom and depôt at 101, St. Vincent Street, Glasgow.

THE STEARN ELECTRIC CO., LTD., has opened a branch at 15, Park Row, Nottingham, under the management of Mr. M. Thorburn.

Catalogues and Lists.—MESSRS. L. ANDREW & Co., 2, Whitworth Street West, Deansgate, Manchester.—Wholesale price list of india-rubber gloves and gauntlets.

MESSRS. HANS RENOLD, LTD., Burnage Works, Didsbury.—An illustrated catalogue of driving chains of various patterns. Priced.

SUPERLAMP, LTD., 92-94, Paul Street, Great Eastern Street, E.C.2.—Two net trade price lists dealing respectively with electrical material and radio apparatus.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38 and 39, Upper Thames Street, E.C.4.—September price list of electrical appliances and materials. Also an illustrated folder giving prices of "Siemens" electric lamps, and List No. 8, giving illustrated and priced details of "Siemens" spotlight projectors.

THE CRESSALL MANUFACTURING CO., 40-41, Staniforth Street, Birmingham.—Leaflet No. 20, illustrating and describing "Cressall" steel-jacket unit heaters.

MESSRS. E. BROOK, LTD., Empress Works, Huddersfield.—Booklet No. 123, dealing with the firm's single-phase, high-torque squirrel-cage motors.

THE WHITWORTH ELECTRIC LAMP CO., LTD., 195, North End Road, West Kensington, W.14.—September price list of electrical materials and appliances.

MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—Pamphlet Ta 154/1, illustrating and describing some large transformers built by the company.

"MANDA" MOTORS, LTD., 53-54, Royal Mint Street, E.1.—A trade list of electric fans, fractional-h.p. motors, &c.

MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Book 5, Section 1, illustrating and describing the "Pul-syn-etic" system of electric impulse clocks and time-keeping apparatus. Priced.

MESSRS. STURGE & BAKER, LTD., Premier Works, Sheepcote Street, Birmingham.—An illustrated and priced leaflet dealing with flex-winders for portable electric lamps.

HIGGS MOTORS, Witton, Birmingham.—September stock list of a.c. motors and d.c. dynamos and motors.

MESSRS. E. P. ALLAM & CO., 107-109, Gray's Inn Road, W.C.1.—September stock list of d.c. motors for sale or hire.

THE PYRENE CO., LTD., 9, Grosvenor Gardens, S.W.1.—A pamphlet advertising "Pyrene" fire extinguishers.

MESSRS. BELLING & CO., Bridge Works, Southbury Road, Enfield.—A well-illustrated and priced catalogue of electrical appliances, including fires, water-heating apparatus, cookers, irons, &c.

TOK SWITCHES, LTD., Granville House, Arundel Street, W.C.2.—A blotter bearing a calendar for September and an illustration of a double-pole "Barrier" switch.

THE MILLNS ELECTRICAL CO., 17, Whitefriars Street, E.C.4.—Leaflet FV5501, advertising "Meco" electric forge blowers.

TUNGSTALITE, LTD., 47, Farringdon Road, E.C.1.—A net trade price list of electrical materials and appliances; and a retail price list of "Tungstalite" lamps.

THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—An illustrated and priced leaflet describing an anti-microphonic valve holder.

CONTRACTORS' SUPPLIES CO., 5, Finsbury Square, E.C.2.—A price list of electrical accessories, including tumbler switches, switch-plugs, lampholders, fuse-boards, &c.

THE BORDESLEY ELECTRICAL ACCESSORIES CO., LTD., 162, High Street, Bordesley, Birmingham.—A well-illustrated and priced catalogue of electrical and radio accessories.

THE ARORA CO., Rosebery Road, Loughborough.—A booklet containing illustrations, details, and prices of electric fires, including some new designs.

Bankruptcy Proceedings.—F. J. TIZZARD and N. TIZZARD (Tizzard Bros.), electrical engineers and contractors, 27, Dalkeith Street, Barrow-in-Furness, and 121, Market Street, Dalton-in-Furness.—First meeting, September 12th, at the Official Receiver's office, 16, Cornwallis Street, Barrow-in-Furness. Public examination, September 25th at the Magistrates' Court, Barrow-in-Furness.

W. H. MURAD (W. H. Murad & Co.), wireless manufacturer, 126, Princess Street, Manchester.—First and final dividend of 1s. 3½d. in the £, payable September 14th, at the Official Receiver's offices, Byrom Street, Manchester.

A. J. BARLOW (Barlow Bros.), 9, Brunswick Place, City Road, E.C.—Trustee, Mr. A. Willmott, 14, Old Jewry Chambers, E.C., released June 4th.

W. A. BEAUMONT, electrical engineer, 44, Warrengate, Wakefield.—Trustee, Mr. B. S. Briggs, Official Receiver, 21, King Street, Wakefield, released July 20th.

R. SHEARD (R. Sheard & Co.), 2, Market Street, and 86, Station Lane, Featherstone, Yorks.—Trustee, Mr. B. S. Briggs, Official Receiver, 21, King Street, Wakefield, released July 20th.

J. B. SHIELDS, plumber and electrician, 221 and 198a, Linthorpe Road, Middlesborough.—Last day for proofs for dividend, September 15th. Trustee, Mr. C. P. Barrowcliff, 55-57, Albert Road, Middlesborough.

G. W. HUMPHREY (Humphrey Electrical Co.), electrical engineer, 24, Broad Quay, Bristol.—Supplemental dividend of 2½d. in the £, payable at the Official Receiver's office, 26, Baldwin Street, Bristol.

J. H. HOPKINS (Electrical Maintenance Co.), 140, Wardour Street, W.C.—Trustee, Mr. M. Hyams, 60, Chancery Lane, W.C., released August 19th.

H. J. W. EMBURY and K. S. EMBURY (H. & K. Embury), electrical and mechanical engineers, 110 and 29, Queen Street, Newton Abbot.—Trustee, Mr. A. L. Honey, 23, Catherine Street, Exeter, released August 7th.

T. BARTON, electrical engineer, Electric Works, Ainsworth Street, Blackburn.—Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester, appointed September 2nd.

Company Liquidations.—ARROTA ELECTRICAL & MOTOR ACCESSORIES CO., LTD.—Winding up voluntarily. Liquidator, Mr. J. E. Cross, Fish Dock Road, Grimsby. A meeting of creditors was held on September 3rd. Particulars of claims to the liquidator by October 3rd.

ALKLUM ELECTRICS, LTD., Waterside Works, Waterside, Halifax.—The first meeting of creditors was held on September 2nd at the County Court House, Halifax. The statement of affairs showed liabilities of £75, and there were no assets. The issued share capital of the company was £1,000, so that there was a deficiency as regarded the contributories of £1,075. The company was incorporated on February 3rd, 1921, to carry on the business of general electrical engineers. It appeared, however, to have had no real trading existence owing, it was stated, to certain negotiations with a view to the introduction of capital by another firm having fallen through at the outset. As the company had, however, actually been floated, it was decided to experiment in and advertise accumulators only, with the object of creating a goodwill. It was alleged that the company did not manufacture accumulators, but that all orders received for the supply of accumulators were passed on to another company for execution, apparently without consideration. All the capital had been allotted as fully paid for cash. It was alleged that the company discharged all its liabilities, and when the £1,000 capital was exhausted early in 1924, it ceased operations, although the same advertisements were continued later, but to the order of the other company. On December 18th, 1924, the company was sued for £36 for advertisements and on March 31st, 1925, judgment was given for the plaintiffs for £36 and £38 14s. 7d. costs. The action was defended on the ground that instructions had been given to stop the advertisement. The failure of the company was attributed to efforts to obtain further capital being unsuccessful and also to the County Court judgment mentioned. The creditors resolved to appoint Mr. Theo Wm. Meldrum, C.A., of 73, Basinghall Street, E.C., as liquidator of the company.

WIRELESS EQUIPMENT, LTD.—A meeting of members is called for September 30th at Messrs. Corfield & Cripwell's offices, Balfour House, Finsbury Pavement, E.C., to hear an account of the winding up from the liquidator, Mr. W. A. J. Osborne.

Social Event.—On August 29th, the employés of Messrs. Robson & Coleman, Newcastle-upon-Tyne, and their friends spent a most enjoyable day at Ponteland. A party of about 100 accepted the invitation of the principal of the firm, Mr. R. E. Robson, to celebrate in this way the marriage of his daughter. Among the events of the day were sports and games, the prizes for which were provided by Mr. and Mrs. Robson, and presented by Mrs. Lowney.

Belgian Manufacturing Development. — A Belgian concern, Lorenz & Cie., has lately acquired a large area of land at Eupen on which to establish works for the manufacture of small electrical accessories of porcelain and copper, for which, it is stated, Belgium is still mainly dependent on imported supplies—articles coming chiefly from Germany.

Proposed Australian Tariff Changes.—Mr. H. E. Pratten, Commonwealth Minister for Trade and Customs, introducing the new Tariff Bill in the House of Representatives on September 2nd, said that there was no question that the action of Australia in giving preference to Great Britain ultimately led the Mother Country to grant a preference on some Australian products. The value of the imports last year, which would be affected by the proposed tariff increases, exceeded £30,000,000, while the value of those which would be affected by the proposed tariff reductions was £10,000,000. The 275 items and sub-items hitherto admitted free from the United Kingdom would now be increased to 311 and the ratio of British preference would be maintained or increased under the present proposals. The principal increases in the British, intermediate, and general tariffs respectively would be as follows: Machinery, including locomotives, mining machinery, and dynamos of over 75 kW, 12½, 15, and 15 per cent. respectively; other machinery, and dynamos of up to 75 kW, 17½, 20, and 20 respectively; iron and steel plate and galvanised sheets, unchanged, 27s. 6d. and 30s. per ton respectively; X-ray transformer apparatus, at present free, 10 and 20 per cent. respectively, would now be 27½, 35 and 40 respectively. Mr. Pratten said the proposals were expected to result in a considerable increase of employment throughout the Commonwealth. The value of the present wide preference to British goods was increased by over half a million. The Government was showing in a practical manner its appreciation of the Imperial Government's action in extending a further preference to Australian products. In a few cases the preference to Great Britain was abolished because the trade in these particular items was negligible. The proposals would also further stimulate *bonâ-fide* British industry.—*Reuter* (Melbourne).

German Tariff Modifications.—The following German tariff modifications are included in a list published by the *Board of Trade Journal*: "Blocks, sheets and rods for electrotechnical purposes, merely roughly stamped, graphited or not," 75 Reichsmarks per 100 kg. "Electrodes: Not graphited, weighing each 3 kg. or more, 7 Rm. per 100 kg.; graphited, weighing each 3 kg. or more, 175 Rm. per 100 kg." "Vulcanised fibre slabs, 3 mm. or less thick," 20 Rm. per 100 kg.

Book Notices.—"The Pirelli-General Cable Book" (291 pp., illustrated). Southampton: Pirelli General Cable Works, Ltd.—This handsomely produced volume is a mine of information relating to the construction and working of cables—particularly those with paper insulation. An introductory portion contains a description of the company's works at Southampton—a subject with which we deal elsewhere in this issue—and then the various processes in the manufacture of the cables are mentioned. Particulars are given of important contracts which the company and its parent company Pirelli & Co. (Milan) have carried out. The bulk of the publication is devoted to practical information concerning the testing and installation of the cables. Protective systems are described and a great mass of tables and statistics are included. Separate sections contain details of telephone cables, vulcanised bitumen and vulcanised rubber cables, as well as instrument and machine-coil wires. The book is profusely illustrated with views of the works, installations, joint boxes, &c. There is also a good deal of general data upon metals and dielectrics.

"The *Journal* of the South African Institution of Engineers." Vol. XXIV, No. 1, August, 1925. The Institution. Price, 2s.

"Alternating Current Problems," by R. E. Brown. Pp. viii + 84; figs. 16. London: Chapman & Hall. Price 6s. net.

"Circular No. 271 of the United States Bureau of Standards," "Master Specification for Rubber Gloves for Electrical Workers." Pp. 7. Washington: Government Printing Office. Price 5 cents.

"*Proceedings* of the Rugby Engineering Society, Session 1923-24." Vol. XVIII. Published by the Society. Price 10s. 6d.

"The *Transactions* of the South African Institute of Electrical Engineers." Vol. XVI, Part 6, July, 1925. The Institute. Price 2s.

"Science Abstracts" (A and B). Vol. XXVIII. Part 8. August 25th, 1925. London: E. & F. N. Spon, Ltd. Price 3s. each net.

"Electrical Engineers' Data Books." Vol. I. "Lighting, Traction, and Power Distribution," by E. B. Wedmore and D. V. Onslow. Pp. xxi+825; figs. 203. Vol. II, "Manufacture, Design, and Laboratory Work," by E. B. Wedmore and D. V. Onslow. Pp. xxi+470; 151 figs. Vol. III, "Radio Engineering," by E. B. Wedmore and J. H. Reyner. Pp. xxii+462; figs. 314. London: Ernest Benn, Ltd. Price 15s. each.

Prussian State Interests.—The State of Prussia, which recently acquired a large financial interest in the Rhenish Westphalian Electricity Works Company, is now participating in a syndicate which is taking over the undertaking of the Siemens Electrical Works Co., of Hamburg, which controls various supply undertakings. The shares purchased by the syndicate represent 4,000,000 marks, which amount is to be increased to 8,000,000 marks and to be taken over also by the syndicate. The sellers are the Siemens and Halske Company and the Swiss Electrical Industry Company, which held 1,250,000 marks of the total share capital.

Water Turbines for Norway.—The Norwegian Storting recently voted an additional sum of 5,200,000 kronor for the accelerated extension of the State hydro-electric works at the Nore, this making a total sum of 9,700,000 kr. granted this year for the execution of works. The further outlay on the works will amount to 17,000,000 kr. in 1926 and 10,000,000 kr. in 1927, it being expected that the undertaking will be completed in 1928. Tenders are now being invited for the supply of two additional turbines. The order for the first turbine was placed in Germany some time ago, a German firm having quoted a price which was 280,000 kr. below that of competitive Norwegian works. Asked whether the new orders would be allotted to German works, the Director of the State Water Power Department is reported to have stated that he was unable to give a reply. He believed, however, that the appreciation of the Norwegian krone would render it more difficult for Norwegian works to tender than on the former occasion.

Telephone Apparatus Manufacture in Spain.—According to a Madrid economic journal, Spain is to be placed in the position of being able to manufacture all the telephone material required in order to carry out the important programme which has been formulated by the Spanish National Telephone Company. This information is said to have been confirmed by a cable received from the president of the International Telephone and Telegraph Corporation, which indirectly controls, among others, the existing telephone factory at Barcelona. It is now proposed to establish in Madrid or vicinity a large works capable of not only supplying the needs of the Spanish market, but also able to export, particularly to South America.

Patent Rights in Russia.—It is reported that the Soviet authorities have notified foreign inventors and patentees that under the new patent law adopted last year patents issued and registered in Russia under the old *régime*, or applied for prior to November 7th, 1918, should be re-submitted to the Inventions Committee, 76, Fontanka, Leningrad, for renewal. It is understood that applications for renewals may be made up to September 25th next and that they should be submitted through some representative residing in Russia.

Re-grading of Worcester Undertaking.—At a meeting of the City Council last week the Council agreed to the transfer of its electricity undertaking to Class D of the National Joint Board's schedule. The salaries affected will be increased by a total of £240.

The British Industries Fair.—A *Times* correspondent says that it is authoritatively stated that the Treasury has decided to make a grant of £20,000 to assist in the promotion of next year's British Industries Fair. The probable period of the holding of the London section will be from February 15th to 26th next.

Cuban Import Duties Increased.—The *Board of Trade Journal* reports that import surtaxes are to be imposed on all classes of goods by the Cuban authorities. "Luxury" articles are to bear a surtax of 10 per cent.; the rate in the case of all other goods is 3 per cent.

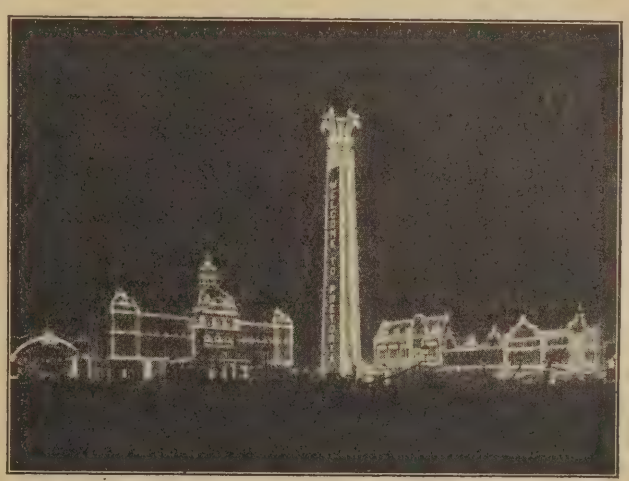
Belgian-Dutch Lamp Agreement.—It is reported from Amsterdam that the Philips Glowlampworks Co. has concluded an agreement for community of interests with La Lampe Electrique Belge. The latter has acquired the Philips' patents and will increase its output to 1,500,000 lamps per annum.

United States Radio Exports.—A review of the United States exports of radio apparatus during the first six months of the current year shows that the total value was $4,068,442, as compared with $1,826,246 in the first half of 1924, and $6,030,914 for the whole of that year. Japan became the most important customer, taking goods to the value of $1,238,030 (as against $60,415), while Canada, with $852,783 (as against $705,287), fell to second place. The principal European customer was Great Britain ($212,958, as compared with $48,074), Spain being second with $164,132. In the Latin-American market Argentina ($237,609) and Brazil ($227,399) were the leading customers. The Australian and New Zealand market absorbed apparatus to the value of $375,380, as compared with $190,665 in the first half of 1924.

The Leipzig Fair.—According to the papers, business during the first day of the Leipzig Fair was chiefly in necessary supplies. Considerably better trade was done at the technical and building fairs. The second day brought no marked change, satisfactory business being transacted in certain sections. Among foreign sales were household appliances for Australia. Home customers as a rule bought only moderate quantities and preferably the cheaper articles.—*Reuter's Trade Service* (Berlin).

Osmiridium Mining in Tasmania.—A Victorian company, with a capital of £30,000, has been formed for the purpose of mining osmiridium from rock at Waratah, in Tasmania. This is stated to be the only place in the world where osmiridium is found.—*Reuter's Trade Service* (Melbourne).

Illumination in South Africa.—During the recent visit of the Prince of Wales to South Africa many local authorities bestowed special care and ingenuity upon the decoration of their towns. One of the most interesting instances of this was



The Illumination of Church Square, Pretoria.

Pretoria, where extensive use was made of electric light. The accompanying illustration is a night view of one side of Church Square, Pretoria, the outlines of the buildings being picked out with "Osram" lamps.

Hydro-Electric Development Tax in Porto Rico.—A law has been passed by both Houses of the Porto Rico Legislature levying a tax of one-tenth of 1 per cent. on all real property in the island for a period of three years, in order to provide a fund, which it is estimated will approximate $500,000, for the development of hydro-electric power. This has not, as yet, been signed by the governor, but it is thought that he will approve the Bill.—*Commerce Reports.*

Electrical Appliances for Uruguay.—*Commerce Reports* says that there is a considerable market in Uruguay for electric reflector-type heaters rated at 1,000 W or less, as well as some market for small electric cooking stoves and self-contained cooking devices.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from September 2nd :—

Ford. No. 454,460. Class 6. Magnetos and dynamos for motor cars, electric starting and ignition machinery, &c., and parts of such goods. No. 454,461. Class 8. Electric batteries and accumulators, electric ignition coils and parts thereof, &c. No. 459,575. Class 13. Electric switches, electric lamps and bulbs, sparking plugs, electric horns, &c. No. 459,577. Class 18. Electric lighting sets for motor vehicles. No. 459,580. Class 50. Batteries, boxes of wood, &c.—The Ford Motor Co. (England), Ltd., Trafford Park, Manchester.

Frelat (lettering and design). No. 454,924. Class 8. Wireless telephonic and telegraphic apparatus.—Naamlooze Vennootschap Frelat Export MIJ. 69, Singel Amsterdam, Holland (J. W. Wilson & Co., 55, Market Street, Manchester).

Valoc. No. 457,866. Class 8. Crystal detectors and detector crystals for use in wireless telephony.—Leslie Gerald Russell, 1-7, Hill Street, Birmingham.

Radio-pal (lettering and design). No. 458,532. Class 8. Portable wireless receiving apparatus. Multistat (lettering and design). No. 458,533. Class 8. Control instruments for wireless transmitting and receiving apparatus.—Joseph A. Bower, trading as J. A. Bower, 7-8, Great Winchester Street, London, E.C.2.

Saxoflex. No. 450,687. Saxbestos. No. 450,688. Class 8. Electrical cable. —Louis Henry Euler, 54, Inchmery Road, Catford, S.E.6.

Siftron. No. 460,848. No. 460,911. Same lettering combined with design. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Edward A. Graham, trading as Alfred Graham & Co., St. Andrew's Works, Crofton Park Road, London, S.E.4.

Patent Application.—Application has been made for the restoration of patent No. 123,545 of 1917, granted to W. E. Prescott and G. R. Baker for "Electrical apparatus for subjecting articles to varying temperatures."

New French Companies.—A new company has lately been formed in Paris (9, Boulevard Denain), with a capital of one million francs and the title La Société de l'Energie Electrique d'Isère et de Drome, to establish a hydro-electric power station on the River Ebron in the Department of Isère.

La Société Electrique de Travaux Agricoles is the name of a new undertaking which has lately been organised in Paris (67, Rue de Dunkerque), with a capital of one million francs to develop the use of electrical appliances in agricultural operations.

A new company has lately been formed in Grenoble (27, Rue de Turenne), with a capital of 220,000 fr. and the title La Société du Barrage de Sechiliennée, to establish a hydro-electric station on the River Romanche at Sechilienne, in the Department of Isère.

La Société Radio-Electrique is the name of a new company which has lately been formed in Nantes (2, Rue Sully), with a capital of 200,000 fr., to engage in the wireless industry in Western France.

La Société Nord-Africaine d'Electricité is the name of a new company which has lately been formed in Paris (94, Rue de la Victoire), with a capital of 300,000 fr., to establish electricity undertakings in North Africa.

A new company has lately been formed in Paris (56, Rue du Faubourg, St. Honoré), with a capital of 500,000 fr. and the title La Société des Relais à Arc to acquire and exploit the Dunoyer and Toulon arc relay patents.

Electric Washers in America.—The *Electrical World* states that a banking firm has issued a special bulletin dealing with the American clothes-washer industry. This states that it is estimated that in 1914 there were 50,000 electric washing machines in use in the United States, valued at $5,000,000, while ten years later, in 1924, there were more than 4,000,000 such machines, valued at over $600,000,000. The average value of each machine is estimated at $150. At the current rate of consumption and allowing for wear and tear, it is estimated that in 1929 there will be over 7,600,000 washing machines in use in 22,850,000 wired homes, valued at over $1,100,000,000, or thirty-three for every hundred wired homes. If this rate is increased to even forty in every hundred, as it well might be, the total number of electric washing machines will exceed 9,000,000 or over, twice the number now in everyday use. Placing the life of an electric washer at ten years, it is obvious that the replacement requirements alone four years from the present time will reach over 700,000 machines, or more than has been produced so far in any one year by the industry. Out of about a hundred companies manufacturing electric washing machines in the United States, there are to-day three which are furnishing 46 per cent. of all the machines now on the market.

Belgian Exhibition Postponed.—According to the *Bulletin* of the Société Belge des Electriciens it has been decided to postpone until 1930 the international electrical exhibition which it was proposed to hold in Brussels next year in order not to clash with the Independence Centenary Exhibition.

New Italian Companies.—Among the new companies recently formed in connection with hydro-electric developments in Italy are the Società Idroelettrica Alpi Maritime, Milan, capital 100,000 lire, to establish plants to utilise the water power of the Rivers Nervina, Nervia, Gordali and Tenarda in the Maritime Alps; the Società Idroelettrica di San Filippo, organised at Contigliano with a capital of 50,000 lire; the Società Idroelettrica Stura, Milan, capital 100,000 lire, to establish a plant in the Lanzo Valley (Stura); the Società Forze Idrauliche del Lago di Molveno, Milan, capital 1,000,000 lire, to utilise the water power of Lake Molveno; the Società Idroelettriche Alto-Caffaro, Milan, capital 100,000 lire; the Società Forze Idrauliche del Rovico, Milan, capital 400,000 lire; and the Società per le Forze Idrauliche del Piceno, Milan, 100,000 lire.

Japanese Telephone Development.—The Japanese Department of Communications has decided to allot 5,000 new telephones a year to the city of Osaka, beginning this year. This will entail the opening of an additional exchange yearly for several years. The Japanese telephones are of the automatic type, and the system adopted is the Strowger system, which is approved by the British Post Office. Much of the equipment required will be supplied by British manufacturers.

Indian Electrical Imports. — Our Indian correspondent says that during the quarter from April to June, the total electrical imports into India amounted to Rs. 113 lacs, as against Rs. 1 crore in the corresponding quarter of 1924. Electrical machinery remained almost unchanged at Rs. 55 lacs, but electrical instruments and apparatus showed a rise as compared with the past year's corresponding quarter from 46 lacs to 59 lacs. In the case of electrical machinery, the decline was chiefly due to decreases in "Generators, alternators, &c.," from 11 lacs to 7½ lacs., and "Motors" from 12 lacs to 9 lacs. "Control and switchgear" increased from 9 lacs to 11½ lacs, and "Turbo-generating sets" from 1½ lacs to 3½ lacs. There was also an increase of two lacs in the miscellaneous items. The principal supplier was, of course, the United Kingdom, supplying 46½ lacs worth of machinery out of the total of 54 lacs, but Germany showed some progress from about one lac to 2½ lacs. The position of the United States remained the same. In the case of electrical instruments and apparatus the main increase was under "Wires and cables," from 12 lacs to 19½ lacs. "Electric fans and parts" increased from 8 lacs to 10 lacs, "Electric glow-lamps" from 3 lacs to 5 lacs, and "Electric lighting accessories" from 3 lacs to 5 lacs. The increase recorded on the whole is spread over all the supplying countries. The United Kingdom supplied 41 lacs worth of goods as against 31 lacs in April-June, 1924; Germany increased her share from 5½ to 6½ lacs; the Netherlands from about 2 lacs to about 3 lacs; and the United States remained at 4½ lacs. As new projects are maturing in India, there is reason to think that this expansion in trade will be kept up.

German Power Fuel Syndicate in Australia.—The *Melbourne Herald* says that the representative of a German syndicate which proposes to establish a factory for the production of power fuel and chemical products by a secret process is now in Australia.—*Reuter's Trade Service* (Melbourne).

Copper, Lead and Rubber Prices.—Messrs. F. Smith and Co. report, September 8th :—Copper (electrolytic) bars, £69, 30s. increase; do., do., sheets, no change; do., do., wire rods, £79, 30s. inc.; do., do., h.c. wire, 9⅞, 3/16 increase.

Messrs. James & Shakespeare report, September 8th :—Copper bars (best selected) sheet and rod, £93, £1 increase; English pig lead £39 10s., 10s. decrease.

Messrs. Edward Till & Co. report, September 8th :—India-rubber, Para fine, 3s., 1d. to 2d. decrease.

Trade with Western Canada.—The *Board of Trade Journal* reproduced recently a report by the Senior Trade Commissioner in Canada (Mr. F. W. Field) upon trade prospects and conditions in Western Canada. He states that United Kingdom manufacturers, as a whole, appear to possess inadequate knowledge of the conditions prevailing in Western Canada, although there are a few successful exceptions. The importance of delivery according to promise and compliance with instructions is emphasised, and it is urged that the subject of packing should be given greater attention. In this connection it is interesting to note that Mr. L. B. Beale, British Trade Commissioner at Vancouver, who has charge of the Western Canadian offices, is at present in the United Kingdom to confer with manufacturers and merchants with a view to advising them as to the Canadian market. Those desiring to meet Mr. Beale should immediately apply to the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, S.W.1.

Local Exhibition.—WAKEFIELD.—The Electricity Committee has agreed to a scheme prepared by the Electrical Engineer for an electrical exhibition during the autumn.

Cable Manufacture in Czecho-Slovakia.—It is announced from Prague that the Bratislava Cable Works Co., of that city, has just acquired a large area of land in the town of Kolin on which to establish a branch factory.

Australian Tariff Decision.—Among the recent decisions of the Australian Tariff Commissioners is the following :—"Cable, telegraph and telephone, paper insulated, lead covered and served, Item 181 (A) : free under the British preferential tariff; 5 per cent. under the intermediate tariff; and 15 per cent. under the general tariff."

German Electrical Exports.—In the course of a report upon German foreign trade in July recently forwarded to the Department of Overseas Trade by Mr. J. W. F. Thelwall (Commercial Secretary at Berlin), it is stated that the exports of electro-technical products increased by 10 million Reichsmarks as compared with the June value.

Swiss Electrical Imports.—Figures just to hand show that the exports of electrical machinery from Switzerland during the first half of the current year attained a value of £552,320, as compared with £419,320 in the corresponding half of 1924. Although France continues to be the principal market, the demand from Spain has lately considerably increased, while an improving business is being done in Norway and Poland.

Cable Manufacture at Southampton.

The Pirelli-General Cable Works.

AMONG the places of interest to which visits were paid by members of the British Association during the course of the annual meeting at Southampton, was the Pirelli-General Cable Works, one of the most important industrial establishments in the town.

This factory is situated on the Western Shore by the walls of ancient Southampton, and within a few hundred yards of the two Southern Railway stations. Being of fairly recent erection, the factory is laid out on modern lines, substantially built, and equipped with up-to-date machinery for the manufacture of every description of cable and particularly for paper-insulated, lead-covered and armoured types. An aerial photograph of the works is reproduced in fig. 1.

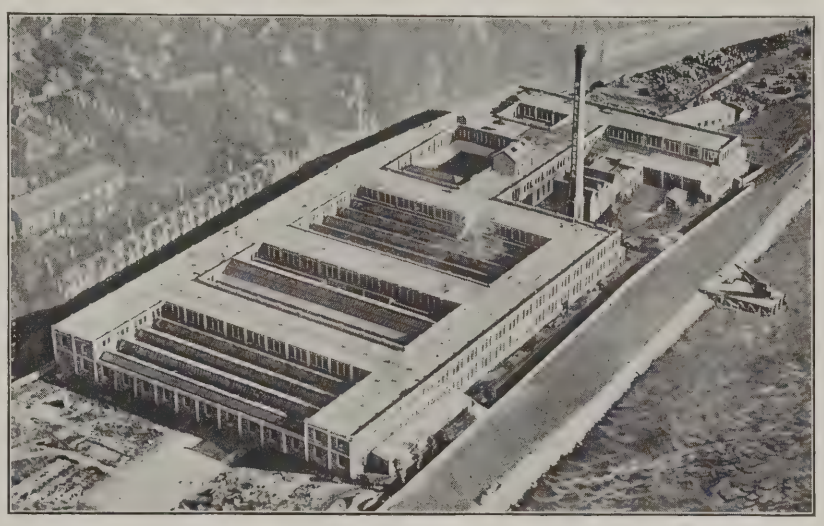


Fig. 1.—Aerial View of the Pirelli-General Works.

The works is supplied with wire by the company's Eastleigh factory situated on the Southern Railway about five miles distant. Thus the processes at the Southampton works commence with the stranding of the cable. For this purpose, a number of heavy and light stranding machines, both horizontal and vertical, have been installed; some of these are to be seen in the view of the main shop which is presented in fig. 2.

All material required in the manufacture of the cables is tested upon entering the factory. For this purpose a spacious laboratory (fig. 3) has been provided with all the necessary equipment. In addition to this testing, a great deal of research work is carried out in the laboratory.

One of the principal jobs which was in process during the British Association visit was the manufacture of a 33,000-V cable. After the wires are stranded, they pass through a paper-lapping machine and receive numerous layers of paper; the three cores are then laid up together and the spaces between them are filled up with paper twisted into the form of a cable. Further paper is lapped on to bind the cores and fillings together and give the cable a circular section. The cable is then run into a steam-heated drying chamber and later immersed in a tank of special impregnating compound under vacuum. The cable next passes to the lead press (fig. 4). Entering through a guiding die the cable is surrounded by lead in a semi-plastic state under pressure. It is then forced through dies of the dimensions necessary to give it a sheathing of the correct thickness for the particular size of cable being covered. The cable next passes through cooling troughs, after which it is wound on a steel drum. The drum and its contents are then taken to the testing tanks (fig. 5), which are situated close to the lead presses to reduce handling to a minimum, and the cable remains immersed in water for 24 hours. At the expiry of this period, the pressure tests prescribed by the British Engineering Standards Association are applied from the test room which adjoins the tanks. The test room is equipped with all the necessary instruments and appliances for testing the great variety of cables which arrive at this point in the course of their manufacture, to be proved before passing to the armouring and finishing machines. In addition to a pressure test, the insulation resistance, the capacity, and the resistance of the conductors are determined. A high insulation resistance does not necessarily imply that the cable is a good one; it very often indicates the reverse. In addition to these tests a bending test is often specified in accordance with the British Standard Specifications dealing with the testing of cables. To carry this out, a sample of the cable of a length not less than 60 times the overall diameter of the cable is bent round the barrel of a drum three times in one direction and three times the reverse way, the diameter of the barrel being twelve times the overall diameter of the cable. After this the cable is subjected to a high-pressure test, and in no case should it break down at less than the specified B.E.S.A. test pressure; Pirelli cables, we are assured, always withstand a much higher pressure. The tests mentioned above are quite satisfactory so long as the cables are for voltages within the limits for which the B.E.S.A. has issued specifications, but for higher working pressures other features assume great importance. For instance, in the case of a cable for a working pressure of 33,000 V, which is now becoming standard in this country, a very high voltage test is not considered desirable, and it is not recom-

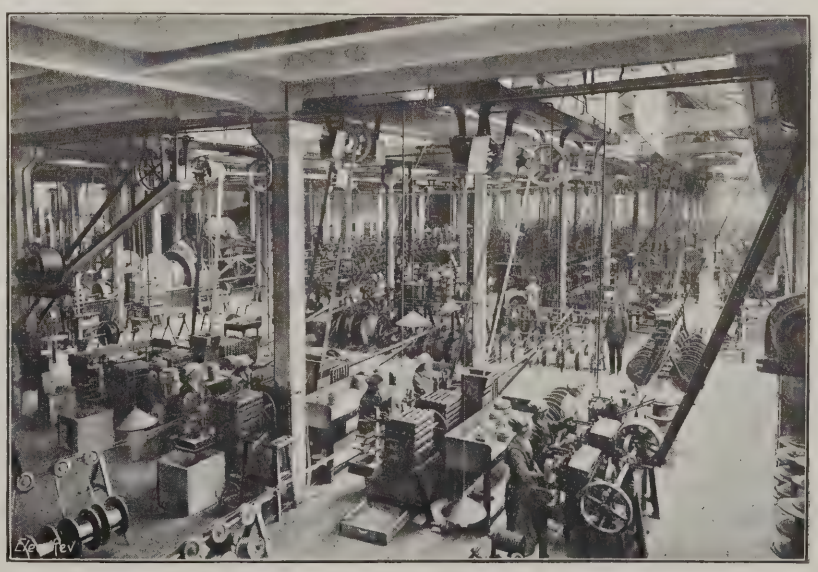


Fig. 2.—View of the Main Shop.

mended that the test shall be at more than 2½ times the working pressure. The bending test is also very important, and after carrying out the bending operations previously specified, the cable should not break down at



Fig. 3.—Chemical Laboratory.

less than four times the working pressure. A test which is recognised to be of great importance for very high voltage cables, is that of the measurement of the dielectric losses. In the technical section of the company's



Fig. 4.—Lead Presses.

handbook, to which we are indebted for these details of tests, curves appear showing the dielectric losses on various types of cables. Whilst these losses are themselves an indication of the soundness or unsoundness of the cable, too much stress should not be laid on them, as although it is true that a cable with high dielectric losses is not a good one, it can equally be true that a cable with extraordinarily low dielectric losses is not necessarily a better cable than one in which the losses are within certain defined limits. Furthermore, the actual loss of power due to normal cable dielectric losses is, to a great extent, unimportant when compared with the power transmitted by the cable. It is quite possible for a greater amount of energy to be lost in the lead sheathing than in the dielectric.

The armouring may consist either of steel tape or iron wire and after passing through this process a layer of jute is usually served upon the cable. The latter is then wound on wooden drums and delivered to the dispatching department; here the drums are battened down, marked and lifted by overhead travelling cranes on to trucks or lorries for dispatch.

A large section of the factory is devoted to the production of dry-core telephone cables in a similar continuous and progressive manner. The individual core wires are wrapped with paper of distinctive colours, and the next machine lays up the required number of pairs together, giving the correct length of lay to each layer, and the whole of the cores are then bound together with an outer paper wrapper (see fig. 6). They then follow the course of the power cables, through the drying ovens, lead presses, and testing tanks, omitting, of course, the impregnation processes. In this type of cable the paper insulation may be applied either helically or longitudinally and held in position by a cotton or flax lapping. The special feature of the construction of the cable is that it permits a third circuit to be superposed on each two-pair core, thus increasing the number of circuits by 50 per cent. In operating a cable in this manner it is important that the overhearing between the circuits shall be so small as not to interfere with the satisfactory working of the cable. This is especially important in a cable with a high transmission efficiency, both on account of the lower attenuation constant of such cables and on account of the fact that they are usually "loaded" and consequently have a higher impedance and operate at a higher voltage. To ensure that overhearing between the circuits shall be small, it is necessary that the electrical constants of the cable shall be

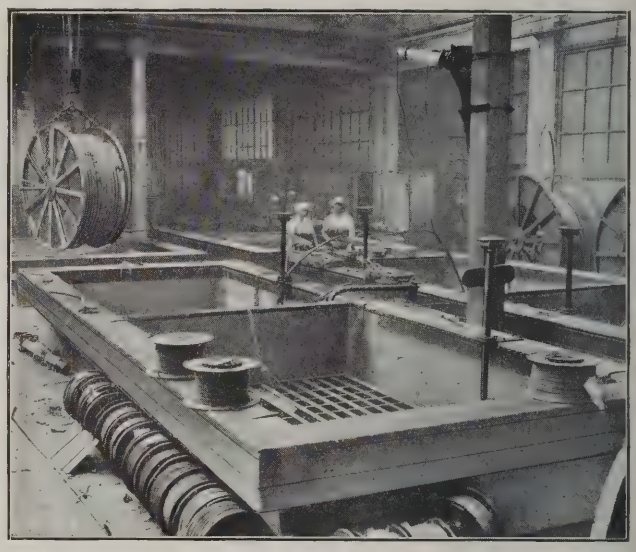


Fig. 5.—Testing Tanks.

uniform, and particularly that there shall be no resistance or capacity unbalance. These can be considerably reduced by care in manufacture, but it is also necessary



Fig. 6.—Insulating Air-spaced Telephone Cable.

to employ special methods when installing the cables to ensure that these "unbalances" are reduced to a minimum. The use of superposed circuits has considerably increased the number of circuits which can be contained in a given size of sheath. This increase in the circuit capacity of a cable has made essential a higher standard of maintenance than has hitherto been necessary. Modern methods of drying and special precautions during manufacture and installation have to be taken to enable the high insulation resistance required by the General Post Office to be obtained.

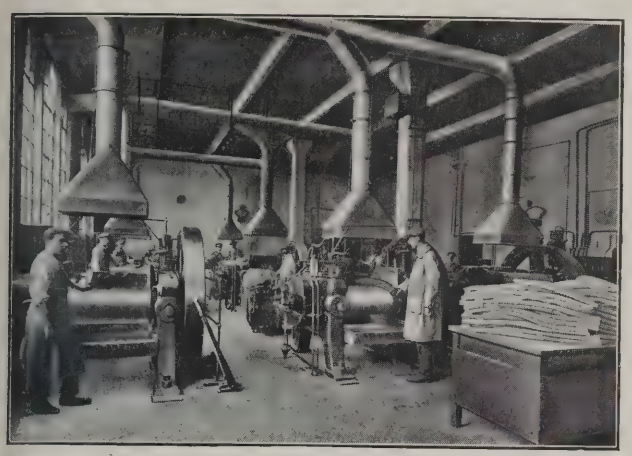


Fig. 7.—Rubber Mixers.

Another extensive portion of the works carries out the production of rubber-insulated cables, including telephone cords and flexibles. The rubber mixers are illustrated in fig. 7. A special formula is followed in the preparation of the rubber compound, but the sulphur necessary in the vulcanisation process is added in such a way that subsequent heating effects thorough and uniform vulcanisation. The wire used in these cables has, of necessity, to be tinned; this is carried out at the Eastleigh works. When the wires have been stranded, a coat of pure Para rubber is first applied, in the form of a tape about 2 in. in width. Covers of rubber compound are then applied, and the cable is subjected to heat to convert its covering into a solid vulcanised mass. One of the most interesting of the subsequent processes is the braiding. The company has a very large number of braiding machines (fig. 8), the bobbins of which wind in and out at a great speed, producing a closely-woven cover of cotton. This section gives a relieving touch to the general drabness of the factory, for cottons and silks of a variety of hues are employed in the braiding process.



Fig. 8.—Braiding Machines.

Mention must be made of the Social Club which the works staff has organised, and for which the company has provided accommodation at the western end of the works. Tennis, football, cricket, sailing, and photography are all included and catered for, and during the winter months successful dances are held.

An All-Electric Housing Scheme.

Particulars of the Glasgow Corporation's Electrically-Equipped Houses.

By R. HARDIE.

It may be recalled that as early as 1915 Mr. George Hamilton, a Glasgow builder, erected some thirty 4- and 5-apartment bungalows, equipped throughout with electric lighting, heating, cooking and water-heating apparatus. After ten years these houses and their equipment remain a tribute to the enterprise and foresight of that now almost extinct individual, the private builder. The people of Glasgow are wont to claim that Lord Kelvin's house was the first electrically lighted house in the world, and it is thought that Mr. Hamilton's electric houses in the Dumbreck suburb of Glasgow were amongst the first chimney-less houses in this or any other country. All honour to this pioneer builder who had the enterprise, or temerity as it was looked upon in those days, to provide this early object lesson on the value of labour-saving houses. To-day the local authority is usually entrusted with the erection of houses, and the 290 houses described herein are the first completed all-electric houses erected by the Glasgow Corporation. A further 510 similar houses have been authorised, and are at present in the process of erection. Each house is furnished with electric lighting throughout, an electric cooker, a wash boiler, and provision for electric fires in all rooms except the living room. The houses are 3-, 4- and 5-apartment buildings situated at Mount Florida and Possilpark. Each 3-apartment house consists of a living room and two bedrooms; the 4-apartment houses each comprise a living room and three bedrooms, while



Fig. 1.—All-Electric Houses at Mount Florida.

each of the 5-apartment houses contains a living room, a sitting room and three bedrooms. Every house also has in addition a bathroom and a "kitchenette."

A 7-kW electric cooker of the Glasgow Corporation's standard hiring type, complete with a three-pint copper electric kettle, 800 W, is part of the equipment of each house. A cast-iron wash boiler fitted with a 4-kW immersion heater is also installed, and it is interesting to note that for over a year not a single case of breakdown in the heaters has occurred, although they have in several instances been allowed to remain on circuit for many hours with the boiler not in use. Under normal conditions an abundant supply of hot water is obtained from the living-room coal fire, which, due to the rigour of the Scottish climate, is necessary throughout the greater part of the year. In several houses immersion heaters in the storage cylinders, for hot water supply when the coal fire is out of use, have been installed at the consumer's expense. Heating sockets are installed in all the rooms except the bath and living rooms to specification, but in many cases the tenants have had sockets fitted in the remaining rooms at their own expense. In fig. 4 is shown a view of one of the bedrooms equipped with the following electrical apparatus: bedwarmer, hair dryer, curling tongs and comb, violet-ray apparatus, trouser press, kettle, table lamp and fire. In addition, a socket for an electric iron is provided, usually in the kitchenette or living room. Electric fires are provided as follows: one 2-kW fire in each 3-apartment house, two 2-kW fires in each of the 4-apartment houses, and two similar fires and one of 1 kW capacity in each of the 5-apartment houses. The entire electrical equipment is provided by the Housing Authority, and there is no hire charge payable by the tenant. The electricity department undertakes the maintenance of all electrical heating and cooking apparatus in the houses. This cost has been found negligible except in the case of the cookers, but with improved types of cookers it is hoped shortly to eliminate, or at least reduce, the cost under this head.



Fig. 2.—An Electric "Kitchenette."

The tenants have the option of being charged at a flat rate of 4½d. per kWh for 730 hours' use per annum of the maximum demand, which in the case of a 3-apartment house is 70 kWh per annum; a 4-apartment house, 100 kWh; and a 5-apartment house, 150 kWh, all over this quantity being charged for at ¾d. per kWh; or a fixed service charge per month, plus ½d. per kWh for all energy consumed. The fixed charge for a 3-apartment house is 6s. 6d.; a 4-apartment house, 7s. 7d.; and a 5-apartment house, 8s. 8d. per month. The majority of the tenants take advantage of the latter scale, its simplicity appealing to them. The returns of the electricity department show that the average weekly bill for a 3-apartment house is 3s.; 4-apartment house, 3s. 6d.; and a 5-apartment house, 4s. 6d. These figures confirm the fact that electrical service has nothing to fear from close comparison on the score of cost with the older methods of lighting, heating and cooking, which it is gradually superseding.



Fig. 3.—One of the Living Rooms.



Fig. 4.—An Electrically Equipped Bedroom.

The Director of Housing estimates that the saving effected in building construction due to the elimination of fireplaces amounts in the case of a 3-apartment house to £27 10s., and in that of a 4-apartment house to £34; which means that a house to-day can be built and equipped with electrical apparatus, including cooker,

wash boiler, and electric fires, as cheaply as a house without these conveniences. An appreciation of this, coupled with the fact that the houses, when built, can be operated at a cost within the means of the average tenant, should lead to a speedy extension of this type of house in the immediate future. The latter condition is, of course, dependent upon the price of electricity in the area, but a growing number of authorities, both municipal and company, in view of the growing appreciation of the possibilities of the domestic load, are now offering electricity at terms which may be considered attractive.

As stated, there are no open fires or fixed fireplaces in any of the rooms apart from the living room, and the resultant additional wall space available in the rooms is much appreciated by the tenant. The rooms are found to be efficiently heated by the electric fires provided, and the absence of the usual accompaniments of the coal fire (ashes, dust and smoked ceilings) is very noticeable. The average height of the ceilings is 8 ft. 6 in., and each room is ventilated by means of a ventilating grating near the ceiling, leading into a ventilating shaft.

Whilst pressing for this business, the Glasgow Electricity Committee urged the desirability of demonstrating on a somewhat larger scale than had been hitherto possible, that an electric house would prove satisfactory to the occupants, and what is important, the running cost would be moderate and well within the means of those who occupied the houses. It was confidently anticipated that the bulk experience gained would confirm that previously obtained in individual cases, and do much to remove the impression generally held that electricity was expensive. More than 100 of the houses have now been occupied for twelve months, and there is no reason to doubt the accuracy of this contention. The occupants themselves, mostly from houses with gas installed, are thoroughly satisfied, and the undertaking's demonstrator, who keeps in touch with them from the date of entry, reports that they fully appreciate the change-over, and experience no trouble whatever in operating the electrical apparatus.

Fig. 2 shows a view of the kitchenette of one of the all-electric houses, from which it will be seen how conveniently spaced and wired for is the electrical equipment. A view of one of the living rooms with an electric fire installed appears in fig. 3, while fig. 1 gives a general view of the houses at Mount Florida.

Lighting and Power Notes.

Australia. — Greater Brisbane. — After conference with representatives of the Brisbane Tramway Trust, the Electric Light, Power and Transit Committee of the Greater Brisbane Council has recommended that, before proceeding with the erection of a large power house, negotiations shall be entered into with the City Electric Light Co., with regard to acquisition of the company's undertaking.—*Electrical Engineer of Australia and New Zealand.*

Basingstoke.—Loan.—The Town Council has applied for sanction to a loan of £1,600 for extending the supply of electricity to Old Basing and district by means of overhead cables.

Bexhill.—Year's Working.—The accounts of the Corporation electricity undertaking (engineer, Mr. C. A. Frost) for the year ended March 31st, 1925, record a total revenue of £30,242, as compared with £27,325 in the preceding year. Working expenses amounted to £17,910, as against £16,808, leaving a gross profit of £12,332 (£10,517). After providing for capital charges, a net surplus of £3,709 remained, as compared with £959 in 1923-24. The capital expenditure during the year amounted to £15,066. The electrical energy sold increased from 1,244,774 to 1,470,012 kWh, and the maximum supply demanded from 965 to 1,115 kW. The Electricity Commissioners have refused to sanction the installation of additional generating plant at Ashdown Road, and an agreement has therefore been entered into with Hastings Corporation for a bulk supply. Sanction has been received to install two 750-kW motor converters with the necessary switchgear, for this purpose.

Blackburn-Preston.—Linking-up Scheme.—The linking-up of the power stations at Blackburn and Preston with a high-voltage cable has been commenced. Work was started at Hoghton, which is about midway between the two towns, and the cable is being carried in the direction of Blackburn first. The work will take about four months to complete. The Leyland cable is nearly finished, and it is expected that it will be available for service by about the beginning of November.

Colchester.—Loan.—The Town Council has decided to borrow from the Ecclesiastical Commissioners £130,000 for its new electricity works. The new works are now in course of erection at the Hythe, Colchester.

Continental.—Portugal.—The Government, having decided to encourage the construction of hydro-electric works, has granted a concession to the Companhia das Quedas d'Agua do Norte de Portugal for the development of power from the waters of the Cavado and Rabagao rivers. It is proposed to establish the first central power station at Villa Nova, where the two rivers meet, to supply 13,400 h.p. It is hoped, however, by the fuller utilisation of the two rivers, to increase the output to 42,000 h.p. Similar work is to be undertaken on the Paiva River, from which it is expected to obtain from 8,000 to 20,000 h.p., as development proceeds. The northern hydro-electric installation will be completed in five years, and the scheme will be financially supported by the Government, an influential group of French financiers and local firms. To finance the second project, a syndicate has been formed by the Companhia do Credito Predial Portuguez and the Banco Ultramarino.—*Reuter's Trade Service* (Lisbon).

Italy.—The Societa Generale Elettrica Tridentina plans to erect two new power plants, capable of generating about 230,000,000 kWh per annum. They will cost about 100,000,000 lire.—*Commerce Reports.*

Austria.—A new hydro-electric power station has recently been completed and put in operation at Gampadel, near Montafon. The plant comprises two 4,500-kVA turbo-generators, space being provided at the station for the installation of a third set of similar capacity at a later date. Energy is generated at 6,000 V and stepped up to 45,000 V for transmission purposes.

Rumania.—A scheme is under consideration for the establishment of a plant to utilise the water power of the River Jalomitza between Scopoasa and Tatinculni. Half the energy generated would be reserved for traction purposes on the Roumanian State railways and the remaining portion transmitted to Bucharest for lighting and power purposes.

Crediton.—Electricity in Bulk.—At a meeting of the Urban District Council on August 31st, a report was submitted on the negotiations with Exeter Electricity Committee relative to a bulk supply of electricity to the district. It was stated that the Committee had reduced the minimum charge to £250 for the first year, £300 for the second year, £350 for the third, and £400 for the fourth. The Council has accepted the Committee's terms.

Dorking.—Proposed Purchase of Undertaking.—The Urban District Council is considering the purchase of the local electricity undertaking, operated by Messrs. Edmundson's Electricity Corporation, Ltd., under an agreement. The present contract expires in 1928.

Elland.—Electricity Supply.—Subject to the Halifax and Huddersfield Corporations agreeing, in connection with the linking up scheme, to lay cables on brackets outside Elland Bridge, the Urban District Council has decided to withdraw opposition to the scheme.

Evesham.—Progress of Scheme.—At a recent meeting of the Town Council it was reported that the electricity scheme was making progress. The cable extended as far as Abbots Morton and it was hoped to have a supply available for the town in October.

Federated Malay States.—Electricity Supply Progress.—*Eastern Engineering* states that the report of the chief engineer of the Federated Malay States Electricity Board (Mr. J. C. M. Matthews) for the year 1924 shows that the net profit on the Board's three main installations was $104,602. The Kuala Lumpur undertaking showed an increase in the sales of electrical energy of 255,787 kWh, the total sold being 2,495,235 kWh; the sales of the Ipoh undertaking were 671,235 kWh; and the energy sold by the Seremban undertaking amounted to 352,400 kWh. The Seremban installation was taken over from United Engineers, Ltd., at the commencement of the year. The plant at this station consists of five Ruston & Hornsby crude oil engines, driving Crompton d.c. generators, with a total capacity of 580 kW.

Grays Thurrock.—Street Lighting.—The County of London Electric Supply Co., Ltd., is carrying out the street lighting of the district, and has placed an order with Messrs. Venner Time Switches, Ltd., for time switches in connection with the scheme.

Halifax.—Inauguration of New Plant.—An additional 10,000-kW turbo-generator was started by Ald. Sutcliffe, vice-chairman of the Electricity Committee, at the Corporation electricity works on September 3rd. The new set runs at a speed of 3,000 r.p.m., and has a maximum continuous output of 12,500 kW. The ceremony is dealt with in our "Notes" columns.

Hastings.—Power Station Closed.—The Corporation's electricity works at Earl Street was formally closed down by the Mayor on August 31st. All the energy required is now generated in the new Broomsgrove works.

India.—Mandi Scheme.—According to *Indian Engineering*, the Administration Report of the Buildings and Roads Branch of the Public Works Department, Punjab, for 1923-24, states that Major R. N. Aylward investigated 150 sites for developing the water power resources of the Punjab and reported that about two million horse-power is capable of economic development. Of these sites the Mandi hydro-electric scheme is the first to be taken up, and carried out in stages. In the first

stage the River Uhl will be diverted and dropped 1,800 ft., creating 26,000 kW at a cost of under five crores. At the next stage by the addition of a dam another 44,000 kW will be secured at a cost of about one crore more. The third stage will give another 48,000 kW by the construction of a fall of 1,200 ft. Further developments will bring the total up to 177,000 kilowatts. It is calculated that the Uhl water power will suffice for the area from Saharanpur to Sialkot.

Electrical Development.—*Commerce Reports* states that the Municipal Council of the city of Vellore, Madras Presidency, which has a population of approximately 225,000, has been considering the installation of plant to furnish electricity for that city. The system of Madras has been studied. The report submitted would seem to show that the capital required for this scheme would be 440,000 rupees; that the municipality should have 1,400 lights for the streets, and that there would be 1,000 private consumers. No definite action has yet been taken.

Japan.—Kobe.—According to *Eastern Engineering*, the Municipal Electric Bureau recently started up a 12,500-kW set at Minatogawa as the second stage of the electricity extensions. The principal object of the extension is, however, to provide against a breakdown in the existing supply, and it is not intended to meet the yearly increasing demand in Kobe and Hyogo. Recently the head of the Bureau and the deputy mayor considered the necessity of increasing Kobe's present electricity supply to 50,000 kW, taking the local consumption for the next ten years into consideration. For this plan 18,000,000 yen is required. The floating of a public loan is projected.

Lytham-St. Annes.—Electricity Supply Progress.—The Town Council is applying for sanction to borrow £33,000 to carry out various works in connection with the electricity undertaking. The chairman of the Electricity Committee stated at a recent meeting of the Council that the increased demand for energy necessitated this step. During the year ended March, 1925, 3,352,000 kWh was sold, being an increase of half a million on the previous year, and nearly double the output of 1921. During the last four years the consumers had increased from 2,513 to over 7,000, and the requirements of 2,000 or 3,000 more consumers were being provided for. In addition, new mains were required from Squires Gate to Freckleton, a distance of nearly eight miles.

New Zealand.—Horowhenua Power Board.—According to the *Electrical Engineer of Australia and New Zealand*, the Horowhenua Power Board reports satisfactory progress during the year ended March 31st, 1925. The Board's reticulation consists of 105 miles of 11,000-V lines, 167 miles at 400 V, 50 miles for street lighting, and 36 miles of service lines. The supply to the boroughs of Otaki and Foxton is given through outdoor sub-stations. There are 61 sub-stations in operation, with a total capacity of 2,115 kVA. In all cases the transformation is from 11,000 to 400 V. The total number of consumers now connected to the board's lines is 1,583. Mr. T. R. Overton is engineer.

Peterborough.—Loan.—The Corporation Electricity Committee is applying for sanction to a loan of £1,950 for h.p. cables and switchgear.

Peterhead.—Electricity Supply.—At a meeting of the Town Council on August 31st, it was agreed to approve of a scheme submitted by the National Electric Supply Corporation to install plant for the provision of an electricity supply for the town.

Plymouth.—Loan Sanction.—The Electricity Committee has received sanction to a loan of £7,450 for converting plant.

Salford.—Electricity in Bulk.—The Electricity Committee has passed a resolution agreeing, in accordance with the recommendation of the South-East Lancashire Electricity Advisory Board, as a temporary arrangement, to provide Eccles Corporation with a bulk supply of electricity during the forthcoming winter.

South Africa.—Fort Beaufort (Cape Province).—The Municipal Council proposes to raise a loan of £8,000 for the provision of an electric lighting scheme.

Dorarecht (Cape Province).—The Corporation has decided to expend £6,500 on an electric lighting scheme.

Hope Town (Cape Province).—A ratepayers' meeting has adopted Mr. Val Davies's electric lighting scheme at a cost of £7,000.

Wynberg (near Cape Town).—The Municipality proposes to spend £9,000 on transformers and cables.

Special Orders.—Application has been made by the Electrical Distribution of Yorkshire, Ltd., for Special Orders authorising it to supply electricity in a number of urban and rural districts in the West Riding.

Application has been made to the Electricity Commissioners by the Urban District Council of Colwyn Bay and Colwyn to amend the Colwyn Bay and Colwyn Electricity (Extension) Order, by inserting provisions authorising the Council to charge certain maximum prices for electricity supply in the areas to be added under the Order.

The Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them for the supply of electricity by the Lancashire Electric Power Co., in parts of the rural districts of Blackburn, Burnley, and Clitheroe.

Stretford.—Electricity Charges.—The Electricity Committee has decided that the scale of the basic tariff charges for power shall be amended, and that in lieu of a fixed charge of 25s. per h.p. of measured demand per quarter, the charge shall be 13s. 4d. per h.p., plus a running charge of .35 pence per kWh for energy as metered; also that the minimum consumption required under the scale shall be abolished.

New Plant.—The Committee is to purchase a 250-kW rotary converter, at an approximate cost of £1,700, for the purpose of giving an additional supply of electricity to Messrs. W. T. Glover & Co., Ltd.

Tarporley. — Scheme Approved. — The Urban District Council has given its consent to the application of Chester Corporation for a Special Order to supply electricity in the Council's area.

United States.—Electrical Development.—Contracts for the installation of a complete generating set for the new power plant of the Comal Power Co., a subsidiary of the San Antonio Public Service Co., at New Braunfield, Texas, have been awarded to the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pennsylvania. Included in the equipment is a 45,000-h.p. steam turbine and a 30,000-kW, 13,000-V generator. The plant, which will cost about $3,000,000, is expected to be completed within a year. It is designed to use powdered coal and will utilise the low-grade coal or lignite mined in the vicinity.—*Power.*

Installation of the second 30,000-kW unit of the new 200,000-kW power station of the Metropolitan Edison Co. on the Susquehanna River at Middletown, Pa., was recently commenced. The first set was placed in operation early this year, and the second is expected to be ready for service in March, 1926.—*Electrical World.*

Wakefield.—Loan Sanctioned.—The Town Council has received sanction to a loan of £15,000 for mains and services.

Wirral.—Electricity Supply.—The Electricity Committee of the Rural District Council, after considering the offer of the Birkenhead Electricity Committee to supply the whole of the parishes in Wirral with electricity at a cost of 6½d. per kWh (inclusive of the distribution charges, cables, &c.), has declined the offer and has decided to proceed with its own scheme at a cost of £180,000. Under this arrangement, the Wirral authority will obtain bulk supplies from Wallasey Corporation and the Mersey Power Co., Ltd., Ellesmere Port.

Tramway and Railway Notes.

Aberdeen.—Year's Working.—The report on the working of the Corporation tramway undertaking (general manager: Mr. W. Forbes) for the year ended May 31st last shows a total income of £189,247, as compared with £181,985 in 1923-24. Working expenses increased from £142,808 to £150,691, and there was a gross profit of £38,556 (£39,177), to which was added interest on investments of £5,290, making a total of £43,846. Capital charges absorbed £43,407, leaving a net surplus of £438 as compared with £2,875 in the preceding year. The capital expenditure during the year amounted to £30,247, of which £14,754 was spent on permanent way. The number of passengers carried increased by 1,930,554 to 43,201,580, and the car-miles run from 2,436,794 to 2,675,785. The extension of the Queen's Road route to Hazlehead was completed during the year. The fiftieth anniversary of the undertaking was celebrated on September 1st, 1924.

Blackpool.—Tramway Improvements.—The Corporation will shortly commence a road improvement scheme in connection with its Fleetwood tramway route. In Lord Street and North Albert Street, Fleetwood, the pillars carrying the overhead wires for the tramway are to be moved from the centre of the roadway to the side, and, in addition, the two sets of lines, which are now 10 ft. apart, are to be moved closer together.

Burnley.—Year's Working.—The report on the working of the Corporation tramway undertaking (general manager: Mr. H. Mozley) for the year ended March 31st last shows a total revenue of £165,620, as compared with £159,893 in the preceding year. Working expenses increased from £123,113 to £130,800, leaving a gross profit of £34,819 (£36,780). After deducting capital charges, and a loss on the motor-omnibus system of £165, there was a net surplus of £12,352, which was transferred to the relaying and renewals account. The previous year's working resulted in a surplus of £15,065. The number of passengers carried increased from 21,758,743 to 23,550,878, and the car-miles run from 1,789,406 to 1,902,058.

Continental.—Germany.—A proposal that the railways in Wurtemburg should be electrified at the same time as those in Baden and Bavaria has been submitted to the Reichstag.

Italy.—The Società dei Tramvie Elettriche Provincia di Imperia has secured a concession for the construction of an electric tramway in the town of Imperia. The steam tramway between Caldiero and Tregnano is also to be converted to electric traction.

Japan.—New Tramways.—A petition has been presented to the Hyogo Prefectural Office by Mr. K. Morimoto, of Osaka, and others for permission to lay a tramway between Koshiki, on the Hankyu line, and Uchide, *via* Kurakuen. The line would cover a distance of 2.8 miles, and the promoters intend to start a company with an authorised capital of y. 500,000. A tramway between Kurakuen and Kurakuen-guchi has already been sanctioned by the Kencho.—*Eastern Engineering.*

Leeds.—Reduction of Fares.—The City Council has decided to reduce the tramway fares from 2½d. to 2d. and 4d. to 3d., and so on *pro rata*, with a maximum through fare between the city and any terminus (except Morley) of 3d. It is estimated that the reductions are equivalent to a loss of revenue of approximately £50,000 per annum.

London.—Piccadilly Station Progress.—Good progress is being made with the construction of the new tube station at Piccadilly Circus. On the site where "Eros" stood, a working shaft has been driven down to a depth of 26 ft., and from the bottom of this, the narrow "pilot tunnel" of the main escalator shaft is already bored to a further depth of 42 ft. This shaft will house three moving stairways abreast. At the lower end of it a landing is now being constructed, and from this point two pairs of escalators will connect with the Bakerloo and Piccadilly lines. An area of 15,000 sq. ft. will be devoted to the booking hall. The reconstruction of this station is one of the biggest schemes included in the Underground Company's programme of new works. The work is not expected to be complete before the end of 1926, but then the new station will be able to handle 50,000,000 passengers annually.

One-Man Tramcars.—The Hanwell to Brentford route of the London United Tramways is now entirely operated by tramcars of the one-man type, and the service has been increased by 50 per cent. One of the principal features of interest of the new cars is the automatic doors which, being interlocked with the "steps," cause the latter to fall into position when the car stops and fold up again before the car re-starts. The driver is unable to start until the doors are closed, and it is also impossible for passengers to open the doors whilst the car is in motion.

Worcester.—Railless Cars.—A recommendation has been made to the City Council in favour of giving authority to the Streets Committee to apply for Parliamentary powers to work the tramway, to convert it to the railless-car system, and to provide a fleet of omnibuses in the city and outside on routes approved by the Ministry. A report has been prepared by Mr. Alfred Baker, manager of Birmingham Corporation tramways.

Telegraph and Telephone Notes.

China.—Radio Development.—The Japanese Foreign Office states that the Peking Government has approached Mr. Yoshizawa, the Japanese Minister in Peking, regarding the settlement of the radio question. China, it appears, proposes the raising of a joint Japanese-American loan for the purpose of constructing a Chinese radio system in conjunction with the existing Japanese system. Owing, however, to the vagueness of the Chinese suggestions, Japan does not intend to take any action until further details are received from Peking.—*Reuter* (Tokio).

Germany.—Cable Loading.—Herr Wagner, the president of the Telegraph Institute of Berlin, in the course of a recent address on "Trans-Oceanic Telegraphy," referred to the Western Electric Co.'s method of overcoming the effect of capacity by a self-induction device, surrounding the whole length of cable with a thin band of "permalloy." He said that the technical laboratory of the German Telegraphs, in collaboration with a number of electrical concerns, had produced an alloy containing only 40 per cent. nickel which could be used in substitution for "permalloy." This new alloy is, states *Elektrotechnik und Maschinenbau*, being used in the German-American cable which is being laid by the German Transatlantic Cable Co.

International Telegraph Conference.—Paris Meeting.—The International Telegraphic Conference, briefly referred to last week, was formally opened at the Sorbonne in Paris on September 1st. The French Minister for Commerce and Posts, M. Chaumet, welcomed the delegates and the commercial delegate for Portugal, where the last conference was held, replied. The leading French delegate, M. Daletete, then took the chair and the conference split itself into four committees to deal with the different subjects on the agenda, the most important of which are an increase in tariffs and code messages. As regards the latter, there are various motions on the agenda for changing the existing classifications into clear "code" and cipher; at present pronounceable non-dictionary words are classed as "code" and must not exceed ten letters, while unpronounceable words (including figures) are "cipher" and must not exceed five letters. One proposal is to class all words in letters, whether pronounceable or not, as "groups" to be treated as code and to limit cipher to figures. Another suggestion is equivalent to the abolition of "code" and the classification of all non-dictionary words as "cipher." The former course would result in a reduction of cost, while the latter would have an inverse effect. It is understood that the British and Dominions delegations are opposed to the principle of an increase of tariffs in any form, and it is expected that there will be a big fight on this matter. Another question is the priority of telegrams; at present no priority is allowed for what may be called "life and death telegrams" affecting the safety of persons, and it is proposed to award priority in this connection. International telephone rates and the relations between wireless and cables are also on the agenda. French is the only language which may be used at the Conference and no interpreters will be allowed; this will handicap delegates who are not fluent French speakers. It has been decided that cable companies and countries which are not members of the Telegraphic Union shall have a deliberating voice in the Committees, but no voting power; the Committee work is likely to occupy the Conference until next month. No decision has so far been reached as regards Press communications.—*Reuter* (Paris).

Italy.—New Telephone Cable.—A new telephone trunk line has recently been completed between Naples and Catanzaro, a distance of approximately 190 miles. New international lines have also lately been inaugurated between Milan and Geneva and between Milan and Berne. Of the latter line about 100 miles is in Italian territory, and part (nearly three miles) is laid in the bed of Lake Maggiori.

Madagascar.—Two radio-telegraph stations have recently been established by the French Colonial authorities—one at Bamako in French Africa and one at Tananarivo, Madagascar. The plant at the Bamako station, which has a capacity of 100 kW, comprises two Bethenod-Latour high-frequency alternators which are operated alternately. Messages can also be sent out by means of spark emitters, this being intended to meet the requirements of navigation and explorers. The necessary power is supplied by two Diesel engines and two steam engines. The power plant, which is adapted to use wood as fuel, is also being utilised to supply the town of Bamako with electricity for lighting purposes until this can be taken over by the hydro-electric station which is being established on the Niger. The plant at Tananarivo is similar to that at Bamako, except that it has a capacity of 150 kW, the distance from Paris being about 5,000 miles.

South America.—Telegraph Concession.—Following the arrival of Señor Francisco Becerra, a representative of the Marconi Company from Argentina, a fortnight ago, *The Times* Lima correspondent announces that the company has in mind the initiation of a series of improvements and extensions of the existing Peruvian postal, telegraph, and wireless services. The scheme, which involves an expenditure of approximately £500,000, includes the erection of a powerful beam station linking up Lima, Buenos Aires, Bogotá, Rio de Janeiro, and the United States. A proposed 25-year concession to the company is under discussion by Congress, and it is thought that the necessary approval will soon be given.

United States.—Aircraft Telephony.—Successful two-way radio telephone communication between aeroplanes and the ground was established in the anti-aircraft test manœuvres just concluded at Fort Tilden, a device having been perfected at the radio laboratories of the signal corps at Camp Vail, New Jersey. A helmet is worn by the aviator, cutting off the noise of the aero-engine and the difficulties caused by the engine's spark system, which had previously prevented successful attempts at communication. The aviators using the radio telephone could hear the land station from a distance of eighty miles, while the airman could talk with the station from a distance of thirty miles.—*Reuter* (New York).

Radio Notes.

Aerials.—Control by Public Authorities.—On Tuesday last the Public Health Act, 1925, came into operation. Section 26 of this Act empowers local authorities to make by-laws for the prevention of danger or obstruction in streets or public places by aerials used in connection with radio-telephony and telegraphy.

Interference Elimination.—Wavelength Tests.—British and European broadcasting stations are continuing their night tests of the efficiency of the newly-allotted wavelengths as a means of preventing interference between stations. So far as Great Britain is concerned, results are regarded as satisfactory notwithstanding the fact that some disturbance was experienced from unexpected sources. Equilibrium will doubtless be established by the time the test transmissions have ended, but wavelengths will probably have to be modified still further before an amicable understanding is arrived at. It is to be noted that the new wavelengths are not based on length, but on frequency, thus introducing fractions of a metre. The last test transmission will take place on Monday night, September 14th.

Radio Exhibition.—Last year's radio exhibition in Berlin showed the restrictions of the German postal authorities to have been somewhat severe. Government regulations were modified on September 1st, 1925, however, so as to permit the production of apparatus that will receive on any wavelength up to 3,000 metres, and the change was made known to manufacturers in time to allow them to prepare entirely new apparatus for the show which is being held in Berlin from September 4th to 13th. The granting of amateur transmitting licences is also under consideration.

United States.—Amateurs' Convention.—The third International Convention of the American Radio Relay League was held at Chicago, concluding on August 21st, and aroused much enthusiasm, the subjects dealt with by prominent radio authorities covering a usefully wide range. A plea was made for more attention to be given to the use of efficient transmitters, in order to reduce the power expended. Mr. J. C. Warner, of the American G.E.C., announced the completion of work that will assist the standardisation of valve bases and sockets.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—Melbourne.—November 9th. Electricity Commission of Victoria. 6,600-V and l.p. lead-covered and armoured cable. 22,000-V, 3-core cable and accessories. (September 4th.)

P.M.G.'s Department. October 27th. Telephone transmitters and parts.*

November 10th. Telephone receivers and parts.

November 17th. Magneto-automatic junction material.*

Birkenhead.—September 17th. Mersey Railway Co. Stores, *viz.* :—Electrical sundries, &c., and metallic and carbon-filament lamps and fittings. Form of tender from Mr. J. Shaw, general manager and secretary, Central Station, Birkenhead.

Brentford.—September 22nd. Board of Guardians. Electric wiring, &c., at the Institution, Warkworth House, Isleworth. (September 4th.)

Croydon.—September 14th. Board of Guardians. Six months' supplies of electrical fittings and accessories. Mr. N. P. Walker, clerk to the Guardians, Mayday Road, Thornton Heath.

Dundee.—Town Council. Electric lighting work at Strathmore Avenue housing scheme. Particulars from Mr. Geo. Baxter, city engineer.

Gainsborough.—October 17th. Urban District Council. Generating plant, mains, transformers, and meters. (September 4th.)

Halifax.—September 15th. Board of Guardians. Electrical fittings (excluding electric lamps) required at several institutions during the six months ending March 31st, 1926. Form of tender from Mr. A. T. Longbottom, clerk to Board of Guardians, Union Offices, Carlton Street.

India.—India Store Department. September 15th. Accumulator and alkaline cells. (September 4th.)

Lanark.—Education Authority. Electric lighting work at school extension at Whifflet. Mr. John Stewart, master of works, 20, Albert Street, Motherwell.

London.—H.M. Office of Works.—September 15th. Supply of electrical and mechanical engineering labour-in-daywork in Cardiff. (August 28th.)

September 24th. Electric wiring installation at the White Wing, British Museum. (September 4th.)

Metropolitan Asylums Board.—October 7th. Installation of a fire-alarm system at Tooting Bec Hospital. (September 4th.)

Islington.—September 17th. St. Mary's Board of Guardians. Electrical supplies for six months. Mr. A. King, clerk, St. John's Road, N.19.

Southwark.—September 23rd. Electricity Department. Twelve months' supply of electric cables. (See this issue.)

Hammersmith.—September 23rd. Electricity Department. Construction of an underground water-tight ferro-concrete pump chamber and overhead pump house at Chancellor's Wharf, also supply of coal for the electricity works. Specifications from the borough electrical engineer.

New Zealand.—Christchurch.—January 5th, 1926. Drainage Board. Three electric sewage pumps. (AX. 2349.)*

Northampton.—The Corporation is inviting tenders for new electric lighting arrangements at the Town Hall.

South Africa.—Johannesburg.—S.A. Railways. October 15th. Incandescent lamps.*

Warrington.—September 12th. Electricity and Tramways Committee. E.h.p. and l.p. paper and lead covered cables. (See this issue.)

September 22nd. Board of Guardians. Six months' electrical supplies for the Whitecross Institution, Warrington, and the cottage homes, Padgate. Particulars from the clerk.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Battery Contracts.—The Edison Swan Electric Co., Ltd., has received contracts for inert cells from the Air Ministry, and for inert batteries from the Admiralty; for dry cells from the Metropolitan Railway Co.; and for dry batteries from the Irish Free State Army.

Bournemouth.—Bournemouth Corporation last week unanimously decided to accept an English tender for 600 tons of steel rails for tramway reconstruction, at a cost of £1,200 more than a Belgian's firm's offer. It was stated that five tenders—three English, one German, and one Belgian—had been received.

Burton-on-Trent.—Electricity Committee. Accepted:—

Two 250-kVA transformers (£478).—Metropolitan-Vickers Electrical Co., Ltd.

Extension of electricity main to Barton (£7,162).—Johnson & Phillips, Ltd.

Darlington.—Electricity Committee. Accepted:—

6,000-kW turbo-alternator (£21,021).—Fraser & Chalmers Engineering Works.

Two boilers (£19,890).—Babcock & Wilcox, Ltd.

Derby.—Corporation. Accepted:—

Erection of patent automatic floatswitch, sewage-lifting plant with automatic electrically-driven air-compressing plant, with duplicate sets of electrically-driven storm-water pumping sets, fitted with automatic control gear, for the Cowsley housing estate.—Daniel Adamson & Co., Ltd.

Dundee.—Housing Committee. Recommended:—

Electrical work at new houses:—Stirling Park: D. J. Macdonald, Ltd. (£200); Lawton: Hutton & Co. (£1,752).

Farnborough.—Air Ministry. Accepted:—

2,100-amp.-hr. battery, with charging apparatus.—Alton Battery Co., Ltd.

Fleetwood. Accepted:—

Installing electric lighting in semi-detached houses in Agnew Road.—W. Roskell and E. Swarbrick.

India.—India Store Department.

Spares for 750-b.h.p. Diesel oil engine (Rs. 18,590), English Electric Co., Ltd.; 25 a.c. ceiling fans (Rs. 2,938).—General Electric Co. (India), Ltd.—*Indian Engineering.*

Lamp Contracts.—The Admiralty has placed a contract for 99,100 "Osram" vacuum lamps, 3,161 "Osram" gas-filled lamps and 150,700 "Robertson" filament lamps with the General Electric Co., Ltd. The Southern Railway has accepted a tender for a six months' supply of "Mazda" lamps from the British Thomson-Houston Co., Ltd.; and for a six months' supply of "Osram" metal-filament vacuum and gasfilled lamps and "Robertson" carbon-filament lamps from the General Electric Co., Ltd.; it has also placed a six months' contract for vacuum and gas-filled-type lamps with the Siemens and English Electric Lamp Co., Ltd.

London.—Metropolitan Asylums Board.—Institution Committee. Recommended:—

Alterations and extensions to electric lighting at North-Eastern Hospital:—

Alpha Manufacturing & Electrical Co., Ltd. (Recommended.)	**£465**
Smethurst & Co. (London), Ltd.	521
Riddle & Goddard, Ltd.	557
Toy & Winslow	585
A. Hawkins & Sons	630
T. Clarke & Co., Ltd.	636
L. J. Godfrey	639
Berry Bros.	650
Coley & Swinnerton, Ltd.	723
H. R. Hall & Co.	804
North Metropolitan Electric Power Supply Co.	812
M. Greenwood & Son, Ltd.	821
Best & Wilson	880

Overhauling electric light engines at St. Luke's Hospital (£346).—J. Downton & Co.

Manchester.—Sewers Committee. Accepted:—

Two 25-b.h.p. motors, &c., for Withington works.—Lancashire Dynamo and Motor Co., Ltd.

Tramways Committee. Accepted:—

Steel girder rails and fishplates.—Cargo Fleet Iron Co., Ltd.

Steel clip plates—R. White & Sons.

Newport (Mon.).—Great Western Railway Co.

Five electric capstans at South Quay.—Stothert & Pitt, Ltd.

South Africa.—Durban.—Corporation. Accepted:—

Two 100-kVA 3-phase transformers (£207); two 50-kVA ditto, ditto (£129); three e.h.p. switch cubicles for Hewitt Road sub-station (£317); three tons 19/14 bare copper wire (£266).—T. Barlow & Sons, Ltd.

Eight 250-kVA transformers (£1,376).—Bartle & Co., Ltd.

Two tons No. 10 S.W.G. bare copper wire (£163); two tons No. 8 ditto (£163).—W. T. Henley's (S.A.) Telegraph Works Co., Ltd.

One 500-kW automatic rotary converter equipment (£4,090); fifteen 100-kVA single-phase transformers (£1,207); e.h.p. and h.p. switchgear for Mitchell Park and Evans Road sub-stations (£2,525).—Metropolitan-Vickers Electrical Co., Ltd.—*South African Power Engineer.*

Johannesburg.—Contracts approximating £25,000 have been placed by the Electricity Supply Commission of South Africa for a hydro-electric station at Sabie, Eastern Transvaal:—

Pipe line and accessories and transmission lines.—Dowson & Dobson.

Pelton wheels, generators, crane and lighting set.—Reunert & Lenz.

Transformers and accessories; switchgear, cables, and telephones; lighting installation and test instruments.—Siemens Bros. & Co., Ltd.

Workshop equipment.—British General Electric Co., Ltd.

—*South African Mining and Engineering Journal.*

Singapore.—Municipal Commissioners. Accepted:—

Patent automatic floatswitch sewage-lifting plant, comprising pneumatic sewage ejectors in c.i. tubing, operated by electrically-driven air compressing plant automatically controlled, at junction of Jalan Sultan and Northbridge Road.—Daniel Adamson & Co., Ltd.

Forthcoming Events.

Industrial Welfare Society.—September 11th to 16th. Annual Lecture Conference. At Balliol College, Oxford.

N.A.R.M.A.T. Wireless Exhibition.—Royal Albert Hall, S.W. September 12th-23rd.

Institution of the Rubber Industry.—Monday, September 14th. At the Engineers' Club, Coventry Street, W. At 8 p.m. Paper on "Some Rubber Compounding Tendencies," by Mr. W. B. Wiegand.

Institution of Public Lighting Engineers.—September 14th-16th. At Leeds. Annual meeting and conference.

Notes.

Gas-Men and the "Menace of Electrical Advancement."—Our readers will be interested in the following copy of a "Private and Confidential" communication which was addressed to members of the Society of British Gas Industries by the Chairman of the Council under date August 25th, 1925:—

Dear Sirs,

Our members on the Executive Committee of the British Commercial Gas Association were summoned to an emergency meeting at the offices of the Association on July 29th. I attended and Mr. Tilley also was present at a full meeting of the Executive.

The object of the meeting was to impress upon the members the urgent necessity of a special publicity campaign to be carried out in October, to counteract the activities of the British Electrical Manufacturers' Association who are proposing to run a very intensive publicity campaign in the autumn, with a view to gaining public favour to the Government scheme for subsidising and development of electrical power stations, and the industry generally.

It was suggested that an appeal should be issued to all gas undertakings for a special subscription of 2s. per million to cover the cost of the campaign, which is estimated at about £25,000. Although the B.C.G.A. have not made any special appeal to the Society for financial support they have intimated that any help and co-operation we can give will be very much appreciated.

I will not labour you in this letter with details of the expenditure suggested, or the outline suggestions which were placed before us. Briefly, however, they include:—

1. Special advertising campaign during October.
2. An essay competition.
3. Special gas week throughout the country.
4. A national function at Wembley on a large scale.

The details of the whole scheme are most excellent in every way and very comprehensive. A copy of the complete scheme may be seen at these offices by those who are interested.

The scheme was unanimously approved by the General Committee of the B.C.G.A. at the meeting in the afternoon, and an appeal is being sent out to the industry.

In view of the urgency of this matter, I called a special meeting of our Council on the 13th inst. to lay this proposal before them, at which meeting it was decided to send out an appeal to our members, and I therefore do not hesitate to ask for your assistance.

The menace of electrical advancement through what we consider unfair channels is a very live one, and we cannot allow the activities of our rivals to proceed without vigorously combating the same. This is an opportunity for our Society to show that it is alive to the situation and I therefore beg your generous support, which I shall greatly appreciate.

Would you be good enough to intimate to our secretary the amount of your subscription, which should be received before the middle of September.

Believe me, yours faithfully,
B. B. Waller,
Chairman of the Council.

Electricity v. Gas.—There were frequent references to the competition of electricity with gas at the annual meeting of the Gas Managers' Association of Scotland held at Dunfermline last week. Mr. James Campbell, gas manager, Dunfermline, in his presidential address, said it was being urged that cheap electrical power would be a cure for the evil of unemployment; and yet on the north-east coast of England, where there were the largest super-stations in this country, belonging to an electricity undertaking probably as up-to-date and efficient as any in the world, and supplying current over a large area at very low rates, the depression of industry was as great as, if not greater than, in any other part of the country. The opposition of the gas industry to the proposed subsidising of its rival was in no sense in the spirit of "the dog in the manger," but was conceived entirely from the view that the granting of subsidies to industry was wrong in principle—especially when, as in this case, one industry would be helped at the expense of another in practically the same line of business. That the electrical industry was in no need of help was shown by the dividends paid by the leading companies. All they asked was that each industry should have a fair field, and no favour, and be allowed to work out its development along lines to be decided by its administrators.

Chill Cast Aluminium.—A method of producing chill-cast aluminium articles with a high degree of tensile strength and density is, according to *Aluminium*, being developed by a German firm. It is claimed that these castings can be produced to limits of about ± 0.01 in., and that even in thin walls down to about 0.04 in. in thickness, the full density and tensile strength of the remainder of the casting can be maintained.

Italian Electrical Congress.—The Associazione Nazionale Industrie Elettriche is holding its first congress in Milan on October 2nd, 3rd, and 4th. Among the papers to be read at the meetings are one on "Tariffs, Prices and Payments for Electrical Energy," by Sig. Giacinto Motta, and one on "The Incidence of Electric Power Costs on Industrial Production," by Sig. Renzo Norsi. Visits are to be paid to the Adda power station at Paderno of the Società Edison and the hydro-electric station in course of construction at Chiavenna for the Società Disalpina.

Remagnetising Magnetos. — A correspondent asks if any reader will furnish particulars of the best apparatus for remagnetising magnetos, saying if a large current is necessary, and of the best method and apparatus for magnetising 'phones.

Educational.—London County Council School of Engineering and Navigation, High Street, Poplar, E.14.—Major and minor courses in electrical engineering (session 1925-6) will commence on September 28th (enrolment during week commencing September 21st). Prospectuses and full particulars can be obtained on application to the secretary at the school. (See our advertisement pages to-day.)

We have received the calendar of the Royal Technical College of Glasgow for the 1925-26 session. The electrical engineering department provides preparation courses for the B.Sc. engineering degree and the College Diploma. Evening-class courses are also provided in electrical engineering for students who have already attended satisfactorily a course of electricity and magnetism.

The 1925-26 session of the College of Technology, Manchester, begins on October 8th. Included in the prospectus are university courses and part-time day and evening courses in electrical engineering and allied subjects. The electrical engineering syllabus covers an extensive field of study, and the college is equipped with up-to-date electrical laboratories.

The Polytechnic. — Special courses in wireless and high-frequency engineering have been arranged for the coming session at the Polytechnic, Regent Street, London, by the electrical engineering department. The courses extend over three years and cover the technique of radio communication and testing. A licence has been obtained, and instruction will be given in the operation of a valve transmitter. Students may enrol on September 16th and onwards between 6 and 8.30 p.m. Mr. Philip Kemp, M.Sc., M.I.E.E., is head of the department, and Capt. W. H. Date, B.Sc., A.M.I.E.E., is head of the wireless section.

B.E.S.A. Specification. — The British Engineering Standards Association has issued a British standard schedule of steel for die blocks for drop forging. This schedule, which has been drawn up in co-operation with the Association of Drop Forgers and Stampers, the Alloy Steelmakers' Association, and the National Federation of Iron and Steel Manufacturers, contains specifications for four classes of steel for the die blocks, covering chemical composition, heat treatment and mechanical tests. Copies of this publication may be obtained from the B.E.S.A. Publication Department, 28, Victoria Street, London, S.W.1, price 1s. 2d. post free.

Fatalities.—On September 3rd, a gas-holder at the Rugby works of the British Thomson-Houston Co., Ltd., containing gas for use in the manufacture of incandescent lamps, exploded, causing the death of one man and injuries to three others. A number of workpeople had remarkable escapes from being injured by large pieces of metal hurled for long distances by the explosion.

Electroculture.—An increased yield of 51 per cent. has been obtained in experiments in growing potatoes with the help of electricity at Stubbington, a village near Portsmouth.

The tests were carried out by the schoolmaster, Mr. R. A. Rushforth, with apparatus of his own invention, on a piece of ground tilled by the scholars.

The *Daily Mail* states that when the potatoes which had been grown with and without electricity were dug up the yield was as follows:—

Variety.	Average yield per set. With electricity. lb.	Without. lb.	Per cent. increase.
King Edward	2.44	1.8	35.3
Sharp's Express ...	2. 0	1.2	66.6
		Net increase per cent.	51.0

The apparatus cost about 24s. and could be made by any handyman. The cost of the electricity was 7d. for the season. Mr. Rushforth is confident that the same apparatus would do for a field as well as for a small plot, the additional wire being the only extra requisite.

The potatoes electrically grown were not affected by the usual pests.

Artificial Crop-drying.—The following note appears in *The Implement and Machinery Review* for September 1st:—"The bad weather has done a good turn to the advocates of artificial crop-drying. . . . In one instance a farmer with 1,000 acres under arable, told us that he had 100 acres of corn and did not know what to do with it owing to the rain. On our advice he got in touch with the advocates of artificial crop-drying, and one day during the very unsettled spell of wet weather which marked the earlier and middle days of August, he told us that he had just dried out satisfactorily three stacks of barley and was that day turning his attention to a large stack of oats. What he would have done with the crops under the circumstances had he been denied the assistance of the artificial drier, he did not care to contemplate. Certainly until he got in touch with the makers of the plant he was in a predicament, but he had since found that the artificial drier worked fully up to expectations and had been a means of saving his crops in the wet weather. As many people have decried the artificial method of handling crops as not worth the trouble, we give the foregoing testimony for what it is worth, with the addendum that it comes from a reliable source, the farmer in question being a resourceful man farming on a large scale and employing modern implements and machinery, including steam tackle and tractors, to the full."

Electrical Dishwashers in the States.—Suddenly—almost overnight it would seem—the electric refrigerator has caught the fancy of the American public, and sales of this device are now taxing the capacity of the makers. The electric ice-box holds the imagination of the public as being a near-magic substitute for an at-best troublesome item of household equipment. But in the electric-appliance family there is another Cinderella, also destined to blossom forth at the touch of that belated prince, Popular Interest. This is the electric dishwasher, a device certainly due soon to come into its own in public favour. For the dishwasher is the one electric appliance yet little known or accepted by the public, which has an inherent strong "interest appeal" an appeal as fundamental as its own solution of the problem of 15 hours' home drudgery a week. Properly promoted before the public, the idea of "washing dishes by electricity" possesses certain of the spectacular elements of electric refrigeration and even radio—in ability to stimulate popular interest and to bring new faces into the electric shop. Several dealers we know of are building their full publicity plans about the dishwasher as the magic wand to whisk away the housewife's troubles. These merchants are putting advertising appropriations into this device as a "leader" and as a novelty which will create fresh interest in their general appliance lines—besides selling dishwashers also. Their lead in thus dramatising the dishwasher is one which electrical merchants generally should not overlook. For electrical shops everywhere can well utilise the appeal of this useful appliance as a re-creator of popular interest in the whole electrical idea.—*Electrical Merchandising.*

Appointments Vacant.—Sales engineer (£300) for the Doncaster Corporation electricity department; charge engineer for the Gravesend Corporation electricity works; shift engineer for Swindon Corporation electricity department; two plumber-jointers for the St. Helens Corporation electricity department; power station superintendent for the City of Port Elizabeth electricity undertaking; generating works superintendent (£569), for the Croydon Corporation electricity department. (See our advertisement pages to-day.)

Electric Taxicab Possibilities.—Under this title the *Commercial Motor* suggests the revival of the use of battery passenger cabs in London, considering that the improvements which have been made in the past few years have made this type of vehicle very reliable and satisfactory. Our contemporary says that one of the leading qualifications of the electric vehicle is its rapidity in traffic. This is due both to a high rate of acceleration and the extreme ease of control, and in these respects it cannot be rivalled by the ordinary petrol vehicle. There would, therefore, appear to be a very good case for the electric taxicab, particularly as its smooth running, silence, cleanliness and freedom from smell should appeal to a large class of user. The ordinary taxicab requires a trained staff for its upkeep, but the maintenance of the battery electric taxicab is one of the simplest of tasks. Occasional lubrication at only a few points and cleaning are the main items, the charging, of course, being in the hands of the officials at the power stations. Charging would take place late at night or very early in the morning, when there would be no peak loads, and operating on smooth roads with comparatively few hills (conditions which occur particularly in the Central London area), the mileage per charge should be considerable. The difficulty which was experienced years ago in securing an efficient staff for the maintenance of batteries no longer exists, while there is much fuller knowledge on the whole subject, so that the undue cost incurred under this head is a thing of the past.

New Plant at Halifax.—On the afternoon of September 3rd a new 10,000-kW turbo-alternator at the Halifax Corporation's electric power station at Foundry Street, was started officially by Alderman Sutcliffe, vice-chairman of the Corporation Electricity Committee, and Mrs. Sutcliffe. The machine was supplied by the British Thomson-Houston Co., Ltd., and runs at 3,000 r.p.m. Many visitors were present at the ceremony, including Mr. J. P. Gregory, of the British Thomson-Houston Co., Ltd., who presented Mrs. Sutcliffe with a gold wrist watch. Accompanying Mr. Gregory was Mr. J. Reid, representing Messrs. Worthington-Simpson, Ltd., builders of the condensing plant. Thanks to the "starters" were expressed by Councillors Crabtree and Barrett, who remarked that the Committee had studied very closely the different types of plant to be installed, including 30,000-kW equipment, but had realised what a vast amount of machinery would be standing in the event of such plant getting out of order, and they believed they had selected the "top line" of plant for Halifax or any other town. Alderman Sutcliffe, responding, said he fancied that if progress in the department continued on present lines they would soon have to consider a new station. The party was subsequently conducted over the works, and tea was served later at the White Swan Hotel, under the chairmanship of Alderman Hey, chairman of the Electricity Committee. Alderman Longbottom, proposing the toast of the Tramways and Electricity Committee and the chairman and vice-chairman, said the present outstanding capital on the undertaking was £466,614, and the day was not far distant when they would have to consider whether or not they were on right lines in taking money from the department for relief of rates rather than using it in quicker liquidation of capital. They were all delighted with the new scheme for linking up electricity supply between Halifax and Huddersfield, to the mutual benefit of both towns. The day had come when municipalities must set aside parochial feelings, and he welcomed the scheme. Alderman Hey replied, and Alderman Sutcliffe paid tribute to Mr. Rogerson, the borough electrical engineer, and his staff, and said that without co-operation between the chief and his staff the department could not have progressed as it had done. The Mayor proposed a toast to the contractors, and complimented them on the results of their work. Mr. J. P. Gregory, responding, said the initiative shown at Halifax was evidence that Mr. Rogerson was not only a sound practical engineer, but also a man of commercial ability—proof of which was particularly found in the showroom of the department. In reply to a toast, Mr. Rogerson said he did not think there was a nut or a split pin in the works that had been in when he came 24 years ago. The work throughout had been very enjoyable, more particularly as he had had in Alderman Hey a chairman who was keenly interested in the department, and realised his own personal responsibility.

United States Electrical Manufacturing Plant.—In tables published in the *Electrical World*, taken from the United States census of manufacturers, 1923, particulars are given concerning the numbers, types, and h.p. of the prime movers in use in the electrical manufacturing industry; and also of the coal consumed and the cost of materials, &c. The total number of prime movers in use in 1923 is shown as 52,410, representing 480,268 h.p., against 17,572 machines totalling 226,320 h.p. in 1914. In this total are included 249 steam engines and turbines, 60 internal-combustion engines, 25 water turbines, and 52,076 electric motors (totalling 297,838 h.p.), driven by purchased energy. The number of electric motors driven by energy generated on the establishments is shown as 43,575, aggregating 233,419 h.p. In 1914 the total h.p. of electric motors installed was 262,119, representing 39,568 machines. The amount of coal consumed in the industry during 1923 is shown as 1,417,929 tons, compared with 844,122 tons for 1914. The cost of materials for 1923 is recorded at $548,626,673, against $154,728,076 for 1914. The value of the products is shown as $1,293,001,771 for 1923, as compared with $335,170,194 for 1914.

The Institution of Structural Engineers.—The Council of the Institution has decided that from January 1st next admission to membership of the Institution will be gained by examination only. In the meantime a final opportunity is to be given to those who have some years of practical experience in the profession and who wish to make application for direct admission.

Thermo-Electric Generator.—Experiments are proceeding at Sheffield University with a view to testing the possibility of a new means of generating electricity. According to the *Daily Mail*, Dr. T. F. Wall, head of the Electrical Engineering Department of the University, claims to have obtained, by means of a new process, a form of thermo junction capable of developing about 0.05 volt per junction when heated to the requisite temperature.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

On leaving Croydon to take up his duties as borough electrical engineer at West Hartlepool, Mr. J. H. Parker was presented by the staff and employés of the Croydon Corporation Electricity Works with a gold watch and fitted suit-case. In making the presentation, Mr. A. C. Cramb, engineer and manager of Croydon Electricity Department, referred to the valuable services Mr. Parker had rendered to the undertaking, and wished him every success in his new position.

The Times reports that Mr. C. J. McKenzie, assistant engineer-in-chief of the New Zealand Public Works Department, who is now visiting London, spent five months in Canada and the United States inspecting highways, railroads, marine, hydro-electric, and irrigation works, and will pursue similar investigations in Great Britain and afterwards in France and Italy.

The marriage took place, on September 1st, of Mr. H. W. Tompkins, assistant engineer at the Grays Electricity Works, and Miss N. R. Hills.

Mr. E. E. Smeeton has been appointed power station superintendent in the Cheltenham Corporation electricity department.

Mr. A. B. Blakey, A.M.I.E.E. (manager of the Birmingham office of the Lancashire Dynamo & Motor Co., Ltd., and of the Crypto Electrical Co., Ltd., for 18 years), who has recovered from his illness, has started in business on his own account at 4, Valentine Road, King's Heath, Birmingham.

Mr. W. R. Montgomery, A.M.I.E.E., has resigned his position as resident Midland representative for Messrs. Richard Garrett & Sons, Ltd., to join the Alton Battery Co., Ltd., as manager.

Obituary.—Mr. M. R. Lawrence.—We regret to record the death, which occurred on August 29th, of Mr. Maximilian Robert Lawrence, works manager of the Sterling Telephone and Electric Co., Ltd., Dagenham. Mr. Lawrence was 53 years of age. Previous to taking up his position with the Sterling Company three years ago, he had held managerial posts with well-known engineering concerns, including the Wolseley Tool

and Motor Car Co., Messrs. Vickers, and Burton, Griffiths and Co., Ltd. He was a frequent contributor to the engineering Press and was prominently associated with several engineering institutions.

Will.—The late Mr. A. E. WELLS, managing director of Messrs. Edgar Allen & Co., Ltd., and the Imperial Steel Works, Sheffield, left £49,553 gross, and £46,140 net personalty.

New Companies Registered.

Detex, Ltd. (208,129).—Private company. Registered August 29th. Capital, £600 in 500 8 per cent. cumulative preference shares of £1 each and 400 ordinary shares of 5s. each. Objects: To carry on the business of manufacturers of, agents for, and dealers in wireless apparatus of all kinds, &c. The directors are:—E. L. Conradi, 23, Priory Court, West Hampstead, N.W.6; G. Mellor, 78, Montpelier Road, Hove, Sussex. Solicitors: H. L. Lumley & Co., 35, Piccadilly, W. Registered office: 59, New Oxford Street, W.C.1.

Spectrome, Ltd. (208,134).—Private company. Registered August 29th. Capital, £1,000 in 900 7 per cent. cumulative participating preference shares of £1 each and 2,000 deferred shares of 1s. each. Objects: To carry on the business of engineers, advisers, experts, consultants and contractors in connection with wireless telephony or telegraphy, also tele-optical and any allied or other sections of science, &c. The directors are:—H. S. Taylor, 39, Hillmarton Road, N.7; A. E. Cooke, 53, Graham Road, E.8. Qualification, £50 shares. Remuneration as fixed by the company. Secretary: S. H. Taylor. Registered office: 39, Hillmarton Road, N.7.

Red Seal Products, Ltd. (208,196).—Private company. Registered September 2nd. Capital, £1,000 in £1 shares. Objects: To adopt agreements (1) with Sexton-Barnes, Ltd., (2) with C. Cassell, and (3) with L. B. Tickle and G. F. Pickering, and to carry on the business of merchants, dealers, factors and sales agents of radio instruments, fittings, apparatus and accessories, and articles particularly of the Red Seal loud speakers. The directors are:—C. Cassell, 30, Torrington Square, W.C.1, merchant; L. B. Tickle, 58, Gonville Road, Thornton Heath, engineer; G. F. Pickering, 33, Cranbourne Gardens, N.W.11, engineer. Qualification, £1. Remuneration, £5 each per annum. Secretary: R. J. Boning. Registered office: 32-34, Theobalds Road, W.C.1.

Telephos (1925), Ltd. (208,225).—Private company. Registered September 3rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers or exporters of and dealers in gas and electrical fittings and appliances, and apparatus for wireless telephony, &c. The directors are:—R. H. Bye, 116, Bellingdon Road, Chesham, engineer; Agnes M. Bye, 116, Bellingdon Road, Chesham, secretary; H. L. Down, 6, Sunningfields Crescent, Hendon, N.W., engineer. Qualification, 50 shares. Registered office: The Gardens, Vaughan Road, Harrow.

Roto-Sign Co., Ltd. (208,281).—Private company. Registered September 7th. Capital, £25,000 in £1 shares. Objects: To acquire the business of electric sign manufacturers, electrical and general engineers, illuminating and decorating contractors and general merchants and importers carried on by W. A. McMullen and S. Jarratt at 122, Shaftesbury Avenue, W., as the "Roto-Sign Company." The permanent directors are:—S. Jarratt, 5, Harvard Court, West Hampstead, N.W.6, electrical engineer; and W. A. McMullen, 122, Shaftesbury Avenue, W., electrical engineer. Qualification, £100. Remuneration as fixed by the company. Solicitors: Cooper, King and Co., 6, New Court, Lincoln's Inn, W.C.2.

Avenue Motor Co. (Hull), Ltd. (208,127).—Private company. Registered August 29th. Capital, £1,000 in £1 shares. Objects: To acquire the business now carried on at 84, Prince's Avenue and Henderwell Street, Hull, as the Avenue Motor Co., and to carry on the business of motor garage proprietors, motor hire contractors and motor manufacturers, repairers and dealers, electrical engineers, dealers in all kinds of electrical goods, including wireless, telegraph and telephone apparatus, &c. The directors are:—C. S. Mason, 84, Prince's Avenue, Hull; J. C. Townsley, 105, Park Avenue, Hull. Qualification, £100 shares.

Battery Plates, Ltd. (208,100).—Private company. Registered August 28th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of battery plates, magneto spare parts, magnetos, ignition apparatus, wireless and all classes of electrical apparatus and appliances, &c. The directors are:—P. Forrester, Ballochingle, Blundellsands, Liverpool; J. Myles, 15, Lichfield Drive, Sedgley Park, Manchester, accountant; and W. H. Hodgson, 61, Eccles Old Road, Pendleton, Manchester, electrical engineer. Qualification, £25. Secretary: H. H. Venables. Solicitors: Doughty & Fraser, 17, Market Street, Manchester.

Manchester Magneto Co., Ltd. (208,221).—Private company. Registered September 3rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, and dealers in magnetos and spare parts, ignition, and all classes of electrical apparatus, electricians, electrical engineers, manufacturers of, and dealers in electrical equipment used on motor vehicles, wireless equipment, &c. The permanent directors are:—F. E. Waring, 48, Parrs Wood Avenue, Didsbury, Manchester, engineer; H. V. Barker, 48, Parrs Wood Avenue, Didsbury, Manchester, engineer. Qualification, 100 fully-paid shares. Remuneration as fixed by the company. Solicitor: F. O. S. Leak, 6, John Dalton Street, Manchester. Registered office: 29, Liverpool Road, Manchester.

Official Returns of Electrical Companies.

Edwards & Armstrong, Ltd. — Mortgage dated August 11th, 1925, to secure £1,500, including £950 advanced by the company's predecessor in title, charged on "The Lawn," Cainscross, Glos. Holders: Trustees of the Stroud Holloway Original Benefit Society.

Acme Electric Wire and Cable Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital dated August 18th, 1925, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Robert Crust, Ltd. (184,087).—Return dated December 31st, 1924 (filed February 26th, 1925). Capital, £1,000 in £1 shares. 999 shares taken up. £698 paid. £301 considered as paid. Mortgages and charges, nil. Return of allotments, made up to April 7th, 1925, shows the remaining share allotted for cash.

Pickvance, Ltd. (183,595).—Return dated December 1st, 1924 (filed March 2nd, 1925). Capital, £5,000 in 2,000 preference and 3,000 ordinary shares of £1 each. 1,002 ordinary and 600 preference shares taken up. £650 paid on 200 ordinary and 450 preference shares. £952 considered as paid on the remainder. Mortgages and charges, £1,650.

Gayton Park Electricity Co., Ltd. (184,208).—Return dated April 6th, 1925. Capital, £3,000 in £1 shares. All shares taken up. £3,000 considered as paid. Mortgages and charges, nil.

Energy Syndicate, Ltd. (184,206).—Return dated March 9th, 1925. Capital, £15,000 in 8,250 preference and 6,750 ordinary shares of £1 each. All shares taken up. £15,000 paid. Mortgages and charges, nil.

Excelsior Magneto and Ignition Co., Ltd. (183,735).—Return dated December 31st, 1924 (filed March 26th, 1925). Capital, £1,000 in £1 shares. All shares taken up. £1 per share called up on 870 shares. £720 paid, leaving £150 in arrears. £130 considered as paid. Mortgages and charges, £300.

Highfield Electrical Co., Ltd. (184,119).—Return dated August 13th, 1925. Capital, £2,500 in £1 shares. 1,802 shares taken up. £1,800 paid. £2 in arrears. Mortgages and charges, nil.

Friend, Wintle & Co., Ltd.—F. J. Alban, of 84, Queen Street, Cardiff, was appointed receiver on August 21st, 1925, under powers contained in debenture dated June 29th, 1923.

E. Saunders (Margate), Ltd. (183,719) (formerly the Margate and District Electrical Co., Ltd.).—Return dated May 3rd, 1924 (filed February 21st, 1925). Capital, £3,000 in £1 shares. 20 shares taken up. £20 paid. Mortgages and charges, nil.

Wickford and District Electricity Supply Co., Ltd. (183,455).—Return dated December 31st, 1924 (filed February 27th, 1925). Capital, £5,000 in £1 shares. 2,051 shares taken up. £2,051 paid. Mortgages and charges, nil.

Cullompton Electric Supply Co., Ltd. (183,058).—Return dated July 16th, 1925. Capital, £6,000 in £1 shares. 3,848 shares taken up. £3,248 paid. £600 considered as paid. Mortgages and charges, nil.

British Electrical Maintenance and Insurance Co., Ltd. (182,942).—Return dated December 5th, 1924 (filed February 28th, 1925). Capital, £1,000 in £1 shares. 999 shares taken up. £999 paid. Mortgages and charges, nil.

Radiant Electrical Co., Ltd. (182,866). — Return dated January 14th, 1925. Capital, £100 in £1 shares. 100 shares taken up. £100 paid. Mortgages and charges, nil.

John Richards & Co. (Electrical Engineers), Ltd. (183,000).—Return dated December 19th, 1924. Capital, £6,000 in £1 shares. 4,802 shares taken up. £2 paid. £4,800 considered as paid. Mortgages and charges, nil.

Power Securities Corporation, Ltd. (184,817).—Return dated March 3rd, 1925. Capital, £2,000,000 in 1,000,000 preference and 1,000,000 ordinary shares of £1 each. 500,000 preference and 500,000 ordinary shares taken up. £1,000,000 paid. Mortgages and charges, nil.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Scarborough Electric Supply Co., Ltd.—At the annual meeting on August 31st, formal approval was given to the proposed sale of the undertaking to the Scarborough Corporation as from December 31st next. The chairman (Mr. A. A. C. Swinton) said the terms of actual purchase were in accordance with the conditions of the original deed of transfer of the undertaking. The negotiations to date had been conducted amicably. It was unfortunate that the company was to be wound up when the undertaking had become prosperous, but that could not be helped. Obviously the Corporation was anxious to acquire it because it was prosperous.

Ferranti, Ltd.—The report for the year ended June 30th last records a gross profit of £165,982, as compared with £134,569 in the preceding year. After meeting all charges, including the transfer of £15,000 to depreciation reserve (against £10,000), there was a net profit of £67,644, as compared with £55,545. It is proposed to place £40,000 to reserve (against £35,000); to pay a dividend of 20 per cent., free of tax (as compared with 15 per cent. in 1924); and to carry forward a balance of £33,313. The meeting is to be held to-day (Friday).

Stratford-on-Avon Electricity Co., Ltd.—At the recent annual meeting it was stated that, with the incorporation of the parish of Alveston in the area of supply, additional plant had become necessary to cope with expanding business. It was intended to issue £10,000 first mortgage debentures bearing interest at 6½ per cent. The recommendations were approved, and at an extraordinary general meeeting, which followed, a resolution was adopted empowering the directors to borrow £10,000.

Stewarts & Lloyds, Ltd.—The following dividends have been declared in respect of the half year to June 30th:—At the rate of 6 per cent. on the preference shares; and at the rate of 10 per cent. on the preferred ordinary shares. Similar dividends were paid last year.

North American Light and Power Co.—The whole of the company's first lien 6 per cent. gold bonds, maturing normally in 1937, have been called for redemption at 102½ per cent. and accrued interest.

Hurst, Nelson & Co.—A final dividend of 2s. 6d. per share has been declared, making 3s. 6d. for the year. Last year the dividend was 4s., but the capital has since been increased.

Western Telegraph Co., Ltd.—The directors have declared a final dividend of 5s. per share, making 10 per cent., free of tax, for the year, as in 1924.

Hendon Electric Supply Co., Ltd.—An interim dividend of 1s. per share, free of tax, has been declared on the ordinary shares.

British Electric Transformer Co., Ltd.—A dividend of 3½ per cent. has been declared in respect of arrears on the preference shares.

Mississippi River Power Co.—A dividend of 1½ per cent. on the preferred stock is announced.

Stocks and Shares.

MONDAY EVENING.

THE principal changes in the Stock Exchange lists since a week ago are rises which reflect the satisfaction felt with the recognition that is being accorded to Mexico by the British Government. On the top of the substantial recoveries to which reference was then made here, further improvements have occurred, ranging from 1 to 5 points, the latter gain being secured by Mexican Light & Power common and preferred shares alike. Mexico Tramway 5 per cent. bonds are a point down, which seems a little anomalous in view of the strength shown by the other Mexican issues. Doubt is not altogether satisfied, even yet, as to whether this recognition will automatically bring in its train the improvement in Mexican conditions that will assuredly restore British industries in Mexico, to profitable working conditions. Each day, however, adds to the assurance that the British Government and the Mexican Government are both in earnest, and that the preliminaries are definitely settled.

Other foreign traction utility stocks are better. British Columbia preferred at 80½ shows a rise of 3 points, and the deferred holds its gain of 3½ secured a week ago. Anglo-Argentine Tramways 5 per cent. debenture stock at 76½ is 1 better. Brazilian Tractions shot up to 74½, thanks to the strength of the milreis. The company is now regarded as being upon a 5 per cent. dividend basis.

Electricity supply shares show few movements. London Electrics, after their rise of 4s. 6d., have shed 6d., going back to 35s. middle. Charing Cross ordinary are better at 2½. Charing Cross City undertaking is thought likely, as already mentioned here, to receive slightly more favourable treatment in the reorganisation proposals than the other members are, though the difference is not likely to be material. County ordinary have dropped back to 57s., a reaction of 1s. 9d. Midland Counties at 22s. 9d. are 6d. lower. St. James's gained ⅛ at 14¼. Urbans at 18s. 3d. are 1s. 3d. higher. There is a steady demand for the debenture stocks and the preference shares of the various companies, and the supply on offer diminishes week by week.

Amongst the Electricity Supply ordinary shares, which can be bought are 500 City Lights at 48s. 6d. x.d., to yield 6¼ per cent.; 500 Counties at 59s. *cum* dividend, paying £5 1s. 6d. per cent., and 1,000 Westminsters at 44s. 6d. x.d., where the yield is 6¾ per cent. There are also on offer 1,000 Electric Supply ordinary at 31s. 9d., to yield £6 18s. 6d. on the basis of the last dividend of 11 per cent. English Electrics at 19s. 3d., of which a few hundreds are available, yield 5¼ per cent., and Edmundsons at 22s. 6d., at which price there are 1,000 shares offered, give 6¼ per cent., taking the 7 per cent. dividend, paid annually for the past three years, as the basis of calculation. Midland Counties ordinary at 23s. 3d. yield £5 3s. 6d. per cent., and Newcastle ordinary at 23s. 6d., *cum* the recently-declared dividend, return just under 6 per cent. on the money; Llanelly ordinary at 20s. x.d. offer the level 7 per cent. Clyde Valley ordinary at 30s. give £5 6s. 8d. per cent., and Yorkshire ordinary at 30s. return a similar sum. There are also obtainable 500 Brompton ordinary at 36s. x.d., where the yield is £5 11s. per cent. net, the dividend being paid free of tax. The prices are given as a rough guide. Purchasers will probably find they can buy more cheaply when they come to deal.

Marconis are beginning to look up again. It has been contended for some time past in the market that Marconis have distinct attractions at anything like 25s., and this view seems to have aroused a little following, with the result that the price, although nominally unchanged at 25s., is, actually, rather better. Canadian Marconis came in for attention at the same time, and the price rose 7½d. to 5s. 1½d. middle. The latest invention of Signor Marconi in the shape of wireless "lighthouses" may have something to do with the greater interest which is being taken in the shares of the company which bears his name, and which, after all, pay 8 per cent. on the money, with future prospects that are difficult to estimate.

The Home railway market is as heavy as ever. Most of the steam stocks are substantially lower in price on the week. Underground Electric income bonds at 96 are ex the 3 per cent. net dividend deducted from the price last Tuesday. The public are taking no interest, however, in Home Railway stocks, the reason being the continual disturbances which occur in labour circles and which all appear to extend into the railway world by one path or another.

Great Northern Telegraphs are a feature of strength at 32½. Otherwise, the cable group is uninteresting. Automatic Telephones jumped to 45s., thus showing a gain of 3s. The market in the shares is now so limited as to render any demand liable to have a disproportionate effect upon the price of the shares. International Telephones are 26s. buyers. Cuba Telephone 5 per cent. bonds at 93½ have risen 2 points.

The manufacturing shares retain their strength, and Edisons have spurted a shilling to 9s. per share. General Electrics lost 6d. of their florin rise, and English Electrics are a little easier at 19s. 3d. British Electric Transformer preference strengthened to 18s. 9d., but the other preference shares in this group are exceedingly well held. Babcocks, amongst the engineering shares, receded to 2½, the iron and steel market being heavy. Rubber shares, after a slight depression due to a fall in the price of the commodity to 3s. 2d. per lb., hardened up again as buyers came forward to take stock for the new Stock Exchange settlement which started on the Tuesday in this week.

Share List of Electrical Companies

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Sept. 7. 1925.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	13	14	3	—	4 13 4
Brompton Ordinary	1	10	10	1⅝	—	*5 14 3
Charing Cross Ordinary	1	14½	15	10/-	+6d.	6 2 5
do. do. 4½ Pref.	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	12	1⅝	—	6 8 0
City of London	1	15	15	48/3	—	6 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	29/6	—	5 8 6
County of London	1	15	15	57/-	—1/9	5 5 3
do. do. 6% Pref.	1	6	6	24/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12⅝	—	5 18 8
Lancs. Light and Power	1	7½	7½	26/6	—	5 15 5
London Electric	1	10	10	35/-	—6d.	5 14 3
do. do. 6% Pref.	5	6	6	5½	—	5 7 10
Metropolitan	1	10	11	39/3	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	22/9	—6d.	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	23/3	—	6 0 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	14¼	+ ⅛	6 2 10
South London	1	15	15	2½	—	6 0 0
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	+1/3	4 7 8
do. 6% Pref.	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/-	—	6 16 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/-	—	5 10 6
HOME RAILS.						
Central London Ord. Assented Stock	4	4	4	66	—	6 1 3
Metropolitan	4	5	5	67½	— ½	7 8 2
do. District	8½	8½	8½	43½	—1	8 0 11
Underground Electric Ordinary	10	Nil	Nil	2½	—	Nil
do. do. "A"	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds	6	6	6	96xd	—	*6 5 0
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref. Stock	6	6	6	103½	—	5 15 11
do. Def.	1½	1½	1½	24	—	6 5 0
Automatic Telephone	1	3	6	45/-	+3/-	2 13 4
Chili Telephone	5	6	5	5½	—	*4 11 0
Cuba Sub. Ord.	10	5	5	6⅞	—	7 8 2
Eastern Extension	10	10	10	17½	—	*5 15 11
Eastern Tel. Ord. Stock	10	10	10	172½	—	*5 15 11
Globe Tel. and T. Ord.	10	10	10	17⅞	— ⅜	*5 12 8
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	22	32½	+ ⅜	6 15 6
Indo-European	25	7	8½	41½	—	*5 2 5
Marconi	1	10	10	1¼	—	8 0 0
Marconi Marine	1	10	7½	17/6	—	8 11 6
Oriental Telephone Ord.	1	12	12	2	—	*6 0 0
United R. Plate Tel.	5	8	8	7⅞	+ ⅛	5 6 8
Western Telegraph	10	10	10	16¼	—	*6 3 1
HOME AND FOREIGN TRAMS, &C.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3⅞	—	8 0 0
do. do. 2nd Pref.	5	6	6	3⅜	—	8 17 10
do. do. 5% Deb. Stock	5	5	5	76½	+1	6 10 9
British Electric Traction Ord.	6	6	6	116½	+2	5 3 0
do. do. 6% Pref.	6	6	6	105	—	5 14 3
Brazil Traction	100	4	4	74½	+4	5 7 5
Brit. Columbia Elec. Rly. Pcc. Stock	5	5	5	88½	—	5 11 9
do. do. Preferred	96/-	96/-	96/-	88½	+3	*5 7 8
do. do. Deferred	129/5	129/5	129/5	109½	—	*5 18 3
do. do. Deb.	4¼	4¼	4¼	77½	—	5 9 8
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb. Stock	4	4	4	42⅜	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	60½	—1	8 5 4
Mexican Light Common	100	Nil	Nil	32	+5	Nil
do. Pref.	100	Nil	Nil	62	+5	Nil
do. 1st Bonds	—	5	5	69⅛	+4	7 3 11
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	12	2⅜	— 1/16	4 16 0
British Aluminium Ord.	1	5	10	1½	+ 1/16	5 14 3
British Elec. Transformer Pref.	1	Nil	7	18/9	+1/3	... ...
British Insulated Ord.	1	15	15	3½	—	4 12 4
Brush Ord.	1	10	10	23/3	—	8 12 0
Callenders	1	15	15	3⅜	—	4 9 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅝	—	... ...
Edison-Swan	4/-	10	10	9/-	+1/-	4 8 11
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	30/6	—	6 11 2
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	19/3	—3d.	5 3 11
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/9	+3d.	5 9 5
do. Ord.	1	5	7½	27/6	—6d	5 9 1
Henley	1	15	16	3½	—	4 18 6
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	22/-	—	*4 10 11
Johnson & Phillips	1	10	10	49/6	—	3 14 9
Met-Vickers, Ord.	1	8	8	24/6	—	6 10 8
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	1½	—	5 0 0
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

The British Association.—III.

The Southampton Meeting.

The Study of Wireless Wave Fronts by Directional Methods.

By R. L. SMITH-ROSE.

Abstract of Paper read before Section A.—Mathematical and Physical Science.)

The directions of the electric and magnetic forces in a simple ave are at right angles to each other and mutually perpen- icular to the direction of propagation of the wave. The lane containing these forces is known as the wave-front. All ıe existing types of wireless direction-finders operating by ·ception of the desired signals make use of the fact that for simple wireless wave propagated along the earth's surface the ıagnetic force is horizontal and perpendicular to the vertical lane of propagation of the wave. Such direction-finders use, ı principle, a closed loop in a vertical plane capable of being ›tated about a vertical axis; the loop is turned to the posi- on of minimum or actually zero e.m.f. when the plane of ıe loop is parallel to the horizontal component of the magnetic eld. Various circumstances may, however, contribute to an ›parent deviation in the direction of travel of the wave as ıdged from the direction of the horizontal component of the agnetic field. For example, various objects, such as metal- ork, whether above or below ground, trees, tuned aerials ıd long stretches of overhead wires may cause an error in the ›parent direction, which may be as much as 50 deg. The nall residual errors which are experienced are taken into ·count by calibrating the direction-finding station on various ·xed transmitting stations; this is found to be sufficiently con- ant for practical use, but when the source is an aerial or a ·stem of overhead wires, the errors are sometimes dependent ›on the electrical circuit constants of these, and more care or equent repetition of the calibration is necessary for accurate orking. In the cases of steel ships and aircraft the error in ›parent direction varies in an approximately sine-wave form ith the direction of the incoming waves relative to the fore- ıd-aft line of the ship. In such installations, either a cor- ·ction curve is prepared from observations taken while the ip is swung on a fixed transmitting station, or sometimes the ·ror is approximately compensated for by some suitable cir- it arrangement. With regard to diurnal variations, when e range of transmission in which a direction-finder is used ·ceeds certain minimum values, the apparent direction of ·rival of the waves is subject to somewhat erratic variations, e frequency and magnitude of which are dependent to a nited extent upon the wave length employed, the distance the transmission, and also upon the time of year and part the day. The apparent bearings of a fixed station on a ·rection-finder are in general continually varying at a rate ·nich is roughly inversely proportional to the wave-length ›ployed.

Discussing land and sea effects, and the application of wire- ss direction-finding to navigation, the author said that when le path of transmission is entirely overland, the difference in ıriations by day and night becomes apparent at distances of ›out 30 miles. When, however, the path of transmission is ·tirely oversea, this minimum distance for serious variation i trebled. This is fortunate, since ranges at which wireless ·rection-finding is required in marine navigation are seldom ›ater than 50 and never more than 100 miles, and a suitable ·oice of the land station ensures that this range is entirely ·ersea. Under such conditions, about 95 per cent. of the ·served bearings fall within a 2-degree limit of error, which ifound to be adequate for most navigational purposes. When t› line of transmission is almost parallel to a coast there is ·liability of errors due to a coastal refraction effect, and it ıll probably be customary in the future to mark all charts ıth "arcs of good bearings" for the various land stations ›d for direction finding. The above facts have been estab- ›ed almost entirely for damped wave transmission on a ve-length of 450 metres, but there is as yet no definite ·dence that they will need modification by the employment undamped waves or of any other wave-lengths within ·sonable limits. When using a direction-finder it is some- ›es necessary to rotate the coil for some 5 to 20 deg. before v change in the signal intensity can be detected. This is ›· to the fact that the horizontal component of the magnetic ·ce of the arriving waves is no longer strictly linear, but of ptical rotating form, probably due to the arrival of two ·ves differing in phase and amplitude. It is evident that · apparent direction of arrival of the waves as given by the ·ating force will be perpendicular to the major axis of such ellipse. An extreme case of this phenomenon is sometimes ·ained in the form of circular polarisation. This results in · signal received on the closed coil direction-finder being of ıiform intensity for a complete rotation of 360 deg. While › waves of from 2,000 to 13,000 metres, the occurrence of ·h circular fields is comparatively rare, on the shorter waves ›from 450 to 1,000 metres it is so frequent during the night ›iods that no definite bearing can be ascertained in from ·to 50 per cent. of cases.

f a closed loop receiver is provided with a horizontal as well a vertical axis of rotation, a means is provided for the ·rmination of the angle of inclination of the magnetic force ·the horizontal plane. To do this, the position of the coil to give a minimum of signal strength with its plane vertical is first determined. It is then rotated through 90 deg., so that the horizontal axis is perpendicular to the horizontal component of the magnetic field. By then rotating the coil about its horizontal axis, the inclination of the magnetic force is determined. In the case where the horizontal force is not linear, it is necessary to repeat this last rotation for a second position of the horizontal axis at right angles to the first. If, as may occur under certain conditions, the resultant magnetic force being examined is elliptically or circularly polarised in space, the above methods enable only the components on three mutually perpendicular planes to be determined, two of these planes being vertical and the third horizontal. In the case of such of these components as are not linearly polarised, only the direction of the major axis can be determined. With regard to the electric force, instead of a closed coil for reception, a straight open wire aerial may be used in the form of a Hertzian rod. In this case the e.m.f. induced will depend upon the component of the electric force parallel to the rod. Hence, if such a Hertzian rod be supported at its midpoint, coupled to suitable receiving apparatus, and rotated about a horizontal axis, a position of zero or minimum signal strength will be found when the rod is perpendicular to the electric force if it is linearly polarised, or to the major axis if it is elliptically polarised. If the horizontal axis of rotation is parallel to the direction of propagation of the wave, the rotation should be repeated about a perpendicular horizontal axis to give a determination of the directions of the components of the electric force on two vertical planes at right angles to each other. When these methods are used it is found that the magnetic force is horizontal and at right angles to the direction of propagation, and the electric force is found to be nearly but not quite vertical, being actually tilted forward by a small amount in the vertical plane of propagation of the wave. It is also found that in this plane the electric force is of slightly elliptically polarised form. The experiments show that the forward tilt of the electric force increases with a reduction in the wave-length employed. The values actually measured in this country range from about 0.5 deg. on 6,900-metre to nearly 3 deg. on 350-metre wave-lengths. From these angles the effective conductivity of the earth at the wireless frequencies employed can be obtained, and has been shown to lie between 0.6 by 10^8 and 4.0 by 10^8 in e.s.u. for various sites in the south of England.

The author said that one of the most promising theories of wireless wave propagation over the earth's surface implies the reception of one or more waves from the upper atmosphere in addition to the wave propagated directly along the earth's surface. It might be thought at first that the detection of the existence of such a down-coming wave would be a comparatively easy matter by determining the directions of the electric and magnetic forces which result at the receiver. It must be remembered, however, that with the above value of conductivity the earth's surface will act as a moderately good reflector, and the incidence of a downcoming wave will give rise to a reflected wave which may have an amplitude nearly equal at its maximum to that of the incident wave. The combined effect of these two waves is to give a resultant electric force which has no horizontal component, and a resultant magnetic field which has no vertical component. Such a wave, therefore, becomes difficult to distinguish from a horizontally propagated wave by directional measurements. This has been partly confirmed by experimental observations made during the last 18 months. Employing the waves from various transmitting stations using wave-lengths between 2.6 and 12.4 km., the maximum departure of the directions of the electric and magnetic forces from their normal values has been about 1 deg., which was considered to be scarcely greater than the possible error of the apparatus employed. Many of these experiments were carried out at night and for distances of transmission known to give rise to the well-known night effects, these being instanced by variations in apparent bearings ranging up to 23 deg. On the shorter wave-lengths the practical difficulties increase considerably, but some recent measurements made on 385 metres have shown that under suitable night conditions the resultant electric force may depart as much as 12 deg. from its normal day value, while the resultant magnetic force may be inclined at 5 deg. to the horizontal. Experiments are being carried out at the Radio Research Board's station at Slough, in which these observations are made simultaneously with the measurement of various other parameters of the forces of the arriving waves, the results of which will probably produce valuable evidence on the problem of the propagation of wireless waves over the earth's surface, which has recently become, perhaps, the most important scientific subject in radio research.

The Efficiency of Marine Auxiliary Machinery.

By STANLEY S. COOK, B.A.

(*Abstract of Paper read before Section G.—Engineering.*)

In the course of this paper the author said that a review of the history of the steam turbine in marine propulsion disclosed the fact that during the past 20 years there had been

an increase of practically 100 per cent. in overall efficiency, made up of improvements in turbine and propeller efficiency, principally through the introduction of gearing between turbine and propeller, and an increase of available energy due to the use of superheat. Since economy in total fuel consumption was the ultimate aim, whilst the highest efficiency of conversion of heat into power was necessary on the part of the main engines which propelled the vessel, consideration must be given to the question of auxiliary machinery wh with the improvements that had been made to reduce the consumption of the main machinery, was now responsible in a complete installation for a very appreciable percentage of the total fuel consumption. Wasteful auxiliary machinery, either through unsatisfactory provision in the first place, through want of care in its maintenance and management, had not infrequently in the past been the cause of a poor overall performance for which the propelling machinery had been blamed.

Taking a typical case of a vessel with high-efficiency turbines developing 5,000 shaft h.p., the author discussed the estimated consumption of the auxiliary plant which comprised air pump, ejector, circulating pump, feed pump, fans, oil pump, steering gear, electric lighting set, &c. Four different methods of driving the auxiliaries were considered, *viz.*, (1) Entirely by steam; (2) by electric motors with energy supplied by turbo-generators; (3) by electric motors with energy supplied by Diesel generators; and (4) mechanically from the main engines. In proposal (1) the steam consumption of the auxiliaries, including the ejector steam, the make-up feed, and the steam used for the evaporator, was calculated at 8,960 lb. per hour. Of this 1,500 lb. was condensed in the evaporator coil and 250 lb. in the oil-fuel heater, leaving 7,210 lb. available for feed heating. To heat the remainder of the feed water from 70 to 215 deg. F. required 5,800 lb. of steam, leaving 1,410 lb. unutilised, which might either go to the winch condenser or be led to the low-pressure turbine. The total steam consumption for all purposes, in this case, was therefore 44,960 lb., per hour, or 8.99 lb. per shaft-h.p.-hour. With a feed-water temperature of 215 deg. F., 13.2 lb. of steam at 500 lb. per square inch and 700 deg. F. could be generated for each pound of oil consumed in the boiler furnace. This figure was based on a calorific value of 18,500 B.th.u. per pound and a boiler efficiency of 84 per cent., which could be attained with efficient pre-heating of the furnace air. On that basis, a steam consumption for all purposes of 8.99 lb. per shaft-h.p.-hour corresponded to an oil-fuel consumption of 0.681 lb. per shaft-h.p.-hour. By utilising steam tapped off from the turbines to raise the feed temperature to 310 deg. F., whilst slightly more steam was required, this was generated at a higher evaporative rate, and the oil consumption per shaft-h.p. was reduced to 0.667 lb. That was the case with proposal (1) with the auxiliaries steam driven. The total brake-h.p. required for the auxiliary machinery was 118.5.

In proposals (2) and (3) that power was supplied by electric motors, absorbing, with a reasonable allowance for motor and transmission losses, 110 kW. In proposal (2) the 110 kW was supplied by turbo-generators taking steam at the same pressure and temperature as the main turbines, but exhausting to a back pressure of 10 lb. above atmosphere. For the consumption of 45 lb. per kW, they required 4,950 lb. of steam per hour. With the same supply of steam as before for ejectors, make-up feed and evaporator, *viz.*, 2,700 lb., the total auxiliary consumption in this arrangement was therefore 7,650 lb. per hour, giving a total consumption for all purposes of 43,650 lb. per hour, or 8.73 lb. per shaft-h.p.-hour. With 1,500 lb. per hour condensed in the evaporator coil and 250 lb. in the oil-fuel heater, there remained 5,900 lb. per hour of auxiliary exhaust steam which was sufficient to heat the feed water to 215 deg. F. The steam consumption of 8.73 lb. per shaft-h.p.-hour for all purposes then corresponded to an oil-fuel consumption of 0.662 lb. per shaft-h.p.-hour, on the same basis of boiler efficiency, &c., which was further reduced to 0.648 lb. per shaft h.p.-hour by using tapped-off steam to heat the feed water to 310 deg. F.

In proposal (3) the 110 kW required for the motors was supplied by Diesel generators. The additional steam for ejectors, make-up feed and evaporators was, in this case, 2,450 lb. per hour, with only 850 lb. per hour available for feed heating. Since, however, in this case, 4,950 lb. per hour was required to heat the feed to 215 deg. F., this 850 lb. must be supplemented by 4,100 lb. of steam tapped off from the low-pressure turbine belt, at the expense of a reduction of the power developed in that turbine by 285 s.h.p. At a consumption of 0.75 lb. of oil per kW, the Diesel generators consumed 82.5 lb. of oil per hour, which, at an evaporative rate of 13.2 lb. per pound of oil, was equivalent to 1,090 lb. of steam per hour. So that, finally, for this proposal, 4,715 s.h.p. was obtained for a total equivalent consumption of 39,540 lb. of steam for all purposes, or at the rate of 8.39 lb. per s.h.p.-hour. The oil consumption was 0.635 lb. per s.h.p.-hour with a feed temperature of 215 deg. F., and 0.62 lb. with a feed temperature of 310 deg. F., using steam tapped off from the turbines.

In proposal (4) the 118.5 brake-h.p. required for the auxiliary machinery was assumed to be supplied mechanically from the main turbines. With allowance for mechanical losses, it was assumed that the output of the main turbines would thereby be reduced by 132 s.h.p. As in proposal (3) it would also be necessary to bleed 4,100 lb. of steam from the low-pressure turbine for feed heating, involving a loss, as before, of 285 s.h.p. So that with this arrangement steam consumption was increased by 2,450 lb. per hour and output reduced by 417 s.h.p., or a total consumption of 38,450 lb. per hour for an output of 4,583 s.h.p., or 8.39 lb. per s.h.p.-hour. This was the same as for proposal (3), and the oil fuel consumed pe s.h.p. was also the same as for proposal (3).

Summarised the results were as follow: For proposal (1 with steam-driven auxiliaries, 0.667 lb. oil per shaft h.p.-hour for proposal (2), with motor-driven auxiliaries and turbo generators, 0.648 lb.; for proposal (3), with motor-driven auxi liaries and Diesel generators, and for proposal (4), with auxi liary machinery mechanically driven from the main engine 0.62 lb. Thus with steam-electric auxiliaries the total fue consumption might be made 2.85 per cent. less than when the were steam-driven, and with Diesel-electric or mechanically driven auxiliaries 7.6 per cent. less.

In proposal (4), for the sake of simplicity, it was supposed that all the auxiliaries were driven from the main engines This might not be considered desirable in the case of all o them, even with the provision of adequate stand-by units The result, however, as regarded fuel consumption being th same as when these auxiliaries were motor-driven from Diese generators, one could make it apply equally to any combina tion of the two systems; that was to say, with as many o the auxiliaries as was considered practicable driven mechanic ally from the main turbines and the rest motor-driven fro Diesel generators.

The Rôle of the Atmosphere in Wireless Telegraphy.

By Prof. E. V. Appleton.

(*Abstract of a "Citizens' Lecture."*)

In the course of this lecture, which was delivered at th Avenue Hall on August 29th, Prof. Appleton said that it wa nowadays very generally recognised that the atmosphere ha a very profound influence on the transmission of electric wave through it, and thus on wireless communication generally Usually, but not always, the influence of the atmosphere wa favourable to communication, and it was now quite certai that long-distance communication was brought about solel by the influence of the ionised layers in the upper atmosphere In short-distance communication, *e.g.*, up to 100 miles, broad casting listeners were familiar with another effect which mus now be regarded as of atmospheric origin. Most listener with valve sets were aware that at distances approachin 100 miles from a broadcasting station the signal intensity a night often underwent pronounced fluctuations varying fro a loud-speaker intensity down to inaudibility in a minute c so. This "signal fading," as it was called, had been a puzzl for a long time, but experiments recently carried out at th Cavendish Laboratory, Cambridge, by Prof. Appleton and M Bagnett had shown that the effect in such cases was due to th interaction of two sets of waves which reached the receivin station. One set of waves travelled straight along the groun from transmitter to receiver, while the other set was reflecte by the upper atmosphere back to the receiver. Sometime these two sets of waves reached the receiver in step, an their effects were additive, but sometimes they were out c step and tended to neutralise one another. The actual chang were due to the variability of the upper atmosphere, whic altered the phase of the waves reflected thence. Theory ind cated that fading should be more pronounced on a loop s than on a set with a vertical-wire aerial, and when an exper mental test of this point was made at Cambridge with accura instruments the theoretical prediction was verified. Loo fading was found to be greater than aerial fading, and fro the results the angle at which the waves reflected by th upper atmosphere reached the ground again could be measure The angle was found to be 60 deg. at Cambridge for th signals from 2 LO. From this figure it was clear that th height of the layer could be estimated. This crucial test larger loop fading than aerial fading might be regarded the experimental proof of the existence of the "Heavisi Layer," which had been strongly contradicted by Germa and American radio engineers. At greater distances fro broadcasting stations (150-200 miles) the train of wav travelling along the ground was highly attenuated and only th waves reflected from the upper atmosphere reached the r ceiver, and then only at appreciable intensity at night. Th atmosphere was also responsible for the troublesome naturall occurring signals known as atmospherics. In recent exper ments the intensity, duration, and wave-form of these di turbances had been determined, and they had been shown be due to electrical discharges (*e.g.*, lightning strokes) in th atmosphere. Fortunately the effects of atmospherics we not as marked on the shorter broadcasting wave-lengths on the longer commercial wave-lengths, and recent exper ments in Cambridge showed that the only atmospherics whi gave real trouble to listeners could usually be attributed actual lightning strokes within the British Isles. With longe range sets of longer wave-length the lightning strokes in th tropics were detectable in England as atmospherics.

The Seat of the Electromotive Force of the Galvanic Cell

By J. A. V. Butler.

(*Abstract of paper read before Section B.—Chemistry.*)

The discovery of the production of an electric current galvanic action gave rise to two distinct views of its origi resulting in a controversy which was waged with considerab zeal for a century, without a decision being reached (cf. S Oliver Lodge's comprehensive report, *B.A. Report*, 1884). the one hand, physical theorists regarded as the chief fact a contact p.d. between the metals, identified with Volta's co

act force and an intrinsic property of the metals. On the ther hand was the chemical view that the current had its rigin in chemical effects at the electrodes. In the course of ne nineteenth century, the chemical theory received convinc- ng support from the work of Davy and Faraday, which estab- shed the quantitative relation between quantity of electricity nd chemical action; the discovery of the relation between lectrical energy produced and the energy of the reaction going n in the cell [Kelvin (1851) had postulated the equality of nese. The exact thermodynamical relation was given later y Helmholtz and Gibbs]; and the Nernst conception of the rocess at metal electrodes which accounted for the effect of con- entration. The chemical theory thus appeared to be established d all points. The Volta effect itself was explained as due to nemical action at the surface of the metals. For thirty years ne metal junction was practically overlooked as an important ntributor to the e.m.f. of the cell. Recent work on the ermionic and photoelectric properties of the metals (Richard- n, Compton and Millikan) has, however, conclusively demon- rated the existence of large metal contact p.d.'s. How are nese to be reconciled with the chemical theory? The author's neory, based on statistical considerations, includes as different spects of the whole truth (1) the existence of metal contact .d.'s between metals, approximately equal to the difference of eir thermionic work functions; the relation between e.m.f. nd the energy of the chemical reaction expressed in the Gibbs- elmholtz relation; and the Nernst relation for the effect of ncentration.

After the reading of the paper the President (Prof. C. H. esch) said the paper threw a new light on a very old sub- ct. It was over 40 years ago that Sir Oliver Lodge drew up is statement of our knowledge of the subject at that time nd it would therefore be interesting to hear his views now.

Sir Oliver Lodge, F.R.S., referring first to the presidential ddress to the Section by Prof. Desch, said that the relation etween physics and chemistry was of the utmost interest and hatever might have been the case in the past there was no ason now for any antagonism between the two. With re- ard to Mr. Butler's paper, although he had had this matter at is fingers' ends 40 years ago he had not looked into it for the ast 30 years. He knew that Mr. Butler was taking it up at wansea and was applying the newer knowledge acquired since hen. In 1884 we knew nothing about electrons and it was bvious that the views held then by himself and others, not- bly the late Lord Kelvin, with whom he had discussed it, ust be revised. A very different state of affairs had been own to exist in the light of our comparatively recent know- dge of electrons and the whole subject required to be pulled it by the roots and put on a proper basis.

Some Technical Problems of Broadcasting.

By Capt. P. P. Eckersley.

(*Abstract of a "Citizens' Lecture."*)

In the course of this lecture Captain Eckersley indicated an interesting manner the early difficulties of the British roadcasting Co., and outlined the policy and aims of the mpany as the result of this early experience. He said that first it was thought that eight stations would be sufficient cover England and Scotland and give good crystal reception erywhere. It was soon evident, however, that this would ot be the case and so the present policy was to have numerous ations or relay stations all over the country with the ideal providing good crystal reception for everyone within a radius 20 miles. This in itself, however, would not give that ser- ce to the community which it was sought to give, *viz.*, a oice of programme, and so the next ideal was to arrange r stations of higher power which would cover a wider area an the "crystal areas," and in that way make alternative ogrammes available. Dealing with complaints of interfer- ce with the broadcasting by ships, Captain Eckersley re- inded his audience that wireless in the working of ships d the saving of life at sea was of much greater moment an broadcasting, which was merely for amusement. He ex- essed his sympathy with the Postmaster-General in the task hich was placed upon him of deciding upon wave-lengths and on in order that not only might the commercial and other ireless business be carried on but also that the whole of the mmunity might have the benefits of broadcasting. Refer- ng again to the aim of the B.B.C., Captain Eckersley said at the object was to enable every listener to adjust his set at e beginning of the evening once for all and for there then be no further necessity to tinker with the apparatus any ore that evening. One of the difficulties which prevented is at the moment was fading, and he explained in non-tech- cal language how fading was caused and how many curious fects in wireless were produced. It was possible, of course, r certain enthusiasts to be able to pick up stations many iles away, and it was not uncommon for the B.B.C. to re- ive letters asking why it was not generally possible for this be done. Such people, of course, knew nothing about the chnical side of wireless, and he expressed the hope that ople would endeavour to understand that such results, in the esent state of our knowledge, were more or less in the nature "freaks." When the B.B.C. first started something like per cent. of listeners had crystal sets; later the number had en to 65 per cent., and to-day something like 85 per cent. d crystal sets. In an appeal to the public generally to ap- eciate the work which the B.B.C. was carrying out, Captain ckersley assured his audience that the company had ideals sed on the idea of service which, however, could only be carried out if there were a due appreciation of obsolescence in the plant used. It was only possible to make due progress if it were realised that development in the art was so rapid that there must be scrapping of plant at more or less frequent intervals in order to keep pace with modern practice. An interesting account was given of the manner in which what has come to be known as simultaneous broadcasting through- out the country is carried on and a picture was drawn of the possibility of extending this to all parts of the Empire and the world in the not far-distant future. In this the "beam station would play an important part. Finally, Captain Eckersley just mentioned the problem which faced wireless engineers in giving out at the loud speaker exactly what was put in at the transmitting station. There were the problems of the microphone, transformers, transmitters, the valves on the receiving sets, and the high- and low-frequency magnifi- cation, the transformers on the sets, the telephones and, finally, the human ear. Reference was made to the efforts at the London studio to control echo and to how experience was beginning to teach that different types of transmission such as chamber music, orchestral music, speech and so on, required to be treated differently as regarded transmission if the best results were to be obtained in the final telephones and loud speakers. Whatever were the defects of broadcasting as it was to-day, the public was asked to have patience and to appre- ciate that even if only it was the means of bringing the out- side world into close touch with those who had to live in parts far removed from large towns, or if it were only to bring relief and amusement to invalids and aged people, it would still be a wonderful thing. It was doing that, and a great deal more already, whilst it could be looked to for providing communica- tion in the future not only throughout the Empire but through- out the world. The speaker paid a high tribute to the manner in which the Post Office telephone authorities co-operated with and assisted the B.B.C. in the matter of telephone lines for the purpose of simultaneous broadcasting.

The Chairman, in proposing a vote of thanks to Captain Eckersley, pointed out that although the efficiency of the tele- phone was only 10 per cent., the efficiency of radio-telephony was at present only one-tenth of one per cent. This indicated the scope that there was for improvement.

Some Thermionic Valve Problems.

By Prof. E. V. Appleton.

(*Abstract of Paper read before Section A.—Mathematical and Physical Science.*)

In this paper three typical problems were discussed:—

(1) *The Internal Action of Thermionic Valves.*—An attempt was made to explain the shape of the static characteristics of thermionic valves and the electronic relations necessary for amplification. It was shown that to explain the characteristics it must be assumed that all the electrodes (filament, grid and anode) emit electrons and that under certain conditions the anode emission, due to electronic bombardment, may be almost as high as the filament emission. The amplification factor of a valve was defined as the ratio of the number of lines of elec- tric force ending on the grid to the number ending on the anode when the grid and anode were maintained at the same potential. From this it could be seen that if the electrons fol- lowed the lines of force, the ratio of the grid current to the anode current, for equal grid and anode potentials, should be equal to the amplification factor. But since the measured ratio was always less than that value, it was concluded that the electrons did not follow the lines of force and that they shot through the interstices of the grid to be caught by the anode. For marked amplification, therefore, the grid should be very effective in attracting the electrons but very ineffective in catching them. An experimental bridge method of measuring the amplification factor of any type of valve was outlined. This consisted in filling the space between the electrodes with badly conducting material, *e.g.*, dilute copper-sulphate solu- tion, and measuring the ratio of grid current to anode current when the grid and anode were maintained at the same poten- tial with respect to the filament.

(2) *The Lag in the Action of Thermionic Valves.*—The in- ternal resistance of a thermionic valve was measured for dif- ferent times of applied voltage and it was found that as the time of applied voltage was increased the internal resistance increased, reaching a constant value for a steady potential. This indicated that for a sudden increase of grid or anode potential, the electron current always jumped first to a value somewhat higher than its final value. The time required to get to equilibrium value might be as long as half a second. The phenomenon was not due to the lag in the response of electron motion to applied voltage, which must be nearly in- stantaneous, but was due to the alteration of the thermal condition of the filament consequent on the closing of the anode circuit. The true electron emission of the filament was re- duced when the anode circuit was closed and space current flowed. The filament was then cooled, due to latent heat being required for the evaporation of the electrons. The effect of the anode current on the filament was to make the negative end hotter than the positive end, the emission of the negative half being 50 per cent. greater than that of the positive.

(3) *Oscillation Hysteresis (or "back-lash") in Valve Gene- rators.*—It had been found that the limiting conditions for starting and stopping oscillations in the valve generator were often not the same. A valve oscillator might have zero ampli- tude (non-oscillating condition) and yet a sudden electrical impulse might make it burst into oscillation. This phe- nomenon was of importance in broadcasting reception when

it often happened that listeners worked with too strong reaction, and the set, though naturally stable when left undisturbed, was caused to oscillate violently by a strong atmospheric. This oscillation-hysteresis (first type) was shown to be due to the shape of the valve characteristic. Another kind of oscillation-hysteresis (second type) had also been found. It was possible to make a set oscillate with one of the possible and stable amplitudes for the same operating conditions. Which of the two amplitudes was obtained depended on the method of approach to the set of conditions in question. To make oscillation jump from the smaller amplitude to the larger, it was only necessary to move a magnet rapidly near the valve. This second kind of oscillation-hysteresis was shown to be due to the damping in the grid circuit due to the grid current which affected the dynamic characteristics of the valve so as to give the required type of decrement to the oscillating circuit.

Electrical Trade Prospects in Central America.

An American View.

Mr. R. A. Lundquist, Chief of the Electrical Equipment Department of the United States Department of Commerce, has recently completed a tour of what he calls "near-by Latin markets," and has contributed some notes on his investigations to the *Electrical World*. Mr. Lundquist's itinerary included Venezuela, Colombia, Costa Rica, Nicaragua, Panama, San Salvador, Guatemala, and Mexico. He points out that although the standard of living and the level of electrical development are lower than in the United States, conditions are steadily improving. Individually, the countries are not large in population, but their potentialities are great in the aggregate, and with the development of their resources they will undoubtedly become better and better markets in all respects.

Venezuela has a population of only 2½ millions, but there are great oil resources which enhance the country's purchasing power. Electrical service is available in practically all the principal towns, but there is a lack of generating facilities, and the owners of local plants are very backward, and make no effort to extend their undertakings. As a consequence, the service is very poor, and suffers frequent interruptions. The sale of wiring devices and the like has been practically confined to the cheaper classes; there has been apparently little effort to sell higher-class manufactures even among those who are able to buy them.

Conditions in Colombia are very similar, although this country has a larger population (about 5,800,000) and greater oil resources, which, however, have not been developed to such an extent as those of Venezuela. Here, again, the supply authorities are not endeavouring to extend their business, and the rates charged generally preclude the use of domestic appliances.

In Panama there has been a fair amount of electrical development, practically wholly on American lines. The other foreign material is confined to lamps, a few cheap fans, and some low-priced wiring devices of European manufacture. Electric fans are not generally popular, although it is thought that the population could be educated up to them.

Costa Rica, although only having a population of 450,000, is a consistent buyer of American products. With two hydro-electric companies competing for business in the capital, San José, there has been considerable selling activity, and the electrical development of the city has been very good. The standard of illumination is high, and there is a fair use of electrical appliances in spite of high charges. Electric cooking has made great progress, and washers are also used.

Nicaragua is very backward, and the United States' exports of electrical goods have declined considerably. A hydro-electric system was recently initiated in Leon, but for the most part the supply undertakings give a very poor service, the distribution systems being badly constructed. Although American manufacturers obtain the bulk of the orders for electrical equipment, there is an increasing entry of German goods.

One of the most progressive of the countries visited is San Salvador. This has a population of 1,300,000 in a comparatively small area. There is abundant water power, and practically every supply system is hydro-electric. Public electrical utilities are more advanced than in the countries mentioned above, but wiring practice is not on a very high plane. The only electrical appliance that is in use to any great extent is the flat-iron; there is also a small number of electric fans in use. San Salvador has been a fair field for manufacturers of farm-lighting plants; those without batteries are preferred.

The principal central stations in Guatemala are in the hands of an American holding company, and the business is developed on American lines. There is a regular commercial department, with a showroom, and very good results are being obtained. The use of appliances is extending, and, through the influence of the power company, new wiring regulations are coming into force, and electrical contractors in Guatemala City are being licensed, which will naturally result in a higher standard of work. The standard of shop lighting is very high, and high-grade lighting fittings have found a good market. Electric signs are also in extensive use in the city.

Mexico is the most important of the countries visited. This country, which has a population of about 13 millions, has heavy investment of American capital, and the central-station practice generally follows American methods. Generally speaking, the electrical business in Mexico is fair at the present time, but purchasers are buying in limited quantities according to local dealers. German manufacturers are very active in Mexico, the Siemens-Schuckert Company having a very large establishment in Mexico City, with branches in the more prominent distributing centres. The Swedish A.S.E.A. is also active in the apparatus field, while Mr. Lundquist also observed "Heemaf" (Dutch) motors. American manufacturers appear to be holding their own, but Germany has taken business on the basis of extraordinary terms in a few instances. In the motor field German competition has only been felt in sizes up to 25 h.p., in which range German manufacturers have a considerable price margin; the quality, however, is not equal to that of American motors. Germans are offering fair quality wiring devices at extremely low prices, and are taking a good deal of the business; in some cases American lines have been closely copied. Appliances have a fair sale in Mexico, but the bulk of the purchases are apparently made by foreigners, except in the case of electric irons.

The general impression gained by Mr. Lundquist from his tour is that in spite of the privileged position which the United States enjoys, American manufacturers are hardly taking full advantage of the possibilities of these adjacent markets. He realises that a good deal of business is lost through a lack of long-term credit facilities, and he thinks that some arrangements could be made to provide these. "It must be realised, of course, that not all of the long-term business is sound, but there must be a worth-while proportion that is safe."

Russian Electrical Notes.

Production of the Manufacturing Works.—During the three months ended with June, which comprised the third quarter of the current Soviet financial year, the total production of the Russian electrical manufacturing works was valued at 25,800,000 roubles, an increase of 13 per cent. over the preceding quarter. The output was divided as to 11.3 millions of roubles among the works of the Central Electrical Trust, 9 millions among those of the Electrical Machine Trust, 3.8 millions among those of the Telephone and Telegraph Trust, 472,000 roubles among the Accumulator Trust, and 272,000 roubles among the "syndicated" works. As compared with the second quarter the value of the production in the June quarter was 37 per cent. greater in the case of machines, 16 per cent. in the case of cables, and 16 per cent. in that of telephone and telegraph appliances. The production of lamps remained on the same level as in the second quarter, while some reduction took place in the glass, accumulator and carbon branches of production, within the limits of from 6 to 16 per cent. The personnel increased by 8 per cent. during the quarter, at the end of which the number of workpeople employed throughout all the branches totalled 21,391, together with a staff of 3,569. The average efficiency of the workmen advanced by 4 per cent. over the preceding quarter or 2 per cent. more than had been expected under the productive programme.

Telephone and Radio Apparatus.—The turnover of the Telephone and Telegraph Trust, which also produces radio apparatus, is reported to have considerably increased owing to the development of wireless telegraphy. During the six months ended with March the value of the turnover averaged 730,000 roubles per month, since when it has risen to 1,100,000 roubles per month. As to the actual growth in the business it is mentioned that the value of the uncompleted orders on April 1st, 1925, amounted to 9,000,000 roubles, while orders for 8,000,000 roubles will have been booked by the end of September. The working funds available to the Trust, however, will only allow of the execution of orders representing a total of 11,000,000 roubles by that date unless further financial assistance is received from State funds. An application for this assistance has already been made, and at the same time permission is being sought for greater freedom in the fixing of the sale prices of a number of manufactures. The prices realised for radio apparatus are said to be unprofitable, and the Trust asks for the right to import such appliances so as to regulate the average prices on sales. It is also suggested that the State should assume at least part of the expenses incurred by the Trust in the carrying out of scientific research.

The Donetz Coal Basin.—Dealing with the proposed extension of the electricity supply system in the Southern coal mining region of the Donetz, the Electrification Section of the State Planning Commission points out that the contemplated development is of great significance having regard to the growth of the metallurgical, chemical and other industries in that district. The section has therefore decided to ask the Supreme Council of National Economy to prepare a general scheme for the development of all the industries in the region, including the Donetz Coal Trust, the Southern Steel Trust, the chemical industry and other large undertakings, and to commission the General Electrical Commission to prepare a plan for the construction of new generating stations and a high-pressure network for the distribution of the load as between the industrial works and the stations. So far as concerns the erection of new transmission lines in 1925-26 the section considers it necessary to proceed with the following lines and sub-stations: (1)

ine between Artem and Rostof with a sub-station; (2) a line rom Bokovo to Rovenetskoe with a sub-station; (3) a line rom Pervomainsk to Karfaren; and (4) a sub-station at the)umo works. It is considered necessary to ascertain what ums would be provided by the interested works to assist in he erection of the lines.

The Shteroff Station.—The engineer in charge of the contructional works in connection with the Shteroff Station in he coal basin of the Donetz states that the erection of the ransmission lines and five sub-stations has begun, as well s the installation of the boilers and one 10,000-kW turbo-enerator. A second set of the same size is shortly expected rom England. It is intended to set the station in operation n January 1st, 1926, a sufficient load having already been uaranteed. As new industrial works are being brought into ervice it is proposed to increase the capacity of the station to 6,000 kW in the year 1926-27.

The Supreme Council of National Economy is considering he question of the establishment of a works for producing luminium in the area of supply of this station.

An E.h.p. Transmission Line.—A successful trial of the 15,000-V line between the Shatur station and Moscow has re-ently taken place in connection with the experimental work-ng of this station which is to begin this month.

The Republic of Georgia.—The State Planning Commission f Georgia has prepared a five years' scheme of works of elec-rification, having regard to the prospective demands of in-ustry, transport and improvement works. Besides the hydro-lectric works which are in course of construction at the pre-nt time the scheme provides for the erection and equipment f a large hydro-electric works on the river Rion in Kutais, nd a second on the River Alosani in Kacheti. It is proposed o proceed with the former in the first place so as to be able o afford a supply of energy in the manganese ore district of hiaturi (the area of the Harriman ore concession). An in-estigation is also being made into the possibility of construct-ng a third hydro-electric works on the River Kumistani in .bchazin.

Central Asian Resources.—The Electric Planning Commis-ion has made application to the higher authorities for the as-gnment of the sum of 2,000,000 roubles for the purpose of con-ucting an investigation of the sources of energy in the Central siatic regions of Uzbekistan and Tadjikistan, so as to ascer-ain the possibility of the establishment of new branches of ndustry and the preparation of a detailed plan of electrifi-ation.

Electric Port Railways.—The Leningrad Port Administra-on has prepared a scheme for the construction of electric ap-roach railways to assist in the loading of timber. Negotiations n the question are reported to have already been opened with rms in America, Germany, England, and Italy. The ap-roach lines will have a length of 7.44 miles and a handling apacity of over 1,000 tons per hour. Foreign firms will be llotted orders to the extent of 15 per cent. of the estimated xpenditure upon the works; the bulk of the work will be arried out in Russia.

Moscow Works Extensions.—The Electric Planning Com-ission has confirmed the supplementary estimates of the Mos-ow supply authority (Moges) for 1924-25. This increases the mount on capital reconstruction and re-equipment to 4,200,000 oubles, and that for new construction to 3,600,000 roubles.

Extensions in the Ural.—On a report from the Ural section he Electric Planning Commission has confirmed a scheme of evelopment of the Kizeloff regional station to 26,000 kW, with he installation of transmission lines to Perm and Chusov. he expenditure is estimated at 8,472,000 roubles, of which 335,000 roubles will be required next year. Approval has lso been given by the Commission to a scheme for the con-truction of the proposed Chelyabin regional station at a cost f 8,100,000 roubles, including transmission lines, of which 770,000 roubles will be needed in 1925-26. It has also been ecided to grant a loan of 500,000 roubles to assist in the com-letion of the Sverdloff station by the beginning of 1926.

A Palace of Electrical Engineering.—A committee under he chairmanship of Mr. L. D. Trotsky has been formed to pre-are a scheme for the establishment in Moscow of a "palace of ectrical engineering" for the housing of all electrotechnical affs—administrative, economic, technical, and scientific—and he creation of a permanent museum of electrotechnics.

The Dnieper Hydro-Electric Works.—The question of this roposed large works again came before the State Planning ommission on June 30th, when a report was presented point-ng out that the solution of the problem was closely connected ith many economic matters, as, for instance, the reconstruc-on of the mining industry in this region, transport, &c., and hat the estimated expenditure on the works in the next six ears would amount to 130,000,000 roubles. The Planning ommission decided to ask the Supreme Council of National conomy to prepare a report on the subject. At the same eeting consideration was given to a scheme for the construc-on of a hydro-electric works on the Boz-Su, which is esti-ated to require the sum of 3,345,000 roubles.

New Radio Stations.—The Weak Current Trust has de-vered to the Radio Transmission Company the equipment for 2 radio stations which are to be erected in Kharkof, Sverd-vsk, Odessa and other towns. Next year a further 30 stations ill be established in other towns for broadcasting purposes.

Trade Statistics of South Africa.

The following statement, showing the imports of electrical and similar goods into the Union of South Africa during the year 1924, has been compiled from the recently-issued official trade statistics. The figures for 1923 are added for purposes of comparison, and notes of any increases or decreases are made. It should be observed that the large decreases under "Other electrical material" are due to a more detailed classification :—

	1923. £	1924. £	Inc. or dec. £
Electrical cable and wire.—			
Total	360,000	360,000	—
From Great Britain	344,000	324,000	– 20,000
,, United States	4,000	9,000	+ 5,000
,, Germany	8,000	12,000	+ 4,000
,, Belgium	2,000	2,000	—
Batteries, primary.—			
Total	24,000	31,000	+ 7,000
From Great Britain	5,000	8,000	+ 3,000
,, United States	14,000	17,000	+ 3,000
,, Sweden	1,000	1,000	—
,, Denmark	2,000	3,000	+ 1,000
Batteries, secondary.—			
Total	50,000	58,000	+ 8,000
From Great Britain	19,000	25,000	+ 6,000
,, United States	24,000	24,000	—
Heating and cooking apparatus.—			
Total	30,000	36,000	+ 6,000
From Great Britain	17,000	23,000	+ 6,000
,, United States	7,000	8,000	+ 1,000
,, Germany	5,000	5,000	—
Insulators, porcelain.—			
Total	6,000	11,000	+ 5,000
From Great Britain	3,000	9,000	+ 6,000
,, United States	1,000	500	– 500
,, Germany	2,000	1,500	– 500
Insulators, all other.—			
Total	3,000	9,000	+ 6,000
From Great Britain	2,000	7,000	+ 5,000
Dynamos and generators.—‡			
Total	—	30,000	—
From Great Britain	—	24,500	—
,, Germany	—	2,000	—
,, United States	—	3,500	—
Motors.—			
Total	225,000	167,000	– 58,000
From Great Britain	122,000	88,000	– 34,000
,, United States	55,000	47,000	– 8,000
,, Germany	27,000	9,000	– 18,000
,, Holland	8,000	2,000	– 6,000
,, Sweden	11,000	14,000	+ 3,000
Transformers.—			
Total	48,000	64,000	+ 16,000
From Great Britain	36,000	51,000	+ 15,000
,, United States	8,000	8,000	—
,, Germany	2,000	4,000	+ 2,000
Meters, electric.—			
Total	*	33,000	—
From United Kingdom	*	18,500	—
,, Germany	*	10,000	—
,, United States	*	4,000	—
Electric hand lamps.—			
Total	†	7,000	—
From United Kingdom	—	1,500	—
,, Germany	—	2,000	—
Other electric lamps, globes, bulbs, &c.—			
Total	112,000	112,000	—
From United Kingdom	49,000	37,000	– 12,000
,, Austria	9,000	4,000	– 5,000
,, Germany	10,000	11,000	+ 1,000
,, Holland	20,000	25,000	+ 5,000
,, United States	18,000	30,000	+ 12,000
Electrical machinery, other.—			
Total	169,000	554,000	+385,000
From Great Britain	121,000	365,000	+244,000
,, United States	23,000	101,000	+ 78,000
,, Germany	17,000	51,000	+ 34,000
,, Sweden	2,000	3,000	+ 1,000
Electrical material, other.—			
Total	428,000	39,000	–389,000
From Great Britain	258,000	23,000	–235,000
,, United States	77,000	7,000	– 70,000
,, Japan	500	—	– 500
,, Holland	3,000	—	– 3,000
,, Germany	66,000	6,000	– 60,000
,, Switzerland	4,000	1,000	– 3,000
,, Czecho-Slovakia	6,000	—	– 6,000
Cranes.—			
Total	25,000	22,000	– 3,000
From Great Britain	23,000	19,000	– 4,000
,, United States	1,000	2,000	+ 1,000

	1923. £	1924. £	Inc. or dec. £
Elevators and lifts.—			
Total	17,000	25,000	+ 8,000
From Great Britain	16,000	24,000	+ 8,000
,, United States	—	1,000	+ 1,000
Telegraph and telephone material.—			
Total	30,000	39,000	+ 9,000
From Great Britain	20,000	17,000	− 3,000
,, Sweden	1,000	3,000	+ 2,000
,, United States	5,000	3,000	− 2,000
,, Czecho-Slovakia	1,000	2,000	+ 1,000
,, Belgium	3,000	12,000	+ 9,000
Electric lighting outfits, self-contained.—			
Total	*	8,000	—
From United Kingdom	*	5,000	—
,, United States	*	2,500	—
Wireless apparatus and parts.—			
Total	29,000	285,000	+256,000
From Great Britain	26,000	264,000	+238,000
,, United States	3,000	6,000	+ 3,000
,, Germany	—	5,000	+ 5,000
Tramway rails.—			
Total	22,000	14,000	− 8,000
From Great Britain	16,000	14,000	− 2,000
,, United States	6,000	—	− 6,000
Tramway rolling-stock.—			
Total	24,000	25,000	+ 1,000
From Great Britain	12,000	11,000	− 1,000
,, United States	12,000	14,000	+ 2,000
Other tramway materials.—			
Total	23,000	55,000	+ 32,000
From Great Britain	17,000	45,000	+ 28,000
,, United States	5,000	9,000	+ 4,000
Pumps.—			
Total	87,000	105,000	+ 18,000
From Great Britain	50,000	60,000	+ 10,000
,, United States	24,000	28,000	+ 4,000
,, Switzerland	6,000	10,000	+ 4,000
,, Germany	5,000	4,000	− 1,000
Engines, oil, petrol and spirit.—			
Total	40,000	57,000	+ 17,000
From Great Britain	30,000	50,000	+ 20,000
,, United States	5,000	4,000	− 1,000
,, Germany	2,000	1,000	− 1,000
,, Sweden	1,500	1,000	− 500
Engines, other.—			
Total	134,000	50,000	− 84,000
From Great Britain	126,000	45,000	− 81,000
,, United States	2,000	1,500	− 500
,, Germany	5,000	1,000	− 4,000
Leather driving belts.—			
Total	41,000	47,000	+ 6,000
From Great Britain	21,000	27,000	+ 6,000
,, France	3,000	4,000	+ 1,000
,, United States	16,000	14,000	− 2,000
Other driving belts.—			
Total	120,000	135,000	+ 15,000
From Great Britain	67,000	70,000	+ 3,000
,, Canada	13,000	28,000	+ 15,000
,, United States	38,000	36,000	− 2,000

In addition to the above the following goods were imported as "Government stores":—

Batteries, primary.—			
Total	4,000	1,500	− 2,500
From Great Britain	2,000	1,200	− 800
Batteries, secondary.—			
Total	1,000	5,000	+ 4,000
From Great Britain	200	4,500	+ 4,300
,, United States	200	—	− 200
,, Germany	—	500	+ 500
Heating and cooking apparatus.—			
From Great Britain	150	300	+ 150
Insulators, porcelain.—			
Total	6,000	7,500	+ 1,500
From Great Britain	2,000	1,600	− 400
,, United States	4,000	4,000	—
Insulators, other.—			
Total	3,000	15,000	+ 12,000
From United Kingdom	2,500	1,000	− 1,500
,, United States	500	14,000	+ 13,500
Motors and parts.—			
Total	1,000	4,000	+ 3,000
From Great Britain	400	4,000	+ 3,600
,, Denmark	600	—	− 600
Transformers—			
Total	—	64,000	+ 64,000
From Great Britain	—	1,000	+ 1,000
,, United States	—	63,000	+ 63,000
Electrical cable and wire.—			
Total	174,000	201,000	+ 27,000
From Great Britain	166,000	175,000	+ 9,000
,, United States	2,000	—	− 2,000
,, Canada	6,000	22,000	+ 16,000
,, Denmark	—	3,000	+ 3,000
Telegraph and telephone material.—			
Total	122,000	270,000	+148,000
From Great Britain	82,000	210,000	+128,000
,, United States	13,000	10,000	− 3,000
,, Sweden	27,000	30,000	+ 3,000
Electrical machinery, other.—			
Total	11,000	1,139,000	+1,128,000
From Great Britain	11,000	1,005,000	+994,000
,, United States	—	121,000	+121,000
Electrical material, other.—			
Total	239,000	—	−239,000
From Great Britain	190,000	—	−190,000
,, United States	47,000	—	− 47,000

* Included with "Material and fittings, other."
† Not previously specified.
‡ Included with "Electrical machinery, other."

Corrosion at Switch Terminals.

A Research into the Causes of Corrosion.

Investigations have been made recently by the Resear Laboratories of the General Electric Co., Ltd., into the cau of the corroding of tumbler-switch terminals, &c. report of the work carried out in making the investigati and the conclusions arrived at will prove of considerable terest. Visits to installations and laboratory tests prove th corrosion only occurs where the installation is wired on t negative side of a 3-wire d.c. system. The experiments a show that corrosion only becomes evident when the switch are located in a damp situation, and that the moisture drawn to the switch terminals by the capillary action of t

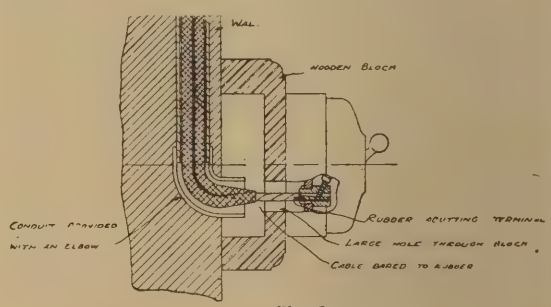


Fig. 1.

outer braiding of the cable. Leakage is set up and electroly action takes place, with the result that copper is deposited the negative terminal, which in air, turns to copper carbon and thus forms a porous covering of a salt, which tends alw to keep the surface wet, thus spreading the trouble. As t blades of the switch become wet the solution is splashed to the cover of the switch when the switch is operated. periments were conducted with the bare ends of the cab well greased before insertion in the switch terminals, and o

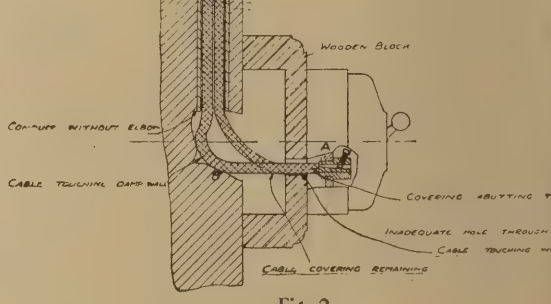


Fig. 2.

slight corrosion was observable. Further experiments we carried out under exactly similar conditions, with the excepti that the outer covering of the cable was bared down to t rubber insulation for some distance before insertion in t switch, so that it could not possibly touch the metal of t switch terminals. It was then found that corrosion did n occur. Switches mounted on the positive side of the syste are not subject to this trouble. A film of high resistance formed on the metal of the positive pole which speedily caus

the cessation of the leakage current, hence the absence of corrosion.

To summarise the matter, it is apparent that the trouble is caused by the wiring of the switches in such a way that the outer braiding, in contact with water from the damp wall (B, fig. 2), is brought right up to the base of the switch terminal (A, fig. 2).

The only remedy is good and careful installation. If the position of the switch is such that the wall and surroundings are damp, the following precautions should be taken: Cables should not touch the damp wall on their way from the conduit to the switch, and a large enough cavity or the protection afforded by an elbow joint in the conduit should be provided behind the switch in order to ensure this; they should be bared down to the rubber for some inches before entering the back of the switch; and the ends of the cable should be covered in thick grease before being inserted into the switch.

This subject is of considerable importance, especially in view of the large number of new houses being erected to-day, and it is hoped that the suggested precautions for overcoming the corrosion trouble will be adopted.

Although tumbler switches only are dealt with, it will be evident that exactly the same conditions may be met with in such other accessories as fuseboards, wall plugs, cutouts, &c., and although these are not called upon to give a mechanical performance as is the case with switches, it is important that for the sake of their lasting properties and electrical efficiency similar care in installing them should be exercised.

The two diagrams given show the correct and incorrect methods of installing a tumbler switch.

We are reminded of the necessity for protection against the creeping of moisture along the conductor itself, and it will be remembered that we drew attention to the importance of this in our issue of February 20th last when we advocated the sealing of cable ends.

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

An Adjustable Wire Stripper.

What should prove of value to the electrical wireman is a wire stripper, described in *Electrical Merchandising*, which is being manufactured by Mr. A. LAUBSCHER, 77, Fort Pleasant, Avenue, Springfield, Mass., known as the Acme electric cord

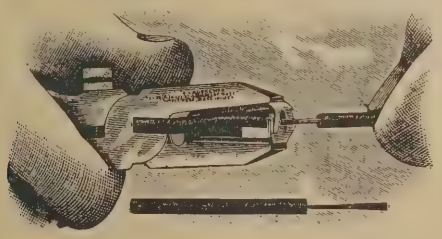


Fig. 1.—Cord and Wire Stripper.

and wire stripper, fig. 1. It is claimed that it will strip double or reinforced cord as well as single. It is possible to set the stripping opening to the size necessary to accommodate the wire. All the parts are interchangeable, and may be easily removed and replaced.

A New Ironclad Switch.

The MIDLAND ELECTRIC MANUFACTURING CO., LTD., Barford Street, Birmingham, has introduced a new series of switches under the trade name of "Memrex." It is claimed that it is the first commercial ironclad switch to comply with No. 67 of



Fig. 2.—The "Memrex" Switch.

the new I.E.E. Regulations, which specifies tests of 50 per cent. excess current at 50 per cent. excess pressure over rating. The switch is fitted with the M.E.M. quick-make-and-break movement, and special attention is drawn to the complete shrouding of the live parts, which enables the switch to comply with the strictest interpretation of the Home Office Regulations. Standard "Memrex" switches have been tested at the Birmingham University Electrical Laboratory under the following conditions, with satisfactory results: a 15-A switch was tested on a load of 22.5 A, a 30-A switch on 45 A, and a 60-A switch on 90 A, all at a pressure of 750 V. Fig. 2 shows the "Memrex" switch, which can also be supplied as a combination switch and fuses.

A Fusible Cartridge for use with an Electric Iron.

A somewhat ingenious device, designed for use in conjunction with their "Safe Economy" electric iron, has been marketed by MESSRS. IMPROVED APPLIANCES, LTD., 43-4, Fetter Lane, London, E.C.4, in the form of a collapsible cartridge designed to hold the switch of the iron "on" for a given period and then release it automatically. It consists of two cylindrical metal tubes, one inside the other, fixed, when cold, at a

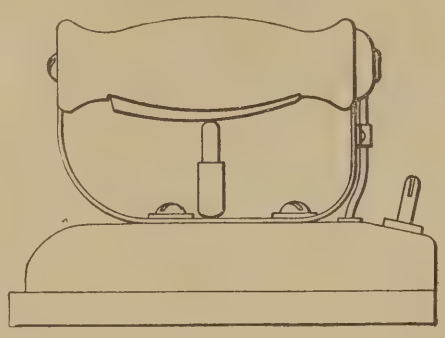


Fig. 3.—Fusible Cartridge in Position.

point giving the required length to hold the switch "on." The cartridge is placed vertically between the switch handle and the element case, as in fig. 3. At a certain temperature or after a period of about 10 minutes the grip between the two portions is released, with the result that the device collapses and the switch is released from the "on" position by its own mechanism.

A New Portable Electric Cylinder Boring Machine.

A description is given in the *Railway Gazette* of a recent product of MESSRS. BEYER, PEACOCK & CO., LTD., 15, Dean's Yard, Westminster, London, S.W.1, in the form of a portable electric cylinder-boring machine, fig. 4. This device consists of a mild steel bar of 4¼ in. diameter, carrying the boring head and mounted in bearings in the main frame. This is designed as an oil-tight gear-box and is fitted with a 2-speed gear for driving the main worm wheel mounted on the bar which can be started, stopped and varied in speed by means of an operating

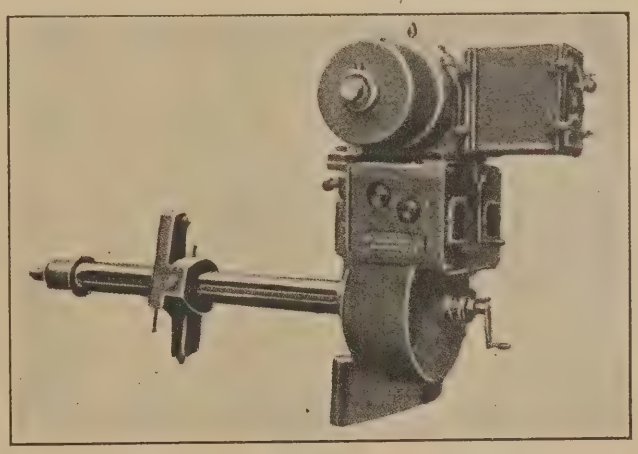


Fig. 4.—A New Electric Portable Boring Machine.

lever without stopping the motor. The machine is driven at constant speed by a 1-h.p. motor mounted on the main frame and carrying the starter on the side. An isolating switch is also provided, together with the necessary plugs, sockets and cable. The equipment comprises two boring heads and sets of tools, one pair of sample adaptors for bolting to the cylinder cover face and the necessary adjusting tools.

By bolting the machine to the adaptors and fitting the boring bar with the bush in the stuffing box of the rear cylinder cover, the machine is rendered self-centring.

A Combined Electric Towel Airer and Radiator.

The accompanying illustration, fig. 5, is of the "Gee-Gee" combined towel airer and radiator, a recent product of MESSRS. GEO. GREEN & CO., 40, Aybrook Street, Manchester Square, London, W.1. It is designed to give efficient service in the bathroom in both of the directions indicated, and is claimed to take up no more room than an ordinary towel rail. The

radiator is of the electrically-heated-water-type, and is equipped with a "Gee-Gee" immersion heater; this is arranged for 3-heat regulation. The maximum loading of 750 W is claimed to be sufficient to heat a bathroom of the

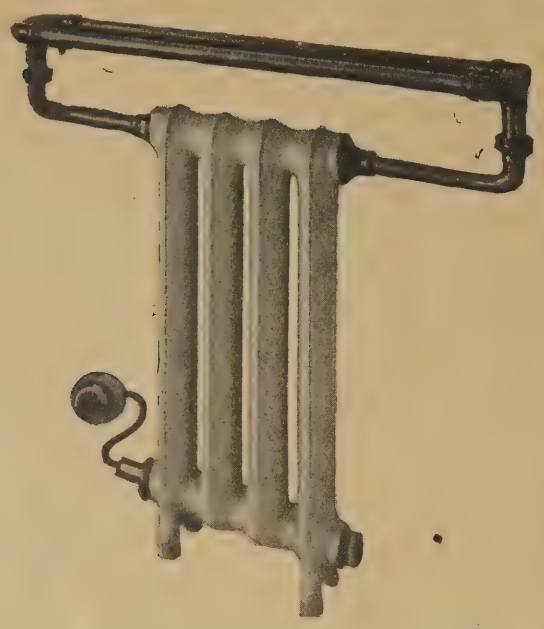


Fig. 5.—Combined Electric Towel Airer and Radiator.

usual dimensions, medium or low switching being used for airing purposes during warm weather.

The combination is finished with polished gun-metal rails and white enamelled radiator.

A Wiring System for Fume-laden Atmospheres.

The "Helsby" Ebonite-Enclosed Wiring System.

The advent of a system of electrical wiring that offers protection against the corrosive conditions obtaining in chemical factories, bleach yards and similar establishments will be welcomed by engineers whose work brings them in touch with conditions where lead or rubber sheathed cables, metal boxes and fittings will not stand up to the action of fumes, &c.

That ebonite is the strongest resistant to corrosive action commercially marketed is the basis on which the British Insulated & Helsby Cables, Ltd., has introduced the "Helsby" ebonite-enclosed wiring system. This consists of a range of cables and fittings completely enclosed in ebonite. The cable is supplied as single, two or three core, Association 600-megohm

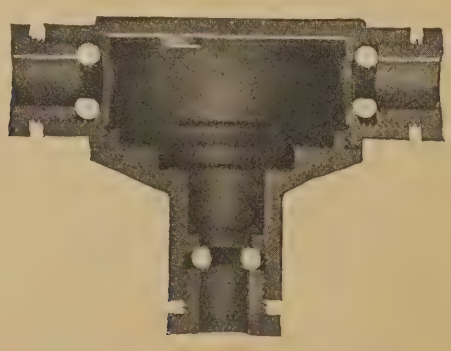


Fig. 1.—Section of Ebonite Case for Ceiling Rose.

grade, insulated with pure and vulcanised rubber and sheathed with a substantial tube of ebonite, all sizes, whether single or multi-core, being built up to an external diameter of half an inch. Only one size of gland is therefore necessary, although the makers have produced a smaller gland for use with flexible suspension lamp fittings, where cab-tire-sheathed twin flexibles may be used. The finished ebonite-sheathed cable is very strong and rigid when erected, and it is claimed that the ebonite sheathing affords mechanical protection to the insulated cores almost comparable to steel conduit.

The fittings, such as connectors for making joints, switches, fuse boards, &c., are enclosed in cylindrical ebonite boxes, in such a way that no metal parts are exposed to the atmosphere. The boxes are provided with screw glands, with rubber packing washers, making gas and watertight joints with the cable surface. The joint boxes are made in two, three and four ways, and gland plugs can be supplied for closing the ways not required. The ceiling rose embodies the same type of gland and screw-on cover as the joint boxes, an internal device preventing the weight of the pendant cable and lamp-holder from straining the joint.

In fig. 1 is shown a section of an ebonite fitting in the form of a ceiling rose.

Two types of lamp holder are provided suitable for vacuum lamps. One of these is intended for use with cab-tire-sheathed pendant cable, where it is desired to have flexible pendants. It comprises a standard brass bayonet socket cord grip lamp-holder enclosed in an ebonite shroud; the shroud is in two parts, enabling the holder to be easily wired. The other type of holder has an arrangement similar to the ceiling rose for taking the weight of the fitting.

Distribution boards or boxes are built up in a similar manner to the other fittings, the fuse elements being enclosed in an ebonite box fitted with cable glands. Fig. 2 shows a 4-way d.p. board, approximately a quarter of the actual size. The other necessary fittings including watertight rotary snap switches are all built up on the same principle.

By virtue of the property of ebonite of softening under heat, the sheathed cable is wound into coils of about 3 ft. 6 in. external diameter. It is, of course, necessary to again heat the cable before it can be uncoiled, a convenient method of doing this being to immerse the coil in hot water for a few minutes. When the sheathing becomes soft enough the cable is straightened out into the lengths required and as it becomes cold it hardens again. During erection it may be easily bent to any radius by heating locally at the required point; when set it permanently retains the curvature it has been given. It is claimed that the cutting of the cable and the preparation of the ends is quite simple. A slight incision made with a knife completely round the circumference enables the ebonite to be cracked on being sharply bent, when the cable inside

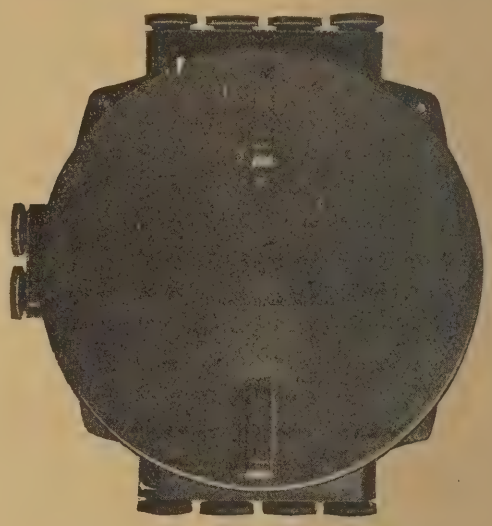


Fig. 2.—Ebonite Case for Distribution Board.

may be severed in the ordinary way with cutting pliers. To prepare the ends the sheath is cracked in the same manner and the piece drawn off.

The system has been subjected to severe practical tests, and some particulars from a report on an installation wired with the system are of great interest. The installation is at the works of a firm of bleachers, mercerisers and dyers. The mills were wired with the ebonite-enclosed wiring system in 1922 and no trouble has yet arisen on the installation, consisting of some 20 h.p. and over 100 lighting points. All departments are wired, including the various dyehouses, bleaching, mercerising, and stoving rooms, where the moisture-laden atmosphere is charged with chemical fumes, and water spraying, splashing, and dipping (slightly acid or alkaline) takes place, rendering the ordinary systems of wiring unsuitable. The whole of the wiring is said to be in as good condition to-day as when it was erected. The connections to the motors are run down the walls, along the floors and in some cases along the dyeing machines themselves, where they are continually subjected to hot and cold chemically charged liquors.

Electrical Train Shunting.—A new car retarding device to eliminate "car riding" and "switching tending," two of the most hazardous kinds of railroad work, was recently demonstrated at Gary, Ind., railway officials representing several roads being present. The new contrivance enables a tower operator to regulate the speed of a car and guide it to the correct track by electric lever switches. The invention was designed jointly by Messrs. George Hanhaner, vice-president of the Indiana Harbour Belt Railroad, and E. M. Wilcox, master technical engineer, and is controlled by them. The Illinois Central Railway has contracted to install the appliance in its yards at Harvey, Ill., and the New York Central Railroad had a representative at the demonstration, with the view of using the invention in its yards near Albany, N.Y.—*Reuter's Trade Service* (Chicago).

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Regulations for Rural Overhead Lines.

Recently, the chairman of a British electric power supply company stated that the cost of connecting a farm to its lines was £300. Just about that time, an Italian engineer complained to the writer that he could not get the cost of switchgear for tapping a 33,000-volt line below £14. These cases are obviously extreme, but there must be a reasonable intermediate solution, preferably rather nearer the lower figure.

Many engineers complain about the present overhead line regulations that exist in this country. However, looking at them from the point of view of absolute safety and uninterrupted continuity of service between central stations and important towns, it would seem that they are not really very far wrong. For a rural service, periodical brief cessations of supply for inspecting and repairing purposes can be permitted. In fact, it is the usual practice on the Continent to close down all overhead networks for a few hours each Sunday morning even though it may stop a few electric church organs, and put out a few cellar lights.

In your editorial for August 28th, in commenting upon the recommendations of the Electricity in Agriculture Committee of the Institution of Electrical Engineers, you expressed the hope that no further obstacles would be placed in the way of rural electrification. With this hope I am in entire agreement. My difficulty is, however, to see how best the end can be attained of installing suitable rural lines in a safe and economical way in this country, without offending official regulations. Further, very few engineers here seem to have studied this work in detail, hence considerable guidance is needed in addition, or else overhead lines that err too much on the side of cheapness and nastiness may be erected. Perhaps some of your readers could put forward suggestions as to the best way to solve the problem of stipulating minimum reasonable requirements, as a matter entirely apart from the present overhead-line regulations.

R. Borlase Matthews.

East Grinstead, *September 2nd*, 1925.

Legal.

S. G. Brown, Ltd., v. The National Association of Radio Manufacturers and Traders.

This case came before Mr. Justice Finlay in the Vacation Court on September 1st. Mr. Jowitt, K.C., Mr. Haydon, K.C., and Mr. Jacobs appeared for Messrs. Brown, and Sir H. Slesser, K.C., and Mr. Steinham for the Association.

Mr. Jowitt stated that the matter was a very serious one. In the first place, plaintiffs were asking for an injunction restraining the Association from including the plaintiffs' name in the Association's "stop list." Secondly, the plaintiffs sought a sequestration order on the ground that the Association had failed to comply with an injunction granted by Mr. Justice Acton restraining it from excluding the plaintiffs from the Wireless Exhibition to be held at the Albert Hall this month. Counsel declared that the Association had so manœuvred as to make it unnecessary for it to grant Messrs. Brown any space at all. The Association was a trade union and Messrs. Brown were well-known manufacturers of all sorts of wireless instruments. Among the rules governing the relationship of the members *inter se* and of the members with the corporate body were rules that the Association was to support and uphold any "stop list" issued by the manufacturers' section; and that there should be 21 days' notice and an opportunity of being heard given to any member before his expulsion from the Association. On May 14th last the plaintiffs received a notice that an emergency meeting of the manufacturers' section would be held on May 20th. There was nothing in the agenda of that meeting to indicate that the business would in any way affect the plaintiffs, although there was one item marked "Price-cutting, to receive correspondence." On the day before the meeting the plaintiffs' secretary was informed by the secretary of the Association that charges would be made against Messrs. Brown. The plaintiffs' secretary said he could not attend and asked for particulars of the charges. These were refused. At the meeting a resolution was passed that the executive was satisfied that Messrs. Brown had committed a breach of the Association's by-laws in giving irregular discounts to retailers and that Messrs. Brown were to be fined £525. It was also resolved that if a satisfactory explanation was not given by a certain date Messrs. Brown would be put upon the official "stop list." Counsel contended that such a resolution could not possibly have any validity in the circumstances for it was made in the absence of the plaintiffs and before they had been given any opportunity of being heard. Plaintiffs refused to recognise the validity of the resolution and their solicitor wrote demanding that the fine be rescinded. Unless this was done he refused to give the plaintiffs' explanation. Ultimately the Association gave some particulars of the irregularities alleged. These the plaintiffs considered "trumpery," and they gave notice of their intention to withdraw from the Association. The manufacturers' sectional executive met again on July 17th and on July 23rd the plaintiffs' name was put upon the Association's official "stop list" for the first time. The Association's secretary also sent a circular to the members pointing out the fact. Counsel said he had evidence showing that the damage done to the plaintiffs by the "stop list" was a continuing one.

Sir H. Slesser said his submission would be that the proceedings were altogether bad. The Association had not in fact acted upon the resolutions of the meeting in May. The fine had not been pressed and a fresh start in the matter was made by a fresh resolution properly in order on July 17th.

Mr. Jowitt argued that subsequent events could not be divorced from the earlier steps. The conduct of the Association was throughout tainted with the illegality of the proceedings on May 20th.

The hearing was continued on September 3rd, when Mr. Jowitt, proceeding with his opening statement, said that he had now received some documents from the other side which, in his submission, proved that the resolution of July 17th could not stand on its own legs, but owed any validity it had to the meeting of June 22nd. At the meeting of June 22nd the sectional executive body resolved, as Messrs. Brown had failed to comply with the resolution of May 20th, to place them on the "stop list," and appointed a special "disciplinary committee" from the executive to meet on June 30th and hear whatever explanations Messrs. Brown, who were requested to attend, should make with regard to the charge made against them of granting irregular discounts. Messrs. Brown refused to attend or make any explanations unless the resolution of May 20th, imposing the fine, was rescinded and the *status quo ante* was restored. Counsel contended that in order to have a reasonable opportunity of explaining, Messrs. Brown wished to go before the Committee as innocent persons and not as persons who had been prejudged and fined. The special Committee adjourned until July 17th, when the resolution in question was passed, which, counsel urged, the Committee had no power to pass.

Sir Henry Slesser said there was a meeting of the whole executive body on July 24th, when the action of the Committee in placing Messrs. Brown on the "stop list" was approved and confirmed.

His Lordship said that, subject to anything Sir Henry Slesser had to say, he thought the real date with which they had to deal was June 22nd.

Sir Henry Slesser said he would deal with the two matters of injunction and sequestration separately, as they were fundamentally different. In the case of the injunction he submitted with confidence that this was really an attempt to reopen a matter which had been fully considered by Mr. Justice Acton. Nothing had happened since that time to justify the Court in doing so. It was a very serious request to make, and entirely contrary to the practice of the Court.

His Lordship: I am disposed to agree if nothing new has happened, and Mr. Justice Acton had all the materials before him.

Sir Henry Slesser said that nothing new had happened, except the publication in a trade paper of the addition of Messrs. Brown to the "stop list." The plaintiffs alleged that the breaches of the Association's rules complained of were trumpery and easily explained. The Association, on the other hand, thought that what was done by Messrs. Brown constituted serious breaches of the rules and seriously menaced the standard rates which the Association existed to protect.

His Lordship said he could not decide that.

Sir Henry Slesser said that Mr. Justice Acton had before him not only evidence of general financial damage as the result of placing Messrs. Brown on the "stop list," but also evidence of specific financial damage. The most, therefore, that the plaintiffs could say was that they had now adduced more evidence on that point. Until July 17th there was no operative resolution to put Messrs. Brown on the "stop list," and quite apart from whether that resolution might be connected with the previous fining resolution, he submitted that on July 3rd the plaintiffs received adequate notice to attend the meeting and full particulars of the charges to be made. Consequently there was nothing here contrary to natural justice because the plaintiffs did not choose to attend.

His Lordship: They had been fined for the very things that were to be inquired into at the meeting.

Sir Henry Slesser: No, I submit not. In May it might have been said that there was no power to fine at all. Secondly, it might have been said that no notice had been given of the charges, and therefore the proceedings were contrary to natural justice. He did not attack or defend what was done in May. That was the subject of further litigation. The point was that at the meeting in June there was no longer any attempt to fine Messrs. Brown, but to put them on the "stop list." Therefore, the first criticism of the May resolution disappeared and the second criticism went by the board also immediately it was seen that adequate notice of the June meeting had been given. In any case an injunction would not be effective as the Association could convene another meeting and properly place the plaintiffs on the "stop list" if they were not properly there now. With regard to sequestration, Sir Henry declared that the Association had not disobeyed the order of Mr. Justice Acton, and had not the least desire to do so. It had done what the Judge intended it to do, and nothing more nor less. It was not to exclude the plaintiffs from the Wireless Exhibition. That did not mean that it was to allot them a stand. The Association was to grant the plaintiffs an equal

opportunity with other members to make an application for a stand, that was all.

His LORDSHIP said that the wording of the order was singularly inoperative, but he felt that it was the intention of Mr. Justice Acton that the plaintiffs should have a stall at the Exhibition. He suggested that there should be no order with respect to the alleged contempt, but that he should now direct the Association to provide the plaintiffs with a stall.

Sir HENRY SLESSER said that the members had no right at all to any space at the Exhibition. Such space allocation was contingent upon the acceptance of a contract. There was no obligation upon the Association to provide space for anybody in particular.

After a lengthy consultation the parties arrived at a settlement of the whole dispute.

Mr. JOWITT stated that the terms were that the defendants agreed to reinstate the plaintiffs forthwith as full members of the Association, the plaintiffs' resignation to stand, but not to be operative until September 27th; the defendants withdrew all charges against the plaintiffs on the plaintiffs' agreeing that the defendants' action in placing them on the "stop list" was taken in good faith; the plaintiffs admitted the moral obligation to abide by the rules of the Association; the defendants agreed to allot a stand to the plaintiffs at the forthcoming exhibition; the defendants agreed to withdraw plaintiffs' name from the "stop list" and delete the resolution with regard to the fine; the record of these proceedings to be withdrawn, and all claims by the plaintiffs to be abandoned, each party paying its own costs. Beyond the publication of these terms both parties agreed not to make any public announcement with regard to the matters in dispute; and the defendants agreed not to place the plaintiffs on the "stop list" by reason of their ceasing to be members of the Association.

His LORDSHIP considered that the parties had taken a very wise course.

British Broadcasting Co., Ltd., v. Wireless League Gazette Publishing Co., Ltd.

THE British Broadcasting Co., Ltd., on September 2nd, in the Vacation Court, applied for an interim injunction restraining until the trial of the action the Wireless League Gazette Publishing Company, Ltd., from infringing its copyright in the *Radio Times* by publishing on Saturdays the substance of the coming week's broadcasting programmes. For the defendants it was contended that there was no copyright and that there was nothing in the contract between the Postmaster-General and the British Broadcasting Company which entitled the company to exploit the programmes for its own profit.

Mr. JUSTICE FINLAY said he was not satisfied that the defendants were right and would ultimately succeed, but he was satisfied that there were serious and difficult questions of copyright to be tried. In the circumstances there would be no order on the motion except that the costs should be made costs in the action and that facilities would be given for an early trial of the action.

Globe & Sampson, Ltd., v. T. W. & R. C. Globe.

AT the Sheffield County Court recently, Globe and Simpson, Ltd., magneto specialists, of Cambridge Street, Sheffield, sued Thomas Wilson Globe and Reginald Cocking Globe, car electrical factors, of Broad Lane, Sheffield, for £50 damages for alleged breach of contract in connection with the sale and purchase of a business of magneto specialists and accumulator and starting battery engineers, and also for an injunction to restrain the defendants from carrying on or being connected with such business within 25 miles of Sheffield, and in particular from continuing to carry on or be connected with such business under the title of "Globe & Co.," at Broad Lane, Sheffield, as being contrary to an agreement entered into by the defendants on April 21st, 1921.

For the defendants, Mr. F. J. O. CODDINGTON said that the agreement had been cancelled at a meeting held on March 24th, 1924.

In cross-examination, REGINALD GLOBE admitted that only one clause of the agreement had been cancelled on the occasion referred to.

After a long summing up, the Judge gave judgment for the plaintiffs, awarded £2 damages, and granted an injunction. His Honour allowed a stay of execution for 14 days pending an appeal.

Japanese Electrical Exhibition.—His Majesty's Consul at Osaka (Mr. W. B. Cunningham) reports that arrangements are being made by the Kwansai (Western Japan) Branch of the Electric Association of Japan for an electrical exhibition on a considerable scale, which is to be held at Osaka from March 20th to May 31st, 1926. The promoters of the exhibition, which will be the largest of its kind as yet held in Japan, state that exhibits from foreign countries will be welcomed, although it is only in the case of Japanese goods that any awards will be offered. Applications for space are to be sent in by December 30th next and should contain full particulars of the nature of the goods to be exhibited, the space and current (if any) required, &c. They should be addressed to the office of the Exhibition, c/o Denki Kyokwai Shibu, Dojimanaka 2 chome, Kita-ku, Osaka.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

6,227. "Wireless receiving circuits." J. Robinson and T. H. Kinman. March 11th, 1924. (238,261.)

9,034. "Thermionic generators of high-frequency electric oscillations." E. W. B. Gill and E. Green. April 9th, 1924. (Addition to 201,585.) (238,265.)

9,347. "Apparatus for recording and reproducing sound." J. R. Robertson. April 12th, 1923. (214,274.)

11,284. "Alternating-current rectifiers." L. J. Hancock and Hancock and Co. (Engineers), Ltd. May 7th, 1924. (238,276.)

11,622. "Electrical apparatus for delivering a constant output when energised by a variable alternating input." W. J. Brown and Metropolitan-Vickers Electrical Co., Ltd. May 10th, 1924. (Cognate Application, 6,381/25.) (238,281.)

11,792. "Variable inductances for wireless telephony and the like." F. Noble. May 13th, 1924. (238,250.)

12,307. "Sound reproducers." P. G. A. H. Voigt. May 20th, 1924. (Cognate Application, 1,578/25.) (238,310.)

12,722. "Inductance coils." Igranic Electric Co., Ltd., A. H. Curtis, L. E. Currah, and W. K. Alford. May 23rd, 1924. (238,318.)

12,939. "Apparatus adapted for wireless reception." E. A. Graham. May 26th, 1924. (238,323.)

13,098. "Electric heaters." J. Schoenfeld. May 28th, 1924. (238,325.)

14,242. "Reproducing amplifiers for sound or like waves." T. W. Case. June 12th, 1924. (238,333.)

14,714. "Electrical heating unit." O. Kitzinger, J. Pickl, M. Moser, and A. Kraus. June 18th, 1923. (217,904.)

15,272. "Electrodes for discharge tubes." British Thomson-Houston Co., Ltd. July 24th, 1923. (219,663.)

15,464. "Radio receivers." N. Lea and Radio Communication Co., Ltd. June 26th, 1924. (238,338.)

15,731. "Electric contact-makers for use on the steering wheels of vehicles." G. Rose. June 30th, 1923. (218,330.)

15,834. "Electric generator and battery protector." T. W. Sampson and W. C. Chappell. July 1st, 1924. (Addition to 215,346.) (238,339.)

16,004. "Wireless receiving apparatus." C. L. Edwards. July 3rd, 1924. (238,342.)

17,497. "Pilotless aircraft for use in war." R. E. Bozon. July 22nd, 1924. (238,352.)

17,904. "Electromagnetic interrupters for the intermittent illumination of electric lamps." British Thomson-Houston Co., Ltd. (General Electric Co.). July 26th, 1924. (238,358.)

18,747. "Wireless apparatus." R. French and C. French. August 6th, 1924. (238,366.)

19,129. "Extra high-tension junction boxes for multi-core electrical cables." Forges & Ateliers de Constructions Electriques de Jeumont. May 13th, 1924. (234,038.)

19,494. "Electric switches." W. Edwards. August 16th, 1924. (238,376.)

20,274. "Heat-responsive electric circuit controllers." British Thomson-Houston Co., Ltd. August 27th, 1923. (221,213.)

20,979. "Electrical switches, particularly for high-tension systems." Electric Control, Ltd., and W. J. Gilson. September 5th, 1924. (238,384.)

23,690. "Sound-reproducing apparatus." British Thomson-Houston Co., Ltd. March 27th, 1924. (231,420.)

24,157. "Damping circuits for alternating-current machines." Siemens-Schuckertwerke Ges. October 13th, 1923. (223,250.)

24,233. "Taping machines." Western Electric Co., Ltd. December 31st, 1923. (Addition to 203,297.) (227,082.)

25,164. "Electric discharge apparatus." British Thomson-Houston Co., Ltd. October 23rd, 1923. (223,921.)

26,421. "Combined manual and automatic switches for electric heaters." M. Klettner. November 5th, 1924. (238,419.)

26,513. "Electrotherapeutic appliances or apparatus." E. R. G. Greville and F. W. Read. November 6th, 1924. (238,420.)

28,783. "Starting and short-circuiting devices for induction motors." J. W. Kirkland (Allgemeine Elektricitats-Ges.). December 1st, 1924. (238,433.)

29,812. "Tuning coils for wireless apparatus." A. M. M. Poole and H. C. Poole. December 11th, 1924. (238,439.)

30,134. "Electric lift machines and the like." J. B. M. Knutsen. December 15th, 1924. (238,441.)

30,357. "Methods of sheathing electrical conductors and like cores." Western Electric Co., Ltd. (Western Electric Co., Inc.). December 17th, 1924. (238,442.)

30,647. "Intermittent electric light fitting." A. Shaw and F. Fairer. December 20th, 1924. (238,443.)

1925.

844. "Overload electric relays." British Thomson-Houston Co., Ltd., and J. Sugden. January 10th, 1925. (238,453.)

1,840. "Combined wireless valve holder and rheostat." E. Dixon and C. J. E. Dixon. January 21st, 1925. (238,459.)

2,851. "Variable resistance devices." P. C. Rushen (Pacent Electric Co., Inc.). January 31st, 1925. (238,462.)

3,751. "Electric switches." International General Electric Co., Inc. February 11th, 1924. (229,297.)

4,053. "Electrical relays." H. J. Fitzpatrick. February 13th, 1925. (238,468.)

5,684. "Electric insulators." Porcelainfabriken Norden Aktieselskabet. March 5th, 1924. (230,446.)

7,632. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd., and J. E. Ostline. May 16th, 1924. (Divided Application on 12,136/24.) (238,477.)

7,776. "Process for electrical gas purification." Lodge-Cottrell, Ltd. (formerly Lodge Fume Co., Ltd.) (Metallbank und Metallurgische Ges. Akt.-Ges.). March 23rd, 1925. (Addition to 177,117.) (238,480.)

8,038. "Relays for the protection of alternating electric current systems." International General Electric Co., Inc. March 25th, 1924. (231,505.)

13,953. "Ignition coils for internal combustion engines." R. Bosch Akt.-Ges. June 26th, 1924. (236,181.)

15,012. "Illuminating appliances." A. J. Stephens (W. A. Dorey). June 9th, 1925. (238,498.)

17,657. "Electrical heating elements." E. L. Wiegand. March 11th, 1924. (Divided Application on 221,180.) (238,502.)

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The Wireless Exhibition.

THE exhibition of wireless apparatus—mainly for use in connection with the broadcasting service—which is in progress at the Albert Hall affords an opportunity to take stock of our position with regard to this application of electricity to the use and convenience of mankind. Considering that broadcasting was unheard of until 1920, and was only practised on a very limited and purely experimental scale during the first year or so, the development which has taken place since a national service was undertaken by the British Broadcasting Company in 1922 is nothing less than astounding. The United States, taking its cue from the achievements of the Marconi engineers and private experimenters in this country, plunged into an orgy of unrestricted broadcasting from which it does not appear to have yet recovered; we, fortunately, were more cautious, and established a controlled monopoly of broadcasting which has proved highly beneficial, both to the public and to the trades concerned: to the former, by ensuring the sane and efficient use of the ether, without interference between conflicting programmes, and to the latter by providing them with an assured market for their products and enabling them to manufacture apparatus to comply with clearly defined conditions.

The success of the policy adopted was well illustrated at the luncheon given to Senatore Marconi last week by the N.A.R.M.A.T., when the speakers bore witness to the fact that British broadcasting and British apparatus were the best in the world, and were in great demand beyond our borders. That the number of licence-holders is already close upon 1½ millions is in itself convincing testimony to the merits of the system, and an amazing record for a period of less than three years; and to that number must be added, we believe, quite a large number of unlicensed listeners who have not thought it incumbent upon them to bear their share of the cost of the programmes which they enjoy.

The early days of the automobile were marked by the numbers of untutored amateur mechanics who plunged into the mysteries of the internal-combustion engine with a zest unquenchable by oil and grime, but there is no precedent for the extraordinary enthusiasm with

which the wireless field has been invaded by hundreds of thousands who previously could not have adjusted an electric bell, but who essayed to capture Hertzian waves with an ardour that was rewarded by an incredible measure of success, aided by a specialist Press that now comprises no fewer than 18 periodicals and innumerable popular handbooks. The exhibition is a rallying-point for this army of would-be electricians, but it is also well worth visiting by the minority who are professionally interested in electrical engineering; whilst they will find there few striking innovations, they will be enabled to gauge the progress that has been made in the perfecting of detail and the evolution of improvements in design, and to appreciate the fact that the exhibits, taken all round, bear testimony to the very high standards of quality that are maintained by the manufacturers. Out of a chaos of complicated connections a few comparatively simple circuits are becoming more or less standard practice, and whilst it is possible to ring the changes indefinitely (perhaps that is the secret of the wireless craze) there is no need to stray far from the paths of simplicity and economy in order to secure perfectly satisfactory results.

Nevertheless, it must be admitted that so long as the overall efficiency of the receiving apparatus is far below one per cent. there is immense scope for invention. The telephone is essentially unchanged from its earliest form. If it made use of even five per cent. of the energy put into it, every headphone would become a "loud speaker." Here is a splendid opening for the experimenter!

Fabians and Farming.

UNDER the chairmanship of Captain Basil Hall, R.N., the fourth and last week of the Fabian Summer School was devoted to the consideration of rural problems. It was quite appropriate to this subject that the school was housed this year at the Bradley Agricultural College, Mitcheldean, Glos.

It is a sign of the times that an evening was allotted to the uses of electricity in agriculture, when Mr. R. Borlase Matthews read a paper on the subject, and a very animated and interesting discussion followed, in which the principal points raised were a demand for more technical information concerning certain of the farming applications; the cost of power; the comparison of hydro-electric and steam-generated power; electric ploughing; making hay without sunshine; the matter of distribution; and overhead lines *versus* cables. Naturally also, as might be expected of such an Association, the subject of economics and the question whether labour would be dispensed with or increased on farms were discussed. The opinion of the author of the paper was that the output per acre and per man would be increased and employment improved generally in rural districts, for the experience of other countries was that much work at present carried out in the towns was transferred to the country when electric power was available there.

A summary of the principal points of the paper will be found elsewhere in this issue.

Japanese Electrical Industry.

THE depressed condition of affairs in Japan has, not unnaturally, led to an agitation for the support of Home industries. It is reported that, consequent upon the great decrease in its revenue and in order to relieve the dullness of trade, the Imperial Government Railways Department has resolved to purchase all requisites from Japanese manufacturers, excepting small products which cannot be made in the country. Further, Japanese industrial concerns are stated to have a predilection for foreign electrical machinery and apparatus, and those interested in the future well-being of Japanese electrical engineering industry are very much exercised by this tendency. The Electrical Association is understood to have decided to make extensive and thorough investigations regarding the weak and defective points in Japanese products, through a committee that has been set up. This committee consists of representatives of 36 electrical machinery manufacturers, including several well-known companies, also of the Tokyo Municipal Electrical Bureau, while the Departments of Communications, Railways, and of the Army and Navy are to be asked to co-operate in the inquiry.

The subject was recently touched upon in an article in the *Electrician's Friend*, written by Mr. S. Mayebara, the chief of the Engineering Section of the Electric Bureau of the Communications Department. Though he was able to give figures showing that the Japanese electric power supply industry was making steady progress, and that a large amount of new generating plant was in course of erection, he had to deplore the Japanese inclination to indiscriminately favour foreign production, especially at a time when it was claimed that Japan produced hydro and steam plant "not so inferior to the foreign products" as a correspondent expresses it in a communication to ourselves. Mr. Mayebara is reported to have urged Japanese engineers to use as much Japanese product as possible, even at the sacrifice of convenience, in order to develop the Japanese electrical machinery and apparatus industry.

With regard to new work in contemplation, we understand that the Imperial Government Railways Department has decided to commence upon the construction of the Shinano-gawa hydro-electric power station in the fiscal year 1926-27. The Osaka municipality has large extensions to its electric power system in prospect. Mr. Amenomiya, the chief of its Electricity Department, has been indicating vast expansion ideas for the next seven or eight years both in respect of power supply and in electric transportation. The 10,000-kW generators for the Kujo power station, which is part of the scheme, were recently obtained in England. Further additions of 20,000 to 30,000 kW per year are contemplated for some years to come, subject to the approval of the loan scheme by the Department of Finance.

Trade Opportunities in Egypt.

THE report of Mr. E. Homan Mulock, Commercial Secretary at Cairo, which we review in this issue, indicates that Egypt is in a position shared by few countries at the present time. The cotton industry is prosperous, and this has had a beneficial effect upon the general economic position of the country. In many quarters attention is being directed to the advantages of electricity, resulting in the placing of a fair quantity of orders for machinery and plant. Unfortunately, the bulk of this business went to our Continental competitors, Germany having been very successful. The reason is plain: the British quotations were 50 per cent. above the German tenders. Mr. Mulock says: "It is to be regretted that, with one exception only, United Kingdom manufacturers do not appear to have submitted tenders for provincial electrical undertakings." In view of the wide price margin, this is not to be wondered at. Nevertheless, in spite of what the report says, Great Britain supplied the second largest share of the imports of electrical machinery during 1924, although France led by a substantial amount, and this share was an improvement upon the previous year's value.

Referring to the supply of smaller appliances and materials, the report states that if British manufacturers had extended their advertising and trade propaganda they would have obtained a larger share of the business. We think that greater efforts are worth while in this market which shows every sign of continued expansion. Hitherto the political uncertainty has handicapped foreign enterprise, but there is reason to believe that stability is now in sight and the position should be easier.

It is worth noting that, *mirabile dictu*, nothing is said about long-term credits, which are proving a difficulty in so many markets just now.

High-Voltage Cables.

Dielectric Loss and Temperature Rise under Working Conditions.

By E. A. BEAVIS, B.Sc.(Eng.), A.M.I.E.E., A.C.G.I.

Introduction.

The economical need for transmission of electrical energy at increasingly higher voltages has in recent years created many problems in connection with the design and manufacture of super-tension cables.

The question of dielectric losses has received universal attention: experience with the earlier paper-impregnated h.v. cables testified to its importance; in fact, the dielectric heating seemed likely to prove a serious limitation from the practical point of view.

A great deal of experimental investigation and research work has already been accomplished in this respect, and although the results available so far appear to be somewhat conflicting, much improvement is evidenced by the lower losses that characterise the more modern h.v. cables. With dielectric loss a matter of secondary consideration, it would seem that the present data in respect of current ratings available for voltages up to 11,000 V can be made applicable for much higher voltages with little or no modification.

In view, however, of our lack of definite knowledge or explanation of many of the dielectric phenomena occurring with high voltages, any conclusions drawn from isolated experiments on cable samples or impregnating compounds must necessarily be of somewhat tentative nature, and in practice allowance should be made for an appreciable factor of safety on the score of reliability.

Characteristics of Impregnated Paper Dielectric.

The losses occasioned with alternating current appear to be due mainly to the combined effects of hysteresis and current leakage,* the former varying with frequency, the latter independent and of electrolytic nature. The magnitude of each component varies rapidly with the temperature, hysteresis decreasing and current leakage increasing with rising temperature, so that the loss-temperature curve has a minimum point which usually coincides with the melting temperature of the impregnating material (between 90 deg. and 100 deg. F.).

At the lower temperatures where hysteresis loss entirely predominates, the effects produced are somewhat inconsistent; appreciable variations with voltage sometimes occur, and in many cases results are modified by past treatment which the particular cable may have undergone. Such changes generally decrease with rising temperature; beyond the minimum point results show more stability and the loss tends to become independent of frequency. The hysteresis effect gradually fades away as the impregnating compound gets more fluid, and at some temperature where current leakage alone prevails, the losses for a.c. and d.c. of equivalent voltage will correspond.

Fig. 2 represents some characteristic temperature curves for impregnated paper dielectric. The direct-current resistivity varies exponentially in a fairly regular manner; the value at any temperature T can be approximately expressed by the equation—

$\rho_T = \rho_0 / \alpha^{T-60}$; ρ_0 is the resistivity at 60° F. and α the coefficient per degree F. (about 1.05 to 1.06).

For comparative purposes the quantity S/K is the most important with regard to the conditions under a.c., and determines the power factor (usually signified as S/pK, where $p = 2\pi f$), and the loss at the temperature, frequency, and voltage concerned.

The general relation between a.c. resistivity and temperature is not capable of simple expression, the slope of the curve changing gradually on either side of the maximum, and finally merging at the higher temperatures into the equivalent d.c. curve. For a given voltage and frequency, however, between definite limits, the a.c. resistivity can be approximately represented by an equation of similar form to that for d.c.

In practice we are concerned chiefly with the conditions at maximum load when the loss is most important. For moderate voltages the permissible maximum conductor temperature is usually specified as 150 deg. F.; the temperature range in the dielectric will normally lie, therefore, between 100 deg. and 150 deg. F. Between these limits the a.c. resistivity can be expressed by the relation—

$\rho_T' = \rho_n' / \beta^{T-N}$; ρ_n' represents the value at minimum loss temperature N°F, and β the coefficient per degree F. (about 1.02 to 1.03).

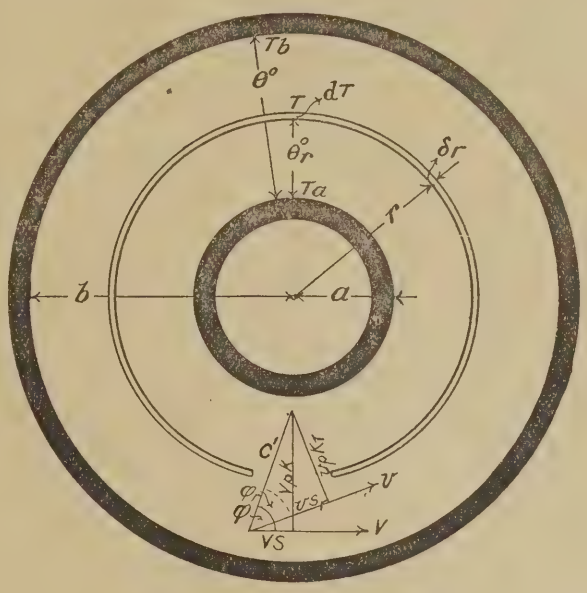


Fig. 1.—H.V. Single-Core Cable.

Resistivity and Temperature Gradient.

(*a*) *With Direct Current.*—Under working conditions a temperature gradient exists in the cable dielectric, and from the core (T_a °) to the sheath (T_b °) there is an appreciable drop in temperature (θ° F.). Now, if H is the heat passing through unit length of cable—neglecting losses and end effects—and k is the thermal resistivity of the material (in the required units)—

$$\theta = T_a - T_b = (Hk/2\pi) \log_e b/a.$$

If T be the temperature at any radius r, then

$$\theta_r = T_a - T = (Hk/2\pi) \log_e r/a.$$

For an elemental concentric ring of unit length, thickness δr, and radius r (fig. 1), the dielectric resistance is given by—

$\delta R = \rho_r \, \delta r / 2\pi r = (\rho_a \, \delta r / 2\pi r) \, a^{\theta r}$; ρ_a is the resistivity at T_a.

Hence $R = (\rho_a/2\pi) \log_e b/a \times (a^\theta - 1)/\theta \log_e a = (\rho_m/2\pi) \log_e b/a$ ... (1)

ρ_m is the true mean resistivity and equals $\rho_a \cdot f$ where f is a temperature factor, $(a^\theta - 1)/\theta \log_e a$, and if R_a is the resistance at uniform temperature T_a, then

$$P_a = (\rho_a/2\pi) \log_e b/a \text{; and } R = R_a \cdot f.$$

(*b*) *With Alternating Current.*—In the same way for the a.c. resistance, between the prescribed limits—

$$R' = (\rho_a'/2\pi) \log_e b/a \times (\beta^\theta - 1)/\theta \log_e \beta = R_a' \cdot f'.$$

* Höchstädter. *E.T.Z.*, April 27th, 1922.

In practice, the power-factor equation is better adapted for calculation purposes, *i.e.*—

$$S/pK = 1/pR' = (S/pK)_a \times 1/f' ; (S/pK)_a$$ is the power factor at T_a ... (2)

In order to gain some idea of the magnitude of this factor, let us consider a fairly general case in which the rise in temperature of the lead sheathing at maximum load is 50 per cent. of the total rise; then presuming T_a is 150 deg. F., with a ground temperature of 60 deg. F., T_b will be 105 deg. F. In this case $f=4.9$ (for $a=1.06$), and $f'=2.1$ (for $\beta=1.03$).

Potential and Temperature Gradient.

*With Direct Pressures.**—When a steady leakage current c is flowing through the dielectric, then by Ohm's law—

$dV = -\rho r(dr/2\pi r)\,c$, *i.e.* $-dV/dr = V/(r \log_e b/a) \times \rho r/\rho m = P_r\, a^{\theta r}/f$ (P_r is the potential gradient with uniform temperature) ... ... (3)

The potential gradient is modified by a temperature factor $a^{\theta r} \log_e a^\theta / (a^\theta - 1)$, and it will be seen that if there is much of a temperature range in the dielectric, the stress on the outer wall will be much greater than with uniform temperature; in fact, the maximum stress may revert to the layers next the sheath.

If we assume that $V/(a \log_e b/a)$ represents the maximum stress that the dielectric may be permitted to withstand for continuous working, then in order that this value shall not be exceeded under load conditions, the factor $a^{\theta r}/f$ must not be greater than r/a. In general with h.v. cables, the most economical ratio $b/a=\epsilon$, and in this case the maximum value a^θ/f must not exceed ϵ. If the factor $a^{\theta r}/r$ is a constant, the cable will have an equal potential gradient throughout;

i.e. $a^{\theta r}/r = 1/a$, and $a^\theta = b/a$,
$\theta = (\log_e b/a)/\log_e a = 1/\log_e a$.

With $a=1.06$, the following values for θ are obtained:—

(*a*) Maximum potential gradient not to be exceeded, then θ must not be greater than 43 deg. F.

(*b*) For equal gradient throughout, $\theta=17$ deg. F. Under normal conditions these figures give about 150 deg. F. as the maximum conductor temperature, and 100 deg. F. for constant gradient. In the case of direct-current cables it would therefore seem that the potential gradient factor is a most important consideration with regard to the permissible temperature rise of the conductor.

With Alternating Pressures.—In this case the voltage across any part of the dielectric is dependent upon the power factor, and if c' is the current flowing, then—

$c' = V\sqrt{(p^2K^2+S^2)} = Vp K \sqrt{(1 + \tan^2\theta)}$; where $\tan\theta = (S/pK)_m$, the true mean power factor.

The potential gradient can be obtained at once from the d.c. equation (3) by substituting the equivalent impedance in lieu of resistivity—

$$-\frac{dV}{dr} = \frac{V}{r \log_e b/a}\cdot\frac{i_r}{i_m} = \frac{V}{r\log_e b/a}\cdot\sqrt{\frac{(1/\rho m)^2 + (p K_m)^2}{(1/\rho r)^2 + (p K_r)^2}}$$

$$\text{Hence: } -\frac{dV}{dr} = \frac{V}{r\log_e b/a}\cdot\frac{\lambda m}{\lambda r}\cdot\frac{\sqrt{(S/pK)_m^2 + 1}}{(S/pK)_r^2 + 1} \cong$$

$$P_r\cdot\frac{\lambda m}{\lambda r}\cdot\frac{(2 + \tan^2\theta)}{(2 + \tan^2\theta_r)}. \qquad (4)$$

The change in the dielectric coefficient is almost negligible, and it is observed that the temperature gradient has little effect on the potential gradient with alternating current.

Dielectric Loss and Current Rating.

The effect of the dielectric losses upon the temperature gradient has not so far been considered; as, however, the transmission voltage is increased, the heat generated in the dielectric by the losses becomes of greater importance in the consideration of the maximum conductor temperature allowable for continuous practice.

When a steady state is reached under load conditions, with applied voltage V, there is a small leakage current flowing, c, and the heat generated in an elementary ring of the dielectric is $c^2 \rho\, dr/2\pi r$. Since the temperature remains constant, then—

$$\frac{d}{dr}\left(\frac{dT}{dr}\cdot\frac{2\pi r}{k}\right) = \frac{c^2\, dr}{2\pi r}\rho :$$

i.e. $\left(\frac{dT}{dr}\cdot\frac{2\pi r}{k}\right) = -\left(c^2\frac{\rho_1}{2\pi}\log_e r + H,\right)$;

and $\therefore T_r = \frac{k}{2\pi}\left(c^2\frac{\rho_2}{2\pi}\cdot\frac{\log_e^2 b/r}{2} + H.\log_e b/r\right) + T_b$.

Hence— $T_a = T_b + \frac{k}{2\pi}\cdot\left(H.\log_e b/a + \frac{c^2 R}{2}\log_e b/a\right)$.

T_b is the sheath temperature, H the heat flow due to the load; then if s represents the thermal resistance of the cable, G the thermal resistance of the soil and cable covering, and t the soil temperature, we have the following relations:—

$T_a = T_b + Hs + V^2 s/2R$; $T_b = t + (H + V^2/R)G$;
i.e., $T_a - T_b = \theta_1 + V^2 s/2R$; $T_b = t_b + (V^2/R)G$.

Since θ_1 is the range of temperature in the dielectric with load current only, we have $\theta_1 = t_a - t_b$; and the rise (x) in the conductor temperature due to the dielectric loss is then—

$$T_a - t_a = x = V^2(s/2 + G)/R.$$

R, the dielectric resistance at the final temperature T_a, can be expressed as $R_a f/a^x$, R_a being the resistance at uniform temperature t_a;

i.e., $x = \frac{V^2}{R_a\cdot f/a^x}(s/2 + G)$, and $\therefore \frac{x\cdot f}{a^x} = \frac{V^2}{R_a}(s/2 + G)$.

The temperature factor f, as previously given, is $(a^\theta - 1)/\theta \log_e a$; θ, *i.e.* $(T_a - T_b)$, can be expressed as $\theta_1 + dx$, where $d = s/(s + 2G)$; and thus $f = (a^{\theta_1 + dx} - 1)/(\theta_1 + dx)\log_e a$.

The complete equation for the temperature rise due to the dielectric loss is then—

$x(a^{\theta_1 + dx} - 1)/a^x \log_e a\,(\theta_1 + dx) = V^2(s/2 + G)/R_a$. (5)

For alternating current the power-factor equation will be:—$x f'/\beta^x = V^2(s/2 + G)\,pK\,(S/pK)_a$; $(S/pK)_a$ is the power factor at uniform t_a . . . ... (6)

The rise in temperature produced by the losses can be calculated in this way; in practice, however—unless the loss be abnormal—it will have little effect upon the dielectric resistance, which, assuming a final maximum conductor temperature of 150 deg. F. in all cases, will practically equal that given by current loading alone, *viz.*, $R f$ (R is the value for a uniform temperature t_a, of 150 deg). Under these conditions the equation for the temperature rise with dielectric loss becomes—

$x = W(s/2 + G)/f = W_m(s/2 + G)$; W is the watts lost, ($V^2/R$ or $V^2 S$) at 150° F uniform.

Allowance has to be made in respect of current rating; if C is the maximum current—neglecting losses—for a final conductor temperature of 150 deg. F., and C_1 the permissible current, including all losses, then—

$C_1/C = \sqrt{[(t_a - t)/(T_a - t)]} = \sqrt{\{[T_a - t - W_m (S/2 + G)]/(T_a - t)\}}$

i.e., $C_1 = C\sqrt{[1 - x/(T_a - t)]}$; (normally $T_a - t$ is about 90° F).

High Voltage and Cable Design.

Although the relative values of the test and breakdown pressures have important bearings with regard to the question of design, in general we can consider that for h.v. cables* $a=V/v$, where a is the conductor radius and v the maximum allowable stress for continuous working at voltage V. If the same dielectric constitution is used in the manufacture of cables for increasing voltage and v remains constant (between 40 and 50 kV/cm. rms); since $v=V/(a \log_e b/a)$, the $\log_e b/a=1$, and the mean gradient $V/(b-a)$ is also constant. The same maximum and mean stresses therefore exist in cables for various voltages under these conditions

* A. Russell: "The Dielectric Strength of Insulating Materials, &c." I.E.E. *Journal*, Vol. 40, 1908.

* C. T. Beaver: "Cables," I.E.E. *Journal*, Vol. 53, 1914.

tions, and the characteristic curves will be similar—assuming the dielectric to be homogeneous—in which case there will be the same value of resistivity and power factor to contend with at the working pressures.

Example.—Fig. 1 represents a cable designed for 40,000 volts a.c., with a maximum stress of 40,000 V/cm., in which case a is equal to 1 cm. and b to e cm. The same cable for d.c. will, on the max./rms ratio, be suitable for 60,000 volts approximately, at a maximum stress of 60,000 V/cm. The thermal resistance of this cable is 80, and that for the soil and covering is calculated to be about 60 (watt Centigrade units), as representing fairly normal conditions with a ground temperature of 60 deg. F.

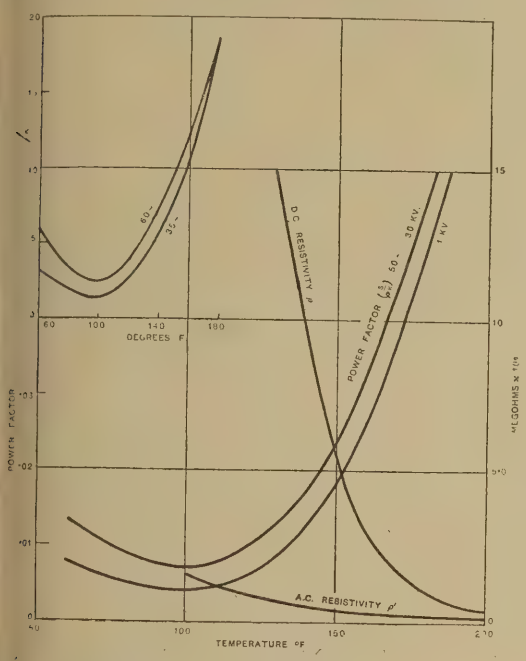


Fig. 2.—Characteristic Curves—Impregnated Paper Dielectric.

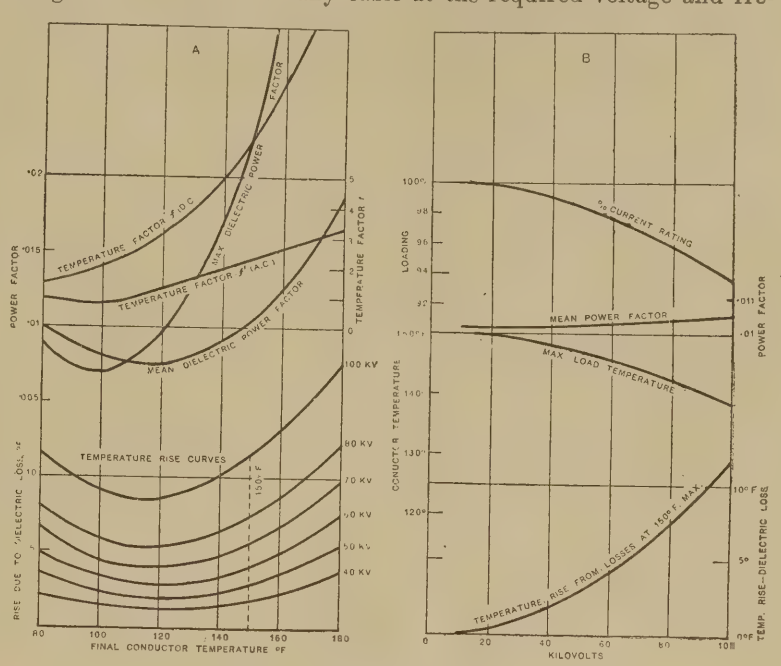


Fig. 3.—Voltage and Current Rating.

It is assumed that such a cable can be run at 150 deg. F., and in fig. 4 curves are given showing the variations in some of the characteristics with changing temperature gradient. In the case of the d.c. curves (A), it will be observed that the potential distribution is greatly altered and the maximum stress entirely reversed by the temperature range prevailing in the dielectric. In this particular example the maximum potential gradient is 70 kV/cm. on the outer layers of the dielectric with the given conditions. With a.c. the potential distribution is practically unaltered by variations of temperature. The effect of dielectric loss in the case of d.c. is immaterial at a maximum temperature of 150 deg. F.; in regard to a.c. there is a rise of about 2 deg. F. with 40 kV, with consequent slight increase in the dielectric power-factor curve (B).

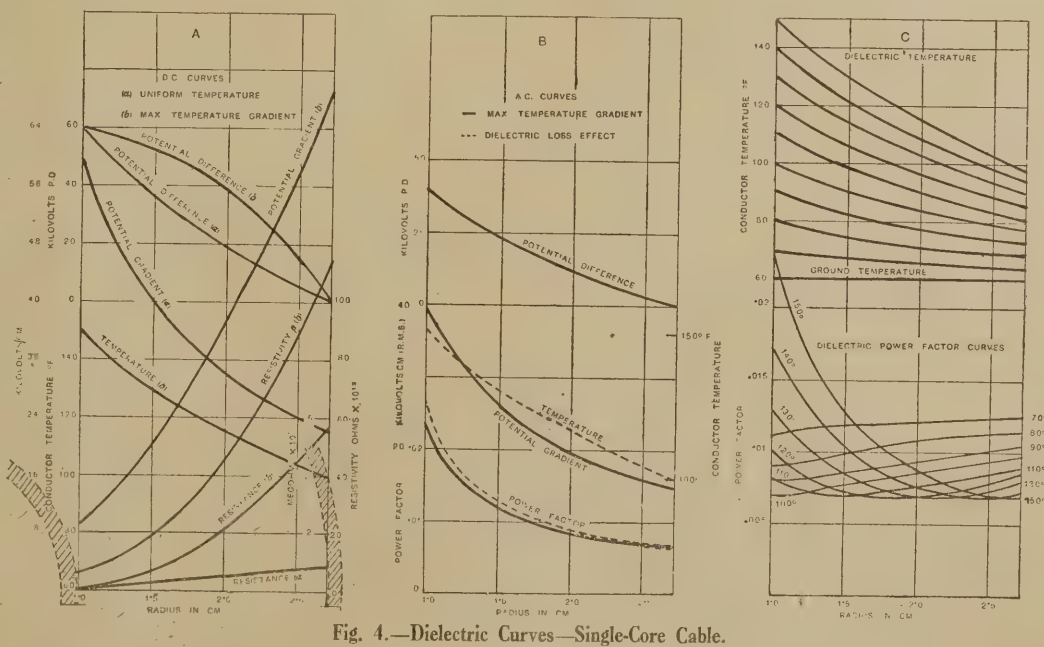


Fig. 4.—Dielectric Curves—Single-Core Cable.

Fig. 3 (A) shows the increasing rise due to dielectric loss with higher a.c. voltages, the rise being plotted against final conductor temperature; and (B) gives the necessary reduction in current rating to allow for the losses, in attaining a final temperature of 150 deg. F., for the various voltages.

These results will only be strictly applicable provided the same conditions in respect of potential gradient are observed, as the question of resistivity in relation to voltage has not been considered. That the dielectric resistance changes with the applied pressure—even at the higher temperatures—is evident from the two power-factor curves given in fig. 2, and under these circumstances the value obtained for the resistivity at any voltage is that corresponding to the mean potential gradient, and is the one contained in the various equations.

Hence, if the resistivity or power-factor curves are obtained for any cable at the required voltage and frequency with uniform temperature, the variations taking place within the dielectric for any conditions of loading can be ascertained as in fig. 4 (c), and the approximate mean value calculated for current rating purposes.

With a.c. cables for extra-high-tension, however, it seems probable—owing to difficulties in respect of size both as regards manufacture and general handling—that for voltages much above 60 kilovolts it will be necessary to increase the permissible value for the maximum potential gradient. If such be the case, the loss will be greater and the consequent temperature rise much increased, since in general the dielectric power factor will be higher in comparison with the figures given here. The matter is even more important in connection with the design of 3-core cables, which for pressures above 33,000 volts are almost out of the question unless greater dielectric stresses are to be brought into more

general use. A departure such as this is much to be deprecated, and it would seem to be attended by a certain amount of risk, so much is as yet unexplained in the behaviour of highly-stressed dielectrics. In particular, there is the debatable question of ionisation, which would appear to be present in some cables, but not in others—no doubt depending upon the degree of perfection attained in manufacture. No difficulty of this description appears to be experienced with well-filled cables having a maximum stress of about 40 kV/cm., but above this limit there seems a likelihood that ionisation may be present, although to what degree it is detrimental to the functioning of the cable, or what its ultimate effect upon the life of the cable will be, time and experience alone can tell.

Conclusions.

An investigation into the effects of temperature gradient upon the characteristics of impregnated paper dielectric leads to the conclusion that the dielectric loss of cables under working conditions can be represented by that produced at some uniform temperature, which for most cases of single-core cables in practice is approximately equivalent to the mean value.

With direct-current cable the dielectric loss is of little importance, but the maximum conductor temperature is limited by the value of potential gradient permitted in the outer layers of the dielectric, owing to the redistribution of potential taking place with temperature gradient.

For alternating-current cables the permissible temperature rise must depend upon the effect of dielectric loss; with 40 kV and over this cannot be ignored—even in single-core cables—and due allowance must be made in determining the current rating. In general, for single-core cables of normal design, a maximum temperature of 150 deg. F., including losses, does not seem to be excessive; this figure, however, to admit of reasonable factor of safety, must depend upon the question of the maximum potential gradient.

It is necessary for practical purposes to be able to foretell what the dielectric losses will be on h.v. cables under working conditions at temperatures corresponding to certain states of loading. In the factory attempts are often made to imitate running conditions—principally at maximum load when the losses are of chief importance—by means of current heating the cable conductors. Such a method, as a rule, can only be partially successful, since it is not possible to entirely create the varied conditions encountered in practice, and due allowances for this have to be made in the results obtained.

It is necessary both from the point of view of cable design and research work, that the characteristics of the impregnating materials should be obtained from time to time over a wide range of temperature, with varying frequency and voltage, and from the results some idea can be gathered of the probable behaviour of cables in practice. There is, however, a vast difference between materials as prepared under ideal conditions in the laboratory and those emerging as the finished cable after having passed through a host of manufacturing processes; and for a really accurate determination of the effects of voltage and temperature gradients on cables, it is essential to deal with the characteristics of a number of actual manufactured lengths—somewhat on the lines suggested in this article. A comparison of these methods affords useful indications with regard to the imperfection factor introduced by various impurities in the course of manufacture.

The Measurement of Electrical Service.

Some Suggestions for its Application.

By E. GRAHAM.

How can electrical service be measured?

The problem is uppermost in many minds. One of the most difficult things to do is to get hold of an idea of just how much service is being given by any stated person or firm. The customer has *his* ideas about it, and to him these are much more clearly defined than to the person giving the service. Were the reverse to hold, perhaps a better state of affairs might exist commercially, but then such conditions must change but slowly. To which end it must be noted that service can only be measured, to begin with, qualitatively. But it will be seen from what follows that the qualitative measurement soon becomes quantitative in a very real sense, and that, as a consequence, another industrial problem is offered a long-wanted solution, *viz.*, the satisfactory payment by results of staffs as distinct from manual workers.

Incidentally, it is possible, as a result of service measurement by the method to be outlined, to institute a means of tracing with some accuracy the effect of certain given circumstances, external to the servant firm, upon its activities. It is well known, for instance, that certain buyers, for reasons only surmised, are definitely prejudiced against certain makers' goods. The makers themselves are aware of the prejudice, would like to overcome it, but are unable to locate the source of it with any degree of accuracy. The sources of such trouble, it is thought, can be located fairly accurately as a result of the measurement of service given.

It is necessary to consider which portion of the electrical trade is most directly affected by service conditions. For plant above 200 kW in size, the maker deals only either with a consulting engineer or with a highly technical customer, this following, as a natural consequence, upon the amount of money involved, which may be anything from £600 upwards per driving (or driven) unit installed, and/or the responsibility attached should a serious hitch arise with the plant ordered. The semi-technical, or non-technical buyer here rarely trusts himself to deal directly with the maker; he wants to be sure in his own mind that he is getting a full and proper return for his heavy outlay. Hence he employs a skilled consultant to look after his affairs. The highly technical buyer, on the other hand, knows exactly what he wants and understands what the maker will supply, and is, therefore, well able to serve himself. So that, commercially, the condition of service, in the ordinary accepted sense, may be said not to apply to plant above 200 kW.

Again, considering plant below 1 h.p. size, the applications of this are more or less of a universal nature. Standardised production combined with the small amount of money at stake in individual instances has led to the marketing of small machinery designed for heavy mechanical service, and therefore usable with little adaptation for practically any kind of work. At the worst, the customer is hardly ruined if his plant should prove to be a "frost." Any service given here lies more in the sphere of the retailer than in the sphere of the maker, although the latter is, of course, the servant of the retailer to some extent.

The limits of practical service, then, may be said to be realised in the medium-powered section of the trade, *i.e.*, that part of the industry dealing with plant of from 1 h.p. up to 200 kW capacity, and the service there given affects (*a*) the maker, (*b*) the middleman, or middlemen (sometimes there are two, or even three), and (*c*) the user. Either (*b*) and (*c*) can be customers

of (*a*). Hence it will be best to consider, for the sake of the principle involved, how the medium-powered maker can measure his service. With suitable modification, the principle can be applied to the middleman.

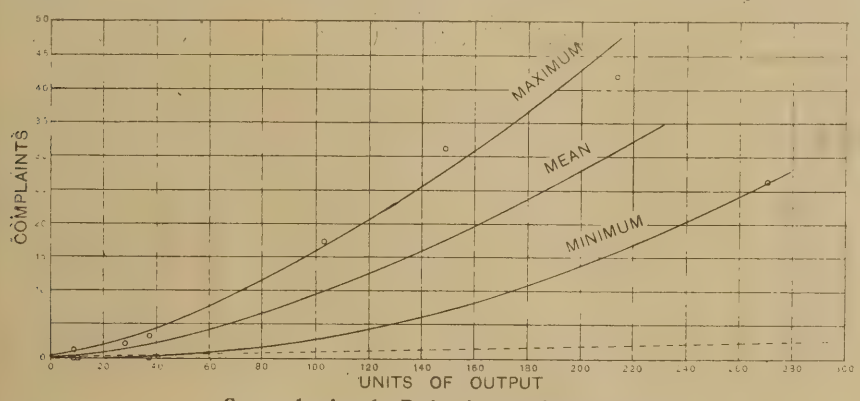
The medium-powered domain covers plant from simple units to the most complex arrangements of machinery, for almost every known industrial purpose; from coal cutters to cream separators, from mincing machines to printing presses and calenders. It is therefore necessary to make an analysis of sales to show a relationship between the type of customer and the mechanical power units (not the £ s. d.) manufactured, and the following analysis of a certain electrical manufacturer's sales of medium-powered dynamos and motors over the year 1924 gives a fair idea of the proportion of skilled, semi-skilled, and non-skilled minds involved in the aforementioned applications of the plant. The sales have been reduced to units of 25 h.p. output (or the equivalent kW), this unit being found to be the nearest to the result: total h.p. manufactured/total customers.

Sales to non-technical customers ...	493 units
Sales to semi-technical customers ...	270 units
Sales to highly-technical customers	167 units

These figures are now further sub-divided as follows:—

	Non-technical.	Semi-technical.	Highly-technical.
Users direct	270	149	28
Middlemen other than contractors ...	214	102	37
Consulting engineers	—	9	66
Contractors	9	10	36

The next step is to make a precisely similar analysis of *complaints of all kinds*, and in the present instance a collateral examination of letter, telegram, and telephone message records gave the number of complaints confirmed as 123.*



Curves showing the Ratio of Complaints to Output.

These dealt with anything from trivialities, such as "the pulley is one-eighth too large in diameter" to complaints of real breakdowns, prices, and demands for more suitable plant. They were apportioned as follows among customers:—

Non-technical	69
Semi-technical	48
Highly-technical	6

Actually, in addition, a few complaints were unconfirmed. Hence the figures for non-technical and semi-technical customers may be actually a little more evenly balanced. However, since the principle only is at stake, this is of no moment. Clearly, with other firms different figures must hold.

The sub-division gave:—

	Non-technical.	Semi-technical.	Highly-technical.
Users direct	26	31	2
Middlemen other than contractors ...	42	17	—
Consulting engineers	—	—	1
Contractors	1	—	3

If the foregoing figures now be plotted—complaints against units of output, as in the accompanying figure—using corresponding figures in the tables, two curves may be drawn through the limiting points so obtained, thereby giving a picture of the limiting numbers of complaints over the year. The value of these limiting curves will be referred to later. Meantime, as the figures themselves must vary from year to year, a mean curve drawn is sufficiently representative to serve two purposes, *viz.*:—

1. It shows, *by its shape*, whether complaints are increasing or decreasing in, or out of proportion with increase or decrease of output.
2. It serves as a means of obtaining a fair average value of the ratio complaints/customers applying to the *types* of customers among whom the sales were divided.

To consider these purposes it is necessary to draw a tangent to the curve at the lowest point.

1. If the slope of the curve continually increases, as in the example, then it clearly indicates that trouble with customers as a whole is increasing at a greater rate than the increase of output. That is to say, customers are less satisfied, *i.e.*, the *service* of the firm is falling off. Hence it is high time for the works' manager or managing director literally "to examine himself" and his organisation. Conferences may be needed to educate the staff in better pulling together; to teach them that unless they do so, and simultaneously pull with customers, the firm's reputation will not be saved. for the decrease in reputation is directly proportional to the distance between the curve and the tangent drawn. The further apart the two lines are, with the curve above, *the less the service being given.* The organisation is then such that conditions are not conducive to the giving of the best service, *e.g.*, there may exist discontent among the staff caused by sundry means, or it may be that delivery dates are not being adhered to, and therefore the progress side of the organisation may require looking into, which would cover an examination of order department, drawing office, foundry, stores, main shops, and dispatch department. If the slackness is not inside, is it outside? Are the agents, travellers, and outside technical men doing their bit to please the customers? If not, why not? and so on.

If the curve follows a straight line the service conditions are much more satisfactory. The same attention is then being given to each and every customer, whether that attention be wholly pleasing or not. Should the curve then make a decided angle with the horizontal axis, the service is *not* wholly pleasing. Yet it is sufficiently good to be classed as fair. There is, however, room for improvement, and an overhaul of the organisation would very likely prove to be an advantage. The greater the angle the greater the need for the overhaul. The ideal condition is that the curve will lie either on, or parallel to, the horizontal axis. Were this so, truly the manufacturer's life would be a happy one, as would also the lives of his customers and staff. However, human nature being as it is, it is to be feared that few firms are able to record a perfectly horizontal line.

The curve further provides a means of applying a satisfactory system of payment by results to the staff as a whole, on the basis of the amount of service done. It is possible to fix a definite percentage increase or decrease in salary dependent upon the shape of the curve. This percentage can be easily enough fixed, for the curve will be of some general order, say, in the present instance, $y = ax^n + b$. A calculated curve can be drawn so near the actual average curve as to make any difference negligible. Hence it is possible to reckon actually the *quantitative improvement* in the firm's service, as distinct from the qualitative one, and so fix a "gang bonus" system of payment by definite results, which will be far more accurate and satisfactory than the usual "bonus on output." The latter does not meet the service condition at all, since it only affects the inside and purely personal part of the business. The

* In obtaining these data, confidential information called for an alteration of the true number of complaints. The number, therefore, has been altered, but the *proportion* of them among the customers has been adhered to.

service bonus (or penalty, as the case may be), on the other hand, takes into consideration *all* the firm's activities. The counter hand dealing with a difficult caller is placed on exactly the same footing as the secretarial man replying to a particularly nasty letter, and *vice-versa*. By giving bad service any employé is penalising the whole staff, who, when working as a team, soon become able to look after such matters exclusive of managerial intervention. Both internal and external conditions, therefore, are properly catered for, since, if the service improves the output will improve, which is really the ultimate end of every system of payment by results. The actual percentage payable, or to be deducted, as the case may be, would, of course, depend upon the oncost and production conditions of individual concerns, but the main thing to be noted is that the *basis* of the system can be found by an earnest consultation of records to be found in any concern. If no records of complaints have been previously kept, it is feasible enough to start off by keeping careful note over three months, say, and correct the curve every three months until a sufficient amount of data is available to give a more authentic graph.

It should be noted, too, that the bonus is practically independent of either trade depression or boom, and is therefore fair in operation. In times of depression staffs generally are reduced, the service payment (total amount) being reduced in proportion to the staff reduction only, thus still leaving the *same incentive* to the remainder to keep on exerting their energies, and not increasing the cost per unit of output. With the purely output bonus, the amount paid decreases independently of the number of staff hands, thus killing the incentive to work hard at the time when hard work is most required.

Before passing on to the consideration of 2, it should be observed that the limiting curves are of use in another manner. It is customary for auditors, when checking books, to permit a firm to charge back on to the previous year any work done in the following year under guarantee or otherwise free of charge to meet customers' complaints respecting plant despatched in the year just closed. The amount to charge back is very difficult to estimate at the time the books are being audited, and in many instances a figure is "jumped" which is likely to contain a serious error. Now any such work will, because of its nature, be largely proportional to the mean curve drawn, but the nature of the year's complaints will indicate broadly whether, in terms of £ s. d., it is more nearly proportional to either of the limiting curves. Hence an estimate of the coming year's probable output will be referred to whichever curve is thought to apply, and a figure obtained with reference to which a fair back charge can be reckoned. The difficulty is generally to know the limits between which to fix the back charge, but if the charges for, say, three or four previous years be averaged and referred to the mean curve, the limits are fairly accurately obtained.

2. The curve provides a means of obtaining a good idea of the effect upon a firm's transactions of the type and class of customer dealt with. If the ratio, complaints/customers be reckoned from corresponding figures in the tables, the following results hold:—

Semi-technical direct user	.208
Non-technical middleman	.196
Semi-technical do.	.1665
Non-technical contractor	.111
Do. direct user	.0964
Highly-technical contractor	.0835
Do. direct user	.0714
Do. consulting engineer	.0151

Corrected to meet the average curve these become:—

Semi-technical direct user	.141
Non-technical middleman	.155
Semi-technical do.	.109
Non-technical contractor	.031
Do. direct user	.130
Highly-technical contractor	.053
Do. direct user	.045
Do. consulting engineer	.031

These figures are very useful in affording a means of locating approximately, in certain circumstances, sources of certain adverse conditions, such as, say, definite negative propaganda. Suppose that in a given district continual complaints arose showing strong similarity. Adding them and reading along from the total to the curve, provides a figure from which a ratio can be calculated, thereby giving an indication of the *type* of customer to whom the plant was sold. Then, since the complaints come from one general district, activities are immediately concentrated upon keeping a strict observance on all such typical customers in the district. Local agents and others are warned to keep ears and eyes open particularly with respect to those customers, and to report the least thing at all suggestive. Meanwhile, another curve is made out in the same way by dealing solely with the complaints and plant distributed among the typical customers concerned, these folks being sub-divided, in their turn, into certain classes or types as accurately as possible. (Thus it would be insufficient here to use the designation "contractor." The customer must be designated more definitely, as "plumber-wireman," "motor engineer," and so on, as all these people label themselves as "contractors" whether entitled to do so or not.) The *shape* of this second curve will then point out the source of the trouble almost right away. If the slope increases, the trouble is located among the larger buyers in the district; if the slope decreases, then among the smaller buyers. A careful scrutiny of the agents' and travellers' reports will confirm almost exactly where the trouble originates. The process is simply a detective one involving logical stages of elimination of conditions not affecting the general adverse one, and other applications of the principle will suggest themselves to individual readers. It is not claimed to be infallible, far from that; but it is thought to have a useful sphere in circumstances similar to that indicated. An actual instance wherein it would have proved useful was concerning many complaints received by a firm supplying ball-bearing motors. Only by chance it was discovered, long after, that the motors complained of were all supplied through a shady middleman who had replaced the original ball bearings by inferior ones. Had some such curve as has been suggested been employed, it is likely that the trouble would have been located within a very short time of receiving the complaints.

A further typical application of the process is where a maker supplies only through a large number of recognised agencies. His output would be divided per unit area of territory, and records would show whence complaints came and their number. The plotted curve would then show with fair accuracy where, among the agents, something existed which required looking into.

Thus, consideration of the principle involved in these remarks will show that it may be put to many uses distinct from, but yet directly dependent upon the measurement of service, and if, in virtue of its versatility, the principle can of itself offer a real service to the electrical trade (as well as to any other trade), why should not use be made of it? Measuring service, it measures quality; measuring quality, it measures status, and as a measure of status it is a definite measure of market pulling power.

Electric Automobiles in France.—As a result of the trials which have been held during the last few years, a steady increase is taking place in the use of industrial electric automobiles in France. The Société pour le Développement des Véhicules Electriques—an association of electricity-supply and other interested undertakings—is also assisting the movement by improving the battery charging facilities in France. As a result of its activities it is stated that there are now fifteen stations in Paris alone where the charging of vehicle batteries for private owners of electric trucks is undertaken.

Water-Power Development in Uruguay.—The *Review of the River Plate* says that the Uruguayan Minister of Public Works was interviewed recently by representatives of J. G. White & Co., who stated that that firm would be interested in financing the projected development of the Rio Negro for hydro-electric purposes.

The Wireless Exhibition, 1925.

An All-British Display of Radio-Telephone Apparatus and Accessories.

The third exhibition of radio-telephone receivers and component parts organised by the National Association of Radio Manufacturers and Traders, and the second to be staged in the Royal Albert Hall, was opened to the public on September 12th for a period of ten days. Since the last show the words ". . . and Traders" have been added to the Association's name, thus enlarging its scope when but little more than two years old, and it is therefore only natural that the number of exhibitors of apparatus should show an increase of 50 per cent. on last year's total of 44. Being the largest and most important function of the year in the radio world, the show may be regarded as an index of the development and progress of the past 12 months.

The fact that it is just 30 years since Guglielmo Marconi made his first successful wireless signals adds interest to the occasion, and to celebrate the event the N.A.R.M.A.T. gave a luncheon in honour of Senatore Marconi at the Savoy Hotel on Friday last. The chairman, Mr. W. W. Burnham, chairman of the Association, proposed the health of the principal guest, who, he said, had more than held his place in the ranks of wireless inventors. British broadcasting was the best in the world, and a large amount of capital had been invested in the British wireless trade, employing many thousands of workers. The Association desired to keep the trade in British hands, to promote British trade, and to keep foreign wireless wares out of the country.

Senatore Marconi responded, expressing his great satisfaction at the progress that had been made since he made his first experiments. He at first followed on the lines of Hertz, Lodge, and Righi, using very short waves and metallic reflectors, with which in 1895 he succeeded in telegraphing over a distance of 1¾ miles; the waves, less than one metre in length, could not overpass obstacles such as houses and hills, but he tried the effect of connecting his oscillator to a vertical wire and an earth-plate, and was then successful in obtaining reliable transmission quite unaffected by intervening obstacles. This was essentially a broadcasting system, and became the basis of all systems of long-distance radio communication. Describing further developments, he expressed his gratitude to the late Sir W. H. Preece, and to the Post Office authorities, for the help and encouragement that he had received from them. The wonderful progress that had since been made was rendered possible by the patient work of a host of investigators the world over, including his own assistants and the great radio and manufacturing companies.

Mr. R. Ferguson, proposing prosperity to the British Broadcasting Company, said the Association was proud of its sister organisation, and, referring to the Committee of Inquiry that had been appointed, he expressed the hope that there would be continuity of policy.

Mr. J. C. W. Reith, managing director of the B.B.C., responded, and pointed out that whatever was done by the B.B.C. in the interests of the public was bound, in the long run, to benefit the trade also. A new trade-mark for British goods was to be registered shortly, for use by members of the company. He heartily welcomed the Committee, and promised the fullest co-operation of the B.B.C.

Mr. W. H. Goodman proposed the health of the guests, and stated that not only British broadcasting, but also British apparatus, was the best in the world, judging by the foreign demand, which could not always be fully met owing to the heavy internal demand.

Capt. Ian Fraser, responding, said that when he was abroad recently he found that British stations were listened to very generally, and that it was held that the best musical programmes were received from Daventry and other stations in this country.

The Exhibition was opened on Saturday last by Viscount Wolmer, Assistant Postmaster-General, and has been visited by a large number of people during the past week.

Mullard Radio Valve Co., Ltd.

Amongst the comprehensive collection of the products of this company over a dozen types of receiving valves are displayed and h.f. and l.f. and the dull-filament power valves are the most recent additions to the firm's series. A dull-filament power amplifier of special interest is the P.M.4, illustrated in fig. 1. It has a filament of high emissivity which needs only 0.1 amp. at from 3.5 to 4.0 volts to heat it. The low temperature at which the filament works reduces the microphonic noises often obtained when using dull emitter valves with very thin filaments. The range of transmitting valves shown is even larger; a 5-watt pattern is available for the novice and



Fig. 1.—New Mullard Dull Power Valve.



Fig. 2.—New Mullard Anode Resistance.

a 30,000-watt valve as used in large stations is to be seen, whilst a dozen valves of intermediate powers are available. The transmitters from the 5-watt up to the 500-watt size have glass bulbs and those of higher-power valves are silica; the 30-kW valve is a metal-glass one and glass, silica, and metal-glass rectifier valves, of which 12 types are available, are made to work in conjunction with the transmitters. A new anode resistance recently developed by the company is also on view, fig. 2; it is entirely wire-wound and is claimed to be absolutely constant under all conditions of reasonable use. The substitution of wire for the usual carbon resistance element greatly increases the current carrying capacity of the resistance and also eliminates the noises usually associated with carbon anode resistances. Condensers to work in conjunction with these resistances for detector valves are also on view.

Radio Instruments, Ltd.

This exhibit is divided into two sections, *viz.*, complete sets and accessories. The new receivers are now all enclosed in mahogany cabinets, all the terminals being at the back with a door at the rear of the instrument to give access to the valves. Reaction is employed in every case, and dual rheostats of the pattern recently illustrated in our pages are fitted to all receivers so as to give the user the choice of either dull or bright valves, as desired, without the set needing modification.

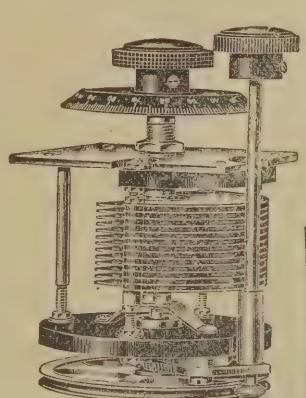


Fig. 3.—"R.I." Geared Condenser.

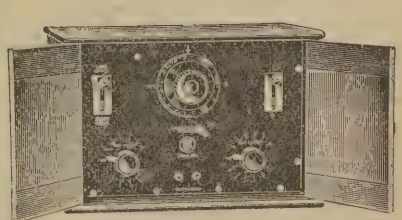


Fig. 4.—"R.I." Crystal and 2-Valve Amplifier.

In addition to "R.I." components, such as transformers, loudspeakers, &c., which have been on view before, there is to be seen a new geared condenser for very fine adjustment, having a gearing ratio of 11 to 1 (fig. 3). The method of gearing is new and obviates backlash; a small fibre pinion presses against a large grooved aluminium wheel and the friction between the two ensures a positive movement and precision tuning. The plates are of hard brass sheet. The firm's super-heterodyne components comprise two forms of oscillation couplers, one being complete with its variable condenser; the other, a somewhat less expensive unit, is for use with a separate variable condenser. A filter unit is made which gives efficient

results on about 6,000 metres, and the company also shows super-heterodyne transformers tuned broadly to the same wavelength as the filter unit. The company is now producing several different types of crystal sets, each including the permanent mineral detector which has been described in our columns. In addition to a comparatively cheap set with crystal detector only, two new instruments are being placed on the market, the permanent detector being used in conjunction with single and double-stage note magnifiers. These instruments are designed with a view to simplicity in operation; both crystal and valves are contained in the back of the instrument as shown in fig. 4 and are accessible by means of a hinged door. A switch is provided for cutting in or out the station at Daventry, and the cabinets are of polished mahogany. Valve detectors are made in three types and enclosed in cabinets very similar to the crystal-amplifier unit. One type comprises a valve detector in conjunction with a single-stage note amplifier; another has a two-stage note amplifier, and each possesses a range of from 300 to 4,000 metres. A pedestal base is provided for housing dry batteries and a third type is fitted with a more elaborate cabinet and has the advantage of an additional stage of h.f. amplification. In all three instruments where valve detectors are used, limited variable aerial reaction is provided by means of the "R.I." retroactive tuner. Note amplifiers are made in two sizes, one having a single stage and the other two stages.

A. J. Stevens & Co. (1914), Ltd.

This firm's productions include two, three, and four-valve receivers in walnut cabinets, and amongst the pedestal cabinets is a new Louis XIV. Renaissance model. The use of multi-valve switches enables some of the valves to be dispensed with. Amongst the amplifiers shown is the "Concert" model with tone, grid bias, and volume controls. In the loud speaker range are included new models of the pedestal,



Fig. 5.—"A.J.S." Cabinet-type Loud Speaker.

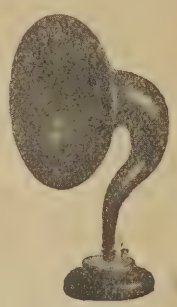


Fig. 6.—"A.J.S." Loud Speaker.

cabinet (fig. 5) and "Junior" speaker (fig. 6). Components are exhibited and an "A.J.S." headphone is now put on the market for the first time. The firm is also showing its new tubular steel telescopic masts in two sizes, measuring respectively 35 and 50 ft. when erected, and 18 ft. 3 in. and 19 ft. 6 in. nested for transit. No erecting gear is required, climbing is obviated, and the whole structure is complete with base plates, angle-iron ground pegs, guy wires fitted with strainers and insulators, aerial pulley, &c. Amongst the components exhibited were plug-in coils encased in ebonite, making a very solid job, a low-loss condenser, and a new choke unit.

Radiax, Ltd.

This exhibit consists of complete receiving sets of various patterns and a multitude of accessories, including sets of super-heterodyne components. A small condenser which is variable over a large proportion of its capacity should be very serviceable, and a new "low loss" loop aerial was shown which



Fig. 7.—Radiax Loud Speaker.

provided with tappings to enable ready adjustment to be obtained and to permit the use of capacity-controlled reaction. The non-resonating horn of the "Radiax" loud speaker, fig. 7, has a crystalline finish and the magnets are of cobalt steel. The diaphragm is adjustable by a method which is claimed to maintain parallelism between it and the magnet poles, and the terminals are mica insulated. The speaker illustrated is 19 in. high, the "Baby" pattern being 12½ in. high. The latest novelties on this stand were the "Cartrodenser" components—a new series of fixed condensers and grid leaks ("cartroleaks"), in the form of cartridges. Low-loss coils were also shown.

British Thomson-Houston Co., Ltd.

Amongst the newer developments of the company's crystal, crystal-valve, and multivalve sets, is the receiver shown in fig. 8, which is housed within a polished walnut case, the two valves being sunk beneath the panel. The circuit embodied is that of a detector valve followed by one stage of low-frequency amplification, reaction being provided by means of a

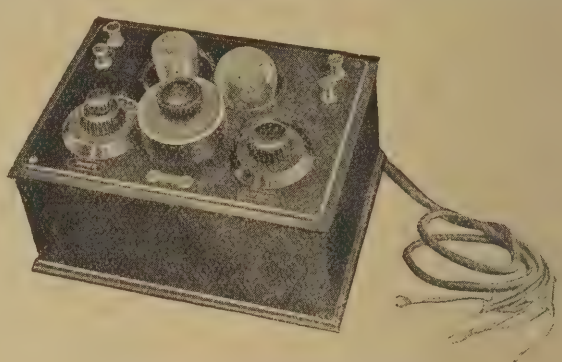


Fig. 8.—B.T.-H. 2-Valve Receiving Set.

specially designed form of plug-in aerial-loading coil and reaction unit. One feature is that no re-adjustment of the aerial-tuning condensers is required when the amount of reaction is varied. The tuning condenser enables fine adjustment to be made and all the battery connections are brought out from the back of the receiver in the form of a braided cable, duly tagged to facilitate connecting up. A variety of valves, loud speakers, and amplifiers, is shown with headphones and other

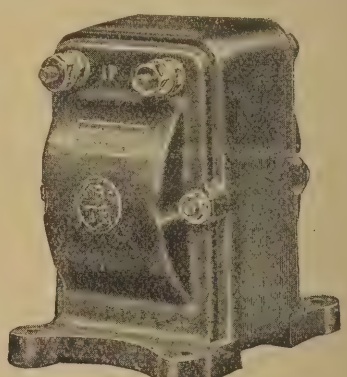


Fig. 9.—New B.T.-H. l.f. Transformer.

components, whilst a new product of interest is the l.f. transformer illustrated in fig. 9. Characteristic curves of this transformer are reproduced in fig. 10. The new component is protected by a casing of brown moulded insulation material, giving it a neat appearance; although comparatively small in size, it is robust, and is obtainable in two ratios—4:1 and 2:1—the former being recommended for use in the first and the latter in succeeding stages. It is essential, the

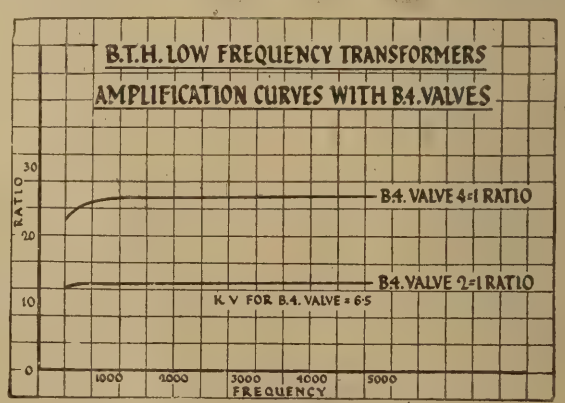


Fig. 10.—B.T.-H. l.f. Transformer Characteristic.

makers point out, that the correct battery voltages be used; if very loud reproduction is desired, a negative grid bias of 4.5 V and an anode voltage of about 120 V should be employed. A new hornless loud speaker, having a diaphragm 10 in. in diameter, of non-hygroscopic material and free at the periphery, is a specially interesting exhibit.

(To be continued.)

The Municipal Tramways Association—I.

Annual Conference at Brighton.

The annual conference of the Municipal Tramways Association was held at Brighton on September 9th, 10th and 11th, under the presidency of Alderman C. Higham (chairman of the Blackburn Tramways Committee). The usual practice of holding the conference in the town with which the president is connected was not followed this year, owing to the lack of hotel accommodation in Blackburn. Some 350 members and 140 ladies were present, and an informal reception, followed by dancing, was held on the Tuesday evening at the Hotel Metropole.

The conference was held in the Music Room of the Royal Pavilion, and on Wednesday, September 9th, the members and visitors were welcomed by the Mayor of Brighton (Alderman C. J. Teasdale, J.P.), who was accompanied by the Mayor of Blackburn (Councillor J. Stanworth, J.P.). In the course of his remarks, the Mayor of Brighton referred to the question of the tramcar *versus* the 'bus. In a pleasure town such as Brighton, he said, they could probably do without the tramways, but they could not scrap them owing to the large amount of money invested in them. Both the 'bus and the tramcar had their advantages, but for each tramcar scrapped, two or three 'buses would be needed.

A vote of thanks having been accorded to the Mayor for the cordial welcome he had extended to the conference, Alderman C. Higham delivered his presidential address, of which an abstract is given below.

Alderman J. S. Pendleton, J.P. (member of the Nottingham Tramways Committee), who proposed a vote of thanks to the President for his address, supported him in his attitude of protest against the unfair competition which tramways had to meet, not only from outside people on the road, but very often from the Ministry of Transport, who ought to be out to help municipal tramway authorities in their public activities. He criticised the officials of the Ministry for their attitude of mind in the Parliamentary committee rooms when municipalities were seeking further powers, and said they seemed to seize every opportunity of curtailing the activities of the municipalities. That was not what the Ministry of Transport was for, and he considered it was time a protest was made against it. He also criticised the indiscriminate granting of omnibus licences by Watch Committees. The Tramways Committees did not get the help from Watch Committees which they ought reasonably to expect.

Alderman Sir Peter Peacock, J.P. (chairman, Warrington Tramways Committee), seconded the vote of thanks, which was duly accorded.

Afterwards a paper was read, "Municipal Tramways and Motor Omnibuses," by Mr. A. R. Fearnley, general manager, Sheffield Corporation Tramways and Motors, and the discussion was carried on until the conference adjourned for luncheon in the Dome, at the invitation of the Mayor of Brighton.

The President proposed the health of the Mayor, and again expressed the thanks of the Association for the manner in which the Corporation and its officials had worked to make the conference a success. The Mayor of Brighton, responding, said that even the inhabitants of Brighton did not know what a valuable undertaking they had in their tramway undertaking, because they did not take enough interest in it. A sum of £300,000 had been invested in the undertaking, and half that sum had been paid off, leaving a debt of £145,000 outstanding. Since the war £50,000 had been spent on track renewals, and scrapping the system was out of the question. The gross profit last year was £27,000, out of which interest and sinking fund charges had to be paid, but if the undertaking had been in the hands of a company, it would have been able to pay a dividend of 13 per cent. on ordinary shares, 6 per cent. on preference shares, and 4 per cent. on debentures.

After luncheon the discussion on Mr. Fearnley's paper was concluded, and a paper was read on "Tramcar Stopping Places," by Mr. Jas. Dalrymple, general manager of the Glasgow Corporation Tramways.

(*To be continued.*)

Presidential Address

By Mr. Ald. Charles Higham.

(*Abstract.*)

In spite of the splendid enterprise of the "Safety First" Association, and the activities of others in warning the public of traffic dangers, there is a most alarming increase in the number of street accidents in this country—both fatal and non-fatal—and an amazing reluctance to take drastic remedial measures. The mechanically-operated road traffic of this country is now slaying yearly as many persons as form a large village community, and maiming or injuring more than dwell in the largest non-county borough in the country. The increase during recent years of mechanical vehicles, and especially those of high speeds, is entirely responsible for this terrible tale of sacrifice.

For some time this Association has called attention to it, and requested that there should be more effective regulation of street traffic, especially at tramway stopping-places. Even the Ministry, whose sole concern is with the supervision of transport, refuses to move. We must rely on an informed public opinion to take up this pressing question.

For the congestion of streets by traffic, especially in the centres of cities and towns, it has been suggested that the remedy may be found in excluding tramways from central areas. Some of these traffic experts have not yet noticed that considerable street congestion arises from rows of motor-cars on each side of the road.

The luxury motor-car has much to answer for, no doubt. Every petrol machine that displaces an electricity-driven one provides more employment for the workers in the oil-fields, but inevitably diminishes employment for the British miner, and accentuates industrial depression at home. We must persist in resisting any proposals for adding unnecessary vehicles to the streets.

Many municipalities which provide an adequate passenger service have been occupied during the year in defending their undertakings from mere exploiters. The time has arrived for a calm survey of the whole field of road passenger transport agencies and the relation that tramways bear to them. Whatever may be the means employed for the conveyance of those who must travel by road, local authorities will never hand over that great public service to private hands. Local authorities can be depended on to adapt the means to the end, and if inter-urban services are required they will be under public control. Recurring attacks are made on tramways by a section of the Press, which is not very scrupulous and has little regard for veracity. In July last, it was twice stated that Leeds and Walsall had decided that tramways were obsolete and had replaced them with other methods of transport. At the moment that was written Leeds had decided to spend about £400,000 on new tramcars and was extending the system. There was no truth in the statement that Walsall had decided to scrap tramways.

The Ministry of Transport has informed the Council that it does not share the opinion that tramways are obsolete. It is certain that the public does not share that view. Some motorists may think that tramways are a nuisance to them, but they forget that they themselves are a much bigger nuisance and danger to the public.

The tramways last year carried more than 4,443,000,000 passengers. The average receipt per passenger was 1.53d. compared with 1.05d. in 1913-14, or an increase of 46 per cent. only. They provide the cheapest and most constant means of transport. Moreover, they are, when taken in the aggregate, a sound commercial proposition.

The London and Home Counties' Traffic Advisory Committee has made its position clear. At a public inquiry as to omnibus traffic in restricted streets in London, on June 22nd, the Chairman, Sir Henry Maybury, said:—"I am desired by the Committee to state, with a view to conserving time, that they have decided that the intention of the Act of Parliament, Section 7 (1), (b), is that protection should be given to tramways and they propose to give such protection. Accordingly, they do not desire to hear evidence upon the question of this policy which, in their view, is not before them. It is an instruction of Parliament; it is an Act of Parliament, and the Committee are instructed to have regard as you know, to the services already provided on every route, and they must so consider."

It has been stated that not one of the London daily papers reported this important pronouncement.

The decision and report of the Special Tribunal appointed by the National Council to deal with the Employés' application of

May 16th, 1924, for a substantial increase in wages was issued on November 1st, 1924. The report was accepted unanimously by both sides, and has been in operation since November 18th, 1924.

In July last, the terms of the constitution of a new Workers' Alliance were published. The Unions representing the employés on the National Council were said to be parties to it. Clause 9 laid it down that:—"The conditions of membership of this alliance shall involve the allied organisations in definitely undertaking, notwithstanding anything in their agreements or constitutions to the contrary, to act as directed by the general conference of this alliance." It would appear, therefore, that agreements within an industry will no longer provide any effective security for the peace of that industry, and that on the employés' side they may be flung among the mere scraps of paper at any moment.

Annual General Meeting.

The annual general meeting was held on Thursday afternoon, September 10th.

It was announced that Mr. A. L. C. Fell, late general manager of the London County Council Tramways, had been elected an honorary member of the Association.

Mr. Fell, who was present and was accorded a very hearty welcome, addressed the meeting, and after expressing his thanks for the honour that had been done him, said that he agreed with Mr. Fearnley that tramways hitherto had been ill-treated, and he believed that if they were only given a chance and were relieved of some of the unjust burdens which were now imposed upon them, there would be no better means of transport in the world.

The resignation of Mr. A. Baker, of Birmingham, as one of the Association representatives on the Joint Industrial Council, was announced, with regret, and a hearty vote of thanks was accorded him for his services ever since the Joint Industrial Council was formed.

The annual report of the Council was then taken.

The meeting confirmed the Council's recommendation to change the name of the Association to the Municipal Tramways and Transport Association (Incorporated).

Mr. E. H. Rayner (General Manager of the Hull Corporation Tramways) moved a resolution to the effect that the Council should consider the advisability of itself promoting a Bill giving local authorities the wider powers with regard to the running of motor 'buses which had been mentioned several times during the Conference.

The President explained that although some members of the Council thought the Council had power to promote such a Bill, the matter would have to be thoroughly investigated.

The proposal that the Council should inquire into the position with a view to the promotion of such a Bill was carried by a large majority.

The election of President and Vice-President for the ensuing year resulted in Mr. P. Priestley (General Manager of the Liverpool Tramways) and Mr. R. L. Horsfield (General Manager of the Cardiff Corporation Tramways) being chosen for the respective positions. Mr. A. R. Fearnley (Sheffield) was elected honorary treasurer. Alderman Canby (Huddersfield) was elected to the Council, as well as Messrs. J. K. Bruce (L.C.C.), J. F. Cameron (Northampton), C. Furness (Blackpool), R. S. Pilcher (Edinburgh), Owen Silvers (Wolverhampton), and N. J. Young (Newport, Mon.).

Votes of thanks to the retiring president and members of Council and the Corporation of Brighton concluded the meeting.

Municipal Tramways and Motor Omnibuses.

By Mr. A. R. Fearnley, M.Inst.A.E.

(*Abstract.*)

The relative position of motor omnibuses in connection with tramways, in the road passenger transport systems in the country, is the most important question before municipal transport operators at this date. The claim of the municipalities is that the control of this traffic must remain in their hands, and that the question of the type of vehicle to be used for the purpose provides no justification, nor even a flimsy excuse for the attempts which have been made to take from them the control and handling of this public service.

The provision of public transport service is to-day equally as important as the provision of electricity, gas, water and other public services, which enter so largely into the every-day lives of the people. A public transport service must make provision for the people who live in the urban and rural districts, to have regular and ready means of access to the towns, so that they may get to and from their work and also have the benefit of the many valuable facilities provided in such areas. Having provided for these, there is a still further duty and responsibility upon the public authority, which is to see that the people who reside in the thickly populated areas have provision made for them so that when time and opportunity offer they can with ease, regularity and certainty, and at reasonable cost, get out of such areas into the healthy country districts and heights surrounding the towns and there enjoy the freedom and freshness of the country. It is obvious that these requirements cannot be adequately met by a system of transport which is tied to a rail or tied to a wire; both such systems have their proper spheres of operation.

Tramways have not suddenly developed any serious defect or weakness—the present cost of construction, renewals and repairs is a handicap, but one which could be met and overcome if nothing more serious required to be dealt with. The defect, that is, lack of mobility, was not so obvious a handicap prior to the great increase in all forms of motor traffic, but it is now a point which is being put forward and magnified on every possible occasion as a serious disability and one that cannot be got over. On occasion, apparently, the tramcar may obstruct other traffic, but when rightly considered it can be demonstrated that really it is assisting such traffic, as statistics for almost any district will readily show. Tramways are still the premier form of street transport for the large industrial areas. No one is yet able to demonstrate anything to the contrary, and one's own daily experience proves beyond question the correctness of this assertion. That other services, however, are required and that other forms of transport can best give such service, does but lead us to the declaration that it is vitally necessary in the public interest that such additional services should be retained under the public control, and provided by the tramway authority which, by co-ordinating the newer and more mobile vehicle with the well-established and still necessary public tramway service, can best meet all the requirements just outlined.

It should be readily granted that every municipality which has accepted the responsibility for street passenger transport operation should have powers to operate, develop and extend motor omnibus services. Where such a system can join up with the systems of other municipalities, arrangements should be made for the joint operation of through services between the various centres, and, if necessary, joint boards or committees appointed and the various systems operated and co-ordinated under their control. By such an arrangement the people will ultimately obtain better services and facilities than in any other way.

Can tramways exist alone on the central and short-distance runs? Their competitor is improving and becoming more efficient every year, and in time even the comparatively short routes will be attacked. The advent of the double-deck top-covered motor omnibus has changed the position of affairs so far as the comparison with tramway operation is concerned. This type of vehicle seats 52 passengers in an excellent manner, provides easy and comfortable riding, and maintains a high average scheduled speed. At the Conference in Dundee in 1919, figures were given showing the comparative costs of operating tramways and motor omnibuses, and these are now supplemented by the figures for the present year. The decrease in cost per seat provided on the motor omnibus is worthy of special attention. The figures are taken from a route on which the 52-seater type of motor 'bus has replaced a tramway.

Comparative Costs of Operating Tramcars and Motor Omnibuses.

Figures given at the M.T.A. Conference, 1919:—Working expenses, per seat per mile run: tramways, 0.230d.; omnibuses, 0.532d.; excess of omnibuses over tramways, 0.302d., or 131.3 per cent.

Service of debt: tramways, 0.031d.; omnibuses, 0.027d.; difference, 0.004d., or 12.9 per cent. less. Total: tramways, 0.261d.; omnibuses, 0.559d.; excess of omnibuses over tramways, 0.298d., or 114.1 per cent.

Figures based on four months ended July 18th, 1925:—

Working expenses: tramways, 0.195d.; omnibuses, 0.248d.; excess of omnibuses over tramways, 0.053d., or 27.2 per cent.

Service of debt: tramways, 0.033d.; omnibuses, 0.042d.; excess, 0.009d., or 27.3 per cent. Total: tramways, 0.228d.; omnibuses, 0.290d.; excess, 0.062d., or 27.2 per cent.

At the coming exhibition of commercial motor vehicles (which should be visited by every tramway operator in the country) more efficient engines, improved low frame chassis, wide track, improved brakes, provision for higher speeds, and good coachwork, with comfortable seating accommodation, are to be put forward for our acceptance. It is to be hoped that a great improvement in springing will also be available, otherwise the advantages outlined will be seriously discounted. People in the dense traffic areas will in time find systems thus equipped highly attractive and press for such services, maybe as supplementary to existing tramways. It is apparent to everyone taking observations that the demand is clearly for transport facilities to go much farther afield than formerly, and as tramway owners and operators we have attempted to overcome the opposition and serious difficulties placed in our way, in order that we may meet this obvious requirement. The reliability of the vehicle cannot be questioned. We have not been limited in our views and observations by what has taken place in our own localities. We bear in mind the lesson taught in the early days of electric traction which, in numerous instances, has only been put right by expensive purchases out of municipal funds. We also profit by the astounding confusion that has been allowed to grow up under close and constant observation in the great metropolitan area of London. The best results are being obtained by those municipalities which have taken a long view of their responsibilities, and have seen that, having got the right to operate in thickly populated areas, they have not cleared themselves of their responsibilities, but must also provide for the more thinly populated districts, not merely for profit making, but with a view to providing what is now an obvious public necessity. Every town should have the clauses giving it the right to enter into through-running agreements, and those towns which have such clauses might profitably consider the advisability of at once acquiring and operating the small independent services which have been started in their neighbourhood. Unless this is done the trouble, difficulties, and great expense brought about by allowing big companies or combines to get hold of such services, as in the early days of electric traction, will be repeated.

In what way can this loss of attractiveness be countered? Cars can be speeded up; nothing less than 50-h.p. motors fitted on all cars which it is intended to retain in regular service for any length of time; power brakes fitted which can control the cars under the increased speeds with ease and without objectionable shocks to, or the throwing of, passengers; ventilation, which in numerous cases is insufficient, might have immediate attention; and clean, comfortable, well-lighted, attractive, and up-to-date cars provided. It may be advisable for employés to be reminded that having entered municipal service, smartness, alertness, promptness, and courtesy are required; that every pedestrian is a possible customer, and that we are all out to sell car sides; that the title of municipal tramways and transport undertaking is "The Sign of Good Service" and that we intend to exist as transport undertakings on our merits in serving the public.

Motor omnibuses should to-day be in general use by all tramway systems for:—

(1) The provision of services in thinly populated areas. The traffic from many such districts is astonishingly good at week-ends, and sufficient to bring up the total receipts to a point covering all operating expenses. When any such services are taken over from small owners by the Corporation, the traffic quickly improves as the reasonable charge and regularity of the municipal service become known.

(2) Providing services in extension of tramway routes and over the tramway routes, thus bringing long-distance passengers through into the centre of the town. Whatever may be the feeling against this proposal, it is evident that if it is not done by the tramway authority strong attempts will be made to do it by other people.

(3) On any routes which might under normal circumstances have been scheduled as tramway routes. If in certain districts the opinion is held that the whole area is provided for, a re-examination of the question will probably show room for some additional service.

(4) Provision of through services over lengthy tramway routes heavily used for short-distance passengers. This question is likely to be brought forward in a more pronounced manner in the future, and is one in which the question of finance will need careful attention. Is it likely that the long-distance tramway passenger will continue to be satisfied with a service making 20 to 30 stops on his run into and out of town—what interest has he in such wasteful machinery?

(5) Linking up adjacent towns where tramways do not cover the whole length of route. A great traffic is to be picked up on routes of this description despite the fact that there may be a frequent service of trains between the towns. There should be little difficulty in neighbouring municipalities amicably arranging such services.

(6) For meeting night trains and excursions. Cars for each route would result in serious loss, but one 'bus can serve two or three routes with a small number of passengers for each. Good experience has been obtained from the Wembley railway service in regard to this class of traffic, and it has been found that passengers landed at town stations in the early hours of the morning eagerly take advantage of a 'bus service of this description, and are willing to pay a fare sufficient to cover the expenses of operation. Punctuality of such railway services on the part of the companies requires their urgent attention, and the public are beginning to take an interest in the matter.

(7) What might be termed "Health and Recreation Routes." A great work can be done in this direction, and it would undoubtedly be a source of surprise to any committee which has not catered for this class of traffic. It is a good thing to see the people of the industrial areas joining the 'buses for a half-day's outing in the country under healthy and comfortable conditions. Advise them to "make the open country their playground." Experience has shown that by attractive advertising sheets in the cars, and advertising in the Press, calling attention to the motor services and pointing out the attractiveness of the districts served, a great amount of traffic is awaiting us, the difficulty being to meet the demands at the week-ends and at holidays. Sufficient traffic can be obtained at these times to make the service remunerative for the whole year, a minimum service being provided on the quieter days in the week and in winter time.

Tramways alone may have been inclined to get somewhat rusty. Speed them up and with the assistance of motor omnibuses improve them in every way possible. There are clear cases where poor tramway routes have been enormously improved by a service of motor 'buses as feeders. Improve the health of the people in the towns by taking them out into the country.

Brighten the lives of the people in the country districts by giving them the opportunity of visiting the towns whenever they desire to do so. Improve the trade of your district by bringing the people in from the out districts. Protect and supplement your tramways in every possible direction by your own 'bus services. With initiative and enterprise such work can be made intensely interesting. Threatened competition should be resolutely faced and with courage and vision may be rendered unnecessary. These notes are written as the result of the writer's experience of a combined service of tramways and motor omnibuses over a considerable number of years, and with the one desire of benefiting the industry and ensuring the continuance of its successful operation.

Steel-Concrete Poles for Transmission Lines.

The Manufacture and Installation of the "Stobie" Pole.

Probably the principal consideration in providing for an overhead transmission scheme for the supply of electrical energy is the question of the poles for supporting the conductors. The choice of wooden or steel poles has always been a controversial point in many parts of the world where the overhead system of transmission has been adopted to a greater extent than in England, and in view of the growing interest in this country in the question of supplying electrical energy to the rural areas, the consideration of overhead transmission and hence transmission poles will engage the minds of supply engineers at home.

The invention of Mr. J. C. Stobie, a member of the staff of the Adelaide Electric Supply Co., may prove a means of solving many of the difficulties met with in the employment of wooden and all-steel poles. It takes the form of a transmission pole of combined steel and concrete construction, and has been used extensively in Australia by the Adelaide Electric Supply Co., 150 miles of h.p. overhead lines with "Stobie" poles having been constructed. The essential feature in the design of this pole is the use of two light standard rolled-steel joists or channel sections, forming the main outside tension and compression members. These are held at the correct distances apart, tapering from the base to the top, by means of bolts passing through the webs of the sections at carefully determined intervals. The space between the steel sections is filled with concrete, which acts as a continuous web, the embedded bolts taking a portion of the shear stresses. This filling also gives to the completed pole the necessary rigidity and resistance to torsion, which may arise from an unbalanced pull.



Fig. 1.—Manufacturing "Stobie" Steel-Concrete Poles.

The process of manufacture is a very simple one, call-

ing for neither special machinery nor skilled labour, and has the great advantage of rendering the construction of poles possible near where they are to be installed, as shown in fig. 1. The joists are first laid out on greased steel slides at right angles to their length and fixed with clamps, and a wooden form acting as a spacer is placed between the flanges at the bottom, forming a trough, fig. 2. This is then filled with a stiff-concrete mixture, when another form is placed similarly between the steel members at the top and clamped down. For a few feet at the narrow end of the pole where the joists are close together, the forms are

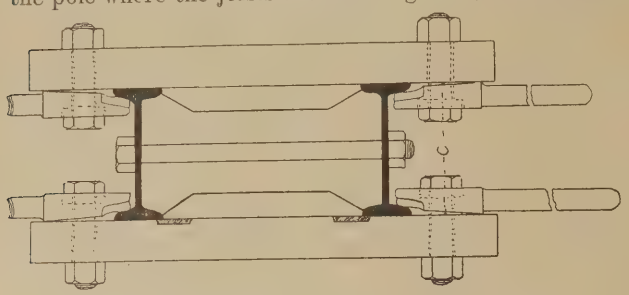


Fig. 2.—Section of "Stobie" Pole and Forms.

not recessed into the concrete, and allow it to run flush with the joist flanges. As soon as the concrete begins to set, the through bolts are tightened up. After 24 hours the forms are removed, and the concrete is allowed to season for from 14 to 21 days. The poles are erected with the cross arms in position; the bolts used for securing the arms to the poles are placed in position before the concrete is set. When completed, the pole has a light and not unsightly appearance. Fig. 3 shows a guyed transposition pole on a cross-country line. Many of the poles manufactured in this way in Australia were

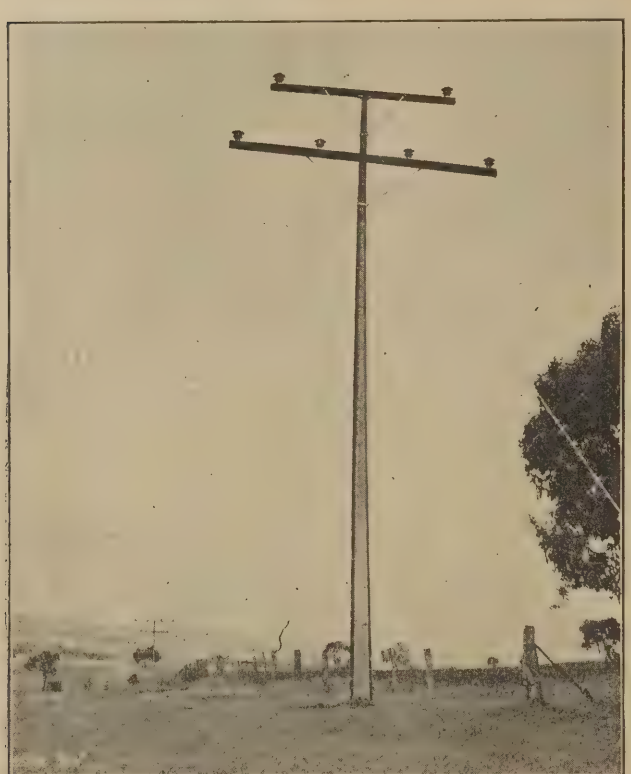


Fig. 3.—A Steel-Concrete Pole in Position.

transported for 20 miles on timber jinkers over rough "bush" tracks, and not a single pole was damaged by the severe handling and jolting it received. The particular claims made for the "Stobie" pole are that by correct section and disposition of the members to withstand the stresses usual in overhead lines, it is for equal strength no heavier than the hard-wood one; while the cost, taking into consideration its longer life, is substantially less than that of wooden poles, and compares favourably with that of fabricated steel structures. Also, as before mentioned, the pole can be made with facility on the site of the transmission line itself.

The "Stobie" pole has been built in 30- to 36-ft. lengths for local low-pressure distribution, and in 42- to 50-ft. lengths for 33,000-V transmission, but the design provides for lengths much in excess of these. A series

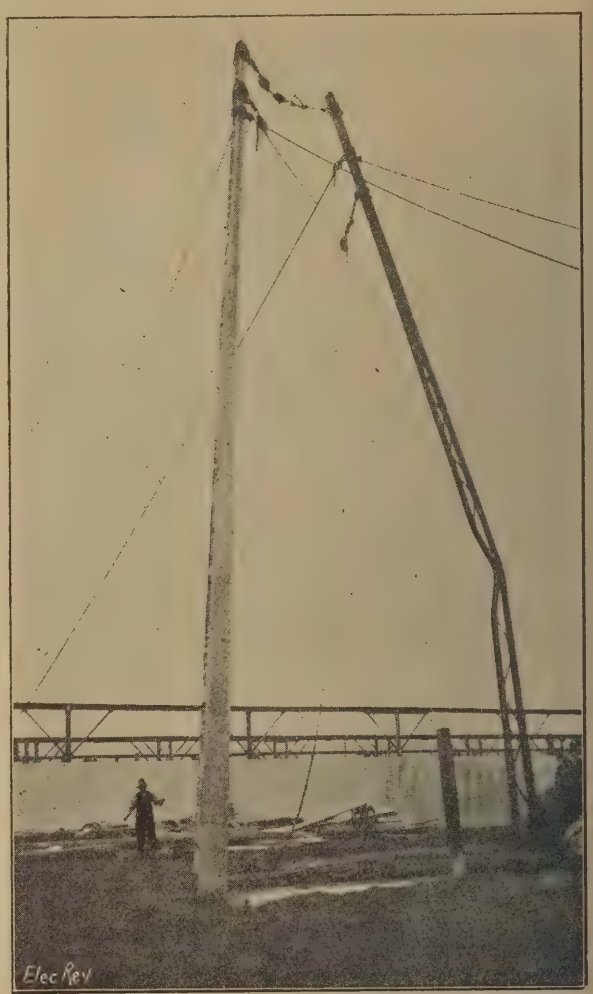


Fig. 4.—Result of Test on a "Stobie" Pole.

of tests have been carried out on poles of this type by an Australian operating company. In one case a steel-concrete pole was tested against

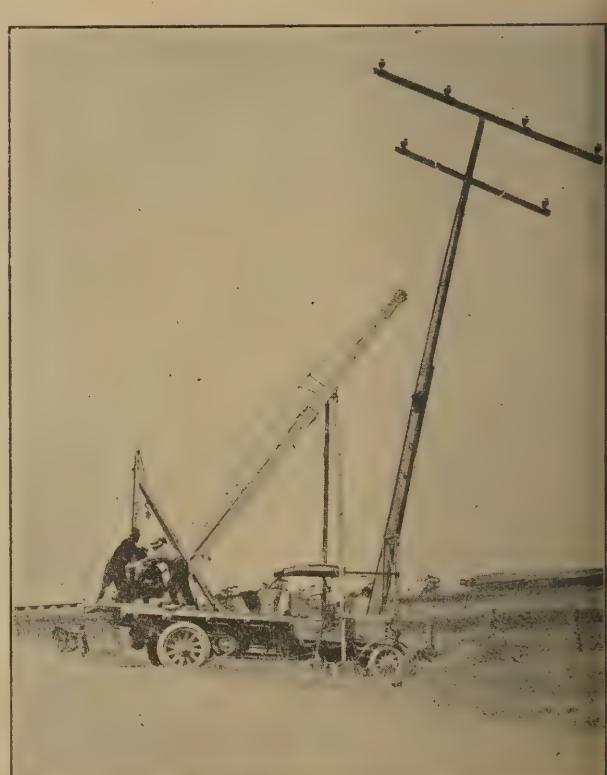


Fig. 5.—The Erection of a 42 ft. 6 in. "Stobie" Pole.

a steel fabricated one, both designed for the same side pull. While both poles showed similar deflections at a 500-lb. pull, the fabricated steel one com

pletely collapsed at a pull of about 1,300 lb., but the "Stobie" pole only showed a heavy permanent set without fracture (fig. 4). Other tests showed that the "Stobie" pole has a factor of safety of 3 for loads at right angles to the line, and that its strength in the direction of the line is ample for ordinary contingencies. The question of possible corrosion of the steel members at the ground line is receiving careful attention. It is considered that in dry climates, such as that of Australia, little more protection than a coat of paint is necessary. For moister conditions, a coat of bitumastic enamel applied to the base, hot, either with or without the usual weathered concrete footing carried 12 in. above and below the ground, will afford sufficient protection to ensure the pole a very long life.

During erection the poles are easily handled by means of an ordinary jib crane. Fig. 5 shows a 42 ft. 6 in. pole in the course of erection.

We are indebted for the foregoing particulars to Mr. F. W. H. Wheadon, M.I.E.E., chief engineer and manager to the Adelaide Electric Supply Co., who is paying a visit to this country.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The Bakers' Exhibition.—The 29th annual Confectioners', Bakers', and Allied Trades Exhibition was held at the Agricultural Hall from September 5th to 11th. A marked feature of these exhibitions has been the gradual growth in the use of electrically-driven machinery, and this year's show was notable for a great advance in this respect. It is not possible to enumerate all the firms which displayed this type of machinery; we must be content to mention that the bulk of it comprised dough and cake mixers of various patterns and sizes. Another prominent feature, from our point of view, was the demonstration of electric baking ovens. Three companies showed these—the General Electric Co., Ltd., the Metropolitan-Vickers Electrical Co., Ltd., and the Artofex Engineering Works, Ltd. We hope to give further details of this apparatus in a later issue. The Hobart Manufacturing Co., Ltd., exhibited a great deal of electrically-operated food-preparing equipment, including coffee mills, dough and cake mixers, food cutters and mincers, sausage machines, &c., each with the motor incorporated in the design of the machine. This firm also showed the "Crescent" dishwasher. This machine has a sheet-metal body with a glass front. Two sets of water-jets are employed; one set revolves and performs the washing action while the other set is fixed and is designed to rinse the cleansed plates or dishes. The water-heating arrangement *can* be electrical, but gas or steam is usually employed. The General Electric Co., Ltd., in addition to the baking oven already mentioned, showed a 4-kW restaurant grill, a doughnut fryer, and a fish-fryer. Autochrome Signs, Ltd., had a display of coloured illuminated signs, with various kinds of flashing and flickering effects, and Mr. E. Duncan Doring exhibited a number of ingenious electro-mechanical advertising devices.

Shannon Scheme Strike.—Labour trouble has occurred at the inception of the Siemens-Schuckert scheme for the harnessing of the River Shannon. It is reported that the contractors endeavoured to make the labourers upon the initial excavation work accept 8d. per hour for a 54-hour week, whereas the union rate for a 47-hour week is 1s. 3d. an hour. The work was delayed for a settlement of the question.

An All-Electric Hire-Purchase Suggestion.—In the September issue of *Electrical Merchandising* it is pointed out that while automobiles and complete bath-room equipments as well as other modern conveniences are sold to the American public by means of "easy-payment" systems, electrical dealers are content to sell a single appliance at a time. At this rate, says our contemporary, complete electrical equipment will never become the standard of the American home. Accordingly the bold suggestion is advanced that the whole of the electrical equipment necessary in a house should be supplied at once on a hire-purchase basis—or against a mortgage. Installations costing from $1,000 to $1,500 are suggested.

"Underfeed" Contracts.—Among the recent orders received from electricity supply authorities by the Underfeed Stoker Co., Ltd., are the following:—Travelling grates: Scottish Central Power Co., Ipswich Corporation, and Gravesend Corporation; ash conveyors: St. Pancras and Hull Corporations; Murray tubes: Glasgow Corporation (Dalmarnock); pulverised fuel plant: Brighton Corporation; "Underfeed" stokers and air heaters: Moghalseria, Gya and Bedawatta power stations; air heaters: Gravesend Corporation; and arches: Eastbourne and Maidstone Corporations.

Reconstruction Work at Paddington.—The Great Western Railway Co. has decided to undertake the reconstruction of Paddington Goods Station and the installation of up-to-date equipment, including electrically-operated labour-saving appliances.—*Financial Times.*

For Sale.—By order of the Receiver, *re* Wakelins Engineering, Ltd., Vicarage Road, Hampton Wick, Messrs. H. Butcher and Co. will sell by auction on the premises on Tuesday, September 22nd, and following day, the lease of the premises, plant, machinery, stores, stock, and goodwill. For full particulars see our advertisement pages to-day.

Trade Commissioners.—Mr. AINSCOUGH, H.M. Senior Trade Commissioner in India, is taking new office premises at Fairlie House, Fairlie Place (P.O. Box 683), Calcutta, from November 1st.

H.M. Trade Commissioner in Western Canada has removed from Winch Building to 18, Commerce Building, Vancouver, B.C.

Free Telegraphic Addresses.—Arrangements have been made by the Postmaster-General, in order to assist foreign trade, enabling any firm with representatives abroad to obtain a telegraphic address for oversea communication free of charge, provided that the applicant is already a holder of one paid registered address. Messages sent "*via* Imperial," by the Anglo-Russian cable, or by the Oxford-Cairo radio service, will be allowed a free registered address without the condition attaching to other routes.

Trade Announcements.—On September 10th, the new show and demonstration rooms in London of Messrs. A. J. STEVENS & Co. (1914), LTD., of Wolverhampton, were opened, the event being marked by a reception and luncheon at which Mr. Lamb presided. The latest models of the company's apparatus were displayed. Mr. Lamb, in the course of a speech, reviewed the development of the business, and said that the staff and workpeople of the company would have passed the one thousand mark before they were many weeks older. He also referred to the wide ground covered by them in manufacturing radio apparatus and accessories. The speaker read a communication received from Sir Oliver Lodge, and other speeches followed. The new premises are situated at 122-124, Charing Cross Road, London, W.C.2.

MESSRS. STUART TURNER, LTD., of Henley-on-Thames, have opened an office at 63, Queen Victoria Street, London, E.C.4, with Mr. B. C. Rhodes in charge, where the Stuart country-house lighting and pumping plants can be seen. 'Phone No.: "City 7381."

INTERNATIONAL COMBUSTION, LTD., has transferred its Commercial Pulverising Department from Africa House to 11, Southampton Row, London, W.C.2.

MESSRS. S. EVANS & SONS, electrical and wireless contractors, have opened premises at 16a and 18, King Street, Maidenhead.

CRYSELCO, LTD., has opened a branch at 35, Duke Street, Brighton, where it will carry stocks of its lamps and all makes of V.M.A. valves. Phone: "Brighton 5512."

Mr. W. H. STONE, agent for South Wales for the Yorkshire Electric Transformer Co., Ltd., and the Wardle Engineering Co., Ltd., who was for many years with Messrs. McWhirter and Sons, Ltd., Cardiff, has removed his office to 63, Rhiwbina, Cardiff.

THE IRON & NICKEL BATTERY CO., LTD., has removed to 17-19, Cockspur Street, Pall Mall, London, S.W.1. Telephone:—"Regent 7187."

Large Canadian Plant Order.—The *Electrical News* (Toronto) states that the Aluminium Company of Canada, which is constructing a large plant at Chute-a-Caron, Quebec, has placed an order for the electrical plant required with the Canadian General Electric Co. The order covers 18 synchronous converters, each of 3,600 kW capacity; 12 transformers of 25,000 kVA each for a primary pressure of 154,000 V; and 10 transformers of 7,500 kVA capacity. The converters will embody automatic starting arrangements.

Catalogues and Lists.—PHILIPS LAMPS, LTD., 60, Wilson Street, Finsbury Square, E.C.2.—An illustrated and priced folder advertising the "Philips" rectifier.

THE CARRINGTON MANUFACTURING CO., LTD., 18-20, Normans Buildings, Central Street, E.C.1.—An illustrated price list of cabinets for radio receiving sets, &c.

MESSRS. FORUM & CO., LTD., 7 & 9, Pershore Street, Birmingham.—Illustrated price lists of radio components and accessories.

MESSRS. A. J. DEW & CO., 33-34, Rathbone Place, Oxford Street, W.1.—Wholesale catalogue for 1925-26 of radio apparatus and accessories of all descriptions. The publication, which has over 200 pages, is fully illustrated and priced.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—September stock list of dynamos and motors.

RADIO INSTRUMENTS, LTD., 12, Hyde Street, New Oxford Street, W.C.1.—A descriptive, illustrated catalogue of radio receiving sets and components; priced. Also a showcard advertising "R.I." apparatus.

MESSRS. I. CALVETE, LTD., 11, Little St. Andrew Street, W.C.2.—An illustrated and priced catalogue of electro-medical apparatus, including violet-ray generators and equipment, hair-waving appliances, &c.

THE METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Leaflets Nos. 783/1-1 and 783/2-1, dealing,

respectively, with the company's arc-welding equipment and its applications.

THE LANCASHIRE DYNAMO & MOTOR CO., LTD., Trafford Park, Manchester.—List No. 445, illustrating and describing the "Crypto" commutating rectifier; and List No. 700, dealing with "Lancashire Maxtorq" induction motors, and describing their manufacture.

MESSRS. T. HARDING CHURTON & CO., LTD., Atlas Works, Water Lane, Leeds.—Circular 660, containing particulars and prices of two- and three-phase induction motors.

WESTERN ELECTRIC CO., LTD., Connaught House, Aldwych, W.C.2.—An illustrated price list of radio receiving sets, components, and accessories.

MESSRS. S. G. LEACH & CO., LTD., 26-30, Artillery Lane, E.C. —An illustrated pamphlet describing "SBIK" automatic oil switches for a.c. motors.

Bankruptcy Proceedings.—JOSEPH BENSON, 18, Ivy Crescent, York Road, Leeds, lately an electrical engineer.—The receiving order in this matter was made recently on debtor's own petition. The statement of affairs shows liabilities of £173, and there are no assets. The first meeting of the creditors was held on August 27th at the Official Receiver's office, Leeds, when the case being a summary one was left with the Official Receiver as trustee. The following are creditors :—

	£		£
Russell, Ltd.	73	Priestman, R.	87

THOMAS BARTON, Ainsworth Street, Blackburn, electrical engineer.—The first meeting of creditors was held recently at the Official Receiver's offices, Preston. The statement of affairs showed liabilities of £3,813, and net assets of £5,794, leaving an estimated surplus of £1,981. Debtor stated that he commenced business at his present address in his own name in 1886 with £600 capital, provided by his wife. He made no profits in the business, but was not aware that he was insolvent. On June 29th last he executed a deed of assignment, and on July 7th a meeting of creditors agreed to accept the deed. The assignment trustee had carried on the business, and paid over to the Official Receiver a sum of £44, being the balance stated to be in his hands at the date of the receiving order. The creditors decided to appoint Mr. A. T. Eaves as trustee.

L. W. PULLMAN, Orchardleigh, Golders Green Road, N.—The first meeting of creditors was held recently at Bankruptcy Buildings, W.C., before Mr. D. Williams, Official Receiver. The debtor, who described himself as an electrical engineer, has carried on business first as a motor-car manufacturer and later as a dealer in wireless goods. According to statements made at his preliminary examination, the debtor in 1921 entered into partnership with three others and they started business as car manufacturers at Richmond under the style of the Globe Manufacturing Company. The debtor put in a capital of £1,250 and retired from the concern, having lost about £2,000. At the end of 1923 he joined the Warren-Lambert Engineering Co., Ltd., at Richmond, it then being in voluntary liquidation. Having a considerable knowledge of radio, gained since 1910, the debtor in January, 1924, obtained a post as wireless salesman and later in the year he joined the Radio Supplies, Ltd., which went into voluntary liquidation the same year. Since March last he has bought and sold radio goods for cash on his own account. No statement of affairs was lodged, but the debtor roughly estimates his liabilities at £1,490 and returns in the shape of assets, doubtful book debts of the face value of £639. He attributes his position to loss incurred in the Globe Manufacturing Co., failure to obtain substantial employment, and inability to perfect his various inventions. The estate was left in the hands of the Official Receiver.

ARTHUR KITSON, electrical engineer, &c., 1, Central Hall Buildings, S.W.1.—A receiving order was made against this debtor at the London Bankruptcy Court on August 26th upon the petition of creditors and on September 14th the first meeting of creditors was held before Mr. Wheeler, Assistant Official Receiver. Having dealt with the proofs of debt the chairman reported that it appeared from the debtor's statements in his preliminary examination that he went to America in 1879 and obtained employment with various electrical firms. He started on his own account as the Kitson Lighting Company, which business was afterwards formed into a limited company with offices in Philadelphia. The debtor acted as president and managing director of the concern until it was merged into the United Lighting & Heating Co.; he sold his interest in the company in 1899 and in the following year came to England with considerable capital invested in American securities. He next formed Kitson's Lighting Co. of Great Britain, but withdrew from that business after a year or so in order to work certain patents for lighting which he had in hand. In 1902 he started the Kitson Light Foreign Supply Company with works and offices at Willesden, and five years later converted that undertaking into the Kitson Empire Light Co., Ltd., which company went into voluntary liquidation in 1910. Assisted by certain friends the debtor purchased the assets from the liquidator and the company was revived and carried on under the same name until 1922, when the title was changed to the Kitson Engineering Co. (London), Ltd., with offices and works at Stamford. A receiver for the debenture holders was appointed recently. The debtor acted as chairman and managing director for some years, but had received no remuneration for two years past, and in consequence got into debt, apart from personal liability upon guarantees given on behalf of the company. He had stated that he saw a good prospect of raising funds with which to discharge the receiver, in which event his holding in the company would again become valuable. No statement of affairs had been lodged but the debtor roughly estimated his liabilities at £15,000 and he had in the shape of assets various shares to the nominal amount of £20,000, but having no present marketable value, and a sum of £4,000 due from the Kitson Engineering Co. He attributed his failure to the company's inability to pay the moneys owing to him. In the absence of a quorum the meeting was adjourned for a week.

S. SCARFI (Scarfi Bros.), cycle, gramophone and wireless agent.—Last day for proofs for dividend, September 30th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

C. W. A. ASHWORTH, electrical engineer, West Street, Oundle, Northampton.—Last day for proofs for dividend, September 26th. Trustee, Mr. J. L. Poland, Official Receiver, 5, Petty Cury, Cambridge.

J. KINGSTON (Cromwell Engineering Works), electrical and general engineer, 176, Romsey Road, Shirley, Southampton.—Last day for proofs for dividend, September 23rd. Trustee, Mr. C. Hoult, Official Receiver, Midland Bank Chambers, High Street, Southampton.

W. T. ROBINSON and H. ATTERBY (J. T. Beckett & Co.), electrical engineers, 134, Victoria Street, Grimsby.—First and final dividend of 8s. 5d. in the £, payable at 1, Town Hall Street, Grimsby.

F. J. NORTH, electrical engineer, 13a, Midland Road, Wellingborough.—Last day for proofs for dividend, September 25th. Trustee, Mr. D. Helliar, Official Receiver, The Parade, Northampton.

J. E. LOCKING, dealer in cycles and wireless goods, 14, Fish Street, Kingston-upon-Hull.—First and final dividend of 2s. in the £ payable at the Official Receiver's office, 37, Scale Lane, Hull.

V. G. BAINES, electrician, 2, West Street, Wellingborough.—First and final dividend of 4s. in the £ payable at the Official Receiver's office, The Parade, Northampton.

Company Liquidations.—CARTER & MITCHELL, LTD., wholesale electrical suppliers, 24, Allsop Street, Upper Baker Street, N.W.1.—A meeting of creditors was held at the above address on September 8th, when the liquidator, Mr. J. V. Higson, of Bradford, reported that the liabilities amounted to £1,237, while the assets, after allowing £61 for preferential claims, totalled £407, leaving a deficiency of £830. The company was formed in July, 1923, with a nominal capital of £2,000, of which £1,000 had been issued. The accounts to June 30th, 1924, showed sales of £3,378, with a gross profit of £577, and a net loss of £802. During the 14 months to the date of liquidation, sales had been £3,507, with a gross profit of £686, and a net loss of £587. After some discussion, Mr. Higson intimated his willingness to resign his position as liquidator, and to request the shareholders to pass another resolution appointing Mr. Charles Latham, 78, New Oxford Street, W.C., as joint liquidator with himself, to obviate the expense of going to the Court. A resolution to that effect was carried. The following are creditors :—

	£		£
Davis, Kent & Stewart	24	Hogan & Wardrop	76
Stewarts, Ltd.	62	Mitchell, T.	376
Planet Stamping Co.	24	Welsbach Lighting Co.	103
Lighting, Heating & Glass, Ltd.	271	Wettern Bros.	51

JOHN R. KINSEY & CO., LTD., Croydon.—The winding-up order herein was made on a creditor's petition. The statement of affairs showed gross liabilities of £4,691, of which £3,422 was expected to rank, against assets of £1,824, from which had to be deducted preferential creditors £350 and loans on debenture bonds £919, leaving net assets of £556, or a deficiency of £2,866. The issued share capital of the company is £3,636, and there is a total deficiency as regards the shareholders of £6,502. The failure of the company is attributed by the directors to losses arising out of a transport service; heavy working expenses; and a judgment and damages obtained against the company. The company was incorporated in January, 1922, to take over the business of motor repairers and electrical engineers previously carried on by the promoters in partnership at Croydon. In the terms of the agreement the company agreed to purchase the assets, including the goodwill, of the business, the consideration for the purchase being £2,686, satisfied as to (*a*) £1,518 by the allotment of fully-paid shares, and (*b*) £1,168, by the due discharge by December, 1922, of the partnership liabilities as existing on August 31st, 1921. There was no professional valuation made, but the purchase consideration, £2,685, is stated to have been based upon the book value of the net assets, the goodwill being taken at £300. Mr. Kinsey stated that the company soon after its incorporation in January, 1922, commenced to develop, on a larger scale than previously, its film transport service, working it as a separate section. Owing, however, to the heavy working expenses and bad debts incurred, this section was not successful and was closed down. As a result the electrical and automobile sides of the business were seriously handicapped and losses in working them also were made throughout. In April, 1924, the company, requiring further working capital, raised £200 by the issue of debentures. In October, 1924, judgment for £600 with taxed costs (£250) was obtained against the company by the petitioning creditor as damages for personal injuries received by him from one of the company's vans. The company's own legal charges amounted to £200, and being unable to satisfy these and another similar judgment for £129, voluntary liquidation was commenced on November 19th, 1924, and on November 20th, 1924, the liquidator was also appointed by Court as receiver and manager for the debenture holder, and thereupon entered into possession of the assets. The receiver for the debenture holder stated that he had realised practi-

cally the whole of the company's assets, but it was doubtful whether the proceeds, after payment of the outgoings, would be sufficient to satisfy the debenture holder.

NORTHUMBERLAND AND DURHAM RADIO ENGINEERING CO., LTD., Newcastle-on-Tyne.—A meeting of the creditors of the above was held recently, when the chair was occupied by the liquidator of the company, Mr. John Mitchell. The latter explained that he was unable to prepare a deficiency account owing to the state of the company's books, but an approximate statement of affairs disclosed liabilities of £204, all due to unsecured creditors. The net assets were estimated at £84, leaving a deficiency of £120. The company was formed in February of this year with a nominal capital of £1,000, and the total issued capital was £275. The matter remains in the hands of the present liquidator.

J. SPRINGER, LTD., 158, Wardour Street, W., kinema furnishers and electrical engineers.—At a recent meeting of creditors, Mr. C. B. Holland, the liquidator in the voluntary liquidation, presented a statement showing a deficiency as regarded the creditors of £110,750. An advisory committee was appointed to assist the liquidator. The following firms appear in the list of creditors :—

	£		£
Albany Engineering Co.	29	S. G. Leach & Co., Ltd.	34
British Thomson-Houston Co., Ltd.	32	Mickelwright, Ltd.	78
Condor Lamps, Ltd.	81	Manufacturing Engineers, Ltd. ...	36
Hendon Electric Lamp Co. ...	36	North British Rubber Co., Ltd.	404
K. F. M. Engineering Co., Ltd.	72	Sloan Electrical Co.	55
R. A. Lister & Co., Ltd. ...	45	Wilkins & Wright	22

CONTINUOUS REACTION CO., LTD.—Winding up voluntarily. Liquidator, Mr. E. C. G. Clarke, Nobel House, Buckingham Gate, S.W. A meeting of creditors was called for September 15th, at Nobel House.

STEARN ELECTRIC LAMP CO., LTD.—A meeting of members is called for October 12th, at 12, Grosvenor Gardens, S.W., to hear an account of the winding up from the liquidator. The business was sold to the Stearn Electric Co., Ltd., a new company, a year ago.

ELECTRICAL ENGINEERING (WEST BROMWICH), LTD.—A meeting of members is called for October 12th at 5, Waterloo Street, Birmingham, to hear an account of the winding up from the liquidator, Mr. J. D. Kerr.

Private Arrangements.—S. E. BLAND, trading as S. E. BLAND & Co., Queen Street, Cheapside, E.C., electrical engineer.—The creditors interested herein were called together on September 9th, at the offices of Mr. P. S. Booth, Holborn Viaduct, E.C. The statement of affairs showed ranking liabilities of £1,487 and net assets of £641, leaving a deficiency of £846. The deficiency was more than accounted for by the depreciation written off the assets, whilst law costs of £25 had been incurred. Mr. Booth reported that the debtor was previously an estimating clerk with an electrical company. In February, 1923, he started trading on his own account. He had a capital of £70, and borrowed £500 from his father. During the first year there was a net profit of £79. Last September he acquired a five-years' lease of another shop in Queen Street. During the year to February last there was a net profit of £168. The drawings in the first year were only £61, and in the second year they were £112. Since February last the turnover had been £2,509. Three assistants were employed who received salaries and commission. The debtor had suffered through lack of capital. Recently an execution was levied and as other creditors were pressing a deed of assignment was executed, the trustees being Mr. Booth and Mr. C. Latham, of 78, New Oxford Street, London, W. The debtor's father would like his son to continue the business, and it was possible that an offer would be submitted. It was decided to confirm the deed already executed, whilst a committee of three of the principal creditors was also appointed. The following are creditors :—

	£		£
Barclay's Advertising Co., Ltd. ...	31	Lee, Albert, & Co. (1923), Ltd.	60
Chloride Electrical Storage Co., Ltd.	28	De Leew & Co., Ltd.	37
Duke & Nedermeyer	36	Merchants & Agencies, Ltd. ...	30
Dickeson, C. R., & Son, Ltd. ...	42	Manhattan Electrical Supplies Co. (New York)	203
Electrical Manufacturing & Plating Co.	40	Stella Lights, Ltd.	20
Houghtons Ltd.	22	Siemens & English Electric Lamp Co., Ltd.	73
Ironmonger	24	Siemens Bros. & Co., Ltd. ...	61
London Electric Wire Co. and Smiths, Ltd.	20		

New French Company.—A new company has lately been formed in Paris (134, Avenue Malakoff), with a capital of 800,000 fr. and the title La Société pour la Fabrication des Projecteurs Electriques Marchal, to manufacture headlights for motor vehicles in accordance with the Marchal patents.

New Italian Companies.—Among the lighting and power undertakings recently formed in Italy are the Società Impresi Elettriche Sicule-Lombarde, Milan, with a capital of 100,000 lire, to take over the undertaking previously known as the Società Imprese Elettriche Nuvolari Angelini; the Società Elettrica Salentina, Bari, 100,000 lire; the Società Elettrica Latronichesé, Latronico (Lagonegro), 200,000 lire; the Società per la Produzione Elettrica, Polizzi Generosa, 360,500 lire; and the Società per le Imprese Elettriche del Gizio, Rome, 100,000 lire.

Italian Loan in the United States.—The Milan correspondent of the *Financial Times* reports that the Cia. Electrica Edison has been successful in its negotiations for placing a $9,000,000 debenture issue in New York.

Dissolution of Partnership.—AMOS & COLEMAN, electrical and motor engineers, 25, Thomas Street, Liverpool.—Mr. E. Amos, Mr. E. C. Wright, and Mr. S. R. Coleman have dissolved partnership. Messrs. Amos and Wright will attend to debts.

The A.E.G. in Argentina.—The *Review of the River Plate* records the formation of the A.E.G. Cia. Argentina de Electricidad, with a capital of $2,000,000 m/n, to take over the assets and liabilities of the A.E.G. Cia. Sudamericana de Electricidad, established in Buenos Aires for the "importation, buying and selling of merchandise, electrical machinery and installations."

Electricity at the Birmingham Building Exhibition.—The Building and Allied Trades Exhibition at Bingley Hall, Birmingham, which was opened on September 7th, by Sir H. Kingsley Wood, M.P., Parliamentary Secretary to the Ministry of Health, and closes to-morrow (Saturday), has been well attended by representatives of trade organisations, and particularly by those associated with local housing and road construction schemes. The exhibition, which was organised by the Birmingham Chamber of Commerce, covers practically the whole field of building work and material, and the internal equipment of houses, prominence being given to electricity in the home. The Birmingham Corporation Electric Supply Department has a stand which in its character is extremely comprehensive. This stand, which is illustrated in the accompanying figure, includes an attractive selection of modern lighting fittings and electrical apparatus, to show the comfort and convenience gained by the installation of electricity for lighting, cooking, heating and other domestic purposes. In addition to the cookers which are being demonstrated, a number



The Birmingham Corporation's Stand at the Building Exhibition.

of electric grills, toasters, coffee percolaters and kettles, are shown. There is also a wide variety of electric fires and heating apparatus; a dish washer; an electric wash boiler; and a clothes washer. Another useful article on view is a small domestic type motor, which can be used to drive a grinder to sharpen knives, and a buffer to polish silver and plate, to drive a small fan, or to work a sewing machine. A few drills and other small portable electric tools are also exhibited. Lectures have been given dealing with such subjects as lighting, heating, and cooking, and also on the use of electricity in the home. Mr. W. E. Bush, of the E.L.M.A. Lighting Service Bureau, and Mr. J. W. Beauchamp, of the Electrical Development Association, were jointly responsible for an interesting contribution. Mr. Bush declared that more progress had been made in the last 14 years in the development of artificial light sources than was made in the preceding 2,000 years. The greater use of electric power in industry was urged by Mr. Beauchamp. Discussing the subject of lighting in industry, Mr. W. J. Jones, of the Electric Lamp Manufacturers' Association, declared that the advent of artificial light had contributed considerably to the stability of industry.

Stoker Contracts.—Riley stokers, constructed by the Riley Stoker Co., Ltd., have been exclusively adopted by the Union Cold Storage Co., Ltd., for its new power plant. Each boiler has a single stoker, direct driven by an electric motor, and provided with its individual fan. The Luton Corporation has placed a further repeat order with the company for Riley stokers to replace stokers of another type, and six more large Riley stokers have been ordered for the latest extension of the Buenos Aires central power station.

Unemployment.—During the week ended August 31st, for the fifth successive week, there was a serious rise in the number of registered unemployed, the total at that date being 1,354,100. This was 10,362 more than a week earlier and 191,220 more than at September 1st, 1924.

Battery Vehicle Aids Hospital.—A lorry belonging to the D.P. Battery Co., Ltd., fitted with "Kathanode" batteries, obtained first prize in a carnival organised in aid of the Bakewell War Memorial Cottage Hospital. It was arranged as a "mobile fair" and collected over £18 for the hospital funds.

Our Foreign Trade.—AUGUST FIGURES.—The Board of Trade returns for August show the following values of electrical imports and exports:—

	August, 1924.	Inc. or dec.	8 months, 1925.
Imports.—	£	£	£
Electrical goods and apparatus	324,272	+ 80,733	+ 808,299
Machinery	1,002,104	+163,252	+1,131,408
(Electrical machinery)	106,132	+ 25,094	+ 37,240
Exports.—			
Electrical goods and apparatus	777,764	− 33,452	+1,423,531
Machinery	4,165,375	+700,996	+3,502,793
(Electrical machinery)	488,406	+111,324	+ 604,005
Re-exports.—			
Electrical goods and apparatus	10,866	+ 672	+ 64,394
Machinery	170,398	+ 87,579	+ 227,120
(Electrical machinery)	4,203	− 1,138	− 21,697

Book Notices.—"Mechanical Draught for Boilers" (48 pp.; 32 figs.). Belfast: Davidson & Co., Ltd.—Although this publication is described as "Catalogue No. 18," it is more of a treatise than mere "publicity matter." The advantages of mechanical over natural boiler draught are considered, and particulars follow of the various forms of mechanical draught. Naturally the firm's "Sirocco" apparatus is given prominence, but this does not detract from the general usefulness of the publication.

"Talks About Wireless," by Sir Oliver Lodge. Pp. viii+251. London: Cassell & Co., Ltd. Price 5s. net.

"Scientific Paradoxes and Problems," by A. S. E. Ackermann, B.Sc., A.M.Inst.C.E. Pp. viii+131. London: Old Westminster Press. Price 5s. net.

"British Wire-Drawing and Wire-Working Machinery," by H. Dunell. Pp. xv+188; figs. 181. London: Constable and Co., Ltd. Price 21s. net.

"Scientific Papers of the U.S.A. Bureau of Standards."—No. 503, "A Flow Calorimeter for Specific Heats of Gases." (20 cents.)

Meter Approved.—The Electricity Commissioners have approved of the construction and pattern of, also the means provided for fixing and connecting the meter known as the Ferranti single-phase watt-hour meter, Type F.C.b., rated from and including 2.5 amp. to 20 amp., 100 V to 500 V, at a frequency of 50 cycles per second.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from September 9th, 1925. In the case of foreign applications, the names and addresses of the British representatives are also given:—

Dabritte. No. 458,941. Class 6. Mechanical and electrical advertising signs.—Dorothy J. Davis, 1, Park Mansions, St. Paul's Avenue, N.W.2.

Accurect. No. 455,678. Class 8. Rectifiers for charging automobile batteries and discharge tubes for X-ray purposes.—Philips' Gloeilampenfabrieken, Eindhoven, Holland. (Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

Wates Bros., Kingsway (lettering and design). No. 455,776. Electrical apparatus included in Class 8.—Wates Bros., Ltd., 12-14, Great Queen Street, W.C.2.

Uniplex. No. 458,405. Class 8. Amplifiers for use in radio telegraphy and telephony.—Burndept Wireless, Ltd.

Holcos (lettering and design). No. 458,492. Class 8. Sound wave detectors for use in radio-telephony.—Holmes, Wilson & Co., Bolton Road, Pendleton, Manchester.

Atlas. No. 456,676. Class 8. Electric batteries (not for medical purposes).—O. Ruhl (1922), Ltd., 85, City Road, E.C.2.

Plastographe. No. 459,271. All goods in Class 8.—Rignon, 1, Rue Blanche, Paris. (Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Kay Ray (lettering and design). No. 460,285. Class 8. Instruments and apparatus for use in radio telegraphy and telephony and parts thereof.—Kate Raymond, trading as K. Raymond, 1, Grape Street, W.C.2.

Triotron (lettering and design). No. 460,449. Class 8. Valves, instruments, and apparatus for use in radio telegraphy and telephony.—Roysentul, 36, Camomile Street, E.C.2.

Andia. No. 460,832. Class 8. Radio telephone apparatus, &c.—Andia, Ltd., Sentinel House, Southampton Row, W.C.2.

Jedson. No. 460,890. All goods in Class 8.—John E. Dallas & Sons, Ltd., 8 and 10, Betterton Street, Drury Lane, W.C.2.

Maxtrip. No. 460,144. Class 13. Incandescent electric lamps (ordinary).—British Electric Lamps, Ltd., 13a, Tabor Grove, Wimbledon, S.E.19.

Nitraglas. No. 459,857. Class 14. Globes and shades used for illuminating purposes.—General Electric Co., Ltd.

Kalioko. No. 457,109. Class 40. India-rubber prepared in strip form for electrical insulating purposes.—Callender's Cable & Construction Co., Ltd.

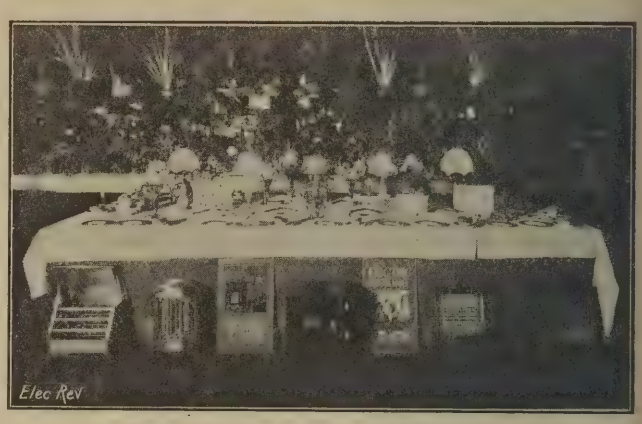
Local Exhibitions.—SALFORD.—The Electricity Committee is holding an exhibition of electrical appliances at the Pendleton Town Hall, to commence on September 21st. An electric-cooker hiring scheme is to be instituted on October 1st.

SALE.—Alderman W. T. Dagnall, the chairman of the Manchester Corporation Electricity Committee, recently opened a comprehensive exhibition of electrical appliances at the Sale Town Hall. The exhibition marked the introduction of the Norwich system of charging for electricity. Leading apparatus manufacturers in the country demonstrated their washing, cooking, and other domestic apparatus.

LIVERPOOL.—A radio exhibition opens at Liverpool to-day for a period of nine days. Every phase of wireless progress is to be represented, and many Liverpool radio firms have taken stands, as well as firms from London and other important centres. Demonstrations of the building of sets are to be given by the Liverpool Wireless Society and by Mr. J. E. Kemp (chairman of the Manchester and District Association of Radio Societies). The components for these sets are presented by exhibitors and at the close of the exhibition the sets will be sold in aid of a local charity. There are two competitions, the first is for the best two-valve amplifier, for which 30 guineas is offered in prizes, and the other for a portable one-valve set, total prizes 25 guineas.

BERMONDSEY.—An electrical exhibition, under the auspices of the borough electricity department, was inaugurated by the Mayor on September 14th. The Corporation stand was divided into two sections—a sitting room and a kitchen—and was wired and fitted for lighting, cooking, heating, &c. Other stands were occupied by leading electrical firms exhibiting domestic electrical apparatus. These included the Cable Accessories Co., Ltd., Credenda Conduits, Ltd., the General Electric Co., the Hotpoint Co., Ltd., Holophane, Ltd., the Jackson Electric Stove Co., Ltd., Metro-Vick Supplies, Ltd., and the Wholesale Fittings Co., Ltd. Electrical apparatus was also loaned for the occasion by the London Electrical Co., Messrs. Siemens Bros. & Co., Ltd., and the Edison Swan Electric Co., Ltd. The City Electrical Co., Ltd., exhibited electrically-driven machines, and Messrs. Barton & Gillette showed an electrical horse-clipper. A finishing machine used for boot repairing was demonstrated by Messrs. Keats & Bexon, and the Hobart Manufacturing Co.'s exhibits included a cake-mixer and a sausage-making machine. The chairman of the Electricity Committee announced that the charge for lighting was to be reduced from 6½d. to 5½d. per kWh.

Electricity at a Horticultural Show.—One of the attractions of the recent annual show of the Royal West Renfrewshire Horticultural Society was a stand arranged by the Greenock Corporation Electricity Department (engineer and manager, Mr. F. H. Whysall). As will be seen from the illustration herewith, the display had a floral background and was arranged as a tea table with appropriate lighting standards and small appliances. Four types of fire and a "Creda" cooker represented the larger domestic appliances. The Department secured an award of merit for this stand.



Electricity at the Greenock Horticultural Show.

Irish Free State Electrical Imports.—The Irish Free State Ministry of Industry and Commerce has now issued detailed figures of imports for the first quarter of 1925 as compared with the corresponding period of last year. From these we have compiled the appended table showing the value of the total imports of electrical machinery and apparatus into the Free State and the amount attributed to the United Kingdom as ports of consignment but not necessarily as the country of manufacture.

	Total.		U.K. Share.	
	January to March.		January to March.	
	1925.	1924.	1925.	1924.
	£	£	£	£
Electric wires and cables	21,935	14,077	15,873	12,128
Teleg. and telegraph instruments and apparatus	5,832	10,511	5,791	10,407
Electric lamps and parts	12,569	8,352	12,364	7,572
Batteries and accumulators	6,879	3,578	6,631	3,160
Radio sets and parts ...	14,483	29,637	13,988	29,589
Other elec. goods and apparatus	11,706	34,738	11,034	33,182
Electric generators ...	4,438	2,189	4,504	2,145
Electric motors	8,488	5,476	8,453	5,371
Other electrical machinery	27,337	9,476	26,447	9,399
Total ...	£113,667	£118,034	£105,085	£112,953

It will be seen that while wide variations are shown in the different classes of goods, the 1925 imports are within £4,500 of those of last year. All but £8,582 of the goods came from the United Kingdom, and of the balance £5,719 is attributed to Belgium, £1,683 to Germany, and £1,180 to other countries.

New Indian Companies.—The Battery Service Co. is the name of a new concern which has lately been formed at 5, New Queens Road, Bombay, with a capital of 25,000 rupees, to deal in batteries for motor vehicles.

STEWART JACKS, LTD., has recently been formed in Bombay (Wodehouse Road), with a capital of 1,00,000 rupees, to carry on business as electrical engineers.

Electricity Supply in Nottingham and District.

The New North Wilford Power Station.

The official opening of the North Wilford power station by Mr. Alderman Edmund Huntsman, the chairman of the Nottingham Electricity Committee, yesterday, marks an important epoch in the history of electricity supply in the City of Nottingham and the surrounding district.

The first public supply of electricity within the City was provided by the Corporation in 1894, under the powers of an Order granted in 1890; by the Nottingham Corporation Act, 1923, the area of supply was extended to its present dimensions.

Up to the present time the supply has been generated at four stations, one at Talbot Street, established in 1894; one at St. Ann's Well Road, established in 1902; the refuse destructor station at Eastcroft Depôt, established in 1902; and the North Wilford temporary station, established in 1922. With the exception of four 3-phase, 6,600-V turbo-alternators, two at St. Ann's Well Road, and two at the temporary North Wilford station, the whole of the generating plant consisted of Willans non-condensing engines and Siemens d.c. dynamos working at about 400 V pressure. The total plant capacity, before certain of the Willans-Siemens machines were recently removed, was 17,730 kW.

The Corporation had been aware for a long time that its existing generating plant was out of date and uneconomical, and in December, 1918, a conference of local authorities instructed Mr. J. H. Rider, M.I.E.E. (of the firm of Preece, Cardew & Rider, consulting engineers) and the late Mr. C. H. Wordingham "To consider and report fully upon the question of the supply of electricity in the district and to advise as to the course which should be followed by the municipalities." These gentlemen presented a report in August, 1919, the chief recommendations of which were the erection of the first section of a large power station on the Trent, at Long Eaton, a system of primary transmission mains between Long Eaton and the principal towns in the district, and a system of secondary transmission mains radiating over the whole district. The Electricity (Supply) Act, 1919, seriously curtailed the financial possibilities, and led to a modified scheme being proposed.



Fig. 1.—Exterior View of Station.

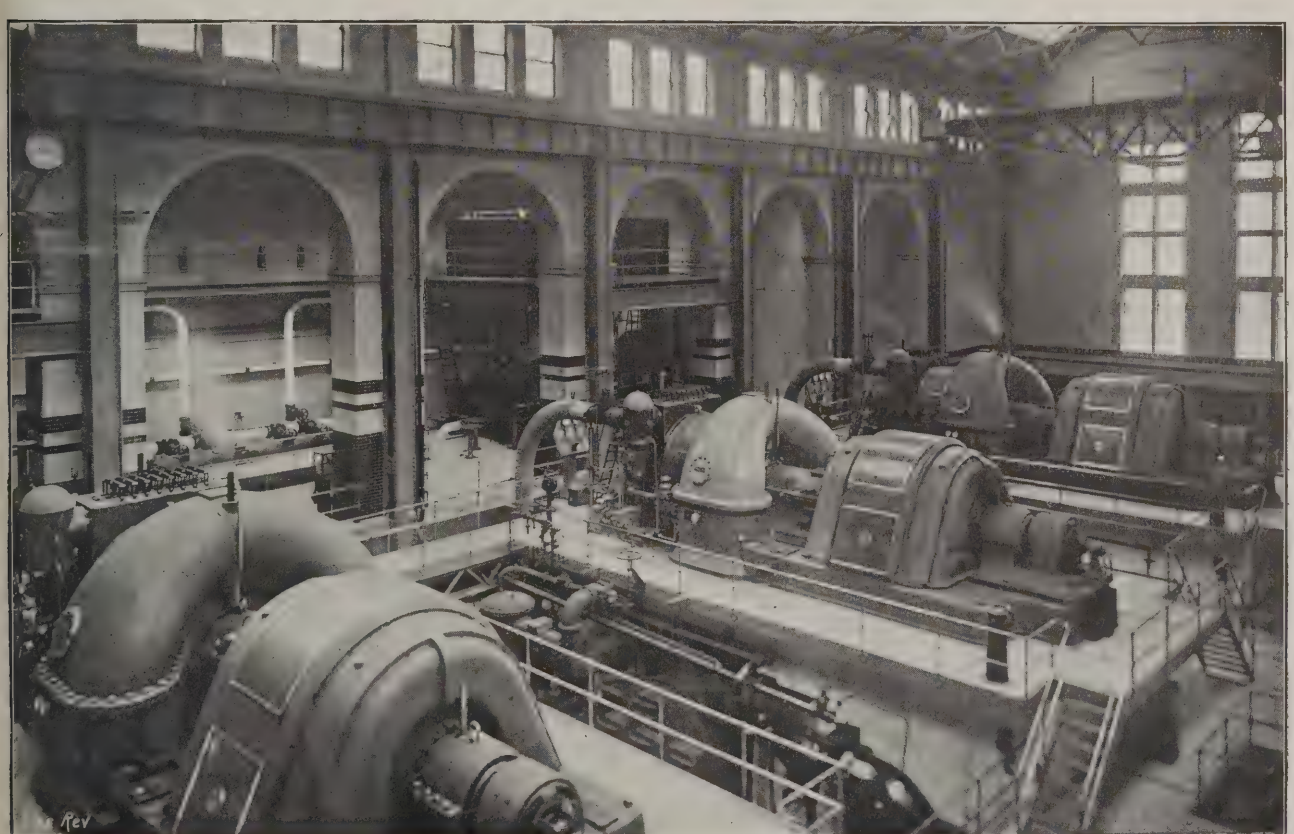


Fig. 2.—Interior of Turbine Room.

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In December, 1919, Mr. Rider was retained by the Nottingham Corporation as its consulting engineer and instructed to report as to a site in the neighbourhood of the city suitable for the erection of a new power station. After a careful investigation he advised the acquisition of the North Wilford site, and an application was forthwith made to the Electricity Commissioners for permission to build a generating station on it. This was granted in September, 1920.

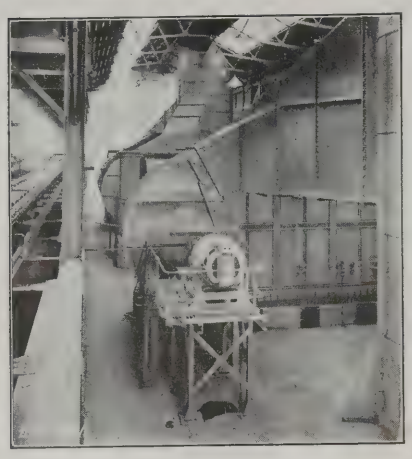


Fig. 3.—Induced-Draught Fans.

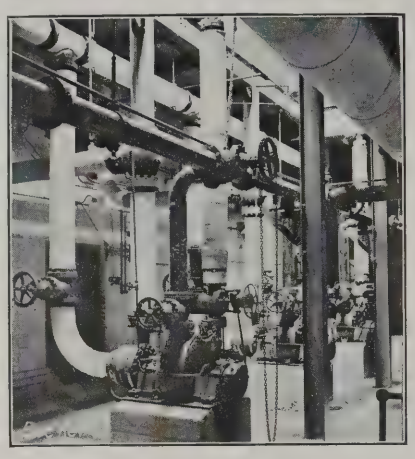


Fig. 4.—Boiler Feed Pumps.

The site at North Wilford, almost an ideal one for a large power station, extends from the River Trent to the L.M. and S. Railway, and adjoins the Clifton Colliery. It has an area of about 80 acres, and sandstone rock is found at a depth of about 15 ft. below the surface. Water for condensing purposes is available for a load of about 200,000 kW.

The general layout of the station is such that the turbine room, with the condensing plant and the switchgear, lies parallel to the river, and will be extended in the same direction. The boiler house is at right angles to the turbine room, and additional boiler houses will be erected as the turbine room is extended. A separate external coal silo, holding about 5,000 tons, has been provided for each boiler-house section, and the various silos will be supplied from a row of receiving hoppers, with two lines of railway tracks. There are four receiving hoppers for each boiler-house section, and each hopper holds about 40 tons. As the line of hoppers is extended with additions to the plant, longer trains will be accommodated. Crushing plant, fig. 7, is provided below the receiving hoppers, and the crushed coal is conveyed by duplicated gravity bucket conveyors to the external silos. Each line of conveyors will carry 40 tons per hour. A similiar duplicate line of conveyors, fig. 6, takes the coal from chutes below each silo to the service bunkers over the centre of the boiler house. One bunker, holding about 140 tons, is provided for each pair of boilers, and each bunker is divided into three compartments.

The boiler house, which is 150 ft. long and 85 ft. wide, is designed for two rows of four boilers, with a central firing gangway. Six boilers are at present installed; each has a normal evaporation of 55,000 lb. per hour at a pressure of 250 lb. per sq. in., and a superheat temperature of about 650 deg. F. Each boiler is provided with three mechanical stokers of the chain-grate type, and a coal meter is fitted to each grate. The ashes are received in hoppers at the backs of the grates, and fall directly, through sealed chutes, into a water trough conveyor for each line of boilers. The conveyors lift the

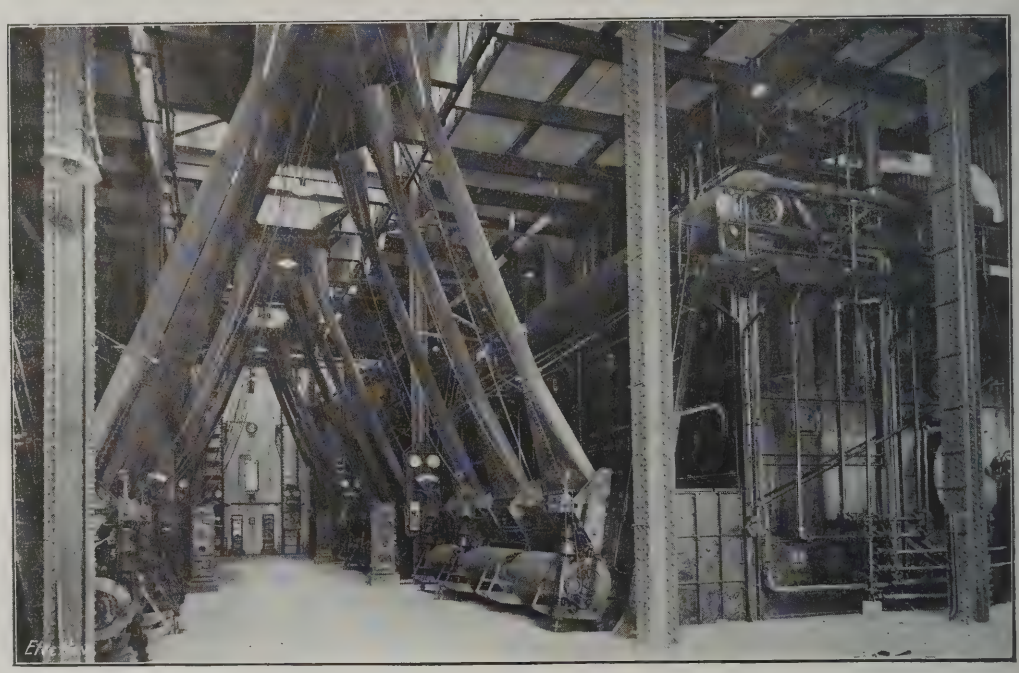


Fig. 5.—Interior of Boiler House.



Fig. 6.—Coal Conveyor.

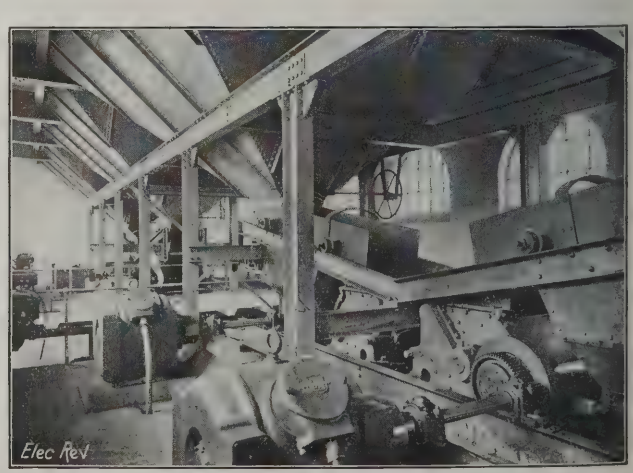


Fig. 7.—Coal Crusher.

ashes to external silos, from which they can be removed in carts, tubs, or railway wagons. For many years to come the ashes will be deposited over the low-lying land behind the power station, until this has been brought up to the final site level. The gases from each boiler pass up, through a short vertical flue, to a fuel economiser on a gallery floor above, and thence to a steel chimney, 9 ft. in diameter and 96 ft. above the ground level. One chimney is provided for each pair of boilers. The boiler furnaces are worked on the balanced draught system, with atmospheric pressure above the fires. A separate forced-draught fan in the basement delivers the air under pressure below the grates of each boiler, and a separate induced-draught fan, fig. 3, between the economiser and the chimney, draws the gases from the combustion chamber and discharges them up the chimney. The fans for each boiler are controlled from the firing floor. A complete system of dust- and soot-removing plant has been provided. Steam jet blowers are used for the boiler and economiser tubes, and a vacuum pump removes the flue dust and soot to a container in the yard, whence it is readily taken away.

The boiler feed-water plant is located in an annexe between the turbine room and the end of the boiler house. Three turbine-driven feed pumps, fig. 4, have been installed in the basement, each capable of dealing with 250,000 lb. of water per hour, against the full boiler pressure. Duplicate feed pipes run down each side of the boiler house, with connections to the various economisers and boilers.

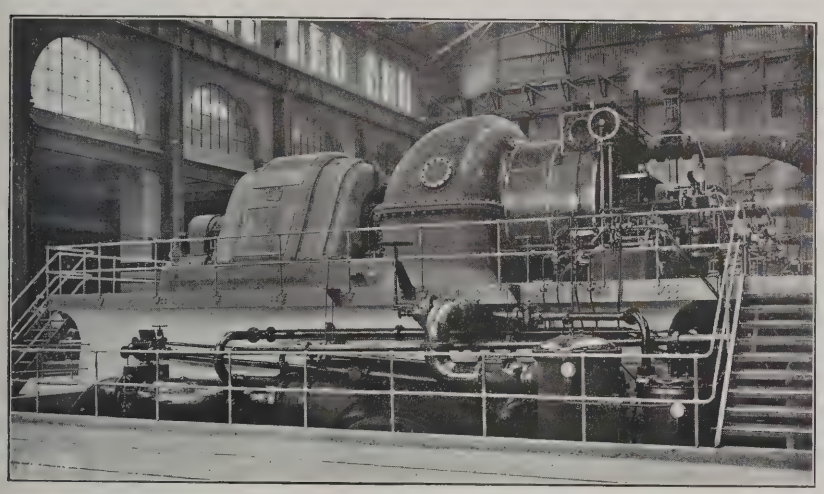


Fig. 8.—One of the Main Turbo-generators.

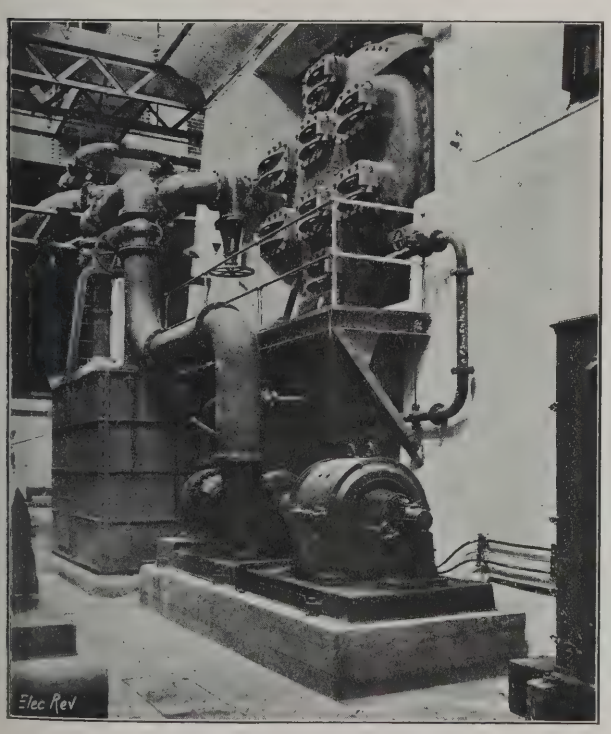


Fig. 9.—Condensing Plant.

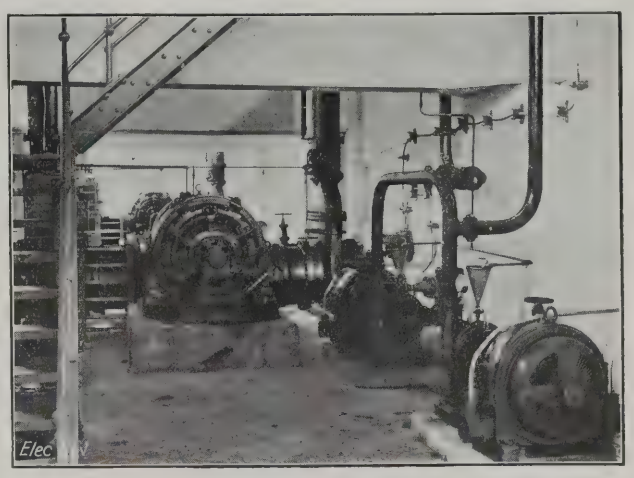


Fig. 10.—Circulating Pumps.

The exhaust steam from the boiler feed pumps is led to closed hotwell tanks, where it passes through exhaust heaters. The overflow pipes from these and the closed storage tanks are sealed in subsidiary tanks, the overflow from which goes to the drainage system. The boilers and economisers are emptied or blown down into a large steel tank, with an 18-in. atmospheric pipe to relieve all pressure. The blowdown tank is drained to a sump pit and thence to the river, *via* the discharge tunnel of the condensing-water system.

The turbine room, at present 112 ft. long and 75 ft. wide, exclusive of a railway bay and space for unloading 50 ft. long, contains three 12,500-kVA, 1,500-r.p.m. turbo-alternators, mounted on monolithic concrete foundations, and one auxiliary 1,000-kW turbo-alternator-dynamo. The last-named set is geared, the turbine running at 3,000 r.p.m., and the alternator and direct-current generator at 750 r.p.m. The three main alternators generate 3-phase energy at 11,000 V between phases, and 50 cycles per second. The 200-kW auxiliary 3-phase alternator generates at 420 V, and the 800-kW generator at 490 V. Separate surface condensers are provided for each turbine, with duplicate air and condensate pumps for the 12,500-kVA machines. One of the former in each case is of the hydraulic type, and the other of the steam ejector type. The condensing plant is designed for a vacuum of 29 in. with the barometer at 30 in. The feed-water heaters are fed with steam bled from the high- and

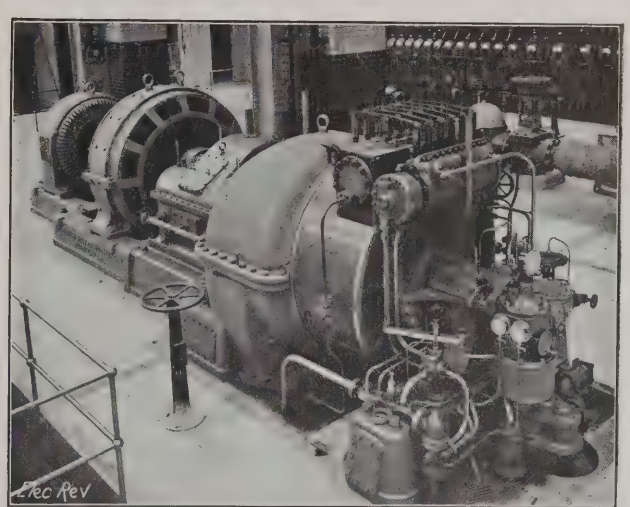


Fig. 11.—Auxiliary Turbine Set.

low-pressure stages of the 10,000-kW turbines, so that the condensate is heated in stages, up to 212 deg. F., before passing to the hotwells. The auxiliary turbine is provided with single air and condensate pumps, but not with feed-water heaters. A closed system of air ventilation with water-tube coolers is used with each 10,000-kW alternator. The cooling water is taken from the main circulating system. The auxiliary alternator and generator are cooled by natural ventilation. A 75-ton electric crane spans the turbine room and railway bay.

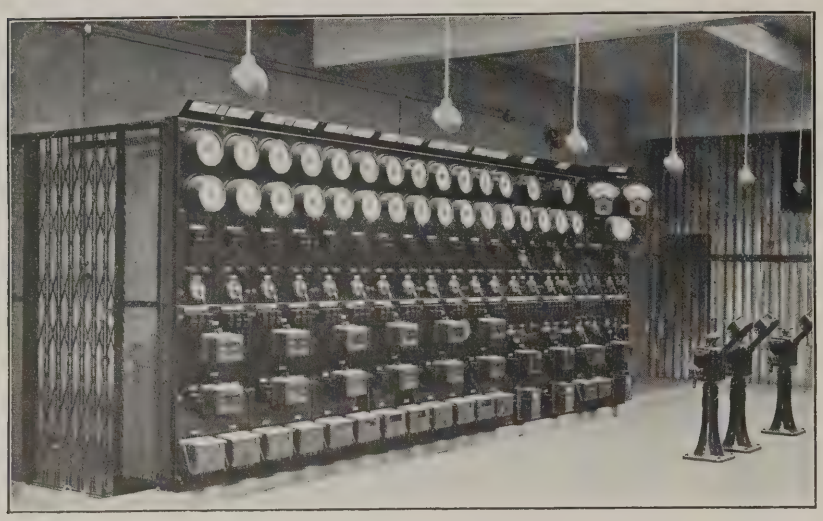


Fig. 12.—Control Chamber.

With the exception of the boiler feed pumps, the whole of the auxiliary plant is motor driven, either by 3-phase, 415-V, or by 480-V d.c. machines. The auxiliary power supply is normally obtained from static transformers for the 3-phase motors, and from rotary converters for the d.c. machines. The auxiliary turbo-alternator-dynamo may be used in parallel with either or both services, and is of sufficient capacity to start up the auxiliary motors of one complete (40,000 kW) section of the station, in the event of a total shut-down of the main plant. A storage battery is used in parallel with the d.c. auxiliary service, and is accommodated in a separate room.

The condensing water is pumped from and returned to the river, for which operations two open and parallel water channels, 10 ft. wide, have been constructed.

Four screens of the continually-moving-band type are provided at present, and similar arrangements will be made as further sections of the station are built. The condenser pumps for the 10,000-kW machines are each of 870,000 gal. per hour capacity, and the one for the auxiliary turbine has a capacity of 102,000 gal. per hour. A 5-ton hand crane serves the pump chamber.

The switchgear is divided into three sections: E.h.p. main switchgear, 11,000 V; e.h.p. auxiliary switchgear, 11,000 V; and l.p. auxiliary switchgear, for 245 and 490 V d.c., and 420 V a.c. The main switchgear is erected on two floors above the centrifugal pump room. The upper floor contains the oil switches and reactors, fig. 13, while on the lower floor, fig. 14, are the bus-bars, isolating switches, instruments, relay transformers, &c. The switchgear is divided into sections, with independent sectional bus-bars, continuous transfer bus-bars, and continuous tie bus-bars. Duplicate oil switches are provided for each alternator and single oil switches for each feeder. The section bus-bars will normally be coupled through reactors to the tie bus-bars. The transfer bus-bars will be used when it is desired to clean or examine any individual set of section bus-bars, by making the necessary change-over through the medium of the link switches. A separate set of reactors connects the transfer bus-bars to the tie bus-bars. In cases of emergency two or more sets of section bus-bars can be coupled together, independently of the

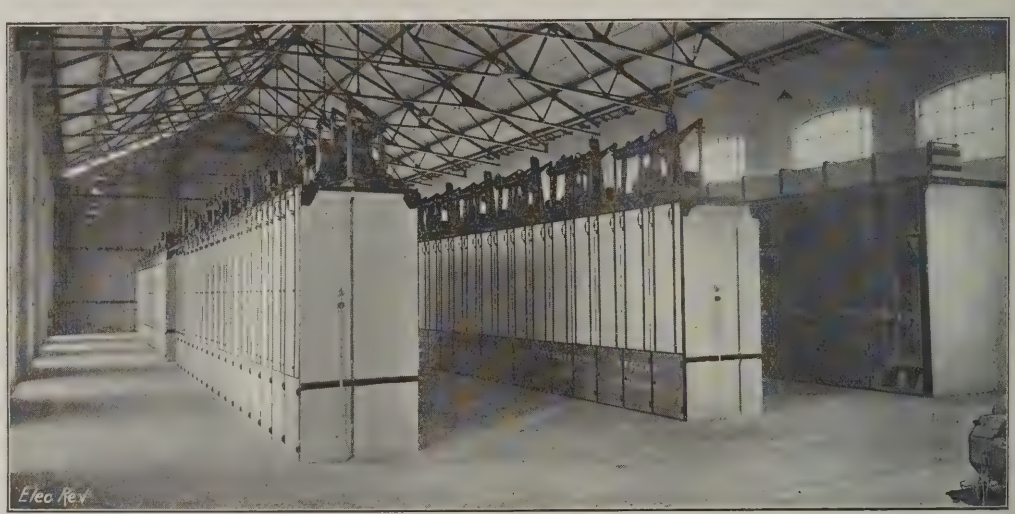


Fig. 13.—Oil Switches.



Fig. 14.—Bus-bar Room.

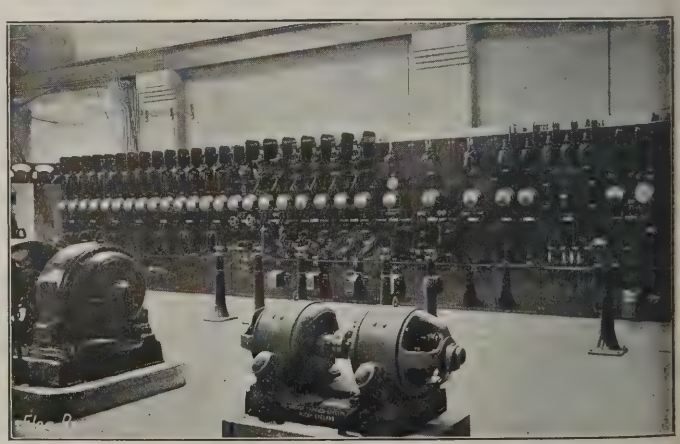


Fig. 15.—Auxiliary Switchgear.

tie bus-bars, by means of the section coupling switches. The alternator oil switches are designed for 2,000 A per phase, and the feeder oil switches for 500 A per phase, in each case at 11,000 V. Each oil switch will, with the current-limiting reactors suitably arranged, safely open under short-circuit conditions, with an ultimate station working capacity of 200,000 kW. The whole of the main oil switchgear is operated electrically from a control switchboard, fig. 12, erected on a gallery above the auxiliary-plant bay, which commands a complete view of the turbine room. The operation is by d.c. at 240 V. The control gallery is laid out for the future accommodation of alternator and feeder control switchgear for 230,000 kW. An electric signalling apparatus is provided on the control gallery, by which independent signals can be given to the starting platform of each main turbine. When the alternator has been switched in, the switchboard attendant takes control of the speeds and the division of the load, by electrical control of the governors of the turbines.

An iron grid resistance, erected in an expanded metal enclosure between the turbine room and the auxiliary plant bay, is used to earth the neutral star point of the stator of one or other of the running alternators.

The low-pressure auxiliary switchgear, fig. 15, is mounted on slate panels, erected on the floor of the auxiliary plant bay. It controls the low-pressure sides of the station transformers and rotary converters, the accumulators, the booster, &c., and also the whole of the direct- and alternating-current motor and lighting services of the station. Separate starting and control switchgear is mounted close to each individual motor throughout the power station. The motors operating the coal- and ash-conveyor lines can be instantly stopped, from a number of points, by pressing special trip switches.

(To be concluded.)

Lighting and Power Notes.

Barrow.—LOANS SANCTIONED.—The Town Council has received sanction to the borrowing of £23,500 for mains, and £1,090 for the erection of a cooling tower.

Birkenhead.—ELECTRICITY CHARGES.—The Corporation has decided that from the September quarter the price of electricity to the out-townships shall be fixed at 25 per cent. above the rates charged in the borough, *viz.*: Lighting, 6¼d. (borough 5d.); heating and cooking, 1¼d. (borough 1d.); there will be special rates for large consumers.

Brecon.—AMENDMENT OF ORDER.—Application has been made by the Corporation to the Electricity Commissioners to amend the draft of a Special Order, so as to include the parishes of Castle Inn and Christ's College, as well as the urban district of Brecon.

Burton-on-Trent.—ELECTRICITY SUPPLY.—The Town Council, following an application from the Hartshorne and Seals Rural District Council for a supply of electricity to the pumping station at Smisby at an approximate cost of £2,000, has applied for consent to carry out the extension. The mains are to be extended forthwith to Barton-under-Needwood at an estimated cost of £2,500.

Carlisle.—LOANS.—The City Council has received from the Electricity Commissioners sanction to a loan of £7,000 for mains. A further loan of £11,108 has been applied for in connection with the laying of mains under an unemployment scheme, and a grant towards the cost is to be sought from the Unemployment Grants Committee.

Chichester.—LOANS.—The Town Council is applying for sanction to loans of £2,000 for electrical apparatus to be let out on hire, and £2,000 for feeder cables.

Denholme.—OPPOSITION TO SCHEME.—The Urban District Council is to oppose the proposal of the Electrical Distribution of Yorkshire, Ltd., to supply electricity in the district under the Queensbury and District Electricity Order, in view of the proposal that the Council shall supply electricity itself.

Felixstowe.—ELECTRICITY IN BULK.—The Urban District Council has entered into an agreement with Ipswich Corporation for a bulk supply of electricity for a period of 21 years.

Fylde.—ELECTRICITY AGREEMENT.—At a meeting of the Rural District Council on September 2nd, reference was made to the supply of electricity to Marton and Carleton. The deputation appointed at the previous meeting had met representatives of the Poulton Council, and the draft form of agreement for the supply of current to Carleton and Marton by the Blackpool Corporation was approved subject to slight alterations.

Hove and Aldrington.—YEAR'S WORKING.—The report of the borough electrical engineer, Mr. C. B. Smith, on the working of the electricity undertaking for the year ended March 31st shows a total income of £64,454, as compared with £58,949 in the preceding year. Working expenses amounted to £33,812, as against £30,395, leaving a gross profit of £30,642 (£28,554). After providing for capital charges, a net surplus of £9,707 remained, as compared with £7,715 in 1923-24. The amount spent on capital account during the year was £36,344, and was chiefly incurred on mains and machinery. The electrical energy sold increased from 2,456,258 to 2,883,308 kWh. Reductions in the charges for electricity were made during the year, and the engineer has recommended the following further reductions as from September 30th:—Lighting: From 6½d. to 6d. per kWh. Power: From 2½d. to 2d. per kWh. Meter rents: A reduction of 1s. per quarter per meter.

India.—MYSORE HYDRO-ELECTRIC EXTENSION.—The total supply now being generated at Sivasamudram is about 32,000 h.p., and the whole of this power has been already taken up. The immediate demands for additional power aggregate to about 10,264 h.p. Proposals were accordingly called for to utilise the additional supplies that could be made available from Krishnarajasagara, for some time to come, and the chief electrical engineer has submitted the seventh installation proposals and estimates amounting to Rs. 87 lacs, providing for the generation of 14,000 h.p. at Sivasamudram and 10,000 h.p. at the Krishnarajasagara-Dam site, together with the necessary transmission line, and the remodelling and extension of the receiving stations and distribution system in Kolar Gold Fields, Bangalore and Mysore cities. After consideration of the matter, the Government has sanctioned the scheme for the development at the Sivasamudram generating station and for the subsidiary works to transmit and distribute the additional 14,000 h.p. to the Kolar Gold Fields, Bangalore and Mysore, at a total approximate cost of Rs. 45½ lacs, postponing the development of the Krishnarajasagara station for the present, and the chief electrical engineer has been requested to submit detailed estimates and specifications for the plant and machineyr. It is expected that the first unit of the extensions will be put into service 18 months from the commencement of the work, and the whole work will be completed in 36 months.

Motherwell.—LOANS SANCTIONED.—The Town Council has received sanction to the borrowing of £2,841 and £428 in respect of mains and services required in the Coltness and Gerviston housing areas.

ELECTRICITY IN BULK.—The Electricity Commissioners, having considered the question of installing additional plant at the power station, or alternatively, taking a bulk supply from the Clyde Valley Electrical Power Co., are of opinion that the Council should arrange for taking bulk supply from the company. It is estimated that modern plant required at the station would cost £35,000.

PRICE REDUCTIONS.—The Town Council has reduced the charges for electricity for private lighting from 4½d. to 4d. per kWh, and the combined rate for domestic purposes from 1d. to ¾d. per kWh.

Mynddislwyn (Mon.).—ELECTRICITY EXTENSIONS.—The Urban District Council has received sanction to the borrowing of £19,700 for extension of its electricity supply, and it is proposed to include Ynysddu, Cwmfelin, and Brynwel in the scheme.

Northern Ireland.—WHITEHEAD (CO. ANTRIM).—At the recent meeting of the Town Commissioners, the proposed electricity scheme for the district was considered, and it was resolved to advertise for quotations as soon as the necessary maps and valuations had been obtained.

Oldham.—NEW STATION SANCTIONED.—At a recent meeting of the Electricity Committee, a letter was received from the Electricity Commissioners consenting to the establishment of a generating station in the urban district of Chadderton. Mr. R. Blackmore, consulting engineer, reported upon the result of an interview which the engineer and himself had with representatives of the Unemployment Grants Committee with regard to the Electricity Committee's application for assistance in connection with the establishment of the new generating station, and submitted an estimate of the expenditure which would be incurred in the event of the committee's deciding to proceed with the installation of two 12,500-kW sets and four boilers instead of the complete first section of the station as originally intended. The estimate was adopted, and the Town Clerk was requested to apply to the Unemployment Grants Committee for a grant in respect of the sum of £207,375, which represents the difference between the scheme as originally submitted and the cost of the section which it is now proposed to put in hand.

Portsmouth.—LOAN SANCTIONED.—The Electricity Commissioners have sanctioned a loan of £65,000 for the extension of plant and buildings at the Corporation generating station.

Sheffield.—MAINS EXTENSIONS.—The Electricity Committee is to carry out mains extensions at a total cost of £6,516.

ELECTRICAL DEVELOPMENT.—The Finance Consultative Committee has approved new capital expenditure of £82,321 on the electricity supply account for the ensuing half year. The Electric Supply Commitee has approved during the past month extensions of mains involving a total expenditure of £9,737.

Southend-on-Sea.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. R. Birkett) for the year ended March 31st last show a total income of £158,953, as compared with £138,341 in the preceding year.

Working expenses amounted to £84,876, as against £85,014, leaving a gross profit of £74,077 (£53,327). To this was added a balance of £18,883 brought forward from the previous year, and other small items making a total of £93,196. This was distributed as follows: Interest loan charges, &c., £46,491; capital expenditure charged to revenue, £22,814; house property at Boston Avenue and Thorpe Bay, £114; removal of No. 1 engine, £42; balance carried forward, £23,563. The capital expenditure during the year amounted to £61,132, and included £41,626 for mains and services, and £11,074 for engines, boilers and other machinery. The sales of electrical energy increased from 9,908,874 to 11,591,812 kWh, and the maximum supply demanded from 5,510 to 6,236 kW.

Sunderland.—LOANS SANCTIONED.—The Corporation has received sanction to the borrowing of the following amounts:—Sub-station buildings, £1,731; house services, £10,000; sub-station on the Barley Mow estate, £1,260.

Tregaron.—ELECTRICITY SCHEME.—The Town Development Committee is to carry out an electric lighting scheme for the town. It is proposed to utilise hydro-electric power.

Truro.—ELECTRICITY SCHEME.—The Town Council has accepted the offer of Edmundsons' Electricity Corporation, Ltd., to supply the city with electricity at 10d. per kWh for lighting and 5d. per kWh for power without any financial liability to the rates.

Ulverston.—LOANS.—The Urban District Council has received sanction from the Unemployment Grants Committee to a grant of 50 per cent. of the interest on a loan of £9,793, and also the sanction of the Electricity Commissioners to a loan of £11,675 for electricity purposes.

Walton-le-Dale.—ELECTRICITY SUPPLY.—The Urban District Council has approved a draft agreement with the Lancashire Electric Power Company and consented to its application for an Order to supply electricity in the district.

Wirral.—OPPOSITION TO SCHEME.—On the ground that the electricity scheme of the Wirral Rural District Council would saddle the district with a heavy liability, a public meeting of Moreton ratepayers has raised opposition to the scheme. The meeting was in favour of the offer of the Birkenhead Corporation which amounted to a supply of electricity at a cost of 25 per cent. less than under the Wirral Council's scheme. Mr. C. R. St. John, consulting engineer to the Wirral Council, stated that Birkenhead having been definitely refused any extensions by the Electricity Commissioners, could not get the necessary powers to supply Wirral. The chairman of the Birkenhead Electricity Committee said that if his authority were given powers, it could guarantee a bulk supply to Moreton within four to six weeks.

York.—ELECTRICITY EXTENSIONS.—The Electricity Committee is expending large sums on extensions and new machinery at the generating stations at Foss Island and Linton-on-the-Ouse, and in order to inspect the two stations and the progress of the work, members of the Corporation recently visited the sites. The Committee is installing a new Oerlikon turbine of 6,000-kW capacity, the condensing plant for which is being fitted by Messrs. W. H. Allen, Sons & Co., of Bedford. This will be the third Swiss generator to be included in the equipment. A new converter of the La Cour type is being placed in the station on the site of the Diesel engines, which have been removed. A new gallery is being erected to receive a h.p. switchboard, and four new water-tube boilers are being added to the equipment, making twelve in all. Further extensions are contemplated. The Chairman stated that as soon as the new 6,000-kW turbine at Foss Island was completed another would be installed.

"ALL-ELECTRIC" HOUSES.—The Town Council is to fit up four experimental houses, which are to be "all electric," on the lines of those at Gateshead. The estimated cost of fitting up each house with electrical apparatus is £50.

Tramway and Railway Notes.

Continental.—THE TYROL.—Plans are being prepared by an Innsbruck syndicate in connection with a proposed electric mountain railway between Langen, *via* the Flexen Pass to Zurs on the Arlberg in the Tyrol.

AUSTRIA.—Negotiations are reported to be in progress regarding the financing of the work of electrifying the Semmering section of the State railways.

ITALY.—A concession has recently been granted for the construction of an electric railway between Penne and Castellammare Adriatica.

Glasgow.—FARES.—A sub-committee of the Tramways Committee has decided in favour of the re-introduction of halfpenny fares on the tramway.

Grimsby.—RAILLESS CARS.—The Corporation contemplates the introduction of a system of railless cars to replace the local tramway which it has acquired.

Heywood.—TRACK RENEWALS.—According to the *Electric Railway and Tramway Journal*, at a recent meeting of the Town Council it was reported that a double tramway track is to be laid along Middleton Road for the Manchester trams from Middleton to Heywood. Application has been made to the Unemployment Grants Committee for a grant towards the cost of the scheme.

London.—TRAMCAR FIRE.—A fire, believed to have started in a fuse-box, caused flames to envelop part of a tramway-car in Vauxhall Bridge Road, opposite Regency Street, on September 13th. The passengers rapidly got out, and the driver smothered the flames with sand until the fire brigade arrived. Some of the body-work of the car was badly damaged before the fire was put out.

Morocco.—RAILWAY ELECTRIFICATION.—Work is well in hand on the electrification of the Casablanca-Khourigat, Casablanca-Rabat, and Casablanca-Marrakech sections of the Morocco Railway. The necessary electrical energy will be supplied from two power stations—a steam-operated one at Roches-Noires, Casablanca, and a hydro-electric plant on the Oum-Er-Rbia at Sidi-Said-Machou. Four transformer stations, to which current will be transmitted at 60,000 V, are being established at Casablanca, Skerat, Sidi-el-Aidi, and Mrizig. The first-named station will be manually controlled, while the other three will be automatic. Each sub-station will comprise two sets of 60,000/5,500-V transformers and 1,500-kVA synchronous converters.

Southend-on-Sea.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (manager: Mr. R. Birkett) for the year ended March 31st last records a total revenue of £126,979, as compared with £128,780 in 1923-24. Working expenses increased from £103,141 to £106,325, leaving a gross profit of £20,654 (£25,639), to which was added a balance of £12,090 brought forward from the preceding year, and bank interest of £339, making a total of £33,182. After deducting interest and other charges, there was a net surplus of £8,282. The amount spent on capital account, which included £16,289 for cars, was £30,353. The number of passengers carried increased from 17,891,287 to 21,732,269, and the car-miles run from 1,999,437 to 1,363,620. The total revenue per car-mile fell from 25.63d. to 22.426d.

Telegraph and Telephone Notes.

Australia.—PACIFIC CABLE.—The carrying capacity of the Pacific cables is being increased by the laying of a new loaded cable on the route Suva-Fanning-Bamfield, and, according to a correspondent of the *Daily Telegraph*, official circles in Australia regard it as essential to raise the capacity of the Atlantic connections to the same working speed; otherwise the traffic will be delayed in the "Atlantic bottle-neck." It is suggested that the best course would be for the Pacific Cable Board to lay a new loaded cable in the Atlantic.

China.—WIRELESS CONCESSIONS.—It is reported that the American Minister at Peking has demanded confirmation of a concession granted to the American Federal Wireless Company in 1921, and that the Japanese Minister demands similar confirmation for a prior concession to the Mitsui Company, dating from 1918. A third concession, it is said, similar to these two, was negotiated for in 1914 by the British Marconi Company. It is understood that the British Government favours the establishment of a joint working arrangement.

Czecho-Slovakia. — LONG-DISTANCE TELEPHONY.—Contracts have recently been let for the establishment of a long-distance telephone line between Prague and Kolin.

Italy.—THE NEW ITALO-ARGENTINE CABLE.—It is reported from Rome that the new cable between that city and Buenos Aires, *via* Madeira and St. Vincent, is nearing completion. The cable is to be formally inaugurated by the King of Italy on October 12th (Columbus Day).

Persia.—MILITARY RADIO INSTALLATION.—A recent report on Persia by Mr. R. H. Hadow, M.C., of the British Legation at Tehran, states that the Persian Army is engaged in constructing near that city a long-range radio installation with which it is hoped to communicate with Moscow and Beirut. Russian engineers are being employed, but Persians are to be trained to take their places. Similar but minor installations are projected at the various divisional headquarters of the Army, the places mentioned being Meshed, Shiraz, Tabriz, Hamadan, and possibly others.

Spain.—ANGLO-SPANISH CABLE.—A new cable between this country and Spain, 500 miles in length, was landed at Bilbao on Sunday by the cable-ship *Colonia*, which took only a week to perform the service. The new cable belongs to the Direct Spanish Telegraph Co., Ltd., which forms one of the undertakings which make up the Eastern Associated group.—*The Times*.

Switzerland.—UNDERGROUND TELEPHONE LINES.—In conjunction with the work of electrifying the Swiss Federal Railway system, the Swiss Telegraph Department has for some time been engaged in substituting underground for overhead telephone lines along the railway. The work of conversion has just been completed between Geneva and Winterthur and between Olten and Basle, while that between Winterthur, St. Gall, and Rorschach is well in hand.

Radio Notes.

Birmingham.—NEW PLANT.—New transmitting plant has been installed at the Birmingham station (5 IT), and is now working. The new apparatus embodies all the latest improvements, and it is claimed by the B.B.C. engineers that this station is now equipped in a manner which will bear favourable comparison with any broadcasting station in Europe. The new transmitter is built on lines similar to the plant at the Daventry high-power station, and a notable feature is the water-cooling system employed for one of the four valves which are used, a gallon of water per minute being kept in circulation round this valve in order to keep it at the right temperature.

Reports from listeners in many parts indicate that with the new plant considerable improvement in the quality of the transmissions has been effected. The input power has been increased from 0.5 to 1 kW. The old transmitting aerial at Summer Lane power station will continue to be used, but the studio controls will shortly be transferred to new premises in Broad Street, where a new method of draping is to be used which is expected to improve still further the quality of transmission.

International Broadcasting. — WAVELENGTH TESTS. — The tests conducted during the past two weeks relating to the effectiveness of the new schedule of wave-lengths provisionally allotted to British and European stations have been concluded for the present, and the results are being examined. Great improvements were effected by slight alterations after the earlier tests. The new station of the B.B.C. at Keston has been particularly useful in this connection; it is situated on a site of 30 acres, several hundred feet above sea level, on the border of Kent and Surrey. Besides checking wave-lengths and identifying transmissions which cause interference, it will be used for receiving and relaying foreign programmes.

Italy.—BROADCASTING STATIONS.—A broadcasting station which is being erected for the Italian Broadcasting Co. at Milan by the Marconi Co. will have a type "Q" transmitter with a power of 6 kW. The new broadcasting station at Rome, which is also being erected by the Marconi Co., will be of the same type as the new 2LO, and will have a power of 12 kW.

Spain.—BROADCASTING DEVELOPMENT.—In connection with the Union Radio broadcasting station at Madrid, which was inaugurated in June, it is proposed to work out an elaborate relaying system. According to a recent report, relay stations are to be built at Barcelona, Seville, Valencia, Cadiz, Santa Cruz de Tererife, Coruña, Oviedo, Santander, Bilbao, Palma de Mallorca, Granada, Salamanca, Pamplona, Logrono, Valladolid, and Malaga. By this means it is hoped to cover the whole of Spain and the Balearic and Canary Islands.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—November 9th. Electricity Commission of Victoria. 6,600-V and l.p. lead-covered and armoured cable. 22,000-V, 3-core cable and accessories. (September 4th.)

P.M.G.'s Department. November 10th. Telephone receivers and parts.

November 17th. Magneto-automatic junction material.*

Belgium.—ANTWERP.—October 19th. Port Equipment Department. One 30-ton electric travelling crane. (A.X. 2,380.)*

Bournemouth.—September 24th. Tramways Committee. 20 bogie electric tramcars. Specifications from Mr. I. Bulfin, general manager, Tramway Offices, Wootton Gardens.

Brentford.—September 22nd. Board of Guardians. Electric wiring, &c., at the Institution, Warkworth House, Isleworth. (September 4th.)

Dublin.—September 29th. Port and Docks Board. 28 pairs of tramway-type switches (chilled iron with manganese steel tongues). Specifications from the Engineer's Office, East Wall, Dublin.

Gainsborough.—October 17th. Urban District Council. Generating plant, mains, transformers, and meters. (September 4th.)

India.—India Store Department. October 14th. L.p. turbine-driven d.c. generating set, condensing plant, and accessories. (See this issue.)

Leeds.—September 23rd. Board of Guardians. Electric lighting installation at the Institution, 3, Green Hill Road, Armley. Form of tender from Mr. J. H. Ford, clerk to Guardians, Poor Law Offices, South Parade.

London.—H.M. OFFICE OF WORKS.—September 24th. Electric wiring installation at the White Wing, British Museum. (September 4th.)

METROPOLITAN ASYLUMS BOARD.—October 7th. Installation of a fire-alarm system at Tooting Bec Hospital. (September 4th.)

SOUTHWARK.—September 23rd. Electricity Department. Twelve months' supply of electric cables. (September 11th.)

HAMMERSMITH.—September 23rd. Electricity Department. Construction of an underground water-tight ferro-concrete pump chamber and overhead pump house at Chancellor's Wharf; also supply of coal for the electricity works. Specifications from the borough electrical engineer.

LONDON COUNTY COUNCIL.—Highways Committee. October 12th. H.p. and l.p. switchgear for Shoreditch L.C.C. tramway sub-station. (See this issue.)

New Zealand.—CHRISTCHURCH.—January 5th, 1926. Drainage Board. Three electric sewage pumps. (AX. 2349.)*

WELLINGTON.—Post and Telegraph Department. October 27th. Rubber insulated wire.*

Public Works Department. November 24th. Neutral earthing reactors.*

Portsmouth.—September 30th. Board of Guardians. Three months' supply of electrical fittings and lamps. Forms of tender from the Guardians' Offices, St. Michael's Road, Portsmouth.

Richmond, Surrey. — September 24th. Board of Guardians. Installation of electric lighting, including wiring and fittings, at the Grove Road Institution, Richmond. Specifications from Mr. T. J. R. Kiernan, consulting engineer, 17, Victoria Street, S.W.

South Africa.—JOHANNESBURG.—S.A. Railways. October 15th. Incandescent lamps.*

October 29th. Electric cables and wires.*

CAPE TOWN.—October 14th. Electricity Department. Electric motors.*

Spain.—March 10th, 1926. Spanish General Direccion de Obras Publicas, Madrid. Supply of electricity for the operation of the Spanish section of the Ripoll-Aix-les-Thermes railway, which is at present being electrified.

Stoke-on-Trent.—October 12th. Electricity Supply Department. Two sets of steam air ejectors, and one centrifugal oil purifier. (See this issue.)

Warrington.—September 22nd. Board of Guardians. Six months' electrical supplies for the Whitecross Institution, Warrington, and the cottage homes, Padgate. Particulars from the clerk.

Workington.—September 15th. Corporation. L.p. cables and services. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Barnes.—Urban Council. Accepted:—
Additional distributor cable (£386).—Macintosh Cable Co., Ltd.

Barnsley.—Electricity Committee. Recommended:—
Ash elevator and storage bunker (£880).—W. J. Jenkins & Co.

Birkenhead.—Electricity Committee.
One 100-kVA transformer (£455).—Metropolitan-Vickers Electrical Co., Ltd.

Bradford.—Electricity Committee. Accepted:—
Unit-type switchgear for the Valley Road generating station.—Parmiter, Hope & Sugden, Ltd.

Dewsbury.—Town Council. Accepted:—
Re-wiring the Town Hall buildings for electric light (£969).—Ward & Co., Ltd.

Dover.—
Electrical installation work (including wiring, &c.) at shop and private residence, 93, High Street, Dover.—J. S. Etheridge & Co.

France.—The Relay Automatic Telephone Co., Ltd. (Paris branch), has received a contract for a new 3,000-line automatic public telephone exchange for Fontainebleau. The apparatus will be of the same type as that supplied by the company to the British G.P.O. for public exchange service.

Glasgow.—Baths Committee. Accepted:—
Electrical installation at Pollokshaws baths (£610).—Johnston, Park and Co.

Markets Committee. Accepted:—
Renewal of electrical work at markets (£187).—Johnston, Park & Co.

Tramways Committee. Accepted:—
D.c.c. wire.—W. T. Henley's Telegraph Works Co., Ltd.
Street poles.—Bromford, Ltd.
Trolley wire (cadmium).—R. Johnson & Nephew, Ltd.
Trolley wire (h.d. copper).—F. Smith & Co., Ltd.

Heywood.—Electricity and Tramways Committee. Accepted:—
Single-phase house-service meters.—Ferranti, Ltd.

Lamp Contracts.—H.M. Office of Works has placed contracts for nine months' supplies of electric lamps with Siemens & English Electric Lamp Co., Ltd., and the General Electric Co., Ltd.; the British Thomson-Houston Co., Ltd., has received contracts from the Admiralty and the Office of Works for supplies of "Mazda" vacuum and gasfilled electric lamps.

Northampton.—Town Council. Accepted:—
Installing electric lighting fittings at the Town Hall (£465).—Northampton Electric Light Co.

Ramsbottom.—General Purposes Committee. Accepted:
Electric light installation at Technical School.—T. Kay.

Weymouth.—Electricity Committee. Accepted:—
Dismantling and re-erecting battery and supplying new positive plates for cells, &c. (£786).—Tudor Accumulator Co., Ltd.

Forthcoming Events.

N.A.R.M.A.T. Wireless Exhibition.—At Royal Albert Hall, S.W. September 11th to 23rd.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, September 19th. At the South Wales Institute of Engineers, Park Place, Cardiff. At 6 p.m.

Cycle and Motor Cycle Show.—At Olympia, W. Opens Monday, September 21st.

Salford Technical and Engineering Association.—Wednesday, September 23rd. Visit to Messrs. Ferguson, Pailin, Ltd.

Radio Society of Great Britain.—Wednesday, September 23rd. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 6 p.m. Address on "The Mechanism of Radiation," by Sir Oliver Lodge, F.R.S.

Notes.

The London Traffic Inquiry.—On October 19th, the London and Home Counties' Traffic Advisory Committee is to commence its first inquiry into the lack of transport facilities in certain parts of the area which comes within its terms of reference. This initial inquiry will concern the North-Eastern suburbs from which numerous complaints have been received. The evidence of a number of public bodies and private individuals will be heard and suggestions for improvement will be considered.

Legal.—THEFT OF ELECTRICITY.—Convicted at Edinburgh for stealing 132 kWh of electricity, a man was fined £2. It was stated that the supply to his house had been cut off, but an engineer who called later found that the cables had been reconnected, the connection being so made that the current did not pass through the meter. The man pleaded that he was unaware that a disconnection had been made.

Individually Driven Textile Machinery.—The author of the article which appeared under this title in our last issue (Mr. A. Haigh) asks us to insert the following correction to the first paragraph on p. 410:—The saving by the use of "high performance" motors in place of ordinary machines should be £600 per annum and not £60, showing a return on the extra capital outlay of 240 per cent., and not 25 per cent.
The error occurred in the original MS.

Educational.—WILLESDEN POLYTECHNIC.—An exhibition of students' work is being held at this Institute during next week. The exhibition will be opened on Monday evening next by the Rt. Hon. T. J. Macnamara, P.C.; admission will be by ticket only. On the other evenings admission will be without tickets. The work shown by the Electrical Department will be one of the many special features of the Institute's activities.
UNIVERSITY COLLEGE, LONDON.—We have received the syllabus and particulars of the general arrangements for the 1925-26 session of the University College, London, Faculty of Engineering. The session commences on October 5th. The department of electrical engineering provides for university degree and diploma courses besides special training courses, &c.
THE POLYTECHNIC.—A two-years' course has been arranged for at the Polytechnic, Regent Street, in illuminating engineering. The course provides lectures in light and optics, electrical engineering and practical mathematics.
BRADFORD MUNICIPAL TECHNICAL COLLEGE.—A special course has been arranged in the Electrical Engineering Department for fitters engaged in electrical machine shop work. The Bradford branch of the Electrical Contractors' Association awards prizes to the most successful indentured apprentices in the evening classes in electrical installation work.

New Underground Railway Link.—The London underground railway companies have placed a contract with Messrs. Walter Scott and Middleton for the construction of a short tunnel connection between the Piccadilly and City lines at King's Cross. This new link will enable the rolling stock of the latter line to reach the tracks of the former and proceed to Lillie Bridge Depôt for overhaul. This work is done at present at the Golder's Green depôt, where some relief is necessary owing to the additional strain thrown upon it since the Edgware extension was opened. Work on the new link line, which will be 400 yards long by 12 ft. 6 in. in diameter, is to begin almost at once. The tracks of the Piccadilly line are 73 ft. below the street level at King's Cross, and those of the City railway are 88 ft. below. The new tunnel will thus have a fall of 15 feet between the two railways. To facilitate the conveyance of material, &c., a working shaft will be driven at Midland Road to a depth of 90 ft. and a temporary tunnel will be constructed from this point to the City line. It is not anticipated that any part of the work will be done under compressed air. The construction of the physical connections with the existing tunnels of both the Piccadilly and City lines will be undertaken at night time to prevent any interruption of the traffic.

Fatalities.—Patrick Gallagher, employed at the Wheatley Hide Brickworks, Co. Durham, received a fatal electric shock on September 7th. He was carrying an iron rail upon his shoulder when it came into contact with an overhead wire.
ALLEGED PRACTICAL JOKE FATALITY.—A charge of culpable homicide has been preferred against Daniel Gray, who was remitted from the Glasgow Eastern Police Court to the Sheriff on Tuesday last week. The case is a sequel to what it is understood was intended as a practical joke in a works. A wire is alleged to have been attached from an electric switch to the handle of a door, which was caught by a labourer, who received a shock from which he died.

Electrical Association for Women.—Members of this Association will visit the St. Helens Cable and Rubber Co., Slough, to-morrow (Saturday). After the works have been inspected, tea will be provided by the company.

Crystal Sets in Hospitals.—The claims of the crystal set have to a large extent been overlooked in the movement for providing radio in hospitals. The multi-valve set, involving as it does high initial expense, does not fulfil all the requirements of the receiving set in a hospital, for it needs more or less skilled supervision if it is to be kept in continuously good working order. The crystal set, on the other hand, is cheap, it involves no extra cost in maintenance, and the set can be left permanently adjusted to the wave-length of the local station, thus giving the patients the pleasures of broadcasting with the same regularity and dependability as that which attaches to the use of electric light.
There is one noteworthy scheme which illustrates the possibilities of the crystal set in this direction. It is at the Birmingham General Hospital, where Doctor J. R. Ratcliffe, a well-known Birmingham medical man who combines professional knowledge with long experience as a wireless amateur, has wired one of the large wards for the use of crystal sets. The most interesting feature of the scheme is the fact that outside aerials are not used. There are four sets, installed inconspicuously in the corners of the ward, and each set is operated off an aerial consisting of rubber-covered wire which is suspended from a picture rail near the roof. All four aerials run close to each other and are therefore not unsightly, and the sets are connected to one common earth lead which is taken to the nearest water pipe. The output terminals of each set are connected to twin flex which is carried round and over the beds, a "bayonet" plug and socket joint being provided above each bed. The plug is fitted to the end of the 'phone leads, so that they can be inserted at will. The plugging-in of the 'phones is all that is necessary for the patient to be able to listen.
In many hospitals the likelihood of nails or screws having to be put into the walls, or holes made in the roofs or window frames, is offered as an objection to the provision of wireless, but this has been overcome in Doctor Ratcliffe's scheme. Where it has been necessary to attach the wire to the wall, it has been done by means of little rubber suction pads which cling tenaciously to the wall, the wire being passed through a small loop in the rubber.
It has been found that each of these four crystal sets will operate six pairs of 'phones quite effectively upon reception from the Birmingham station. The hospital is in an advantageous position, being within very close range of 5IT, but there can be little doubt that a similar arrangement of crystal sets and indoor aerials would prove quite successful up to a range of five or six miles from the transmitting station. There are many hospitals and similar institutions within this range of a main or relay broadcasting station which could be equipped throughout with radio, cheaply and effectively, on this crystal-set basis.

Railway Electrification in South Africa.—According to a special correspondent of *The Times*, the electrification of 287 miles of main-line railway in Natal has been carried out without disturbance to the ordinary traffic, which during the process exceeded all previous records. The outlay originally authorised by Parliament was £3,318,000, excluding the cost of electric locomotives, and the matter was treated as urgent, so that close estimates could not be made, with the result that the cost was under-estimated by £535,000, largely due to the severe curves and gradients. The Daimana-Mooi River section is in full electric operation, and the service between Glencoe Junction and Maritzburg will be at work early next year.

The Electrification of Palestine.—According to *Science*, a new engineering scheme which will use the sun's energy to provide electrical power for all Palestine, make water available for the irrigation of thousands of dry acres, and provide a new interior port for ocean shipping and canals for inland transportation, has been suggested by a French engineer, M. Pierre Gandillion, and accepted for execution by several French business men.
The project consists in utilising the falls that can easily be created between the Mediterranean and the Dead Sea by carrying the water of the Mediterranean over a 260-feet ridge by means of canals, pumps and a great siphon and then letting it drop to the Valley of the Jordan and from there down into the Dead Sea, a total vertical distance of more than 1,500 feet. The Dead Sea is an inland lake, and only as much water as the sun can easily evaporate will be thrown into it.

M. Gandillion estimates that the sun now evaporates all the water that the Jordan carries into the Dead Sea at the rate of about 92 cubic yards a second. That it used to evaporate much more is shown by a series of terraces at different levels on its borders, formed when the water was higher and the surface exposed to evaporation by the sun's heat therefore greater. The new plan will raise the level of the Dead Sea and evaporation by the sun will take care of the additional and regulated inflow. It is believed that an evaporation of 135 cubic yards a second is easily possible and the inflow from the Jordan is to be augmented by that amount.

The scheme will necessitate the building of a sea-level canal from the port of Haiffa to a point about four miles inland. It will end in a great basin where ocean steamers can turn. From there on, either navigable canals with locks or ascensional water pipes will be built to reach the ridge at Afoule, a way station. At that point a 1½-mile tunnel will be bored through the rock and the water will run into chambers at about 262 feet above the level of the Mediterranean and about 1,125 feet above that of the Jordan, where a hydraulic turbine will be installed. Another drop of 394 feet is available between the Jordan and the Dead Sea, making a total drop of over 1,500 feet.

In all, 617,000 horse power will be generated, says M. Gandillion. Of this, 190,500 horse power will be used to lift the 135 cubic yards of water a second from the Mediterranean over the 260-foot ridge, leaving enough power for the electrification of the entire Holy Land with its railroads, industries and agriculture.

The fresh waters of the Jordan and the Sea of Galilee need not be poured into the Dead Sea with the salt water of the Mediterranean, but can be diverted and used to irrigate thousands of acres of dry land.

B.E.A.M.A. Annual Dinner.—The annual dinner of the B.E.A.M.A. will be held at the Connaught Rooms on Thursday, November 19th, when the Rt. Hon. the Earl of Derby, K.G., president of the Association, will be in the chair.

Storage-Battery Locomotive Competition: The Prize Awarded.—Colonel G. R. Lane-Fox, M.P., Secretary for Mines, announces that the judges appointed to adjudicate on this competition for a prize of £1,000 which was offered by Mr. Charles Markham for the best type of locomotive for use underground in coal mines, have arrived at their decision. They award the whole of the prize to Messrs. Joseph Booth and Bros., Ltd., engineers, Union Foundry and Ironworks, Rodley, Leeds, whose design fulfilled the conditions of entry and was, in their opinion, the best that was submitted to them. The judges propose to present in due course a report of the competition and a summary of the technical results obtained at the trials under working conditions. This will be published as soon as it is available.

Appointments Vacant. — Electric workshop foreman (Rs. 575 per month), for the Eastern Bengal Railway (Indian State Railways); mains foreman, for the Stoke Newington Borough Council electricity department. (See our advertisement pages to-day.)

World Power Conference.—INTERNATIONAL EXECUTIVE COMMITTEE.—Meetings of the International Executive Committee was held on July 27th to 30th in London, at which it was provisionally agreed to hold the Second World Power Conference in Rome in 1930. A Sectional Meeting is to be held at Basle in 1926. Further particulars of the proceedings will appear in our next issue.

Electrical Looms at a College.—Two electrically-driven looms have been installed in the cotton department of the Wigan Mining and Technical College, for the practical training of students.

Modern Demonstration Methods for Electric Lighting.—The call for efficient methods of demonstrating the advantages of lighting by electricity increases as progress is made and competition in the lighting services becomes more keen. To bring itself up-to-date during the coming season, the Lighting Service Bureau has made considerable developments and improvements to its demonstrating rooms at 15, Savoy Street, London, W.C.2. The two main features in these improvements are the equipment of one room to demonstrate shop-lighting systems, and a revolving tower for the demonstration of domestic lighting. In the former four sections of the room are each equipped to represent an independent class of shop and thus create a proper atmosphere for the audience. At the time of a recent visit by us to this room, its sections were representing a confectionery, a grocery, a draper's, and a boot shop. Flap doors are arranged in the ceiling, which are opened to allow lighting fittings to pass to and from the false roof, where they are concealed when not required for demonstration purposes. The opening and closing of the doors and the raising and lowering of the fittings are controlled from a position outside the room by small winches. The revolving tower is an ingenious arrangement for contrasting the good and bad systems of domestic lighting. Except that the floor also revolves, the arrangement is similar to an installation of ordinary revolving entrance doors, the doors in this case representing the walls, which are divided into two sections, top and bottom, each section revolving independently of the other. Each compartment of the bottom section is suitably furnished to represent a portion of a room, while the top sections are equipped to show the good and poor methods of lighting the room, so that by one setting of the bottom half, two or more turns of the top half will allow the demonstration of that number of lighting systems for the one setting. Many new devices for demonstrating the uses of special fittings and lamps, &c., have been added to the rooms.

The Late Sir Adam Beck.—Writing editorially on the late Sir Adam Beck's career, the *Electrical World* says:—"Up to the time of his death Sir Adam remained the guiding genius of the Hydro-Electric Power Commission of Ontario. During the twenty years of his incumbency he was oftentimes a storm centre around whom waged many a heated controversy. 'Dictator' and 'tyrant' his opponents called him; yet, without adverting to the conditions under which Sir Adam worked his will, it can be said that throughout all his career he showed great resourcefulness, and to his dying day he retained the confidence and admiration of the people of the province. He popularised and increased the use of electricity in Ontario and created one of the greatest superpower systems in the world. Whether or not his work will endure time alone can tell. He was stricken in the height of his power, and it remains to be seen how Ontario's hydro system will get along now that its master mind is dead."

Institution Notes.

Institution of Public Lighting Engineers.—ANNUAL MEETING.—During the past week the Institution has been in conference at Leeds. On Monday evening the Lord Mayor and Lady Mayoress held an informal reception in the Art Gallery, and after dark the visitors made a tour of the city in charabancs to inspect the street lighting. The Conference commenced on Tuesday morning, with an address by the Lord Mayor, to which the president, Mr. S. B. Langlands, responded. The chairman of the Leeds Street Lighting Committee (Councillor E. J. Clarke) congratulated the incoming president, Mr. Shapley, who delivered his inaugural address, after which the members were entertained at luncheon by the Lord Mayor and the Street Lighting Committee. In the afternoon they went on a long excursion to Templenewsam and Harrogate. On Wednesday a paper was read by Mr. Lennox and one by the Distribution Department of the South Metropolitan Gas Co.

The Faraday Society.—A general discussion on "Photochemical Reactions in Liquids and Gases" is to be held at Oxford on October 1st and 2nd, 1925, Prof. F. G. Donnan, president, being in the chair. On Thursday, October 1st, from 3.30 to 5 and 5.30 to 7.30, Einstein's "Law of Photochemical Equivalence" will be discussed, Prof. A. J. Allmand (London University) reading an introductory paper. On Friday, October 2nd, from 10 to 1 and 2.30 to 5, the subject of discussion will be "The Mechanism of Photochemical Reactions," the introductory paper being read by Prof. M. Bodenstein (Berlin). Many papers will be read or communicated, and copies will be sent to all who have signified their intention of being present, and to those who specially apply.

The Röntgen Society.—The officers elected for the session 1925-6 are as follows:—President: Dr. F. W. Aston, F.R.S. Vice-presidents: Dr. Robert Knox, M.I.E.E., Dr. N. S. Finzi, and Prof. A. W. Porter, F.R.S. Hon. treasurer: Mr. Geoffrey Pearce. Hon. editor: Dr. G. W. C. Kaye, O.B.E. Hon. secretaries: Dr. E. A. Owen and Dr. R. J. Reynolds.

Diesel Engine Users' Association.—At the next meeting, which is to be held on Friday, October 9th, a paper by Mr. Edwin M. Bailey, on "The Scottish Shale Oil Industry" is to be read and discussed.

The Junior Institution of Engineers.—The opening meeting of the Winter Session will be held on Friday, October 2nd, at 39, Victoria Street, when a lecturette, "Problems of Broadcasting," will be delivered by Mr. H. Bishop, B.Sc. Further meetings will be held every Friday at the same place and time. The inaugural meeting of the 45th Session will be held at the Royal Society of Arts on Friday, December 11th, when Mr. J. S. Highfield, M.Inst.C.E., M.I.E.E., will be inducted president of the Institution by Dr. Alexander Russell and will deliver his presidential address.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

The Walsall Corporation has appointed as tramway manager Captain W. VANE MORLAND, M.Inst.T., the general manager and engineer of the St. Helens Corporation tramway and motor-'bus undertaking. The salary is £800 a year, rising by £50 per annum to £900.

The Leigh Council last week decided to congratulate the borough electrical engineer and his staff upon their great success. It was stated that, with the exception of Stepney, Leigh was at the head of the electricity undertakings in the country with regard to low fuel consumption and thermal efficiency, and was the first so far as the Lancashire district was concerned.

MR. F. E. CHILTON has resigned his position as London sales manager to the Wellman Smith Owen Engineering Corporation, Ltd., and has joined the Perfecta Seamless Steel Tube and Conduit Co. (1923), Ltd., as manager of its London office, 66, Victoria Street, Westminster, S.W.1.

On leaving his post at the Willesden works of the North Metropolitan Electric Power Supply Co. on August 29th to take up the position of boiler-house superintendent at the North Wilford generating station of the Nottingham Corporation, Mr. L. MARSHALL JOCKEL, A.M.I.Mech.E., A.M.I.E.E., was presented by the staff and employés with a handsome silver salver as a token of the esteem which he had earned during the past five years.

MR. HUMPHREY F. FOSTER, of Messrs. Foster Bros., Ltd., Wednesbury, has just returned from a visit to the United States, where has has been studying the latest developments in high-pressure steam pipe practice.

MR. H. C. BABB, general manager of the Lothians Electric Power Co., celebrated his silver wedding on September 4th. On behalf of the departmental heads, he was presented with a silver tantalus.

It is announced from Toronto that Mr. CHARLES A. MAGRATH, chairman of the International Waterways Commission, has been appointed to the post of chairman of the Hydro-Electric Power Commission of Ontario, rendered vacant by the recent death of Sir Adam Beck. Mr. A. MAGUIRE, formerly Mayor of Toronto, has also been appointed to the Power Commission.

M. F. A. C. MAGNIER, director of the Société de Production et Distribution d'Energie Electrique, of Paris, has been appointed a Chevalier of the Légion d'Honneur.

MR. L. JESSOP, head of Messrs. Jessop & Boydell, Ltd., electrical contractors, of Bradford, has accepted nomination as the Liberal candidate for the Great Horton Ward in the forthcoming municipal elections at Bradford.

MR. W. R. SMALL, founder and late managing director of the Armorduct Manufacturing Co., Ltd., has resigned his position as managing director of the Anglo Electric Co., Ltd.

MR. ERNEST E. BRIGGS, M.I.Mech.E., A.M.I.E.E., has been appointed sales manager to Messrs. Thomas Cass & Co., Ltd., Bolton, Lancs., and will devote himself to the sales development of their new "Falcon" sprinkler stoker and self-cleaning furnace and other manufactures.

Mr. JAMES DUNCANSON, A.M.I.E.E., has recently resigned his position on the staff of the Glasgow Corporation Electricity Department, where he has been for over twelve years, to take up an appointment with Messrs. Caldwell & Co., Glasgow, makers of steering gear, cranes, and steam- and electrically-driven auxiliaries.

The Swansea Educational Committee has appointed Mr. REGINALD RICHARDS as lecturer on electrical engineering at the Swansea Technical College.

Barnes Urban Council has increased the salary of the electrical engineer, Mr. C. S. DAVIDSON, by £200 per annum.

Mr. R. F. PROCTOR, B.Sc., A.M.I.E.E., has been presented with a dinner service as a wedding present by the staff of the Research Laboratories of the General Electric Co., Ltd. Mr. Proctor was formerly at the National Physical Laboratory.

Obituary.—HERR F. HAFFERL.—The death recently occurred, at Linz, at the age of 68 years, of Herr Franz Hafferl, one of the chief directors of the Stern-Hafferl Gesellschaft, of that city, which owns a number of hydro-electric stations in Upper Austria.

Will.—The late Sir ADAM BECK, chairman of the Hydro-Electric Power Commission of Ontario, left estate valued at $600,000.

New Companies Registered.

Super Electric Carpet Beating and Cleaning Co., Ltd. (208,315).—Private company. Registered September 9th. Capital, £450 in 5s. shares. Objects: To acquire (1) the business of carpet cleaners and beaters carried on as the Imperial Carpet Beating and Cleaning Co. at 29, Hubbard Street, West Ham, and (2) the subsidiary business of the Re-Echo Electrical Manufacturing Co., Ltd. The directors are:—A. L. Leaver, 482, High Street North, East Ham, wholesale confectioner and tobacconist; R. G. Harley, 87, Woodford Road, Forest Gate, E.7, caterer; C. E. Harley, 149, Plashet Grove, East Ham, E.6; C. W. Martin, 823, Romford Road, Manor Park, E.12, grocer; W. E. Thorpe, 179, Bredmore Road, Goodmayes, corporate accountant; W. B. Pearson, 151, Plashet Grove, East Ham, E.6, corporate accountant (all permanent). Secretary: W. B. Pearson. Solicitor: W. H. Lane, 17, College Hill, E.C. Registered office: 5, John Street, Bedford Row, W.C.1.

Loveland & Co., Ltd. (208,332).—Private company. Registered September 10th. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with H. F. Loveland for the acquisition of provisional specification of letters patent No. 5,605, dated March 2nd, 1925, for an "improved collapsible carrier for electric accumulators and the like," and to carry on the business of wireless, electrical, mechanical, motor and general engineers, manufacturers of and dealers in motor accessories, wireless instruments, parts and goods, transformers, radiators, motors and radio instruments of all kinds, &c. The directors are:—H. F. Loveland, 440, High Road, Streatham, S.W.16; G. E. Spencer, address not stated; H. W. Killick, address not stated; F. W. Knight, 41, Norbury Court Road, Norbury, S.W.16. Solicitors: T. H. Goodwin, 14/15, Coleman Street, E.C.

Ultra Electric, Ltd. (208,298).—Private company. Registered September 8th. Capital, £5,000 in £1 shares. Objects: To adopt an agreement with E. E. Rosen and A. I. Cornberg, trading as E. E. Rosen and Co. to acquire the registered trade mark "Ultra," and to carry on the business of electrical engineers, manufacturers of and dealers in goods appertaining to the wireless, electrical and engineering trades and industries, &c. The directors are:—E. E. Rosen, 288, Cricklewood Lane, N.W.10, radio engineer (chairman and managing director); A. I. Cornberg, 145, The Vale, N.W.10, merchant; Dr. G. Seibt, Haupstrasse 11, Schonberg, Berlin, merchant. Solicitor: H. S. Baron, 16, Fenchurch Street, E.C.3. Registered office: 661/663, Harrow Road, N.W.10.

Fleet Electric Co., Ltd. (208,352).—Private company. Registered September 11th. Capital, £1,000 in £1 shares. Objects: To carry on business as electrical, mechanical and general engineers, to acquire the right to use or manufacture and put up telephones, telegraphs, phonographs, accumulators, lamps, &c. The subscribers (each with one share) are:—M. Haar, 42, Queen's Road, Finsbury Park, N.4, electrical engineer; P. J. Quin, 125, Beaufort Street, Chelsea, S.W.3, company secretary. H. Haar is permanent managing director. Secretary: P. J. Quin. Registered office: 5, Hind Court, Fleet Street, E.C.4.

Brandwood, Ltd. (208,348).—Private company. Registered September 11th. Capital, £1,000 in £1 shares. Objects: To acquire the business of a manufacturer of and dealer in baby carriages, toys and cycles carried on by W. O. Brandwood at 1 and 1a, Priory Road, Anfield, Liverpool, as the "County Bassinette Co.," and to carry on the same and the business of electrical and mechanical engineers, makers of and dealers in wireless apparatus and electrical goods of all kinds, &c. The permanent directors are:—W. O. Brandwood, 2, Breck Road, Anfield, Liverpool, manufacturer; Mrs. M. N. Brandwood, 2, Breck Road, Anfield, Liverpool; L. Brandwood, 2, Breck Road, Anfield, Liverpool, bookkeeper; H. Brandwood, 2, Breck Road, Anfield, Liverpool, bookkeeper. Qualification, £10. Remuneration as fixed by the company. Secretary: L. Brandwood. Registered office: 1 and 1a, Priory Road, Anfield, Liverpool.

C. K. Hanbury, Ltd. (208,350).—Private company. Registered September 11th. Capital, £1,000 in £1 shares. Objects: To carry on business of dealers in wireless receiving and transmitting apparatus and all component parts used in connection therewith, &c. The directors are:—C. K. Hanbury, 20, Padiham Road, Burnley, electrician (permanent managing director and chairman); H. Hankey, Garrison Hotel, Padiham Road, Burnley, licensed victualler. Qualification, 100 shares. Remuneration as fixed by the company. Registered office: 20, Padiham Road, Burnley.

Official Returns of Electrical Companies.

Trust Electrical Accessories Manufacturing Co., Ltd.—A. R. Atkins, of 31, Twyford Street, N.1, ceased to act as receiver or manager on June 3rd, 1925. (Notice filed September 8th.)

W. J. Tough & Partners, Ltd.—E. J. Barnes, of 24, Cambridge Road, Gunnersbury, W.4, was appointed receiver and manager on August 24th under powers contained in debenture dated August 4th, 1925.

Fuller's United Electric Works, Ltd.—Prior lien debenture, constituting a first charge on the company's land, building and hereditaments, goodwill and uncalled capital, and a first floating charge on the company's other assets, dated September 1st, 1925, to secure £75,000. Holders: National Bank of Scotland, Ltd., 37, Nicholas Lane, E.C.

Archibald J. Wright, Ltd.—Debenture dated August 19th, 1925, to secure £1,000, charged on the company's undertaking and property, present and future. Holder: A. J. Wright, 66, Canonbury Park South, N.1.

Lancashire Telephone Systems, Ltd. — Deposit of deeds, without instruments, dated August 9th, 1925, to secure £500, charged on moneys due or to become due to the company in respect of certain contracts for the rental of automatic telephone instruments. Holders: C. S. Ashworth, The Homestead, Poynton, Cheshire, and others.

Continental Automatic Telephone and Electric Co., Ltd. (184,764).—Return dated December 31st, 1924 (filed April 8th, 1925). Capital, £10,000 in £1 shares. 1,302 shares taken up. £302 paid. £1,000 considered as paid. Mortgages and charges, nil.

L. W. Douthwaite & Co., Ltd. (185,649).—Capital, £7,000 in £1 shares. Return dated August 14th, 1924 (filed March 7th, 1925). 5,519 shares taken up. £1,321 paid. £4,198 considered as paid. Mortgages and charges, nil.

Scott Insulated Wire Co., Ltd. (183,890).—Return dated January 14th (filed February 13th), 1925. Capital, £14,000 in 4,000 preference and 10,000 ordinary shares of £1 each. 2,075 preference and 10,000 ordinary shares taken up. £12,075 paid. Mortgages and charges, nil.

Thames Valley Electric Supply Co., Ltd. (185,597).—Return dated April 16th, 1925. Capital, £100 in £1 shares. All shares taken up. £100 paid. Mortgages and charges, nil.

Weldrics (1922), Ltd. (185,661).—Return dated February 12th, 1925. Capital, £25,000 in £1 shares. 14,000 shares taken up. £1 per share called up on 12,500 shares. £12,425 paid, leaving £75 in arrears. £1,500 considered as paid on 1,500 shares. Mortgages and charges, nil. Return of allotments, made up to March 18th, 1925, shows 1,000 ordinary shares allotted for cash.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Ferranti, Ltd.

The annual meeting of the company was held in London on September 11th; Mr. A. W. Tait, C.B.E., chairman, presided. In submitting the report, he said that the net profit for the year, after making provision for general establishment charges, repairs and renewals, bad debts, taxation, and interest on debenture stock, and making the usual substantial allocation to depreciation reserve, was £67,644. The net profit for the previous year on the same basis was £55,545. The turnover for the year to June 30th, 1925, again showed a substantial increase over that of the previous year, to which increase all departments had contributed. The trading profit of £161,960 showed an increase of about £30,470 over that of the previous year. In the Meter Department there had been an increase both in quantity and value, and satisfactory progress had been made in the Power Transformer Department. The Instrument Department had also shown encouraging progress, and there was every reason to believe that the company's sales of radio apparatus would show still further increase during the current year. The sum of £15,000 had been transferred to the credit of the depreciation reserve account, as against £10,000, which had been the usual allocation for some years, and the amount standing at the credit of that

account was now £91,912. That was approximately equal to 35 per cent. of the total value of the fixed assets of the company. The balance-sheet was very satisfactory and showed the strong financial position of the company. As to the liabilities, the first mortgage debenture stock outstanding showed a decrease of £6,100, being the amount of stock redeemed during the year. They had also transferred to the credit of general reserve account the sum of £40,000, increasing the amount to the credit of that account to £165,000. The dividends on the preference shares had been paid, and the directors recommended the payment of a dividend on the ordinary shares of 20 per cent., free of tax, requiring £12,000, leaving £33,312 to be carried forward to the current year, which was an increase of about £6,124 on the amount brought into the account.

The chairman said that the position of the company was very sound. The liquid resources were ample for the company's present requirements, and, in addition, over £80,000 invested in War Loan and Treasury Bonds was available for the further expansion of the company's business. He did not propose to make any forecast with regard to the current financial year, except to say that they had started the year with a satisfactory order book, and the orders which had been received since that date showed an increase over the same period of the previous year. While business, particularly in the export markets, was difficult, and competition very keen, he believed that the company would obtain its share, and with the expansion of the electrical industry both at home and abroad, it would be able to continue the progress which it had made during the last four years, and, unless unforeseen difficulties arose, it would be possible to present an equally satisfactory account next year. The report and accounts were adopted.

Manila Electric Corporation.—A dividend of 62½ cents per share has been declared on the common capital stock in respect of the quarter ending September 30th.

It is reported that the board of the Associated Gas and Electric Co. has extended the time for the exchange of certain Manila Electric securities for the company's gold bonds to September 24th.

Alabama Traction, Light and Power Co., Ltd.—The South-Eastern Power & Light Co. has made an offer to exchange its 6 per cent. gold debentures, series "A," for the Alabama company's 5 per cent., first mortgage, 50-year gold bonds. A meeting of bondholders to consider the proposal is to be held in Montreal on October 7th.

British Aluminium Co., Ltd.—A dividend at the rate of 8 per cent. per annum has been declared on the ordinary shares in respect of the half-year ended June 30th last. This compares with an interim dividend at the rate of 5 per cent. last year.

Direct Spanish Telegraph Co., Ltd.—The board has decided to pay, in addition to the dividend for the half-year to June 30th, 1925, at the rate of 10 per cent. per annum on the preference shares, an interim dividend of 4 per cent., free of tax, on the ordinary shares.

British Electric Transformer Co., Ltd.—The accounts for the first half of the current year show a profit of £25,827, as compared with £1,236 for the first six months of 1924, and a loss of £19,959 for the equivalent period of 1923.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under rule 159:—

Aluminium Corporation.—£250,000 8 per cent. "B" debentures (registered) of £100 each, Nos. 1 to 2,500.

Oxford Electric Co.—£10,000 new 6 per cent. debenture stock.

Eastern Telegraph Co., Ltd.—The directors have declared a dividend at the rate of 3½ per cent. on the preference stock, less tax, and one of 2½ per cent., free of tax, on the ordinary stock, in respect of the quarter ending September 30th.

British Insulated & Helsby Cables, Ltd.—An interim dividend of 5 per cent. has been declared on the ordinary shares, as in 1924.

Globe Telegraph and Trust Co., Ltd.—Quarterly dividends of 3s. per share, less tax, on the preference shares, and 5s. net on the ordinary shares, have been declared.

Lisbon Electric Tramways, Ltd.—A dividend has been declared on the cumulative preference shares in respect of arrears from July 1st, 1917, to December 31st, 1919, less tax.

Newcastle-upon-Tyne Electric Supply Co., Ltd.—An interim dividend of 2½ per cent. has been declared on the ordinary shares.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The directors have declared a dividend for the three months ended June 30th last of 5s. per share, free of tax.

Isle of Thanet Electric Supply Co., Ltd.—The dividend for the half-year ending September 30th on the 6 per cent. cumulative preference shares has been announced.

Midland Electric Corporation for Power Distribution.—An interim dividend at the rate of 10 per cent. per annum has been declared on the ordinary shares, as in 1924.

International Telephone and Telegraph Co.—The usual quarterly dividend (1½ per cent.) has been declared by the directors.

Bromley (Kent) Electric Light and Power Co., Ltd.—A dividend of 9 3/5d. net per share has been declared.

Mackay Companies.—A quarterly dividend of 1¾ per cent. has been declared on the common stock.

Stocks and Shares.

MONDAY EVENING.

THE feature this week in the markets which deal with electrical and allied industries, is the strength that has developed amongst wireless shares. There has been a decided increase in the amount of interest taken by the public. After a long period of inattention, people have begun to buy Marconi shares again, and those of the parent company are up to 28s. 9d. Marines strengthened to 18s. 3d. Canadian Marconis, on the circulation of a variety of rumours, hardened to 5s. 9d. The amount of business passing in the group has quickened remarkably. It is difficult to point to any special reason for the revival. No doubt it was merely a coincidence that this happened to start immediately after the thirtieth anniversary of the invention of wireless, which was celebrated last week by a luncheon given to Senatore Marconi. The famous inventor humorously maintained that wireless existed when the prehistoric man first understood, or felt, the meaning of a smile of encouragement from the pre-historic girl, and, very modestly, all that he claimed to have done was to discover that electric waves were capable of travelling and being received across great distances.

The electricity supply market continues very firm. Various deductions from the prices were made last Thursday on account of dividends, and these have all been recovered. Chelseas, for instance, are 1⅞ x.d., County 57s., and the preference 23s. St. James's rose 5s. to 14½. London Electrics remain dull, falling another shilling to 34s. The floating supply of stock is being steadily absorbed, but there remain 1,000 Westminsters on offer at 44s. 6d., 500 Countys at 56s. 6d., and the same number of City Lights at 47s. 6d. Westminsters pay the best in the London list, but St. James's still yield about 6 per cent. and Chelseas return 6⅜ per cent. on the money.

The Isle of Thanet Electric Supply Company announces the usual dividend of 6 per cent. on the preference shares, but no dividend is yet forthcoming on the ordinary. The price of the latter, which is 17s., indicates the expectation of a distribution at the end of the current year. The Bromley (Kent) interim dividend is to be at the rate of 4 per cent. free of tax, the same as it was a year ago, and the price of these shares, which seldom varies, is 34s. 6d. middle. No bargain has been recorded in the shares since the early part of June, when they changed hands at 34s. The full dividend for last year was 10 per cent. free of tax.

Yorkshire Electrics at 29s. 6d. are rather better, and a good deal of business is passing in the preference as well as in the ordinary shares of the provincial power, lighting and tramway companies.

Home Railway stocks make an indifferent showing. Metropolitans have eased off to 67, and the £10 shares of the Underground Electric Railways have gone back to 2⅜. There is nothing of interest to report in the London traction descriptions, but British Electric Traction shows no diminution of its strength. The ordinary stock is 1 up at 117½. The persistent buying that has taken the price to its present level is based upon what is regarded as the practical certainty of an early improvement in the dividend. Some of the prior-charge stocks of the British Railways have eased off. London Electric 4 per cent. preference, as an example, declined to 71½.

The Lisbon Electric Tramways re-enters the dividend list with a payment on account of the arrears of interest on the preference shares for the period from July, 1917, to December 31st, 1919. This is the first dividend that the shares have received since 1917. The preference stand at about 13s. 9d. and the ordinary were done a few days ago at 6s., although the official quotation for the latter is, anomalously, no better than 2s. 6d.—5s.

To the rise in Automatic Telephones there seems to be no end. The price is half-a-crown higher at 47s. 6d. On the basis of the last dividend, the yield is now but 2½ per cent. on the money. International Automatic Telephones have risen to 28s. It may be that some of the recent buyers are unacquainted with the fact that an American syndicate has the option to purchase these at 30s. Chili Telephones have risen to 5⅜ and United River Plates are 3/16 up at 7 11/16. Orientals are also a better market at 2 1/16. Brazilian Tractions, after a rise to 75, reacted a trifle, and Anglo-Argentine Tramways first preference at 3⅜ show a small reaction. The Mexican stocks, generally speaking, are hard. The best feature is a rise of 3 to 65 in Mexican Light & Power preferred. Amongst Colonials, Melbourne Electric ordinary gained 2 points at 151, and in the foreign traction group, Rio Tramways 5 per cent. second debentures at 86 are harder.

A slight decline occurred amongst a few of the shares of the manufacturing group. General Electrics, British Insulated, British Aluminiums and Brush are a little easier. On the other hand, Telegraph Constructions advanced to 26¾. British Electric Transformer preference strengthened to 19s. 6d. The engineering group is dull, though Babcocks keep steady at 2½.

The Rubber market ferments in a state of incipient buoyancy, with buyers eagerly clamouring for shares. Those men whose business lies principally in this market have as much as they can do to cope with the orders that they receive, amongst which orders those for the purchase of shares largely predominate.

Share List of Electrical Companies

	Nom. £	Dividend 1923	Dividend 1924	Price Sept. 14. 1925	Rise or fall	Yield p.c.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole	1	13	14	3	—	4 13 4
Brompton Ordinary	1	10	10	1⅜	—	*5 14 3
Charing Cross Ordinary	1	14½	15	£0/-	—	6 2 5
do. do. 4½ Pref	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	12	17xd	+9d.	6 8 0
City of London	1	15	15	48/3	—	6 1 4
do. do. 6% Pref	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	29/-xd	—	5 10 4
County of London	1	15	15	57/-xd	1/-	5 5 3
do. do. 6% Pref.	1	6	6	23/-xd	+6d.	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12⅝	—	5 18 8
Lancs Light and Power	1	7½	7½	26/6	—	5 15 5
London Electric	1	10	10	34/-	-1/-	5 17 8
do. do. 6% Pref	5	6	6	5½	—	5 7 10
Metropolitan	1	10	11	39/3	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	23/3	—	6 0 5
do. 5% Pref.	1	5	5	18/-	—	5 6 8
do. 7% Pref.	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	14½	+ ¼	5 18 8
South London	1	15	15	2½	—	6 0 0
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/-	—	6 16 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	+6d.	5 8 6
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	66	—	6 1 3
Metropolitan	,,	4	5	67	— ½	7 9 3
do. District	,,	3½	3½	43½	—	8 0 11
Underground Electric Ordinary	10	Nil	Nil	2⅝	— ⅛	Nil
do. do. "A"	1/-	Nil	Nil	7/-	—	Nil
do do. Income Bonds	6	6	6	96	—	*6 5 0
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	103½	—	5 15 11
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	3	6	47/6	+2/6	2 10 7
Chili Telephone	5	6	5	5⅝	+ ⅛	*4 8 11
Cuba Sub. Ord.	10	5	5	6¾	—	7 8 2
Eastern Extension	10	10	10	17½	—	*5 15 11
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 15 11
Globe Tel. and T. Ord.	10	10	10	17⅜	—	*5 12 8
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	22	32½	—	6 15 6
Indo-European	25	7	8½	41½	—	*5 2 5
Marconi	1	10	10	1 7/16	+3/16	6 19 2
Marconi Marine	1	10	7½	18/3	+9d.	8 0 0
Oriental Telephone Ord.	1	12	12	2 1/16	+1/16	*5 16 4
United R. Plate Tel.	5	8	8	7 1/16	+1/16	4 14 10
Western Telegraph	10	10	10	16¼	—	*6 3 1
HOME AND FOREIGN TRAMS, &C.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3⅜	—1/16	8 3 0
do. do. 2nd Pref.	5	6	6	3⅜	—	8 17 10
do. do. 5% Deb.	Stock	5	5	76½	—	6 10 9
British Electric Traction Ord.	,,	6	6	117½	+1	5 2 0
do. do. 6% Pref.	,,	6	6	105	—	5 14 3
Brazil Traction	100	4	4	73½	-1	5 8 10
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	88½	—	5 11 9
do. do. Preferred	,,	96/-	96/-	88½	—	*5 7 8
do. do. Deferred	,,	129/5	129/5	109½	—	*5 18 3
do. do. Deb.	,,	4½	4½	76½xd	—	5 11 1
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	42⅝	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	61½	+1	8 2 8
Mexican Light Common	100	Nil	Nil	3½	—	Nil
do. Pref.	100	Nil	Nil	15	+3	Nil
do. 1st Bonds	—	5	5	70½	+1	7 1 10
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	12	2⅝	—	*4 16 0
British Aluminium Ord.	1	5	10	1 1/16	— 1/16	5 18 6
British Elec. Transformer Pref.	1	Nil	7	19/6xd	+1/3	...
British Insulated Ord.	1	15	15	3½	—	4 12 4
Brush Ord.	1	10	10	1½	—9d.	8 17 10
Callenders	1	15	15	3⅜	—	4 9 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅜	—	... ...
Edison-Swan	4/-	10	10	9/-	—	4 8 11
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	30/6	—	6 11 2
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	18/9	—6d.	5 6 8
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	27/-	—9d.	5 11 1
Henley	1	15	16	3½	—	4 18 6
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	22/-	—	*4 10 11
Johnson & Phillips	1	10	10	49/6	—	3 14 9
Met-Vickers, Ord.	1	8	8	24/-	—	6 10 8
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	1½	—	5 0 0
Telegraph Construction	12	20	20	26½	+ ¼	4 8 2

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.		Price September 15th.	Fortnight's Inc. or dec
a Acid, Oxalic	per lb.	5½d.	
a Ammoniac, Sal	per ton	£60	...
a Ammonia, Muriate (large crystal)	,,	£52	...
a Bisulphide of Carbon	,,		...
a Borax	,,	£25	...
a Copper Sulphate	,,	£25 10s.	
a Potash, Chlorate	per lb.	4d. to 4½d.	...
a ,, Perchlorate	,,	5½d.	...
a Shellac	per cwt.	£15 15s.	
a Sulphur, Commercial	,,	£7 15s.	...
a ,, Roll	,,	£7 15s.	...
a Soda Chlorate	per lb.	3½d. to 3⅔d.	...
a ,, Crystals	per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks	per lb.	4d.	...
METALS, &c.			
b Aluminium, Ingots	per ton	£120 to £125	...
b ,, Wire	per lb.	1/9 to 2/6*	...
b ,, Sheet		1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net	£229	...
Grade II	,, ,,	£164	...
Grade III	,, ,,	£95	...
c Brass (rolled metal 2" to 12" basis)	per lb.	9¾d.	...
c ,, Tubes (solid drawn)	,,	1/- to 1/0¼	...
c ,, Wire, basis	,,	10⅜d.	...
c Copper Tubes (solid drawn)	,,	1/1½	...
c ,, Bars (best selected)	per ton	£93	£1 inc.
c ,, Sheet	,,	£93	£1 inc.
c ,, Rod	,,	£93	£1 inc.
d ,, (Electrolytic) Bars	,,	£68 15s.	25s. inc.
d ,, Sheets	,,	£143 10s.	...
d ,, Wire Rods	,,	£78 15s.	25s. inc.
d ,, H.C. Wire	per lb.	9¾d.	1/16d. inc.
f Ebonite Rod	,,	2/3 to 2/3	...
f Sheet	,,	2 3 to 2/6	...
a German Silver Wire	,,	2/3	...
h Gutta-percha, fine	,,	3/9	...
b India-rubber, Para fine	,,	3/-	1d. to 2d. dec.
l Iron Pig (Cleveland Warrants)	per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qual.	,,	£21	...
g Lead, English Pig	,,	£39 15s.	5/- dec.
g Mercury	per bot.	£13 10s. to £13 12s. 6d.	...
e Mica (in original cases) small	per lb.	8d. to 8/-	...
e ,, ,, medium	,,	4/- to 8/-	...
e ,, ,, large	,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	,,	1/3½	...
p ,, ,, drawn bars & rods	,,	1/8	...
p ,, ,, rolled strip & sheet	,,	1/2½	...
p ,, ,, wire	,,	1/3½	...
o Platinum	per oz.	£26	...
d Silicium Bronze Wire	per lb.	1/0½	...
r Steel, Magnet, in bars	,,	7¾d.	...
a Tin, Block (English)	per ton.	£258 5s. to £258 10s.	£7 15s. to £8 inc.
n Wire, Nos. 1 to 16	per lb.	3/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd,
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
o C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

The Properties of Some Aluminium Alloys.—In a paper presented at the annual autumn meeting of the Institute of Metals, Mr. Harry Hyman, Ph.D., said that aluminium alloys available for sand castings for engineering purposes generally possessed low ductility; this rendered them difficult to manipulate in workshop practice. If used as part of apparatus on board ship they were readily susceptible to corrosion. A series of alloys was prepared with a view to passing a minimum test of 5 tons yield point, 10 tons breaking stress, and 5 per cent. elongation on sand cast test-bars, and at the same time capable of undergoing a severe salt spray corrosion test without marked loss in weight. The alloy B.S.7, containing copper, nickel, iron and magnesium, gave the most promising results and had been adopted on a commercial scale. The mechanical tests could be readily maintained; fatigue tests showed the metal to be reliable under alternating stress, and it could be remelted several times without deterioration. Under the corrosion test its behaviour was as good as other alloys with which it was compared. When the magnesium content was increased, an alloy readily responding to heat treatment at temperatures about 50 degrees higher than those generally in use was obtained; owing to the increased mobility of the constituents at the higher temperatures the period of heating could be materially reduced.

A Large Condenser.—An exceptionally large single steam condenser has been built by the Westinghouse Electric and Manufacturing Co. for the new Richmond station of the Philadelphia Electric Co. It weighs almost 1,000,000 lb. and stands nearly 30 ft. high; when operating at maximum capacity it will require approximately 150,000,000 gallons of circulating water per day. It has a cooling surface of 70,000 square feet. Provision has been made for the ultimate installation of 12 condensers of this type.

The British Association.—IV.

The Southampton Meeting.

lectricity Supply and Electrical Plant at the Southampton Docks.

By H. Wauchope.

(*Abstract of Paper read before Section G.—Engineering.*)

The Southampton Docks provide a good example of the rapid increase in the use of electrically-operated machinery in docks. Fifteen years ago, with the exception of grain-handling machinery and one 50-ton crane, electricity as a power agent was unknown in the Docks, although electric lighting had been in use for a number of years. The power was originally supplied by a small generating station in the docks, but at the time when the building of the Trafalgar Graving Dock

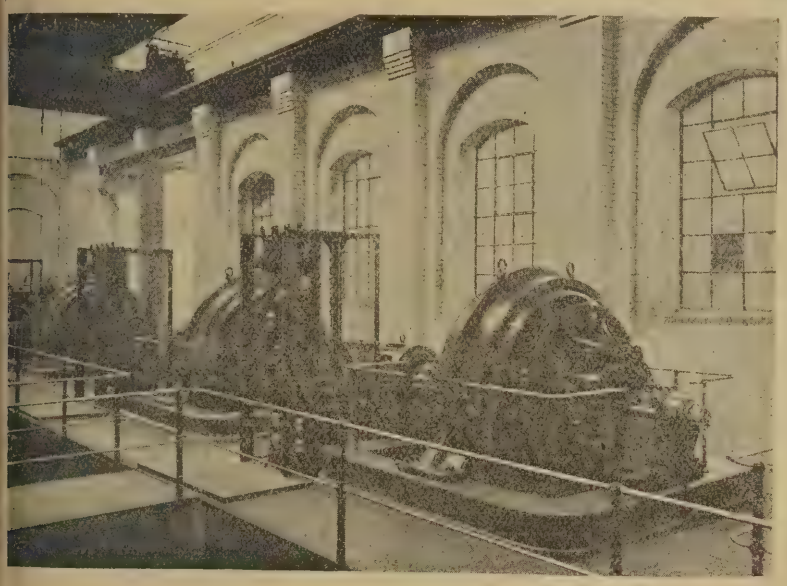


Fig. 1.—G.E.C. Rotary Converters in the Main Sub-Station.

was entered upon, this station was found to be inadequate to meet the increased demand, and a new station was built. This was completed in 1903, and housed two reciprocating steam sets of 500 kW each, either of which was capable of meeting the requirements. The present supply of electricity provides for a maximum demand of 3,500 kW. When the Outer Dock was completed in 1911, it was decided to use electrically-operated wharf cranes, and the first batch of these cranes, supplied by Messrs. Stothert & Pitt, Ltd., of Bath, were erected in that year. The cranes were found to be highly economical and successful in operation, and from that time further cranes have been rapidly added, some of them replacing hydraulic cranes. In 1923 an extension of electrification was decided upon. This development was given an impetus by the purchase by the Southern Railway Co. of a 60,000-ton floating dock, the operation of which requires 1,200 kW.

The first consideration was obviously to provide for a larger supply of electricity, and an agreement was entered into with the Southampton Corporation for the supply of all the necessary electricity. At that time the maximum load had already increased to approximately 1,000 kW. The total new requirements aggregated 4,000 kW, but the maximum demand was reduced by refraining, as far as possible, from pumping the three larger docks at the same time.

The No. 6 Pumping Station was retained as the main supply point, and the Corporation supply enters at this building at 6,600 V, three-phase, 50 cycles. A portion is converted to the standard Dock supply of 480 V, d.c. (three-wire). High-pressure current is also distributed from the station to Nos. 3, 4, and 5 pumping stations. At No. 5 Pumping Station the current is used to drive the dry dock pumps and a portion is converted to 480 V d.c. in order to cope with the growing load for power at this extreme end of the Docks and also to drive a hydraulic pressure pump. At No. 4 Pumping Station the current used is for dry docking purposes only, and at No. 3 Pumping Station for dry docking and hydraulic pressure pumps.

In order to economise space and unify supervision the layout of the sub-station has been arranged in three storeys. On the main pump floor 25 ft. 6 in. below the ground level is situated the dry dock pumping machinery. On the ground level, carried on a steel joist structure, is the converting machinery and the switchgear, while an intermediate gallery accommodates the transformers for supplying the rotary converters and the e.h.p. stator switchgear operating two of the main pumps. The Corporation supply is fed into two e.h.p. metal-clad switches of Messrs. Reyrolle & Co.'s manufacture, which in turn supply the seven-panel e.h.p. consumers' distributing switchboard, which is of the draw-out truck type manufactured by the Mentropolitan-Vickers Electrical Co., Ltd. Three of the panels of this switchboard supply three 1,000-kW rotary converters of the six-phase type, supplied by the General Electric Co., Ltd. (fig. 1), which are of their patent self-starting and synchronising type. The transformers, manufactured by the British Electric Transformer Co., are of that company's usual air-cooled type. From the converters, l.p. direct current is led to the main d.c. distribution board which supplies the general Dock load, the floating dock, and one main de-watering pump for the dry dock. The equipment for pumping the dry dock comprises two 48-in. centrifugal de-watering pumps, each capable of discharging an average of 450 tons per minute against a head varying from 0 to 37 ft. and one 48-in. impounding pump designed to deliver 200 tons of water per minute in order to raise the level of the water in the dock above the tide level as required, to a maximum of 10 ft. These pumps, and all the dry docking pumps supplied under the electrification scheme, were manufactured by Messrs. Gwynnes Engineering Co., Ltd., who were the main contractors for this section of the work. In order to provide for slow pumping operations which are sometimes called for, advantage was taken of the fact that sufficient d.c. had to be available to operate the floating dock, and one of the two de-watering pumps was arranged to be driven by a d.c. variable-speed motor of 1,200 b.h.p. running at 210-245 r.p.m. (fig. 2). The other pumps, for economy of operation, were arranged to be driven by motors fed direct from the e.h.p. main. In order to comply with the power-factor agreement with the Corporation these machines are of the asynchronous-synchronous type, giving a power factor on full load up to 0.9 leading. The motor driving the a.c. de-watering pump is of 1,200 b.h.p. running at 231 r.p.m., and the motor driving the impounding pump is of 350 b.h.p. running at 214 r.p.m. These machines were manufactured by the English Electric Co., Ltd.

The starting and stopping of the motors is entirely automatic, by means of push-button contactor control gear, manufactured by Electric Control, Ltd., of Glasgow. In addition to the main docking pumps at No. 6 Pumping Station, there are also one 12-in. draining pump, one 4-in. sump pump, and two charging units for the purpose of extracting the air from the various pumps for priming purposes.

As previously stated, the power is supplied from No. 6 Pumping Station for the operation of the floating dock situated near by. (This dock was described in our issue of November 7th, 1924, p. 713.) The power required to operate the dock, 1,200 kW at full load, is conveyed by means of three 1-sq.-in. lead-covered, paper-insulated cables per pole. These

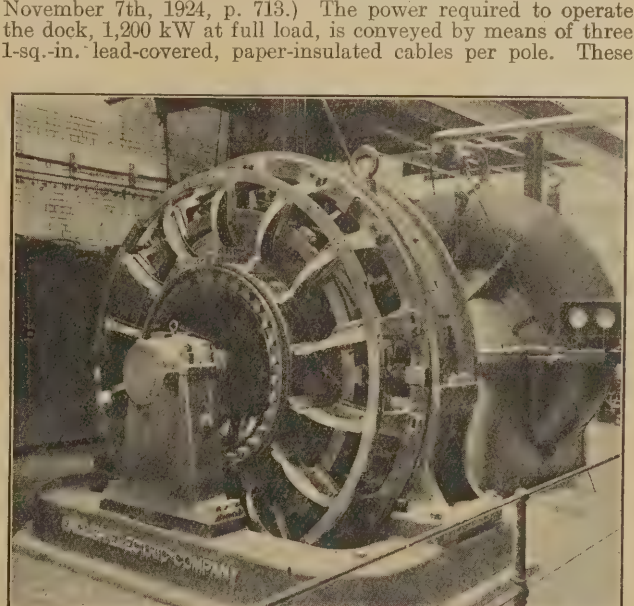


Fig. 2.—A 1,200-h.p. English Electric d.c. Motor driving a de-watering Pump.

cables are carried under one of the mooring booms and up the dock wall to the main switchboard which is erected in a cabin on the top of the starboard wall.

The No. 5 Sub-station and Pumping Station houses three groups of machinery. In the dry docking well, the floor of which is 24 ft. below ground level, are situated two 48-in. diameter de-watering pumps of similar design to those at No. 6 Pumping Station, the duty, however, being considerably less. The average amount of water displaced is about 350

tons per minute against a head varying from 0 to 36 ft. As there is not sufficient d.c. supply available at the south end of the Docks, it was necessary to install motors of the asynchronous-synchronous type. The equipment and operation is similar in all respects to that at No. 6 Pumping Station, with the exception that owing to the limited space available the exciters had to be staggered and are driven from the rotor shafts by means of chain drives, the driving wheels being connected to the rotors by means of centrifugal clutches to avoid sudden shocks. Similar plant for draining, charging, &c., is installed as in the case of No. 6 Pumping Station. Situated at the side of the pumping well, six feet below the ground level, are two rotary converters and a hydraulic pump. This machinery occupies the space previously taken up by

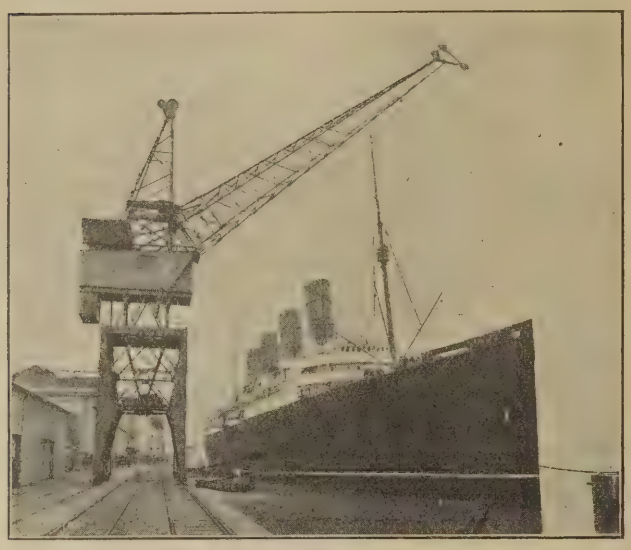


Fig. 3.—A 5-ton Horizontal Luffing Crane (Messrs. Stothert & Pitt, Ltd.).

the steam-driven ram pressure pump. The rotary converters are each of 250 kW capacity, and are similar in design to the machines at No. 6 Sub-station. The transformers are also in this case arranged under the machines.

The No. 4 Pumping Station is used solely for de-watering purposes. Two 24-in. diameter pumps are installed which can be used for emptying either No. 4 or No. 3 dry docks by the operation of electrically-driven sluice gates. The pumps are driven by three-phase induction motors, each of 175 b.h.p. running at 416 r.p.m. supplied at 415 V by means of a 300-kVA transformer, and controlled by push buttons.

The No. 3 Dry Dock and hydraulic pumping station houses two 24-in. diameter de-watering pumps used for emptying either Nos. 1, 2, or 3 dry docks. The pumping plant is similar to that at No. 4 Pumping Station, except that the pumps are of the normal single inlet type. In addition to dry dock pumping, No. 3 Pumping Station is the main centre for hydraulic power pumping for dock use. There are installed for this purpose two 17-stage turbine pumps, manufactured by Messrs. Mather & Platt, Ltd. Each pump is designed to deliver 200 gal. of sea water per minute against a pressure of 750 lb. per sq. in. The pumps are driven by three-phase slip-ring, 165-b.h.p., 415-V induction motors running at 1,450 r.p.m. For this supply, together with that for the dry dock pump motors are installed two 400-kVA transformers. The starting and stopping of the hydraulic pumps is automatically controlled by tappets on the hydraulic accumulator.

At No. 5 Pumping Station a similar pump to the two at No. 3 Pumping Station is being erected. This pump will, however, be driven by a direct-current variable speed motor. The use of direct current allows a ready adjustment of load between the pumps at Nos. 3 and 5 Pumping Stations when running together.

The majority of the berths used by the largest ocean-going liners are equipped with high-speed electrically-operated portal cranes. With the completion of the batch of cranes at present being erected, there will be an unbroken line of modern electric cranes from Berth No. 34 on the Itchen side of the Docks right round to Berth No. 47, including the whole of the Test Quays. With the exception of three cranes on No. 41 Berth which were supplied by Messrs. Babcock & Wilcox, Ltd., in 1915, and two second-hand small radius cranes on No. 45 Berth, the whole of the electric cranes, to the number of 28, have been supplied by Messrs. Stothert & Pitt, Ltd., of Bath. All those cranes are of the level luffing type using a minimum amount of power for this important motion. The first 14 cranes situated around the Ocean Dock are of solid girder construction. The actual rotating part is carried on a horizontal roller path and is centrally held by means of the usual centre post. The whole of the cranes are of the free barrel type which permits an instant and rapid lowering of the load as required, by gravity. The power consumption of this type of crane is particularly low; it is found that with the average cargo load, 4 or 5 cycles of operation can be effected with one kWh. The electrical equipment of these cranes, which in common with all the cranes in the Docks is supplied at 480 V direct current, consists of an independent motor drive for each motion.

All cranes south of No. 40 Berth are constructed throughout on the lattice principle and are of the mast type. The rotating portion of the cranes of this type is pivoted on a foot-step bearing, suspended considerably below the gantry top and the roller path and the axis of the rollers are in the vertical plane on a level with the gantry top. No separate centre post is therefore required as the whole superstructure in a sense takes the place of the centre post.

The tendency of late has been towards increased radii. The cranes under construction at No. 34 Berth are of 86 ft. radius and the 5-ton cranes erected at No. 41 Berth which were intended for use with liners boomed off considerably from the quay have a maximum radius of 90 ft. (fig. 3). All these cranes are of Messrs. Stothert & Pitt's latent mono-rope, balanced jib type, the luffing being effected by a bell crank mechanism arranged that over-luffing is impossible. If the luffing is carried beyond the limit, the jib merely begins to return to the minimum or maximum position as the case may be. The newer cranes are all equipped with power-operated travelling gear, whereas the older cranes previously described are moved by manually-operated gear.

In addition to the cargo cranes on the wharves, there are two electrically-operated heavy lifting cranes. The first of these is a 50-ton crane of the ordinary jib type situated at No. 6 Dock. This crane, which was the first electric crane to be installed, being erected in 1904, has a radius of 87 ft. A recent addition to the plant is a 150-ton floating crane (fig. 4), built last year by Messrs. Cowans, Sheldon & Co., Ltd., of Carlisle. This crane is entirely self-contained and can either be operated by an independent generating set contained in the pontoon or by supply from the shore. It is of the luffing type and has three separate hoisting gears. The main hoist has a maximum radius of 106 ft. In this crane there are three motors of 80 b.h.p., one of 160 b.h.p., one of 60 b.h.p., and two of 30 b.h.p. The whole of the electrical control, which is mainly effected by contactors and master controllers, was supplied by the Igranic Electric Co., Ltd. The warping of the pontoon is carried out by means of four electrically-operated capstans on the deck and an electric winch is used to manipulate the anchor.

A number of warehouses situated around the Inner Dock are equipped with belt conveyors for handling grain, the grain in the first place, being raised from the ship's hold by means of a bucket type elevator of 100 tons per hour capacity. All this machinery is electrically driven but there are no features in connection with it which can claim special interest.

After tests of many types of electric battery trucks it was decided to employ the electric elevating platform truck manufactured by the Elwell Parker Electrical Co., Ltd. This truck, which is of a particularly robust construction, has a capacity of two tons. There are already 28 of these in operation. They are propelled by Edison nickel-iron accumulators, each capable of working on one charge for an eight-hour day; the working time can be further lengthened if required by a mid-day boost at a heavy charging rate. The charging of the batteries is carried out by means of a five-wire balancer supplied from the



Fig. 4.—A 130-ton Floating Crane (Messrs. Cowans, Sheldon & Co., Ltd.

480-V mains. For moving odd wagons, ships' booms and gangways, and other heavy transportable articles for which horses were previously employed, two battery-operated tractors, also supplied by the Elwell Parker Electrical Co., Ltd., are in use. The longer distance conveyance of light cargo and the collection and disposal of refuse, is carried out by battery-driven lorries of 2½-tons capacity, two of which are of the tipping type. These lorries were manufactured by Messrs. Garrett and Sons, Ltd., and are also equipped with Edison batteries. These battery vehicles have amply justified the somewhat heavy first cost involved.

The various ship repairing workshops in the docks are all supplied with electricity from the dock mains, and power is also available for other occasional work.

Discussion.

The above paper and that on the Southampton electricity undertaking by Mr. W. G. Turner, which was abstracted in our issue of September 4th (p. 391), were discussed together.

Mr. Aldridge, who was the engineer of the company which commenced the electricity supply in Southampton, spoke of the difficulties which the company encountered. Referring to Mr. Wauchope's paper he stated that he was the inventor of the first free-barrel crane

Mr. F. H. Nalder drew attention to the advantages of the efficiency meter which Mr. Turner had devised. He considered that its use would develop rapidly.

Prof. F. C. Lea asked Mr. Turner if the fuel-saving effected in the Southampton electricity works justified the heavy capital expenditure involved, and if the use of pulverised fuel had been considered. Many American power stations claimed great economies from the use of coal in this form. He asked Mr. Wauchope to say how electric cranes compared, as regarded running cost and reliability, with hydraulic cranes.

Mr. Turner, in replying, said that the Southampton undertaking had the unenviable distinction of possessing five different systems of supply; a change-over to 3-phase a.c. was being made as rapidly as possible. He pointed out that a great deal of the capital expenditure was due to converting plant. Pulverised fuel had been considered unsuitable; the theoretical saving was not sufficient to justify the capital expenditure involved, although no doubt it would be excellent for a new plant.

Mr. Wauchope, replying to Prof. Lea's question as to how electric cranes compared with the hydraulic type, said that the consumption of pressure units by hydraulic cranes was out of all proportion to the work that they did; as the compressors had to be kept running whether the cranes were working or not. The cranes could not be compared with electric cranes. The latter were certainly more reliable, especially in winter, and stoppages for repairs were very infrequent. The chief trouble was the plug boxes on the quays, which, at times, were liable to be flooded.

The President (Sir Archibald Denny) said that his experience had proved that electric cranes were far ahead of hydraulic cranes. Except for very short lifts his firm had entirely replaced the hydraulic by electric cranes.

Standardisation in Industry.

By C. le Maistre, C.B.E.

(Abstract of Paper read before Section G.—Engineering.)

This paper dealt with the present position of standardisation generally. After referring to the need for greater economy in industry by the elimination of waste and excessive diversity of parts through the medium of standardisation the author said that during the past 25 years the B.E.S.A. had carried out a great deal of most useful work in industrial standardisation. The simplification and standardisation of steel sections had resulted in a saving of 5s. per ton to the steel industry, whilst recently a single electrical specification resulted in a saving of £10,000 in the stock which one company alone had to carry, and a continuous saving of £500 per annum. Since the war many other countries had instituted national organisations and in practically all cases they had drawn on the experience of the B.S.A. In the United States, in addition to a standardisation organisation, there had been instituted by the Government a Division of Simplified Practice, which carried on a campaign for the elimination of national waste, under the Department of Commerce. The procedure of that Department was based almost entirely on that of the B.E.S.A. with the exception that it was financed entirely by the Government, and the term "simplification" had been adopted as being more significant commercially than our term "standardisation."

Among the results of these efforts, which began in 1921 in the U.S.A., were the following:—The American miller cutter industry, after months of study and survey, had made a reduction of 35 per cent. in prices. A reduction of 50 per cent. had been made in the sheet metal industry in the varieties which had to be stocked by the ironmongers in the States. Even in the china trade, the paper-bag industry, the lumber industry, and many others were to be found examples of reductions in varieties and consequently in prices through the application of the principles of simplified practice, upon which the U.S.A. Government was now spending £20,000 per annum. After pointing the directions in which similar results could be achieved in this country through the medium of the B.E.S.A., the author pleaded for a greater measure of financial support for the work in hand and in prospect. At present the general funds were provided largely by industry and, to a very small extent, by the Government. The Association was not a profit-making concern, and all the expenses were concerned with office accommodation, staff salaries, and so on, amounting to £1,000 per annum. Manufacturers also helped in many ways other than in providing finance, and it was computed that the total value of the support given by industry was about £4,000 per annum. Support was also given by the Governments of the Oversea Dominions, including the Government of India and the Crown Agents for the Colonies. Considering, however, the large sums of money being devoted to similar work in the United States and other countries, the hope was expressed that the British Government would recognise the appropriateness of increasing its support of that much-needed national work so that it might no longer be as hampered as it was at present in its activities for the benefit of industry. Many thousands of copies of British Standard Specifications had been translated into foreign languages in an endeavour to assist British trade abroad, but this work had had to cease on account of lack of funds. In order to widen the scope of the membership, the Main Committee was, in October, putting into operation a scheme for the reorganisation of the membership. The members of technical committees of the Association were to be known as honorary members and a new class of membership was being formed to include professional engineers, individual firms, and business men connected with the great industries of the country, who were to be invited to become members at a minimum annual subscription of two guineas. The income from this new source would be used more particularly towards making the home work effective throughout the world. Some of the representatives of the trade organisations who had taken part in drawing up the scheme had already intimated their willingness to continue their present very considerable contributions and, at the same time, to recommend to their constituent members the great desirability of applying for membership of the B.E.S.A., thus enhancing the value of the trade contributions and assisting the Association to widen its scope.

Recent Progress in the Peat Problem.

By Dr. R. Mollwo Perkin, C.B.E.

(Abstract of Paper read before Section B.—Chemistry.)

This paper described a new process for treating peat which, the author claimed, enabled it to be marketed in a form which contained only 20 per cent. of moisture, if necessary. But peat produced by this process, in which 40 per cent. of the original moisture remained, was said to be specially suitable as a fuel for electrical generation purposes, and figures were given showing that the calorific value of such a fuel compared exceedingly favourably with coal. Although figures of working costs were not given it was stated that the cost of peat treated by the process in question compared well with that of coal. The process described was admittedly based on the failures of the past. The great problem in treating peat was to remove the large amount of water in it and many methods had been suggested for doing this which were classified as follows:—(1) Maceration; (2) Heating and compression; (3) Electrical; (4) Chemical; and (5) Macerating, heating under pressure, and briquetting. Although full details of the plant used in the process described were not disclosed, the author said that it consisted of a combination of maceration, under suitable conditions, extracting as much water as possible, and then passing the peat into an autoclave and heating it under regulated pressure. This caused a certain rise in temperature, and then the peat was suddenly discharged by means of a sluice valve, the necessary water afterwards being filtered or pressed off and finally passed into a press. In this way briquettes containing from 18 to 20 per cent. of water only had been made. The speed of this plant was such that the briquettes were made within eight hours and were immediately ready for transport, being very hard and not liable to disintegration. It was said that the process was extremely simple to work and did not require much labour.

The author said that British peat was much superior in many respects to foreign peat and that in the United Kingdom and Ireland there was some 8,000,000 acres of an average depth of 12 to 14 feet. Dr. Perkin made a strong plea for the immediate development of this new industry, now that it had been shown that there was an economic and commercial process available. The fuel, he claimed, would not compete with coal in the ordinary way. On the other hand, from it smokeless briquettes were obtained, as well as a very valuable charcoal for metallurgical purposes—to replace the Swedish wood charcoal now imported—a high yield of oils, and a material valuable as a decolorising agent. The specific gravity of the peat so treated was about that of coal, so that the freightage would not be higher.

Among the processes mentioned which had been tried for the treatment of peat in order to make a commercial article, was the Buckle process. In this, the peat, after being macerated was mixed with a little water, in order to make it less pasty, and was forced under a pressure of about ten atmospheres through a tube system which was heated to a temperature of about 100 deg. C. A current of electricity at 200 V was passed through the tube system, it being claimed that electrical osmosis caused the decomposition of the hydro-cellulose. The inventors of this system stated that if the passage of the peat pulp between the electrodes was arrested, the electric current automatically ceased to flow because the peat ceased to conduct electricity as soon as the hydro-cellulose in it was decomposed. It was found advantageous to change the polarity of the electrodes from time to time in order to prevent accumulation of peat material on the positive electrode. Either alternating or direct current might be used but a direct current appeared to give the better results. The main object in heating the peat was to cause it to conduct electricity; it had been found that below 80 deg. C., peat was such a bad conductor that practically no electro-osmosis took place. A unit working scale plant was erected in Norfolk which was capable of dealing with 250 lb. of peat pulp per hour, and Dr. Perkin stated that this small plant worked very satisfactorily. It had not, however, been developed on a commercial scale. In the process described by Dr. Perkin, and for which he claimed many advantages, electricity did not play a part, so far as the actual process was concerned. The electrical interest in it was the claim that peat with from 30 to 40 per cent. of moisture made an ideal fuel for the production of electricity.

Egyptian Trade and Finance.

A Record of Prosperity.

A report upon the economic and financial situation of Egypt has been forwarded to the Department of Overseas Trade by Mr. E. Homan Mulock, Commercial Secretary at Cairo.*

It is stated at the outset that Egypt is in a very prosperous condition, owing mainly to the enhanced value of cotton exports during 1924. The general trade figures show that exports from Egypt during 1924 exceeded imports by £E16,467,000. There was a substantial addition to the financial resources of Egypt during that period, this being represented by an increase in the country's foreign investments. To these important factors in the prosperous economic situation of Egypt is added the highly-satisfactory condition of Government finance, indicated by an estimated surplus of nearly £E6,000,000 on March 31st, 1925, and a corresponding increase in the Reserve Fund which on that date was approximately £E24,000,000. In addition to this, two special reserves have been created, one of which relates to the Ottoman Debt, while the other (£E1,537,000) is a reserve relating to the capital account of the State railways, telegraphs and telephones.

Telephone Development.

The 1925-26 Budget embodies a total credit of £E182,300 for telephones. This includes £E38,500 for automatic exchange equipment, £E32,500 for new telephone instruments, and £E21,000 each for telephone trunks and additional manual exchange equipment. On the revenue side, the telephones are expected to bring in £E105,000, this substantial increase over the 1924-25 figure being an anticipation of increased business upon the opening of the first automatic exchange (2,000 lines) and an additional manual exchange (6,000 lines). The automatic exchange was ordered from a British firm by the Ministry of Communications, but for a number of reasons the precedent was not followed up, the latest addition being the 6,000-line manual exchange. It is satisfactory to note that out of a total value of £E48,681, representing telegraph and telephone material imported during 1924 (as against £E33,336 in 1923), Great Britain supplied goods to the value of £E36,038, the next highest being Sweden (£E7,754). The figure represented a rise of almost 50 per cent. above the 1923 total.

Electrical Trade.

The report states that last year marked a general advance in municipal electrical undertakings in the provinces; seven contracts, totalling approximately £E180,000, for the supply and erection of equipment for generating stations have been placed. Mr. Mulock says that it is to be regretted that, with one exception only, United Kingdom manufacturers do not appear to have submitted tenders for provincial electricity undertakings. All the generating plant and most of the material for the distributing systems is being supplied by German manufacturers. One local agent, however, who represents various French suppliers having a large capital in depreciated French francs, was able to secure a contract at a very low price for an electrical distribution system, valued at about £E20,000, in the provinces. The Diesel engines for these installations are, with the exception of two small orders placed in Germany, being supplied by a well-known Swiss firm. An order for water turbines for one installation was also secured by a Swiss firm, the main contractors, however, being the local representatives of the Siemens-Schuckertwerke. A comparison of the tenders submitted shows that, whereas there was little appreciable difference between the Swiss and German prices for engines for electrical generating plant, French and British quotations were about 20 and 50 per cent. respectively above those of German firms. The only important order placed by the Ministry of Public Works during 1924 was one valued at £E12,000 for extensions to power plant, four 50-h.p. motor-pumping sets, and 4 km. of underground armoured cable for Montazah Palace. The order for Diesel engines went to Italy, that for generators to Germany, that for pumps to Switzerland, and the motor and control gear and cable was ordered from a Belgian firm. There has been little activity in the local business world, owing to the fact that the more important public utility companies purchase, as a rule, through their head offices in Brussels and Paris. An appendix to the report shows that Great Britain's share of the machinery trade has not been so meagre as the foregoing notes might suggest. Stationary i.c. engines to the value of £E399,718 were imported during 1924, and Great Britain's share of this amounted to £E216,639, as against £E147,399 in 1923. Again, out of the total imports of power pumps valued at £E59,495, the United Kingdom provided £E25,936, as against £E14,908.

In the small supply business, in spite of the fact that the market is inundated with lighting fittings and various appliances of German manufacture, there is a good demand for American goods in these lines. Small generators and motors supplied locally are mostly of French or Italian manufacture, but here, again, there is a steady demand for the superior American-made motors. Mr. Mulock considers that it is not too much to expect of British manufacturers that they should make greater efforts to capture a proportion of this trade. It is also of interest to note that local German dealers are p chasing American lighting switches in considerable quantiti

Compared with the year 1923, the volume of electri business, apart from Government contracts, has risen steadi and an increasing demand by local industrial concerns electric motors has been remarked. Outside the cities Cairo and Alexandria there has been little demand for electri goods, but the extensive construction of new buildings in th towns has involved a large increase in installation wo which is often carried out by some obscure dealer posses of little or no knowledge of the work.

Electrical Import Statistics.

The imports of electrical machinery during 1924 reached value of £E146,564, as compared with £E144,361 in 19 The shares of the principal importing countries were as f lows:—France, £E45,605; United Kingdom, £E28,7 Switzerland, £E18,418; Germany, £E16,926; United Stat £E13,502; and Italy, £E13,326. The United Kingdom, G many, and Switzerland increased the value of their suppli but those of most of the other supplying countries dropp very considerably. The total trade in "certain appliance and batteries amounted to £E50,218, of which the Germ share was £E15,334, the British share £E13,569, and that Italy £E10,493.

The electric lamp market shows little change, one Dut firm supplying about 50 per cent. of the total consumptio but German penetration has become more marked of la In respect of this market, a recent price agreement arriv at by most of the leading lamp manufacturers should te to distribute this business among the various local deale but as the latter are not in every case adhering to this agr ment, British lamp manufacturers represented locally are a worse position than before. It is expected that furth developments will arise in the future. The total import lamps amounted to 1,363,103, valued at £E39,352; the Unit Kingdom's share amounted to only 13,416, valued at £E6

Many proposals, such as traffic control by electricity Cairo and Alexandria, electric transport trucks and overhe travellers for use at the main railway stations and warehous and improved electric lighting schemes, have been submitt by at least one British firm, but the Egyptian Governme appears to maintain a somewhat lethargic attitude with rega to such proposals.

Advice to British Traders.

Mr. Mulock says that in spite of German competition in t small electrical supply business, it is quite reasonable to assu that if British manufacturers had extended their advertisi and trade propaganda in general they would have obtain quite an important share of the trade. Under present con tions, however, their local representatives find themselv almost unable to obtain a market for their principal goo whereas foreign competitors have every facility possible securing distributors, &c. Foreign private enterprise, duri the year under review, was handicapped by reason of t unsatisfactory political situation, but it is hoped that the adverse conditions, so prejudicial to the economic welfare the country will, under the present Government, tend disappear.

The lift business is at present mostly in the hands of Milan company; the low rate of exchange in its favour a its working arrangements with local building contractors lea little chance for competitors to seriously disturb its positio However, as a well-known Swiss firm of lift manufacture has cut prices with a view to challenging the Italian firm supremacy, it is to be hoped that United Kingdom firms w also study this very difficult market.

Suggested Development in Persia.—In the course of report to the Department of Overseas Trade, Mr. R. H. Hadow M.C., Secretary in Charge of Commercial Affairs at the Briti Legation, Tehran, says that there can be little doubt that a opportunity presents itself to any firm which can make a sati factory agreement with the Persian Government for the util sation for electrical purposes of the energy existing with measurable distance of the capital in the form of two co siderable rivers, each of which could be dammed with no a parent difficulty. Provision in this manner of cheap power f lighting, traction and heating would make no small differen to the life of the capital, and would doubtless lead to simil development in other districts of Persia, such as Tabriz, Isp han, and Shiraz. An accurate survey of the rivers would b necessary. The report also says that a concession for the d velopment of telephonic communication in Persia has been f some years in the hands of the Persian Telephone Co., whic has recently commenced work in Tehran in conjunction wit the German firm of Siemens and Halske. At the present tim telephone systems exist in the principal cities of Persia, bu the companies are small and the service is variable.

* Stationery Office, 2s. net.

Underground Cables in the United States.

SOME particulars of interest concerning cables installed in the United States are given by the *Electrical World* in a review of the work of the Underground System Committee of the N.E.L.A. during the past year.

During 1923 and 1924 the Electrical Testing Laboratories of New York tested 3,725,999 ft. and 4,269,139 ft. of cable respectively. Of the latter 87.45 per cent. was passed, 8.45 per cent. held over as deficient in minor respects, 3.84 per cent. rejected and 0.26 per cent. withdrawn by the manufacturers. The outstanding points of interest considered were the high-pressure joints made on cables installed in America. These joints were of the design of three European companies and were installed on cables made by these firms under the supervision of their engineers The designs of these joints, as regarded the amount of applied insulation, dimensions, filling temperatures and pressures, methods of connecting the conductors, &c., were very different from each other and from American practice.

Eight months' service of the two 66-kV lines in Cleveland has resulted in no joint failures in service, and three failures in tests. The test failures were ascribed to the migration of a large amount of the filling compound, which is "thin," into the cable itself.

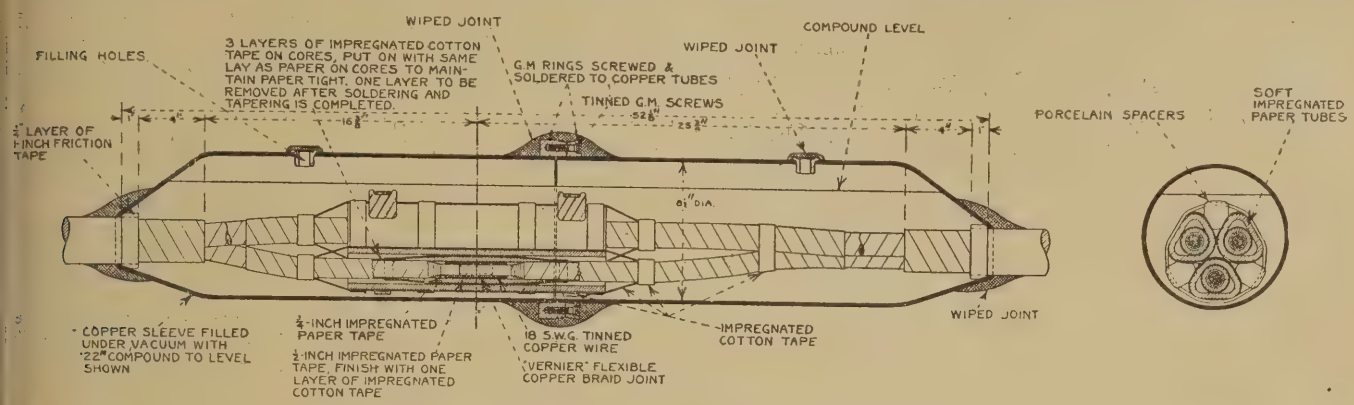


Fig. 1.—Section of 35-kV Cable Joint (B. I. & H. Cables).

The design of potheads which have been used for pressures below 15,000 V has been standardised in some cases for several years and very little trouble is experienced with them. Recent cable installations at pressures as high as 35 kV for 3-core cables and 66 kV, 3-phase, for single-core cables, have produced the necessity for potheads for these installations, and the requirements have been met successfully. At the present time there are manufacturers who claim that they can make potheads which will be satisfactory for single- conductor cables

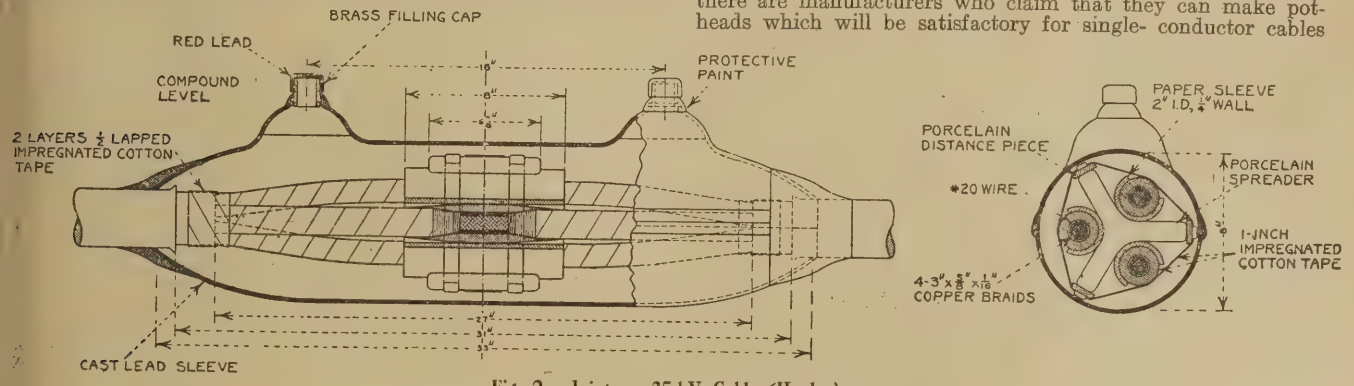


Fig. 2.—Joint on 35-kV Cable (Henley).

on 100- to 132-kV three-phase circuits. Thirty-one companies have contributed information on high-pressure cable performance for the year 1924. While this is twice the number of companies that reported during the previous year, the total mileage of cable of the additional companies is only about 8.4 per cent. of the total. The total amount of high-pressure cable in operation by all the companies which reported for 1924, including all pressures of 6,600 V and over, is 7,321 miles. Of this 85 per cent. is operating at pressures below 16,500 V. The total mileage of h.p. cables in operation during 1924 represents an increase of about 36 per cent. over that for 1923.

The combined cable and joint failures for 1924 was 13.3 per

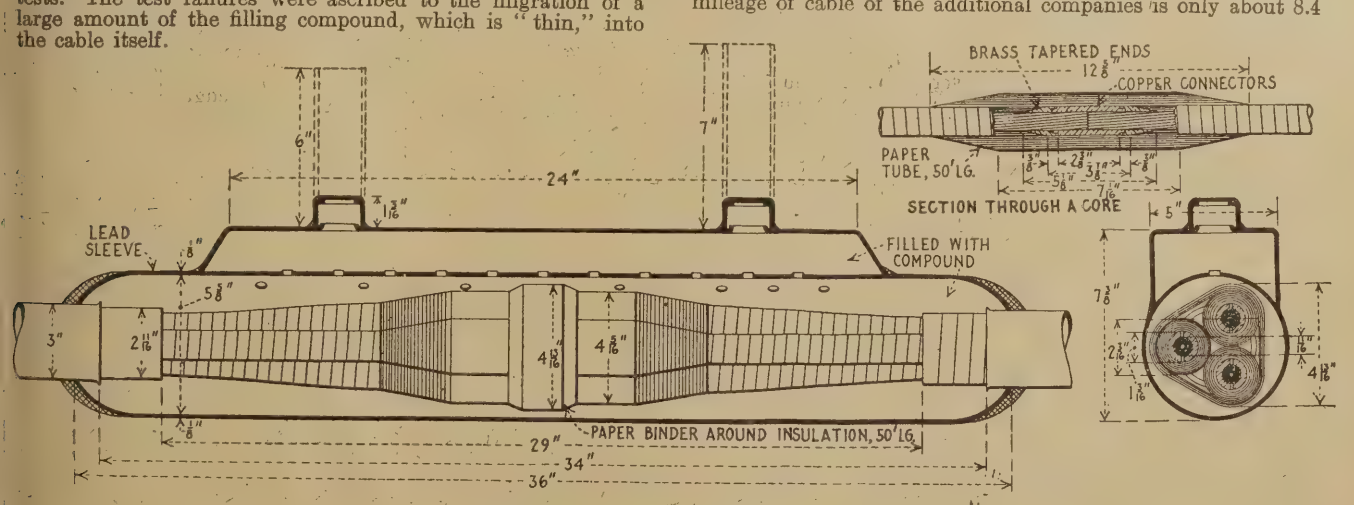


Fig. 3.—A 36-kV Cable Joint (Pirelli).

A joint for a 350,000-circ. mil, 3-core, 35-kV cable, installed by British Insulated & Helsby Cables, Ltd., in Chicago, is shown in sections in fig. 1; fig. 2 shows the sections of a joint on a similar cable by Messrs. W. T. Henley's Telegraph Works Company, Ltd.; and a 300,000-circ. mil, 3-core, 36-kV joint installed in Boston by the Società Italiana Pirelli is shown similarly in fig. 3.

cent. of the total; this is about 14 per cent. higher than for the two previous years. Elimination of the additional companies included in 1924 would not appreciably affect this record.

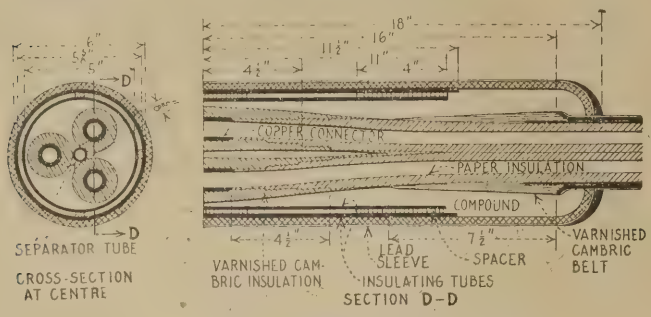


Fig. 4.—Joint on a 33-kW. Submarine Cable.

While the total cable and joint failures in the lower pressure class for 1924 are of the same order as in the previous years, this is not so in the case of the higher pressure cables, in which the total number of failures per 100 miles is not only considerably higher than for 1923, but is also about 18 per cent. above the average for the past six years. Separating cable from joint failures regardless of pressure, 74 per cent. of the failures are in cables and 26 per cent. in joints.

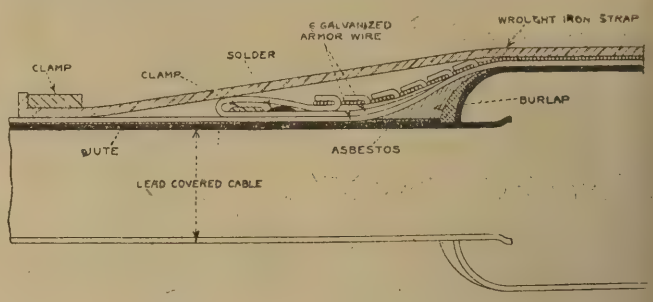


Fig. 5.—Method of Clamping Armouring

Segregation of cable for joint failures, but with respect to the two pressure classes, brings out other interesting information. Joint failures alone in the lower pressure class are only about 3.3 per 100 miles.

High-Frequency Induction Furnaces.

Their Construction and Operation.

By DONALD F. CAMPBELL.

(Abstract of a Paper read before the IRON AND STEEL INSTITUTE.)

THE use of high-frequency currents for induction heating has added a new series of physical conditions to those under which metallurgical operations may be performed. Although still in its early stages of development, it provides an unrivalled means for rapid experimental and research work on alloy steels, and it is being used for several metallurgical operations of the utmost importance. The early work in connection with high-frequency furnaces was carried out by Dr. Northrup at Princeton University, whose brilliant studies on the physical laws governing induction from high-frequency equipment led to the evolution of the first metal-melting furnaces.

Inductive heating has recently found wide application in the non-ferrous trade in furnaces having a vertical slot worked on normal commercial frequencies. But all these furnaces have the disadvantage of requiring an iron core, as the result of which the molten metal is contained in small channels surrounding the core, as well as in the main bath of the furnace. In the case of high-frequency heating, the ideal form of container is available, a cylindrical vessel holding a maximum metal with a minimum of radiating surface and of refractory material exposed to corrosive action. Obviously, inductive heating is superior in thermal efficiency to any arc furnace or fuel-fired equipment, owing to the fact that the heat is actually generated in the charge to be melted.

The high-frequency furnace has an immensely steep heat gradient between the molten metal and the outside of the furnace, the distance between molten platinum at, say, 1,900 deg. C., and a water-cooled copper coil being only ¾ in. in platinum-melting furnaces. This somewhat extraordinary fact does not produce excessive heat losses owing to the rate of input of calories into the charge, and the loss, being a function of time, is only considerable during the last few minutes of the melting operation, when the temperature of the metal is high.

A high-frequency furnace installation consists of a source of high-frequency current, with suitable power factor correction, and a furnace of extreme simplicity of design, but the great disadvantage lies in the difficulty and expense of obtaining the necessary equipment to produce the high-frequency currents. Spark gaps and valves are at present available for small units only; they are not the robust type of machinery desirable for metallurgical works, but they will be gradually replaced or supplemented by ordinary rotating high-frequency generators, as the demand for larger melting units increases. Such machines can now be obtained of simple and substantial construction up to 500 kW capacity, though a high degree of accuracy and workmanship are required in their manufacture, and they are expensive. The frequency required varies according to the size of the furnace and the quality of the metal.

A high-frequency furnace is shown (sectionally) in fig. 1. It consists merely of a container or crucible C placed inside a flat cylindrical coil A. The intermediate space between the coil and the crucible, which generally does not exceed 1 in., is filled with zircon or other insulating material D contained in a silica or mica sleeve B. The crucible or container may be of very thin construction, as it fulfils a different function from an ordinary crucible. If it be ½ in. thick there is a distance of only 1¼ in. between the coil, which is generally water cooled, and the molten metal, which may be heated to over 2,000 deg. C. Thus a greater temperature gradient is obtained than in any other process of melting metals in bulk.

As the heat generated is within the metal itself, the temperature of the crucible is very much lower than that of the metal, and the heat passes from the metal to the crucible, and is not conducted through the crucible walls as in other processes. Consequently reactions between the metal and the crucible walls are reduced to a minimum, and crucibles of material quite inadmissible for melting certain metals by ordinary methods stand well in the furnace. Also, the crucible is supported outside by well-packed ground zircon, and even if a crack occurs there is seldom a loss of metal or any tendency for the crucible to break to pieces. Thus, an ordinary clay crucible, such as is used for gold assays, will make from 10 to 30 heats of nickel-iron alloys containing less than 0.02

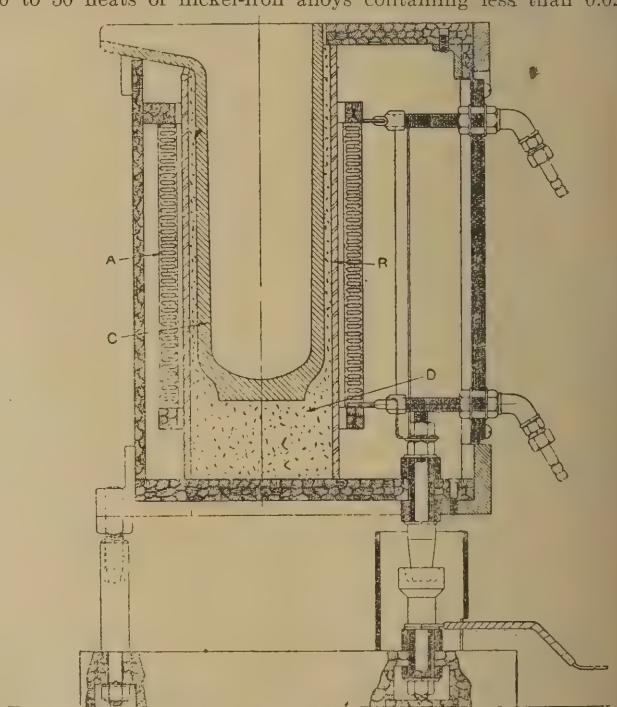


Fig. 1.—Section of High-frequency Crucible Furnace.

per cent. of carbon. This proves that the conditions under which the crucible works are fundamentally different from those of other processes. As the metal container is an ordinary crucible of cylindrical form, there is no necessity to leave metal in the furnace, or to have narrow channels or any of the other features which have rendered the old type of induction furnace uneconomical and obsolescent for the steel trade.

High-frequency furnaces mix the metal intensely, the surface of the molten metal being pronouncedly convex, owing to the violent upward current at the centre of the liquid mass. This is a great advantage for the manufacture of alloys containing metals which do not readily mix, and difficult alloys can be melted with exceptional uniformity. The frequencies used may be termed high or medium, and have varied from 20,000 to 400 periods per second, the lower figures being applicable to the larger furnaces for melting nickel-silver and similar alloys. Furnaces of a capacity of 600 lb. are now work-

ing on certain nickel alloys, and this method of melting is worth consideration by makers of tungsten and cobalt crucible steel, and anyone engaged in the manufacture of alloys of the highest

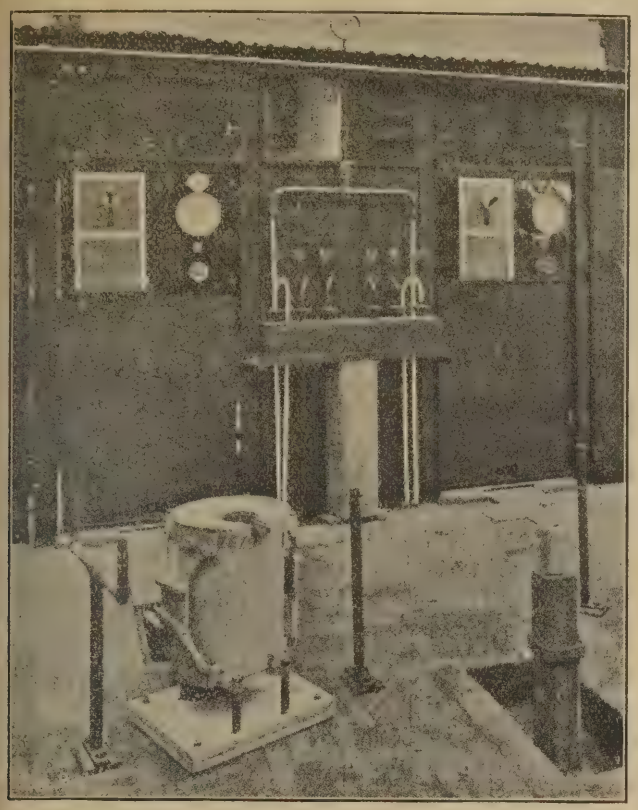


Fig. 2.—High-frequency Crucible Furnace Installation.

quality for electrical work where freedom from carbon is of the utmost importance.

The capital cost of the equipment is at present high, but this may be reduced in the future. The rate of melting is rapid, and the conditions of working are exceptionally clean, accurate, and comfortable for the workmen. The thermal efficiency is high, but the total consumption is in excess of that of good arc furnaces.

High-frequency heating may be found useful in the forging and heat treatment of steel, especially in the case of small objects of irregular shape, as the heating effect is to a great extent independent of the shape of the object submitted to the field. At present the principal application of this method of heating is in the preparation of alloys of nickel and iron with small percentages of other metals, and the lowest possible amount of carbon, which are used for the manufacture of continuously loaded cables. By the use of this metal the speed of signalling on long-distance submarine cables has been raised from a maximum of 300 letters per min. for the old type cable to 1,800 with the continuously loaded cable. This performance was obtained on a cable from the Azores to the United States and has given an entirely new aspect to the economics of submarine cabling, which, coupled with the secrecy and reliability of this form of transmission, ensures extensive demands for a larger production of this remarkable series of alloys.

An installation recently completed in England has by far the largest melting capacity of any high-frequency metallurgical works yet erected. The equipment consists of 42 small converter units, each of 35- to 40-kVA capacity, fitted with furnaces capable of melting 20 lb. of nickel-iron alloys of exceptional purity in 40 to 45 minutes. Two or more converter units may be used on single furnaces of double or treble this capacity. The melting capacity is several tons per day, and a steady and continuous output is being maintained under strictly commercial conditions. As a crucible furnace the equipment illustrated in fig. 2 has many attractive features, and is worth the attention of manufacturers who are interested in the improvement of alloy steels and other metals, especially those which may find wide application in the growing demand for improved alloys in the electrical industry.

The advantages of high-frequency furnaces for research work are very great, owing to the speed with which small heats can be made, either *in vacuo* or in air. In one instance, where an investigation was being made into the properties of a series of alloys with a relatively high melting point, 20 2-lb. heats were made in eight hours. The consequent saving of the investigator's time and the increase in the amount of work he was able to perform were of the utmost importance.

The discovery of the two principal alloys used for cable loading, permalloy and numetal, was made possible by the use of a high-frequency furnace, and further investigations are now being made in several different countries which may result in the discovery of alloys with properties previously unknown.

Electricity in Agriculture.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

(*Abstract of lecture delivered at the* Fabian Summer School.)

As the wealth of any nation is dependent upon the success of its agriculture, it is of great importance to see that the cultivation of crops and the rearing of livestock are put on a sound financial basis. Conditions have changed so much since before the war, that in many respects farming is a new business. The cost of labour is very much higher; taxation is very oppressive; transport in towns is now chiefly mechanical and the horse—which was a big consumer of farm products—has practically disappeared. What has to be effected is to increase the output of each farm per acre and per man. One factor that will very materially assist in this desideratum, is the application of electricity. About a year ago 200 British farmers employed it; to-day there are over 400, and it is to be anticipated that there will be over 800 within another year.

It is not generally appreciated that if the farms of Great Britain were just moderately electrically equipped, they would consume more electrical energy than the total present output of all the generating stations in the country. Here, then, lies an enormous field for the development of electricity supply undertakings.

From the financial point of view, the recent share issues of electric power supply companies have all been over-subscribed. Hence the prospects of a supply to a large section of the farming community seem promising. The load is already there, and the only problem to be solved is how to supply it economically.

One of the great difficulties is that the electrical engineer is not sufficiently acquainted with the practical requirements of the farmer; neither is the farmer enlightened as to the technical stipulations of the electrical engineer, and the implement manufacturer has not yet devoted serious study to the application of electric motors to his machines.

The first and most important use of electricity is for the lighting of the livestock byres and stables; at least half-an-hour per day per man can be saved by the aid of good light. On a dairy farm, the milk that was not accidentally spilled—owing to the existence of good lighting—more than paid for the cost of the light itself. At the present time in Great Britain there are over 50 large poultry farms which employ electric light, while about 90 per cent. of American poultry farms use it; the result is that there is an increase of winter eggs of from 15 to 34 per cent.

There are also possibilities in electric lighting for the market gardener. The author has recently obtained new results of commercial importance. The first was in connection with the transplanting of seedlings, and the second the short-time (one-night) treatment of glass-house plants, to obtain a general and more rapid progress. Ordinarily when seedlings are pricked out, they are apt to fall down and become wilted by the next day; however, when electric light was applied overnight, the seedlings were fresh and vigorous on the next morning—in fact they developed a week's normal growth overnight. With six hours' light each night, daffodils flowered in four days and narcissi in seven days. In other words, the application of electric light had accomplished three or four weeks' growth in four to seven days. The difference in the method of lighting from that which had previously been experimented with was that 1,000-watt ordinary Mazda lamps and large enamelled reflectors were employed, close to the plants, *i.e.*, very intensive illumination.

The next important use of electricity on farms, after lighting, is driving chaffing machines. Taking advantage of the convenience of electric power, many farmers now install cyclone dust extractors. The extraction of dry dust from the chaff is very beneficial to cattle.

The pumping of water is the next important application. The electrical operation of dairy and barn machinery follows as a matter of course, electric ploughing, now quite practical, is developing slowly, but surely.

Electric thrashing, with its 5 per cent. increase in output (due to the steadier running) is the next stage of application of electricity.

There are many ways in which the farmer can expedite work, such as making hay without sunshine and the curing of crops in the rick instead of by stooking on the fields.

Some years ago, in association with the late Mr. W. W.

Hood and Mr. Boyd, the writer assisted in carrying out large-scale experiments to confirm some previous laboratory tests. In 1922, both Mr. Hood and the writer for the first time, took the risk and successfully dealt with full-sized ricks. Mr. Charley Tinker made hay on a large scale in the previous year, but his work was not then known to the others. This work was carried out independently and on slightly different lines.

While the early experiments in artificial hay-making were carried out on a similar basis to that of previous experiments, subsequently changes were made, as the result of modern knowledge of ventilating engineering and scientific procedure, coupled with practical farming experience. This led to the discovery that what was required was cured hay, and not dried grass.

When the matter had been proved a commercial success, first the late Mr. W. W. Hood approached the Ministry of Agriculture and then the writer. Through the enterprise and courtesy of Sir Daniel Hall, the Ministry conducted a number of tests in 1923. Unfortunately the officials in charge did not see fit to follow the instructions of those who had developed the new system, hence the tests were not successful. However, in 1924, after very painstaking and most useful laboratory research during the winter, the technical staff of the Ministry of Agriculture, which had been transferred to the Agricultural Engineering Department of Oxford University, continued the full-scale work. This time they reverted to pre-heating of the air, which had been tried and given up as unnecessary by the earlier experimenters for ordinary hay, though it has advantages for clovers, &c. One of the two ricks thus made proved very successful, even though the method of construction of the rick was not quite correct. Anyhow, the work was sufficient to substantiate the work of what might be termed the modern school of haymaking by artificial methods.

The modern process is essentially of a very simple character and one that any intelligent labourer can carry out once he has been shown how. On the site where the rick is to be built, ducts or covered channels are constructed about ten feet apart, with openings at every ten feet of their length. The rick is built over these ducts in the usual way except that over the openings vertical shafts are constructed that reach about two-thirds up the rick, for the purpose of distributing the air equally. A portable fan is placed at the entrance of the ducts. When the rick is first built, the fan is worked for several hours, to take away the surface moisture. After this preliminary blowing, it is only necessary to blow an hour or so every day for about ten days, when the process is complete. Four years out of five, better hay will be made in this way than by the ordinary method. The whole process is dependent upon ventilating engineering principles.

Corn crops can be treated by the same process, with the further advantageous result that a better milling wheat is produced; a superior malting quality of barley is obtained; and peas can be so cured as to retain their green hue instead of being blanched.

Attention is drawn to the importance of using a special type of motor for agricultural purposes. Long experience on the Continent proved this need, for the habits of the farmers' labourers could not be changed. An agricultural electric motor must stand being left exposed to the weather, artificial manures, dust, uric acid, ammonia, &c. Further it must be simple and foolproof.

Among other problems that the engineer has to solve is the provision of cheaper rural lines; the farmers of South Wales are already setting him an example in this direction.

People talk enviously of the advantage of cheap water-power which falls to the lot of other nations, not realising that the British consumer in larger towns pays far less for his supply than his water-power-provided neighbours. The average price paid by Continental farmers is fourpence per unit for power purposes and eightpence for lighting; but at these prices, it is cheaper than any other source of power or light.

Very little is to be expected in the way of help from any Government. What is rather needed is that legislation should be so modified as to facilitate progress instead of retarding it. As regards finance, electric power supply undertakings can obtain all they require from the public.

Recently the chairman of a large electric power supply company stated that it was not practical politics to consider supplying the farmer, as it would cost at least £300 to tap the power lines. About the same time the writer heard from an Italian engineer, who was sorrowful because he could not see how to reduce the cost of his switchgear, for the same purpose, below fourteen pounds. There is a wide margin between these two figures. The latter is undoubtedly on the low side, but it indicates that a reasonable cost need not be very much more.

It must be borne in mind that in providing the farmer with electricity, the nation is benefited, for the farmer is one of the main sources of national wealth. Hence it is not entirely an unselfish matter to forward the plea for a more complete rural electrification.

Admiralty Electrical Inspectors' Salaries.—An award has just been published by the Civil Service Arbitration Court relating to the salaries of inspectors of various trades in Admiralty establishments. It is decided that the salary scale of inspectors of electricians, telephones and mains (Electrical Engineering Department), shall commence at £150 and rise by annual increments of £10 to a maximum of £220, plus the Civil Service bonus.

Proposed New Australian Tariffs.

THE *Board of Trade Journal*, dated September 10th, contained a full list of the proposed alterations in the Australian import duties. From this list the following information is abstracted. The rates are given as percentages *ad valorem*, except where specially mentioned :—

Item.	Description.	Old Rates. British preferential tariff.	Old Rates. General tariff.	New Rates. British preferential tariff.	New Rates. General tariff.
170 E.	Coal-cutting machines	free	10	free	free
176 E.	Mining machinery ...	27½	40	40	55
178 B.	Cylindrical boilers, 6 ft. and over external dia.; water-tube boilers; boiler furnaces; gas producers	27½	40	27½	40
178 C.	Steam condensers; cylindrical boilers under 6 ft. ext. dia., but not less than 4 ft. 6 in. ...	27½	40	35	55
178 D.	Motive power machinery and appliances, n.e.i. ...	27½	40	45	60
179 B.	Electrical fittings, consisting wholly or partly of metal, *viz.*, switches, fuses, and lightning arresters	27½	40	35	50
179 C.	Regulating, starting, and controlling apparatus for all electrical purposes, including distributing boards and switchboards, n.e.i.	27½	40	35	50
179 D.	Dynamo-electric machines :—				
	(*a*) up to and including 75 kW	27½	40	45	60
	(*b*) n.e.i. ...	27½	40	40	55
	Static transformers and induction coils	27½	40	35	50
	Electric fans ...	27½	40	27½	40
180 D.	Filament lamps for lighting and heating (per lb.) ...	1s.	3s.	free	2s.
180 E.	Wireless receiving sets	not specified		35	55
180 F.	Electrical and gas appliances, n.e.i. ...	27½	40	27½	40
181 A.	Valves for wireless telegraphy and telephony	not specified		free	15
181 AA.	A.c. recording watt-hour meters, each or *ad valorem*, whichever is higher	35	45	{ 10s. / 35	15s. / 45
419 E.	X-ray transformer apparatus (except that designed exclusively for deep therapy)	free	20	27½	40
419 F, G, & H.	Various other X-ray appliances ...	free	20	free	20
380 B.	Household vacuum cleaners	30	40	free	free

"Bull" Motor Curves.—Referring to the characteristic curves of the "Bull" motor published in our issue of July 3rd, a correspondent informs us that as the b.h.p. curve has no indication as to whether it refers to the power developed at full field or otherwise, he worked out a few points from the torque and speed curves given for each case and found that the power curves at full field and with 34 per cent. diversion were exactly the same, showing the efficiencies in each case to be equal. We are informed by Messrs. E. R. & F. Turner, Ltd., that as the result of about seventy accurate tests on the machine from which the curves were taken, and a number of other tests on slightly different machines, it was found that the actual difference in efficiency between full field and diverted field conditions amounted to only about 3 per cent., the full field condition being the most efficient. As the difference was so small, only one efficiency line and one b.h.p. line were shown in the characteristic curves. These represent a mean between the diverted and full field efficiencies. It will be appreciated that there is little value in working one's calculations to fine limits when rolling resistances, due to varying road conditions, can only be predicted approximately.

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

An Improved Coal Meter.

The "Lea Cubi-Meter," illustrated in fig. 1, is a recent production of the LEA RECORDER CO., LTD., 28, Deansgate, Manchester, embodying, it is claimed, the advantages of both the Lea V-notch water recorder and the Lea coal meter. It differs in principle from the Lea recorder in that the velocity of flow is an artificial one, equalling the speed of the conveyor, and is not due to gravity. The machine is driven through a worm gear driving the main axle on which the conveyor by which

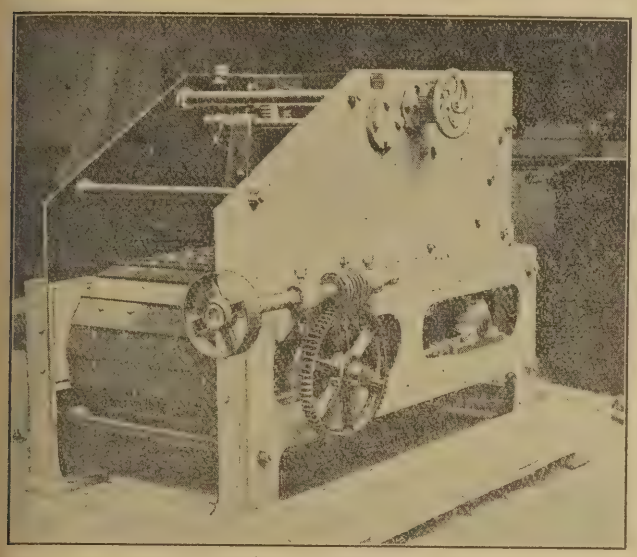


Fig. 1.—The Lea Cubi-Meter.

the coal is carried travels. The "flow" or rate of delivery of the coal is fixed by limiting the depth of the fuel as it passes through the machine. This is done by means of a regulator door which can be raised or lowered. Fig. 2 illustrates the principle of the device. The chief feature of the apparatus is the registering mechanism. A measuring door is hinged in such a way that its lower part rests on the surface of the layer of fuel passing through the machine, the angular position of the door or "flap" being determined by the thickness of the layer. A cam moves with the flap and operates a horizontal rod, varying the position of a counting pinion, attached to the rod. This pinion is geared with a toothed cylinder which

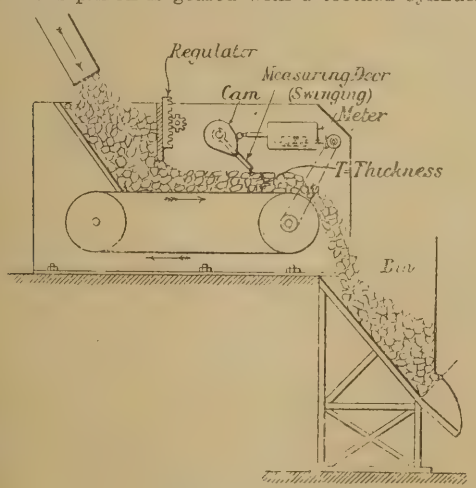


Fig. 2.—Diagram of Arrangements.

is chain-driven from the conveyor shaft, with the speed of which its speed is in proportion. The teeth on the cylinder are reduced spirally towards the "low position" end so that the number of teeth which engage with the counting pinion is proportional to the distance which the pinion has travelled along the cylinder and hence to the thickness of the coal. The number of revolutions made by the pinion is thus in joint proportion to the speed and thickness at which the coal travels through the machine. The counting pinion is, of course, connected with suitable registering mechanism. It is claimed that this method of measurement of coal gives results which are comparable with any of the usual routine measurements adopted.

A New Street Lighting Reflector.

We illustrate herewith a new street lighting reflector, the "Rodalux," which MESSRS. THE BENJAMIN ELECTRIC, LTD., Tariff Road, Tottenham, N.17, have recently put on the market. It is of an unusual "inverted U trough" construction which, it is claimed, ensures a uniform illumination of the roadway for a considerable distance, and by which projected illumination is obtained up and down the road, allowing a much wider spacing between lighting points. It is made of stout-gauge steel, heavily vitreous-enamelled black outside

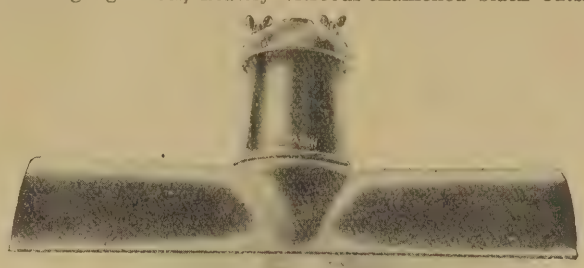


Fig. 3.—The "Rodalux" Reflector.

and white inside. It is equipped with a specially designed porcelain bayonet cap or Edison screw lampholder, supported by a heavy cast-iron weatherproof flange bush. Its dimensions are 1 ft. 9 in. long by 11 in. high.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The Manufacture of Induction Motors.

With reference to Messrs. F. and A. Parkinson's advertisement which appeared in the September 4th issue of the ELECTRICAL REVIEW, wherein they claim that they manufacture 25 per cent. of all a.c. industrial motors manufactured in the United Kingdom, we should be much obliged if they would let us know:—

1. How their estimated output of competitors' factories is arrived at, as we know of no source from which this information could be obtained.
2. What machines do they include under the heading "Industrial Motors"?
3. On what period of time is their estimate based?
4. What is the horse-power of the range of the machines covered by their claim?

As Messrs. Parkinson well know, any manufacturer could, with the greatest of ease, if he were so inclined, make an exactly similar claim to the one they have made, and we feel sure that if they can substantiate their claim they will be only too glad to do so, otherwise we presume we shall hear no further of it.

The Crypto Electrical Co., Ltd.
(J. G. SHAW, *Managing Director.*)

London, *September 14th*, 1925.

The "Davidson" Dust Collector.

In the paper on the Southampton electricity undertaking, read by Mr. W. G. Turner, A.M.I.E.E., before the British Association, and published in abstract in your current issue, reference is made to a "Cyclone" dust collector which is to be fitted to the steel chimney for the boilers shortly to be erected.

The use of the word "Cyclone" in connection with the "Davidson" patent flue-dust collector, which is the apparatus referred to, is really a misnomer, as the Davidson collector is designed upon entirely different lines and bears no resemblance whatever to the ordinary dust collector known as a "Cyclone." The "Davidson" patent flue dust collector in question consists of two distinct parts, *viz.*, first, a separator having perpendicular sides and of volute portion in plan, and secondly, a collector comprising an upper volute portion and a series of truncated cones and cylinders arranged below.

This flue-dust collector is supplied in other types to suit local conditions, space being usually the controlling factor; thus, in some cases the collector alone is applied, while in others a combination of the two forms of apparatus above described is employed.

It is, therefore, quite apparent that there is no similarity between a "Cyclone" and a "Davidson" patent flue-dust collector, which has proved its efficiency by collecting, under actual working conditions, from 30 lb. to 500 lb. of dust per hour, the quantity, of course, depending upon the quality of the fuel used.

Davidson & Co., Ltd.

Belfast, *September 9th*, 1925.

[The term "Cyclone" was used by the author of the paper. —EDS. ELEC. REV.]

Charges for Electricity Supply.

I have read with much interest the replies to my previous letter on the above subject. I am sorry to note that in view of my small consumption, I am considered a nuisance and an unprofitable consumer. I may say that my consumption of gas for the quarter was proportionately small, but the gas department did *not* double the price per B.th.u. on this account.

I note that Mr. Walker states there are several items in connection with the electrical installation, such as meter, mains, &c., which have to be paid for. Does he infer that the gas mains and meter, also the cooker, were presented to the Cor-

poration by a benevolent manufacturer for propaganda purposes?

I thank Mr. Walker for pointing out that if I took the whole of Barton's output, I might get my "juice" at ¾d. per unit, and I might be delighted to act on his advice, and install an electric cooker and radiators if I could afford them, but I fear that by the time these things were paid for, I should be unable to compare electrically and gas-cooked joints of meat, as meatless days would be the order of the day for some time to come, seeing that my means are strictly limited. In any case I prefer a coal fire.

It may interest Mr. Walker to know that I have several friends in the Eccles area who are on a straight "Pay for what you consume" basis at less per unit than Manchester and no "Minimum Charge." Remarkable for a small place like Eccles, isn't it?

May I quote an example of what is happening in Manchester? One of my neighbours was away for some considerable time during the quarter and his consumption was *four* units: the charge for this was ten shillings. Perhaps Mr. Walker will forward this gentleman some "Trylites" so that he can investigate how "juice" could possibly cost 2s. 6d. per unit, or alternatively forward me some advice how to convince this gentleman and countless others who object to paying "summat for nowt" that they are receiving fair treatment.

The "Minimum Charge" and the "Norwich Charge" are far too high for moderate-sized houses such as mine, where more than one lighting point is seldom in use. It is undoubtedly astounding to people who economise in light, to find at the quarter's end that they have just as much to pay as the people across the way who go to bed and inadvertently leave the hall light on all night.

Stung.

Manchester, *September 10th*, 1925.

Choosing and Using an Electric Washer.

I have found your article on "Choosing and Using an Electric Washer" very interesting reading, as I consider electric washers to be one of the important pieces of equipment for a farm house. In fact, as Mr. C. T. Allan stated recently at the first British Electro-Farming Conference at Chester, it is a favourite method of the South Wales Power Company when attempting to secure a farm load, to get hold of the farmer's wife through a washing machine—and the rest follows.

There seems to be a great deal of sales psychology mixed up with the selling of washing machines. There is no getting away from the fact that undoubtedly these are extremely useful, saving much labour and money. However, their use is not learnt without a little enthusiasm. It is a remarkable fact that second-hand washing machines usually fetch as many shillings as they cost in pounds, owing to the lack of salesmanship. Undoubtedly the manufacturers sell just as easily at £40 or so, as at half this figure; so I suppose they fall into the temptation.

On the Continent it is now a rare thing to find a farm house without an electrically-driven washer, and many of these only cost about £10. They are certainly not quite as refined as American machines, but they do their work efficiently. It seems to me that both washing machines and electric cookers still have to be handled efficiently. I think if your correspondent "Wren" were to write his experiences in choosing and using an electric cooker he need only delete "washer" and substitute "cooker," and what he has said would almost do.

If he does investigate electric cookers, he might also look into gas cookers, and see how many different makers would supply him with a modern type known as the "New World" cooker, wherein lies an object lesson for the makers of electric cookers.

R. Borlase Matthews.

East Grinstead, *September 7th*, 1925.

Super-Pressure Electric Cables.

In a book recently published by Mr. Del Mar on "Electric Cables," the subject of "Intersheath" cables is dismissed in four lines, chiefly on the basis of the statements by Clark and Shanklin in their 1919 paper. It may interest your readers to know that I traversed, in the paper which I read in January, 1925, before the J.I.E., the four statements (a, b, c, d) by Clark and Shanklin, and have given a complete answer to each one.

The most serious charge that they made is "high dielectric loss." Surely it is now time that technical engineers, generally, should accept the elaborate tests, extending (off and on) over a year, made on a working size of cable and under working conditions, by one of the foremost cable companies in the world, rather than a conjecture which was probably not based on any tests at all, but merely thrown out by parties (however eminent) who were conducting tests in a rather different direction.

I am not blaming Mr. Del Mar; he could not have seen my paper at the date of writing his book; but I want to call attention to the misrepresentation of facts conveyed—no doubt quite unintentionally—by Messrs. Clark and Shanklin's statements, who, I am sure, would be the first to correct them, on presentation of the facts.

Particulars of my tests were published in *The Electrician* of June 5th, 1925.

A. M. Taylor,
Major, S.O.2.

Erdington, *September 3rd*, 1925.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

6,265. "Electrical heating elements." E. L. Wiegand. August 31st, 1923. (221,180.)

12,000. "Systems of electric ship propulsion." British Thomson-Houston Co., Ltd. May 28th, 1923. (Addition to 147,029.) (216,854.)

12,030. "Apparatus for obtaining substantially steady heating effects from alternating current." W. J. Brown, E. Y. Robinson, B. A. G. Churcher, and Metropolitan-Vickers Electrical Co., Ltd. May 15th, 1924. (238,594.)

12,342. "Coloured electric incandescent lamps for advertising signs and the like." A. H. Brackensey and Franco-British Electrical Co., Ltd. May 20th, 1924. (238,603.)

12,359. "Current limiters for alternating or direct currents." E. Garavini. May 20th, 1924. (238,604.)

12,460. "Crystal rectifiers for wireless reception." A. Compare. May 21st, 1924. (238,610.)

12,490. "Electric ignition systems for twin-cylinder internal-combustion engines." British Thomson-Houston Co., Ltd., and L. Griffiths. May 21st, 1924. (238,611.)

12,572. "Construction of aerial for wireless telegraphy." R. D. Phillips. May 22nd, 1924. (238,617.)

12,732. "Synchronising systems." H. V. Higgitt and Eastern Telegraph Co., Ltd. May 23rd, 1924. (238,622.)

12,820. "Electric relays for disconnecting polyphase apparatus." British Thomson-Houston Co., Ltd. (Compagnie Française pour l'Exploitation des Procédés Thomson-Houston). May 24th, 1924. (Addition to 202,744.) (238,627.)

13,100. "Receivers for high-frequency signals." A. E. L. Scanes and Metropolitan-Vickers Electrical Co., Ltd. May 28th, 1924. 238,632.)

13,373. "Retention of insulation within sparking-plug casings and other devices." British Thomson-Houston Co., Ltd., and H. W. H. Warren. May 31st, 1924. (238,637.)

13,416. "Means for maintaining harmony between the speeds of electric motors." F. B. Holt. May 31st, 1924. (238,638.)

13,497. "Electric time fuses for blasting." W. Eschbach. June 2nd, 1924. (Addition to 210,518.) (238,640.)

13,533. "Clamping device for electric transformer windings." A. H. Railing, W. Widdowson, and A. E. Angold. June 4th, 1924. (238,641.)

13,800. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and W. Saville (Automatic Electric Co. (in part)). June 5th, 1924. (238,644.)

14,037. "Rheostats and operating means therefor." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). June 10th, 1924. (238,647.)

14,095. "Electric water heater." T. H. McQuinn. June 10th, 1924. (238,648.)

14,660. "Wander plugs for use with high-tension batteries and the like." A. H. Hunt. June 21st, 1924. (238,655.)

15,114. "Variable-speed dynamo-electric machines." British Lighting and Ignition Co., Ltd., and J. C. Hutton. June 23rd, 1924. (238,660.)

16,620. "Tuning-coil holders for use in connection with wireless telegraphy and the like." Fuller's United Electric Works, Ltd., and A. P. Welch. July 10th, 1924. (238,669.)

16,703. "Terminal for electric and wireless connections." L. J. Simon. July 11th, 1924. (Cognate applications, 23,470/24 and 25,237/24.) (238,670.)

16,999. "Deviating cams for interrupting electric circuits." British Lighting and Ignition Co., Ltd., and J. C. Hutton. July 15th, 1924. (238,672.)

17,785. "Dynamo-electric machines." T. L. R. Cooper. July 25th, 1924. (238,680.)

17,873. "Arresters for lightning and other heavy electrical discharges." W. C. Butler and R. W. Angel. July 26th, 1924. (238,682.)

21,856. "Electrically-driven apparatus for operating railway signals, train stops, and the like." Siemens Bros. & Co., Ltd., and L. De M. G. Ferreira. September 16th, 1924. (238,716.)

22,861. "Electric lamps for motor vehicles." J. Lucas, Ltd., O. Lucas, and W. H. Egginton. September 27th, 1924. (238,726.)

24,409. "Overhead trolley pulleys for trams and like vehicles." C. Kershaw and R. Russell. October 14th, 1924. (238,733.)

24,421. "Electrically-controlled direction indicator for motor-cars or automobiles and other vehicles." G. P. Deneef and M. J. A. Boisson. October 15th, 1923. (223,570.)

24,508. "Dry batteries." L. A. Levy. October 15th, 1924. (238,735.)

26,541. "Systems of heating feed-water and the like." International General Electric Co., Inc. November 6th, 1923. (224,545.)

29,414. "Crystal detector for wireless reception." W. D. McGowan. December 8th, 1924. (238,757.)

30,610. "Furnaces, and method of operating the same." British Thomson-Houston Co., Ltd. December 20th, 1923. (226,559.)

1925.

1,793. "Manufacture of vessels adapted to be electrically heated." J. Wangler Ges. January 20th, 1925. (Addition to 213,897.) (238,774.)

1,817. "Carriers for electric storage batteries or accumulators." R. F. Winder and A. Harrison. January 21st, 1925. (238,775.)

5,669. "Filament rheostats and the like." Igranic Electric Co., Ltd., and A. H. Curtis. March 2nd, 1925. (Addition to 215,096.) (238,793.)

6,123. "Dynamo-electric machinery." J. H. Holmes and A. T. Robertson. March 6th, 1925. (238,799.)

7,482. "Metal filaments for electric incandescent lamps." General Electric Co., Ltd. September 25th, 1924. (238,810.)

7,580. "Electrical tee connectors." A. B. Dibner. March 31st, 1924. (231,478.)

10,490. "Electrical anchor winch or capstan." Atlas-Werke Akt.-Ges. June 28th, 1924. (236,167.)

11,493. "Device for indicating the correct adjustment of speed of electromotors." C. Lott. March 21st, 1923. (Divided application on 213,275.) (233,360.)

11,588. "Electric truncheon torch." A. McMurray. November 5th, 1924. (238,824.)

18,785. "Apparatus for obtaining substantially steady heating effects from alternating current for heating the cathodes of thermionic valves or for other purposes." W. J. Brown, E. Y. Robinson, B. A. G. Churcher, and Metropolitan-Vickers Electrical Co., Ltd. May 15th, 1924. (Divided application on 12,030/24.) (238,691.)

The

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Electrical Development Propaganda.

AT the present moment when, we presume, the plans of the British Electrical Development Association for intenser operations are in course of preparation, it may be profitable to draw attention to the very big electrical propaganda effort that commenced in the United States in the month of September. It is described by the *Electrical World* as a "nation-wide plan," launched by many electric light and power companies, assisted by the National Electric Light Association, to "carry the central station industry's story to the public." Every month during the coming year consumers of electrical energy will receive a four-page pamphlet explaining certain important features of the industry. "Envelope-stuffers" of approved form will carry messages with every consumer's account and with every electricity supply shareholder's dividend coupons. Down to the middle of August five million of the "envelope-stuffers" had been ordered and 500,000 sets of a series of pamphlets—indeed, under the scheme, 67,000,000 separate messages will be placed in the hands of customers and stockholders during the twelve months ending with August, 1926. We can quite believe that the claim that this is the largest single piece of publicity work ever undertaken by any industry, is correct, and it is safe to agree that it promises to be of inestimable value to the electrical industry in clarifying some questions which are obscure to the public mind, for the closer the relations existing between electrical organisations and the public whom they serve the better it will be for both.

The questions discussed in the American pamphlets and folders are not such as we are in the habit of seeing dealt with in our electricity supply publicity literature. in which are set forth the advantages of electrical service in the home, or particulars of cooking appliances, electric fires, washing machines, &c., or reasons why everybody should make better and more generous use of electricity as an illuminating agent. The kind of information given in this particular propaganda movement may be indicated by a reference to one example entitled "Yes! Grape-fruit is cheap in Florida." The suggestion that one could run down to Florida and get a grape-fruit for nothing is met with the retort: "That's a good idea; the car-fare is only $57.16," the thought

carried home being that while it costs only 20 per cent. of electricity's selling price to manufacture it, it requires 80 per cent. for delivery cost, taxes, interest on investment, and service; another fact driven home at the same time being that, while the average cost of all other commodities has gone up 65 per cent. since 1913, the electric light and power industry has actually lowered the cost of its commodity during the same period; a third thought that emerges is that "it is better for Government to govern and let business be run by business men." One pamphlet bears a title which excites the interest of people who have been led to think on the subject of generation at the pit's mouth: "Why not generate all electricity at the coal-mine?" Another title asks: "Why did 860 municipally-owned plants close down?" and so on. The folders for stockholders are entitled: "What is a Holding Company?"; "What is Super-power?"; "What About Service at Cost?"; and "If All the Streams were Harnessed."

These educational efforts make it plain to the "common people" that, while electricity is a magic thing, "very stimulating to the imaginations of orators and self-appointed friends of the people," "it is the business men who have built up the electrical industry," and they are not "overlooking any bright ideas," but "are alive to every possibility of reducing costs and improving service."

It will be recognised that extensive as the foregoing scheme is, it is only part of the larger educational and general electrical development campaign that has been in progress in the United States, at enormous outlay compared with what is spent here, for some years past. Prognostications respecting the rate of electrical development during the next five or ten years across the Atlantic produce a huge total in additional capital outlay for the electrical industry and in revenue for supply companies and investors. True it is that the field there is much bigger than that in which we operate here, but the leeway to be made up and the great headway that we are justified in anticipating during the same period should together give us a larger rate of advance with advantage to every section of the electrical trade and with benefit to the community. If only the industry, with its 500 or 600 millions of capital invested would take an enterprising plunge suited to its ability and its opportunity, electrical ignorance among millions of dwellers in the British Isles would be dispelled, interest would be aroused, electrical service would rapidly extend, and a continuously progressive and larger return would come far sooner than it is likely to do if we continue to be satisfied with a little activity where much is justified.

Analysing the Domestic Budget.

AFTER analysing the sales of electricity and electrical appliances to wired houses in about 60 representative towns in the United States, *Electrical Merchandising* comes to the conclusion that the American public does not yet take its electrical expenditure very seriously. It was found that electricity for home use accounted for an expenditure of $30 per annum for each wired home, while the expenditure upon appliances was $10.88. To indicate the low plane upon which electricity finds itself, our contemporary goes into further details of domestic expenditure, and finds that each family spends an average of $420 per year upon automobiles and supplies; $236 upon women's clothing; $100 upon tobacco; $60 upon theatres and "movies"; $25 upon "radio"; and a great deal on other non-essentials, while electricity is well at the bottom of the list.

We do not know how the figures are arrived at, but they have made us wonder what a similar analysis of British domestic expenditure would look like. While, no doubt, taxation would figure very largely, we are quite certain that electricity would still be at the bottom—in fact it would only just come into the list. If Americans consider that there is such a wide scope for electrical expansion in their country, what are the conditions in Great Britain?

The analysis makes it apparent that a great deal remains to be done in the way of educating the American public to the benefits of electricity, and it can be taken for granted, if any further indication is needed, that there is still greater room for development in this country.

The Trade Facilities Acts.

THE statements of proceedings under the Trade Facilities Acts, issued by the Treasury, have certain points of interest for our readers, both manufacturing and electricity supply. The interest to electrical manufacturers lies in the big proportion of loans which have been devoted to electrical enterprise and which should give a corresponding stimulus to business. Certainly over, say, £20,000,000 appears to be allocated thus. Then as to the electricity supply industry, one interest may lie in the fact that with the extended provision in the Act of 1925, the Advisory Committee has a balance unallotted of £15,547,064 (according to the figures of the last Treasury statement), so there is still room to entertain further applications. It is perhaps a little surprising that the industry has made so little use of the Acts, seeing that out of the 225 supply companies, the majority of which are small companies, only 14 appear in the lists. The nature of a supply company entails a constant capital expenditure, and probably three-quarters of the companies in the country have to depend on local or individual capital, making the question frequently an anxious one. One would have anticipated, therefore, that from an industry of this kind there would have been almost shoals of applications. One thing, possibly, may have militated against the making use of these guarantees, namely, the fact that the difficulties of capitalisation in the past have sometimes involved companies in complicated finance which precludes their giving a first charge or something equivalent as security as required by the Advisory Committee. Still, in the case of public utility companies, the Advisory Committee may possibly be coaxed into a little elasticity of procedure where the loans are required for sound and remunerative extensions of operation. We see that the North Wales Electric Power Co. has taken up a loan of £1,700,000 to cover its programme of exercising the operating powers of the Joint Electricity Authority constituted for the North Wales and South Cheshire Electricity District. It is for part of a similar programme for the South-West Midlands Electricity District scheme that the Shropshire Power Co. has also received a loan of £700,000. Now that further of these reorganisation schemes are ripening into action it may be that similar assistance will be solicited. Anyhow, the existence of such provision of capital ought to give a fillip to the spirit of enterprise in electricity supply companies, both singly and co-operatively.

Electrical Trade Abuses.

A "MASS MEETING" of Manchester district electrical contractors, manufacturers and wholesalers has been summoned for 2 p.m. on Monday next at the Rooms of the Manchester, Salford and District Building Trades Employers' Association, 10, South Parade (St. Mary's Parsonage), Manchester.

The object of the meeting is further to consider a report which has been prepared by the sub-committee and the main committee after a long series of meetings held to inquire into certain well-known abuses in the trade—particularly in their local application—and if possible to bring about better conditions of trading generally. The first meeting of representatives of manufacturers, wholesalers and contractors took place a year ago. It was very well attended, and whilst recognising that the three sections of the trade had their own organisations and that a national policy was preferable to a parochial one, it was felt that if local representatives of the three sections of the trade could meet together, a better and more harmonious condition of things might be brought about, and that suggestions

emanating from such an important section of the industry as was contained in the Manchester and district area would be of more than local benefit. A committee consisting of six representatives of each of the three sections was appointed, but eventually the matter was referred to a sub-committee of six gentlemen, and it is the report of these six that will come under consideration at Monday's mass meeting.

The Engineering Industry and Over-Capitalisation.

At the recent meetings of the Trade Union Congress references were made to the subject of over-capitalisation in industry. In this connection it is useful to recall that early in the present year this matter was dealt with in a special Memorandum by Mr. D. A. Bremner, Director of the British Engineers' Association, submitted to the Balfour Committee on Trade and Industry. This statement was briefly alluded to in our issue of April 17th, 1925 (p. 614), but those who are interested in the recent discussions would do well to study the particulars set forth in the B.E.A. summary of its investigation where watered capital, over-capitalisation, and bonus share distributions came under discussion. An analysis was given showing the relation of these financial operations to some 31 companies connected with the engineering trades, and the result of the investigation was to show that the engineering industry was exceptionally free from watered capital and that the chief cause of over-capitalisation had been the slump in capital values consequent upon the fall in price levels since the post-Armistice boom. This cause, it was held, had probably had more than an average incidence on the British engineering and metal industries. The Memorandum added that there were no grounds for attributing the state of the engineering industry to unsound financial policy; the chief causes of the depression were held to be our high costs of production and distribution and the under-consumption of our export markets.

The Austrian Electrical Industry.

It is stated that, apart from the orders given in connection with the electrification of the federal railways and the construction of hydro-electric works, the situation of the Austrian heavy electrical engineering industry in general is not favourable. In the lead cable branch some revival has taken place, as the postal authorities have placed orders for one-half of the telephone cables which are required for the line between Vienna and Passau, the first long-distance line in Austria, and one which will connect with the German network at Passau. Business in insulated conductors and windings is reported flat, and the wireless apparatus branch is also depressed, although a revival is expected in the near future. The other branches of the electrical industry likewise are suffering from the general economic crisis. The treaty of commerce with Jugo-Slavia has been the means of effecting some reductions in the Customs tariff, although the duties are still higher than before the introduction of the new tariff. Business with Poland labours under the difficulty of the depreciation of the zloty, while the absence of a treaty of commerce with Hungary has a disturbing effect on exports as the autonomous Hungarian tariff almost completely prevents the importation of electrical products into that country.

Public Lighting.

The Institution of Public Lighting Engineers held a very successful conference at Leeds last week—the second annual meeting—and may be regarded as fairly launched on its career of usefulness. Like the Illuminating Engineering Society, it brings electrical and gas engineers together for the discussion of their common objects and in friendly rivalry; and whilst we do not regard with favour the multiplication of specialist societies whose functions can be efficiently performed under the ægis of existing organisations, the test of survival cannot be gainsaid—if a new society is not needed, it will perish of inanition. It would appear, therefore, that the Institution fills a want.

That the subject with which it deals is very much alive may be inferred from the fact that during the last year or two great improvements have been effected in street lighting apparatus, and the author of one of the papers remarked that since it was written progress had been made which already necessitated notable modifications in his conclusions. The new president, Mr. C. S. Shapley, in his inaugural address, observed that he had been disappointed with the results of "directional beam lighting" in one of the main thoroughfares of Leeds, and that it was sometimes advantageous in street lighting to sacrifice illumination for effect; moreover, he thought the horizontal illumination test did not give a true measure of the available illumination. There is a great deal more in these remarks than might appear at first sight. When one is dealing with purely physical problems the teachings of science can be applied with confidence; for instance, the energy required to maintain an electric lamp at normal incandescence for a known period can be predetermined with a high degree of accuracy. But the moment we go from physics to physiology precision ceases to have a meaning. The main purpose of street lighting is to enable the human eye to function after sunset, and whilst the degree of illumination produced can be defined in various ways, and measured in accordance with those definitions, the final criterion not of its efficiency but of its efficacy must necessarily be the effect produced upon the human organism, which is incapable of measurement. As an example of the inadequacy of ordinary scientific methods in such cases we may cite the experience of a speaker at the conference, who said that at a well-lighted and important crossing a policeman in white clothing was nearly knocked down by motor-cars on several occasions; it was found that he was safer in his blue uniform. Evidently there is a great deal yet to be learnt about public lighting.

The Development of Electricity Supply.

Opening an extension of the Keighley electricity works last Saturday, Mr. Philip Snowden once more expressed his views on the subject of electricity supply. We are sorry to learn that he thought the industry was still in its infancy—when will that pernicious phrase be dropped?—but we may forgive him the platitude in view of his robust and well-grounded faith in its triumphant future. The age of steam, he said, had left us a legacy of social problems; he looked to electricity to spread our population over the country, with immense benefit to the community. He rightly attributed the delay in electrical development mainly to the parochial policy followed in the past, and advocated legislation "on an ambitious scale," supplemented by State financial aid.

As a general rule, it is pretty safe to say that any remedy proposed by a politician for a social or industrial disorder is more likely to be one of the many wrong cures than the right one. Here we have Mr. Snowden recommending a larger dose of the same kind of medicine that stunted the growth of electricity supply when it really was in its cradle—legislation—and sugaring the pill with "a large expenditure of public money," another favourite nostrum of the professional politician. There are many members of the electrical industry who believe that its chief need is to be free from interference and to be permitted to develop on its own sound lines; that the only legislation that is likely to be of benefit is the repeal of the past legislative errors, but, unfortunately, the mischief that has been done cannot so easily be undone. If legislation there must be, let it be directed to removing the obstacles that have been built up, and smoothing the path of development. Electricity is no hot-house plant needing artificial coddling; neither is it the panacea for all social evils that it is represented to be by Mr. Snowden and other politicians. We are with him in the end to be attained, but we doubt the soundness of the means by which he would get there—*timeo Danaos*. . . .

High-Power Mercury Arc Rectifiers.

The Automatic Control of Sub-station Plant.

By R. L. MORRISON, A.M.I.E.E.

Automatic control, though still in its infancy, has made considerable strides during recent years, and to-day we find that a large proportion of the control of machinery installed in factories, workshops, &c., is more or less automatic. It is found that properly designed automatic apparatus with little supervision is not only more reliable in its functioning than hand control, but also is freer from breakdown and therefore more dependable.

A very large number of the low-pressure distribution systems at present in being utilise direct current which is supplied through the medium of rotating converters or mercury arc rectifiers. In the case of traction systems it is now generally conceded that this form of supply is the most suitable. Semi and fully automatic control of such converting plant has been very highly developed, the precise form of control being designed to suit local requirements. The more usual forms at present in use are:—

(*a*) Control by time switch.

(*b*) Control by predetermined line conditions, such as maximum and minimum pressure limits.

(*c*) Push-button control from a central point, which can be extended by the addition of signalling back arrangements to enable the control engineer to follow the sequence of operations.

By the use of a suitable selector switch and the provision of the necessary relays, it is possible to combine all the above methods of control in the one plant, or, on the other hand, to include any special requirements that may be desired to suit local circumstances. From this it will be understood that the provision of automatic features is to a large extent flexible, but naturally the precise requirements must be known when the design of such plant is undertaken.

In point of simplicity the automatic high-power mercury arc rectifier is unapproached by any other form of converter. The number of relays employed with the automatic rectifier is very considerably less than, for instance, with the automatic rotary converter, and those that are used are of the simplest possible character and have been tried out for a long period of years under the most exacting conditions. It is not proposed here to give a detailed description of the mercury arc rectifier and its functioning—a good deal of information has already been published in the past, and in particular reference should be made to the Electrical Review, February 18th and 25th, 1921, and March 10th, 17th and 24th, 1922; also *Engineering*, October 19th and 26th, 1923. It is sufficient to indicate that the rectifier is a converter for statically transforming alternating into direct current, and as such presents many advantages when compared with the more usual systems employing rotating machinery.

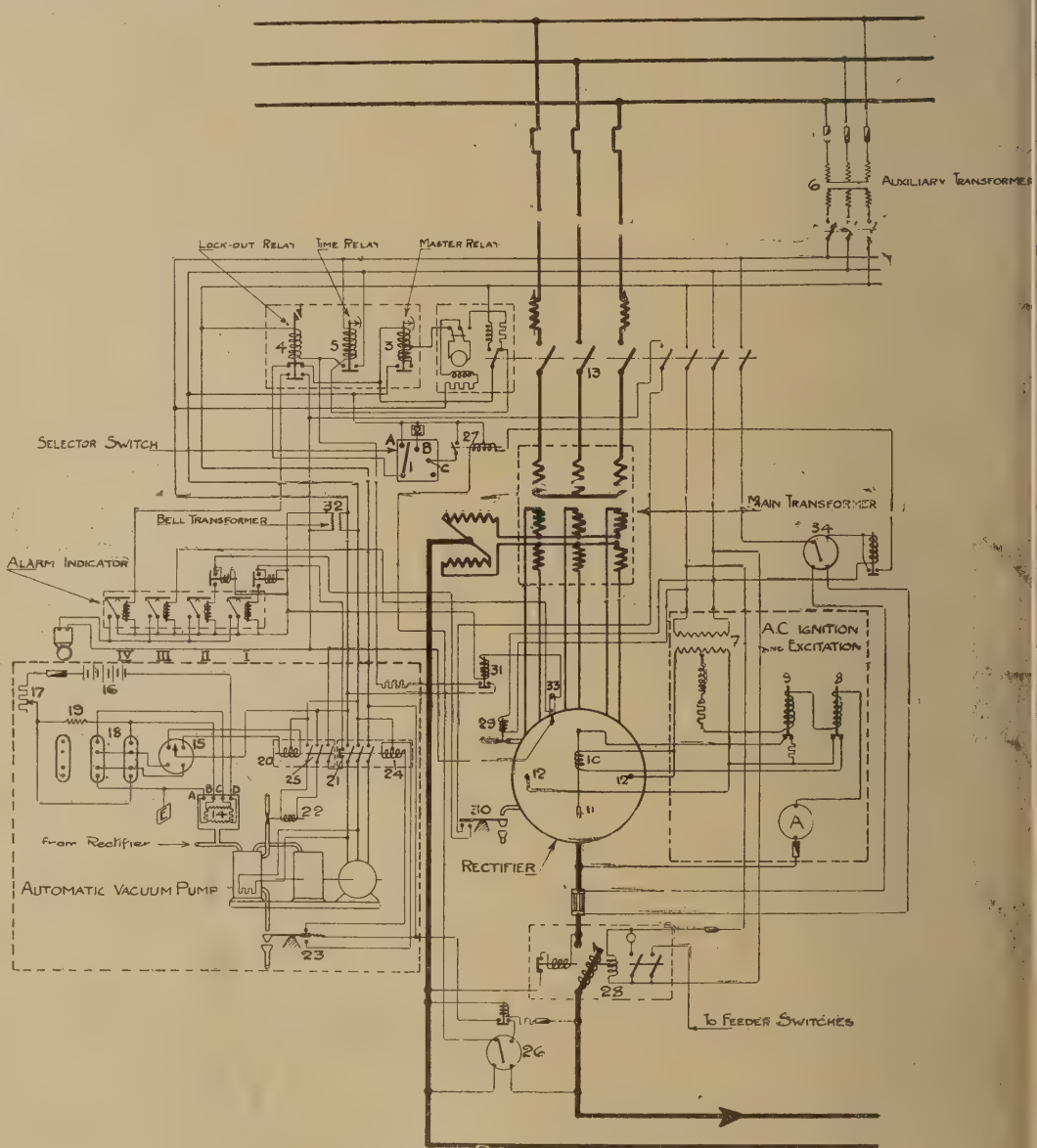


Fig. 1.—Diagram of Connections.

Rectifier equipment consists essentially of three parts:—

(1) A three/six-phase transformer of special construction connected on the primary side to the incoming h.p. supply and delivering its secondary six-phase current to

(2) the mercury arc rectifier, where the conversion takes place due to the valve action of the mercury arc when operating in a vacuum. The six-phase current received therefore at its anodes is delivered at the cathode in the form of a unidirectional current.

(3) The vacuum-pump set which maintains the degree of vacuum necessary to the satisfactory operation of the plant.

Methods of Operation.

Reference has already been made to the different methods of operation that can be employed. All equipments may be considered to be fully automatic in the sense that every relay necessary for the operations of starting up and shutting down in all their stages is provided, and any special alternative or further methods of control that may be desired must be considered as additional to the automatic equipment in its simplest form.

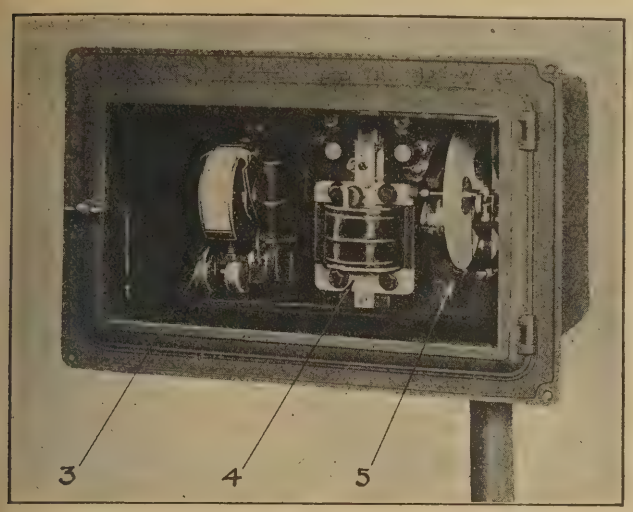


Fig. 2.—Main Relays.

Local conditions generally govern the particular method of control, and the diagram illustrated in fig. 1 shows three alternative forms. A selector switch 1 provides for direct control at sub-station (A), as a function of time (B), and as a function of line pressure and load (C).

The number of relays employed can be increased or decreased according to the degree of control desired. The diagram shown provides an average degree of control without unduly complicating the arrangement, but can be simplified if only one of the above methods is required.

Principal Relays.

The three main relays are embodied in one case, fig. 2, and consist of a master relay, 3, a lock-out relay, 4, and a time relay, 5.

The master relay is a slightly modified form of the well-known Brown, Boveri H-type time-limit overload relay, and controls the motor mechanism of the main h.p. switch. The lock-out relay is of the simple solenoid pattern which permanently shuts down the plant in the event of a continuance of abnormal circumstances, such as a permanent short circuit on the line. The time relay is also a well-known Brown, Boveri type, and operates in conjunction with the lock-out relay, the circuit of which it eventually completes. It is capable of adjustment over a wide range in order that the plant may trip out several times before being permanently locked out.

The few remaining relays are of extremely simple construction, and perform such minor duties that they need not be specially described.

The master relay has a time adjustment, and can be set to prevent the plant being unnecessarily put into service on the occurrence of momentary overloads on the system. On the other hand, where very rapid starting would be an advantage, the relay can be set accordingly and the plant be in service within a very few seconds.

Permanent Automatic Features.

There are two accessory portions of an automatically controlled rectifier equipment which can be considered apart from the rest, namely:—

(*a*) A.c. ignition and excitation which are permanently automatic irrespective of whether the rest of the plant is automatic or not, and

(*b*) The vacuum pump set which is constantly under pressure from the auxiliary transformer 6, and is therefore in a position to operate at any time, thereby maintaining in the rectifier the degree of vacuum necessary. This ensures the plant always being ready to be put on load at a moment's notice.

A.C. Ignition and Excitation.

Prior to the introduction of a.c. ignition the operation of striking the arc in the rectifier was performed with direct current supplied by a separate $\frac{1}{2}$-kW converter. This introduced complications and was expensive, so that the new method of ignition is not only simpler but less costly. The operation of the circuit is as follows:—

When the main h.p. switch 13 closes, the $\frac{1}{2}$-kVA excitation transformer 7 is switched in at the same time. This energises the coil 10 which pulls down the ignition anode 11. With the first positive half-wave or a following one of the same polarity, the arc is struck, and

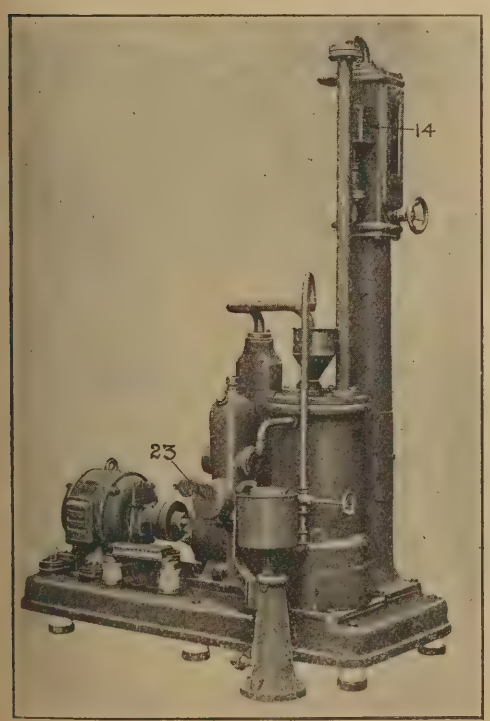


Fig. 3.—Vacuum Pump Set.

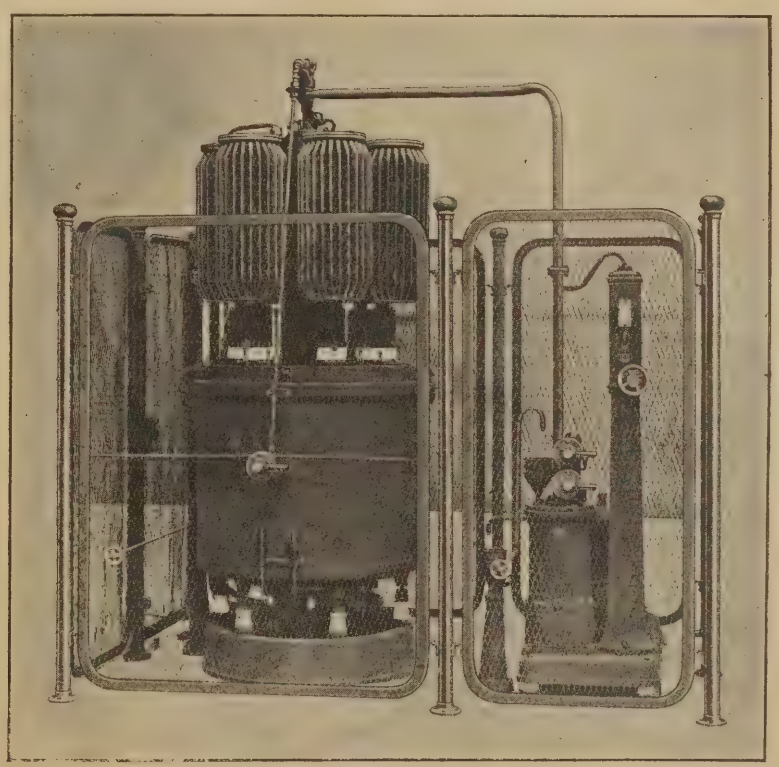


Fig. 4.—High Power Rectifier with Vacuum Pump and Screening.

relay 8 breaks its contacts and thereby de-energises coil 10. As there is pressure across the two excitation anodes 12, an arc is now started between these points and the cathode, causing relay 9 to function and the ignition circuit to be opened. The rectifier is now ready to be put on load.

Vacuum Pump Set.

The modified type of McLeod mercury gauge so well known in connection with these plants has been superseded by a direct-reading hot-wire vacuum gauge. The working principle is based upon the fact that the thermal conductivity of a gas depends upon the gas pressure.

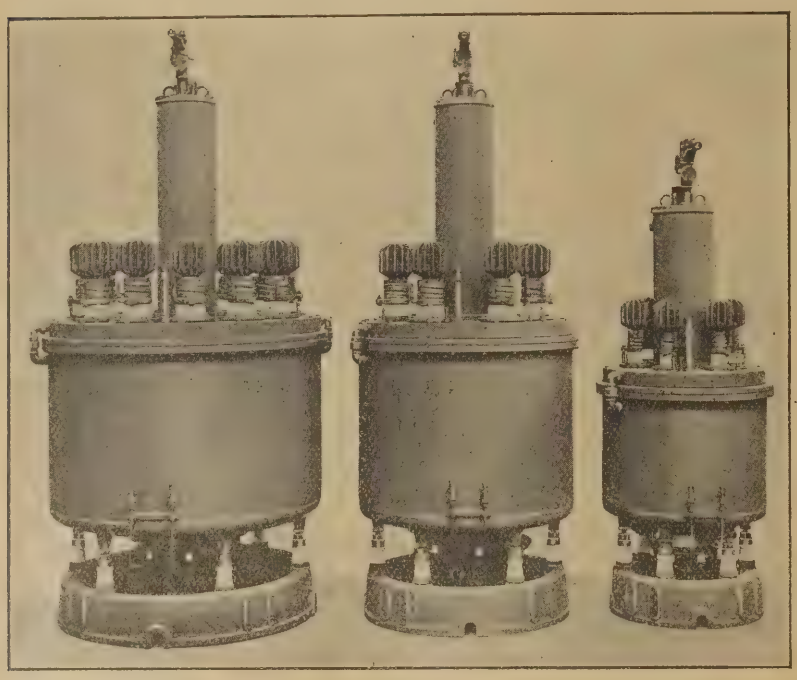


Fig. 5.—High-Pressure Rectifiers.

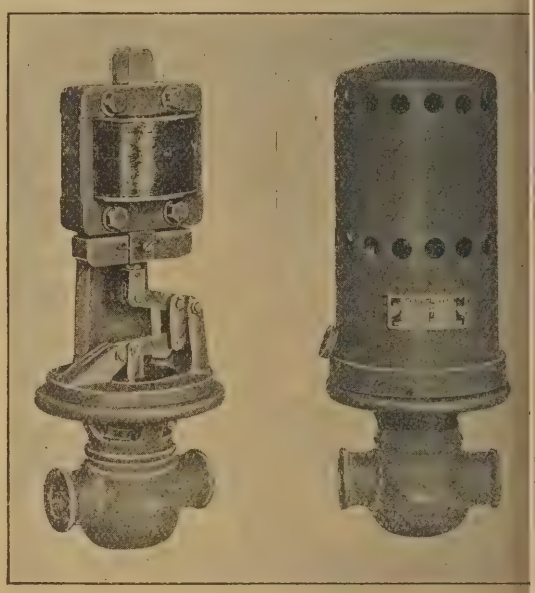


Fig. 6.—Electrically Operated Water Valve.

At the very low working pressures customary with rectifiers, the thermal conductivity is directly proportional to the gas pressure. The gauge 14 consists of four resistances connected as a Wheatstone bridge, two, namely, A D and B C, being in the vacuum, and two, A B and C D, being exposed to the atmosphere, the object of the latter being to compensate for any influence the external temperature may have on the accuracy of the readings. The resistances are electrically heated by means of a small battery 16, the current being adjusted by the rheostat 17 to 152 milliamperes. The branches A D and B C are heated in proportion to the vacuum, their ohmic resistance varying to the same extent, thus altering the potential difference between the points A and C, which difference is recorded on the voltmeter 15. To adjust for the correct current passing through the bridge, the plug is put into the right-hand contacts 18, which measures the drop across the shunt 19, in parallel with points B and D. The plug is then put into the middle set of contacts to record the potential difference across A and C, which is a measure of the vacuum in the rectifier. Through the medium of adjustable contacts on the voltmeter and the split coil 20, the switch 25 opens or closes the circuit of the water valve 22, thus controlling the cooling water supply to the stationary section of the pump. At the same time the tipping switch 23 operates switch 21 through split coil 24, and so connects or disconnects the pump motor. The complete vacuum pump set is shown in fig. 3.

The Operation of an Automatic Rectifier Equipment.

A high-power rectifier with vacuum pump set similar to that referred to in the diagram is shown in fig. 4. The rating of such a unit would depend upon the d.c. working pressure. Roughly, it would vary between 315 and 730 kW, the corresponding pressures being 300 to 750 volts. There are three further types manufactured, fig. 5, the ratings varying between 150 and 2,000 kW at pressures up to 1,800 volts. For higher d.c. pressures up to 6,000 volts the last three types are used, the current ratings in such circumstances being somewhat reduced. These outputs can, of course, be doubled by connecting two rectifiers to a single transformer of double the output.

As has already been explained, in the diagram three alternative methods of control are shown depending upon the position of the selector switch 1. The more usual is for the control to be dependent upon the line pressure either outside the sub-station itself or at some more remote point in the system. The following sequence of operations will therefore be based upon this assumption, and the position of the selector switch will therefore be "C." We will assume that the plant has been shut down; as the load on the network builds up, the needle of the contact voltmeter 26 connected across the d.c. supply closes the circuit of the left-hand coil of the small auxiliary switch 27. The master relay 3, now energised, bridges its heavy current contacts, thus running up the motor control for the h.p. switch 13, which puts pressure on the main transformer. It will be seen that the auxiliary switch for the exciting transformer 7 closes at the same time as the main switch—this ignites the arc and puts the excitation into operation, as has already been described. The rectifier is now under pressure on the d.c. side, and the circuit breaker 28 puts the plant on load through the operating coil connected across the d.c. supply. By coupling a small auxiliary

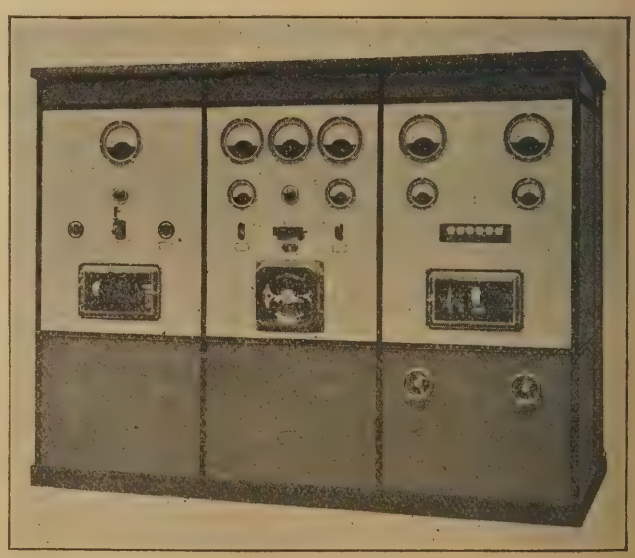


Fig. 7.—D.C. Switchboard for Automatically Controlled Rectifiers.

switch to the circuit breaker 28, the feeders can without difficulty be electrically operated.

To dissipate the heat generated in the rectifier, a small quantity of water is passed through the jacketing surrounding it. The flow of this water is controlled by the electrically-operated valve 29 shown in fig. 6, which opens when the plant is put under pressure on the a.c. side. In the event of the water supply failing when the plant is under load, the tipping switch 30 closes its contacts, drops the indicator II of the alarm device, and sets the bell ringing. Of course, the same operations would take place should the quantity of water be insufficient for the load being dealt with. The auxiliary supply for the alarm circuits is provided by the 8-V bell transformer 32. Should the water remain off for an appreciable time, the temperature of that remaining in the jacketing will rise until contact is made on the first point of the thermometer 33, which drops the indicator III. If the same conditions continue, the upper temperature limit is finally reached and contact made on the second point of the thermometer, thereby shutting the whole plant down through the medium of relay 31 which operates the lock-out relay 4. Indicator IV then drops, showing that the plant is permanently off load and cannot be re-started until the lock-out relay is re-set, which would not be possible until the water supply had been resumed and the temperature in the jacketing reduced below the maximum.

From what has already been said, it will be seen that the whole of the operations involved in the starting and subsequent running of automatic high-power rectifier equipment are exceremely simple, and not in any way involved. The same simplicity is apparent when shutting down, the operation for the method under consideration being performed through the medium of the contact ammeter 34, which cuts the plant out on predetermined minimum conditions being reached.

In the case of large sub-stations requiring more than one rectifier equipment, the automatic features are no more complicated than those described. The various sets are in such circumstances so arranged that as the load increases beyond the capacity of the units on load, others are brought into service and *vice versa* shut down as the load again decreases. The functioning of the relays can be delayed to prevent switching-in where the load variations are only of a temporary character, such as may be expected on traction systems.

General.

The practice of centralising the control of automatic sub-stations is finding favour in certain quarters at the present time. Where the units consist of rotary or motor converters, signalling-back arrangements are provided to enable the engineer in charge to see at a glance that the various sections of the automatic apparatus are functioning correctly. This is mainly due to the multitude and complication of such apparatus, and also to the difficulties inherent to the automatic starting up of converters of that class. On the other hand, it can be very definitely stated that no such difficulties arise with the automatic high-power rectifier, and consequently signalling back to the same extent is unnecessary—in fact, the only indication that might be considered essential would be the load on the sub-station. For control from a central point the selector switch would be on contact "A," with pilot wire connection to the central point.

The automatic features are usually incorporated in neatly designed panels similar to those shown on fig. 7. In this particular case the equipment comprises, in addition, an automatically operated induction regulator for pressure control. The voltage regulator itself seen on the centre panel is of the Brown, Boveri pattern. Immediately above it are the panel mounted parts of the thermal vacuum gauge.

Though the present automatic features are of a simple character, it is likely that in the near future further developments will take place tending to greater simplification, and in that case the details will be published in due course.

Experience has amply demonstrated that the chief sphere of utility of the high-power rectifier is undoubtedly in the direction of conversion for traction and other similar fluctuating load conditions. To date, the capacity of high-power rectifiers installed or on order is well over 200,000 kW, of which fully 80 per cent. is for traction or kindred loads. This is accounted for by the fact that heavy fluctuations are handled just as easily as steady loads, and also that d.c. pressures up to 6,000 V can be obtained in single units. A typical chart of an average day's load on the Turin-Lanzo-Ceres Railway in Northern Italy is shown in fig. 8. This railway is served by an 800-kW power rectifier operating at 4,000 V d.c. The success obtained with the sixteen 1,200-kW 1,500-V equipments on the Midi Railway of France is too well known to need further comment. Furthermore, in various parts of the world several 1,500-V plants are in completely satisfactory operation, while recently the Dutch railway authorities, after careful investigation, decided to equip their sub-stations on the new electrified line between Amsterdam and Rotterdam with high-power rectifiers. Considerable progress has also been made in the United States of America, several units already being in operation, and others in course of construction.

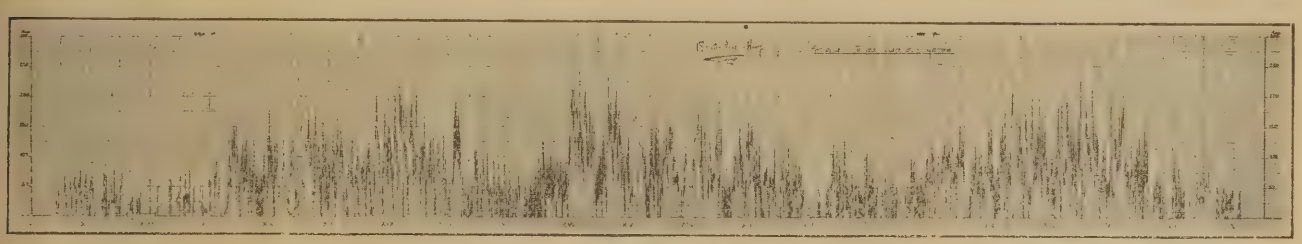


Fig. 8.—Load Chart on Railway Operating at 4,000 Volts D.C.

Reliability and low maintenance charges are outstanding features of the modern high-power rectifier, especially when used for loads similar to those mainly referred to above. In addition, there is the high efficiency obtained with this class of plant especially at the higher d.c. pressures of 1,500 V and upwards. Due to the peculiar characteristic of the rectifier, the overall efficiency remains practically constant from full to quarter load; while the advantage at full load might not be considerable, at the lower loads it is very marked, and as the average load under traction conditions is usually something between a quarter and three-quarters load, a very material advantage is gained by the employment of rectifiers.

The future of high-pressure d.c. railway electrification will be decided largely on the question of satisfactory conversion, and it is the considered opinion of many intimately acquainted with the high-power rectifier that such decisions will depend very much upon its capacity for handling such conditions.

The author desires to thank Messrs. Brown, Boveri and Co. and his firm, Messrs. Power-Rectifiers, Ltd., for the facilities given and information placed at his disposal upon which this article has been based.

Water-Power Education in Switzerland.—Under the ægis of a number of Swiss technical and scientific bodies, and with the financial support of various cantons, arrangements are in hand for the establishment of a water-power utilisation experimental department at the Federal Technical High School of Zurich.

Electricity Supply in Nottingham and District.

The New North Wilford Power Station.

(*Concluded from page* 463.)

Only one alternator is earthed at one time, and the opening of the main oil switch of that machine automatically breaks the earth connection. A red lamp is mounted on the control panel of each alternator, and serves as an indication to the attendant as to which alternator is earthed. Should the earth connection be broken by the opening of the alternator switch, the attendant can earth any other running alternator by closing a control switch. Closing the earthing control switch of any standing alternator, or of one not switched on to the bus-bars, cannot earth that machine. Balanced protection is used on each alternator circuit, with compensated pilot wire protection on each feeder circuit. Excess pressure dischargers have been provided for each section of the switchgear. The extra-high-pressure auxiliary switchgear is built up in steel cubicles on the floor of the auxiliary plant bay. It controls the high-pressure side of the station transformers, and the switches are operated by hand. It is fed by two feeders, through special reactors, from one section of the main switchgear. Each turbo-generator is equipped with a separate synchroscope, which can be put in parallel with the synchronising instrument in the control room by means of a switch on the control panel for the particular machine in question. This is done when a machine is "run up" for paralleling, and the driver himself regulates the set into synchronism from the machine stop valve. The control of the machine governor is arranged from the control room. A system of signal telegraphs from the control room to the machines is installed, and also a load indicator to the boiler house; this is operated by hand to signal by illuminated signs the load on the station, and whether it is rising or falling.

The whole of the steam pipes are of steel, with steel flanges riveted on. They are laid with a continuous fall from the boiler stop valves to large separators at each turbine in the basement. The separators are drained by duplicate float traps, and the flow of the steam and of any condensed water is always in the same direction, up to these points. The atmospheric exhaust branches of the main turbines connect, through automatic valves, to a large steel exhaust tank in the basement of the feed pump annexe. This tank is drained, and a 30-in. atmospheric pipe is carried up above the roof of the annexe.

The bearings of the various turbines are lubricated, under pressure, by gear-driven pumps on each machine. The oil is pumped from settling tanks in the basement, and is returned after passing through duplicate oil coolers. The cooling water is taken from the main circulating system. New oil is brought to the station by railway, and is pumped, through filters, into a common oil storage tank, erected in a corner of the workshop building. The clean oil is pumped from the storage tank into the various turbine tanks, through a pipe line, so that no oil cans or barrels have to be carried into the turbine room.

Oil may be drawn off from any turbine tank, and be pumped up to a dirty-oil tank, erected above the filters. Thence it is passed through the filters into the clean-oil storage tank, where it is ready for filling or replenishing the oil supply of any turbine.

A workshop, 100 ft. long by 60 ft. wide, through which the railway track passes, is situated adjacent to the boiler house. A bay, 24 ft. wide, has been divided off from the workshop by an expanded metal partition, to form the main store-room of the station. Above the battery room a chemical laboratory has been equipped with all the apparatus necessary for coal, ash, oil, water, and other analyses and tests.

Offices, mess rooms, lavatories, bath rooms, &c., equipped with electric heating and cooking apparatus, have been provided for the station staff.

The foundation of the buildings has been constructed as a concrete raft, with concrete retaining walls. The basements of the turbine room and boiler house form a waterproof tank, up to a level above that of the highest recorded flood level. The building is largely a steel-framed structure; the walls are of brick with Derbyshire stone dressings, and the floors are of reinforced concrete. The elevations have been designed of as simple a character as possible, consistent with the size and use of the building. Fig. 16 shows a sectional elevation of the station, and fig. 17 shows the general lay-out of the plant, &c.

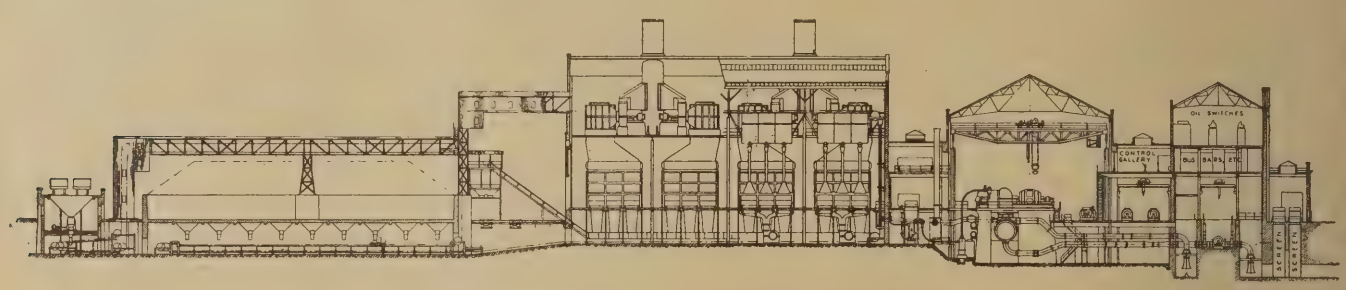


Fig. 16.—North Wilford Power Station: Sectional Elevation.

The roof of the oil-switch house is of fireproof construction. The other roofs are boarded and slated. Steel window frames are used throughout.

The interior of the turbine room is lined with glazed brick, up to a level of about 10 ft. above the floor line. Above the glazed brick lining, the walls have been treated with "Walpamur."

Foreseeing the rapid growth of the demand which will certainly arise, the Corporation has already authorised an extension of the station, by the addition of one 20,000-kW turbo-alternator, &c. This extension has been approved by the East Midlands Electricity Board, and confirmed by the Electricity Commissioners. The preliminary work is in hand, and installation will proceed immediately.

The transmission system has been laid and the sub-stations have been designed and equipped by Mr. H. Talbot, M.I.E.E., city electrical engineer. Energy is transmitted from the North Wilford power station at 11,000 V by underground cables to the Talbot Street and St. Ann's Well Road stations (to be used in the future as sub-stations) and to new sub-stations. Ten 0.2-sq. in., 3-core feeder cables have been laid from the power station to sub-stations at Wilford, Ruddington, Loughborough Road, Edwalton, The Park, Pierrepont Road, Holme Pierrepont, Radcliffe, Colwick, Carlton, City Asylum, Woodthorpe, Arnold, Radford, the University, Bullwell and Hucknall. A large proportion of the centre of the city is supplied with direct current, rotary converters being used for this purpose. Special

coupling transformers are erected at Talbot Street and St. Ann's Well Road to connect the 11,000-V supply from North Wilford to the 6,600-V system which had previously been supplied from the alternating-current plant at St. Ann's Well Road and the temporary power station. The whole of the outer portion of the area is and will be supplied with low-pressure, 3-phase, alternating current from a number of local sub-stations. Those which were originally fed at 6,600 volts will continue to be so fed, *via* Talbot Street and St. Ann's Well Road. Future sub-stations will be fed from North Wilford at 11,000 volts. While the North Wilford power station has been erected primarily for supplying

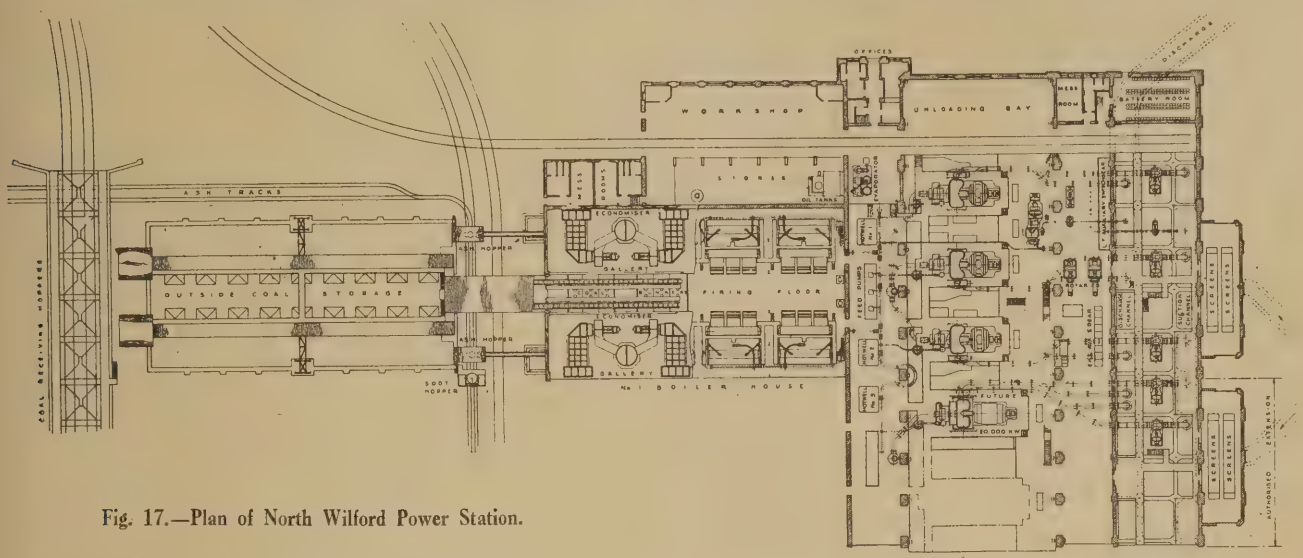


Fig. 17.—Plan of North Wilford Power Station.

the distribution area of the Nottingham Corporation, it has been designed so that it may be extended to deal with a working load of 200,000 kW should the necessity arise. The natural features of the site are such that the highest economy in generation will be possible, while its position, almost at the geographical centre of the East Midlands Electricity District, marks it as being the future source of the supply for that district, when the economical and physical limits of the existing power stations have been reached. Fig. 18 is a map of the area; the circles described about the station are of 5 miles increasing radii. The total area of supply is about 47 square miles.

The following is a brief *résumé* of the circumstances leading up to the erection of the new power station :—

The Corporation had been aware for a long time that its existing generating plant was out of date and uneconomical, and that the Talbot Street and St. Ann's Well Road sites were unsuitable for modern requirements. The question of the early provision of an up-to-date station was being fully considered in 1914, but the advent of the Great War effectively postponed for the time being all possibility of the provision of further generating facilities.

In 1918, upon the issue of the report of the Coal Conservation Committee of the Ministry of Reconstruction and the report of the Board of Trade Committee on Electricity Supply, the local authorities of Burton-on-Trent, Derby, Ilkeston, Leicester, Long Eaton, Loughborough, Mansfield, Newark, and Nottingham, on the invitation of the then chairman of the Electricity Committee of Nottingham (Mr. Councillor Swain) met in conference, and as a result of that meeting associated themselves together to consider the whole question.

Proposals were formulated for the reorganisation of electricity supply in the district, and in July, 1920, the Commissioners held a local inquiry at which the question was exhaustively considered, evidence being given by Mr. Alderman Huntsman and Mr. Rider. In due course the Commissioners granted the application, formal sanction to the construction of the new station being given on September 17th. Instructions were at once given to Messrs. Preece, Cardew & Rider to complete the plans for the first section of the station, the city engineer (Mr. T. Wallis Gordon) was instructed to prepare plans for the foundations and the buildings, and a site of 80 acres was purchased. The foundation stone of the new buildings was laid by Mr. Alderman Huntsman on June 14th, 1923. Progress was hampered in the early stages by the serious shortage of labour and building materials. To meet the growing demands in the city, two 2,000-kW turbo-alternators and two water-tube boilers were erected in the temporary building at North Wilford already mentioned.

The following are some of the contractors for the plant at North Wilford :—Messrs. Pritchett & Gold and E.P.S. Co., Ltd., accumulators; Underfeed Stoker Co., Ltd., ash conveyors and stokers; Stirling Boiler Co., Ltd., boilers; Davidson & Co., Ltd., fans; W. H. Allen, Sons & Co., Ltd., centrifugal pumps; W. J. Jenkins & Co., Ltd., coal conveyors; Stothert & Pitt, Ltd., crane (75 tons); S. H. Heywood & Co., Ltd., crane (25 tons); Babcock & Wilcox, Ltd., economisers and chimneys; G. & J. Weir, Ltd., feed pumps; British Vacuum Cleaner Co., Ltd., flue dust plant; Sheepbridge Coal & Iron Co., Ltd., pipework; P. & B. Evaporators, Ltd., evaporator; F. W. Brackett & Co., Ltd., screens; Foster Bros., Ltd., steel pipes; British Thomson-Houston Co., Ltd., rotaries, switchgear,



Fig. 18.—Map of East Midlands Electricity District.

turbo-alternators, &c.; Callender's Cable & Construction Co., Ltd., cables; Brush Electrical Engineering Co., Ltd., transformers; Worthington-Simpson, Ltd., condensing plant and air pumps.

The photographs reproduced in this article are by Messrs. Henson & Co., of Nottingham. For most of the information we are indebted to a souvenir issued last week.

Defrosting Frozen Meat with Electricity.

A New Process of Australian Origin.

We were recently favoured with an opportunity of inspecting a process which is likely to be of considerable importance to the public generally, as well as to the electrical industry—the "defrosting" of frozen carcasses by electricity. The process is the invention of Mr. A. U. Alcock, M.I.E.E., managing director of Messrs. Herbert del Cotte Proprietary, Ltd., electrical engineers, of Melbourne, Australia, and was demonstrated to us at the offices of Messrs. Heatley & Co., London. A short note apeared in our issue of September 11th.

For the information of readers who are not familiar with the trade in imported meat, we may premise that the bulk of our supplies of beef are derived from the Argentine, as "chilled" meat, which is never actually frozen, and has to be distributed and retailed immediately on arrival in this country; it cannot be put into cold storage without serious deterioration. Carcasses imported from Australia, however, have to be frozen in order to enable them to withstand the long voyage; in this condition they remain sound and wholesome indefinitely, and can be kept in cold storage at the home ports for any length of time without undergoing change, so that they need not be distributed until the market is ready for their reception—a great advantage as compared with the conditions controlling the chilled-meat trade. Moreover, they can be stored on the premises of wholesale and retail dealers who are provided with cold rooms.

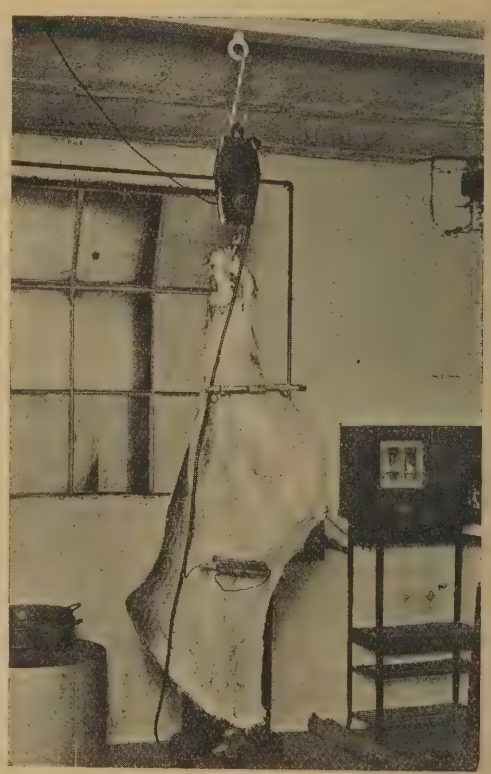
But hitherto frozen carcasses have been subject to the drawback that they could only be thawed by exposure to air at the atmospheric temperature, a process occupying three or four days in summer and a longer time in winter, during this time, as the whole of the heat must necessarily penetrate the carcass from the outside, through the external layer of fat, the outer portions thaw first and suffer deterioration through the prolonged hanging, and loss is incurred from this cause. Further damage results from the fact that the meat juices drain away from the outer portions whilst the inner parts are being defrosted, rendering the meat pale, dry, and unpalatable. Consequently, beef which has been frozen commands a lower price than chilled beef, though the smaller frozen carcasses of lamb and mutton, which obviously thaw much more quickly, have a high reputation and are imported from Australia and New Zealand in enormous quantities.

Mr. Alcock conceived the idea that the process of "defrosting" could be greatly accelerated by the use of electric heating applied to the interior of the carcass, and after long investigation—for the matter proved less simple than it might appear—he has devised a system which, it is claimed, restores frozen meat to its natural condition quickly and without the disadvantages of the atmospheric method of thawing. His process consists of passing an alternating current through the substance of the meat, thus heating it from the interior. By the use of a.c., electrolytic action is avoided; and as the interior of the carcass is thawed first, it is protected from deterioration by the colder surrounding layers. Dripping of the juices is practically negligible, owing both to the sealing action of the frozen surface and to the shortness of the time during which the meat is being defrosted.

The apparatus required for the purpose is very simple. It comprises a small transformer and a set of electrodes, with the necessary connecting leads. The transformer case is provided with large hooks, one of which attaches it to the ceiling, while the other supports the carcass—a matter not merely of convenience, but also ensuring that the connections will naturally fall in the right positions. As the power consumed never exceeds 150 watts, the transformer primary leads can be connected to an ordinary lampholder with an adapter. The secondary leads, of cab-tire-sheathed cable, are suspended from the transformer, and are provided with plug connections well covered with insulating material. Three electrodes are employed: one for the hind leg (the uppermost portion), consisting of three six-pronged forks, which are held in a fibre frame; one for the middle, comprising two similar forks; and one for the thin end of the carcass, consisting of a single fork. These electrodes are driven into the frozen meat with a mallet, at intervals measured with a templet, and are made alive by the plug connections, which are suitably spaced apart on the cable. The triple-fork electrode is attached to one pole of the transformer, and the other two to corresponding connections of the special winding. The prongs are of stainless steel, which neither tarnishes in use nor imparts any taste to the meat.

The current flowing from the middle double-fork electrode to the triple-fork, traverses a solid mass of flesh of about the same length as, but more than double the cross-section of, the remainder of the carcass; whilst the current flowing from the single-fork electrode, traversing the whole length of the carcass, meets with a much higher resistance. Consequently, with the same applied potential difference, a much larger current flows through the solid flesh than through the thinner rib portion of the carcass—thus ensuring that all parts will be defrosted in about the same time.

As the thawing proceeds, the resistance of the circuit diminishes, so that the current tends to increase; for this reason the transformer is specially designed so as to be self-regulating; the process is therefore entirely



Defrosting a Hind-quarter of Beef.

automatic. All that the butcher has to do is to insert and couple up the electrodes, and to remove them when the operation is completed. The electrodes are carefully proportioned so that, on the one hand, there is no local heating, and on the other, the meat is not marked or disfigured in any way that would affect its selling value. The maximum voltage employed is 200 V, and the maximum current is 1.5 A; the total consumption of energy for defrosting a hind-quarter of beef is less than 3 kWh, costing 6d. at 2d. a kWh. The value of the meat defrosted would be from 80s. to 90s., so that the cost of the energy is trifling in comparison with the value

of the meat—much less than the loss that results from the scrapping of rancid fat when carcasses are thawed by exposure to the air. An incidental advantage of the process is that, whereas defrosting by air involves the hanging of carcasses three or four days before they can be cut up and sold, the electrical method involves only one day's hanging; consequently a dealer need only provide about one-third the space and invest one-third the capital hitherto required for frozen meat. But a much more important consideration is the fact that beef defrosted electrically has a far higher market value than frozen meat thawed by air. Thus, the great obstacle to the importation of Australian beef on a large scale is removed, and a further stimulus is given to trade within the Empire.

According to *Whitaker's Almanac* for 1925, Argentina sent us 9,105,651 cwt. of beef in 1923, whilst from Australia we received only 712,127 cwt., a ratio of 13 to 1, whilst the values were in a higher ratio—15 to 1. In the case of mutton, however, New Zealand and Australia furnished 1,464,704 cwt. against Argentina's 1,076,296 cwt. Evidently there is immense scope for increase in the trade in frozen (Australian) beef. The electrical defrosting of the present comparatively small imports of frozen beef alone would represent a revenue of nearly a quarter of a million sterling per annum to the electricity supply industry.

The process and appliances have been patented, and arrangements are being made to hire out the apparatus to users.

Hydro-Electric Possibilities in South America.

Opportunities in Brazil and Bolivia.

(By our Special Correspondent.)

Probably no other State in the world has greater undeveloped hydro-electric potential water power awaiting exploitation than Brazil, nor is there any that has made less progress in this direction. Experts who have examined the many waterfalls and rivers of South America that can be adapted to the generation of energy are agreed that the possible development in Brazil approaches something like 50,000,000 h.p., yet of this total little more than 9,000,000 h.p. is at present harnessed. Successive governments have naturally been desirous of seeing power and light more generally used—especially for industrial purposes—throughout the Union; but, unfortunately, funds with which to foster the enterprise have always been lacking. Brazilians have been as reluctant to subscribe to the hydro-electric undertakings as they have been to finance transport, such as railways and steamships. With some exceptions, these have been left in the hands of foreigners, mainly British (that is to say, Canadian), and the fine services of electric light, power and traction now offered in Brazil are the results of foreign enterprise owing little or nothing to native support.

Where electrical energy has been introduced as a substitute for steam power, it has been found that the saving has amounted to as much as 50 per cent., and in some casee even to more. It is clear that there exists an enormous development for industrial activity in direct relation to the natural resources of the country, facilitated by the provision of cheap hydro-electric power. Among many different enterprises in Brazil, supported, as hitherto, by the contributions of foreign capital, may be mentioned a project known as Mar Energo, the promoters of which will endeavour to utilise tidal energy. A moderate preliminary capital, consisting of 1,150 milreis, has been subscribed, and a patent has been taken out for a "hydro-motor." It is considered doubtful, however, whether the undertaking will make very much progress.

Lack of funds has again interfered with the carrying-on of the long-delayed Brazil Central Railway electrification scheme. As far back as 1922, a loan of $25,000,000 was raised in the United States clearly labelled "Central Railway Electrification Loan." But instead of expending the money obtained upon the prosecution of this enterprise the Government of the day, with the consent of the President, Dr. Epatacio Pessoa (who afterwards attempted to excuse the action), expended the greater part of the proceeds upon improving the Federal Railways. No further capital from abroad was then obtainable, and by the end of 1923 little or nothing had been done towards carrying out the electrification of the Central Railway. During the past year or so some appreciable progress has been made, not sufficient, however, to enable the management to institute a scale of working economies such as were expected and promised. Now, another halt in construction has ensued, and before further work can proceed a credit of at least 1,500 contos of reis will be needed. A large sum on account has been asked for to carry out urgent repairs, but the Brazilian Congress has not as yet voted the payment.

A commencement has been made upon the electrification of a part of the Oëste-Minas Railway, the contract being in the hands of the Metropolitan-Vickers Electrical Co., Ltd. The portion of the line referred to is between Barra Mansa and Augusta Pestana, a length of about 71 km.

When the existing contract with the Sao Paulo Railway Co., a British-owned concern, terminates two years hence, it is proposed to build a competitive and parallel line, wholly worked by electricity, to provide facilities at the port of Santos. For this purpose an enormous capital would be required, and although it is expected that the Brazilian Government will promise a large contribution, the entire sum cannot be derived from that source. The Minister of Public Works, Dr. Francisco Sá, is doing his best to raise capital, but at the time of writing his progress seems to have been very slow. The best way out of the difficulties with which transport in this—the most important—commercial centre is confronted, will be for the Brazilian Government to renew its contract with the British company, which, on its part, has expressed its willingness to build a parallel line to its own and then work the two in conjunction. But for the local hostility and jealousy displayed, this scheme would undoubtedly have recommended itself to the Government, Federal as well as State. Political, rather than economic, reasons have hitherto prevailed, and the Administration has not seen its way to accept the offer.

But for the new political upheaval in Bolivia that has recently taken place, and promised to be one of a series of similar presidential election disturbances, foreign capital would have been forthcoming for one or other of the various schemes put forward for the utilisation of the hitherto untouched available water power for the production of electricity on the eastern slopes of the Andes. Congress has had this matter under discussion upon various occasions over a number of years, and it was hoped that certain developments would have been decided upon this year. The Senate has likewise manifested its interest in the proposal by instituting—and eventually accepting—Governmental surveys.

Another Bolivian project suggested, but one which is considered wholly impracticable, is in connection with the utilisation of the waters of Lake Titicáca. It is reported that German engineers have asked for a concession to utilise this lake, the area of which is estimated at 5,000 square miles, standing at an altitude of 12,800 ft. The catchment area apparently is enormous, but the rainy season lasts only for three months of the year, and the extent of evaporation is very large. Between the wet and dry seasons the maximum difference of water level is about three feet. The natural discharge is through the Desaguavero, a sluggish river which remains nearly dry during six months of the year, and eventually loses itself in the Bolivian plateau located about 500 km. south. The only method by which the waters of Lake Titicáca could be utilised for the provision of electric power would be to construct a tunnel 100 km. in length, but when the cost of such an enterprise is considered, the proposition appears wholly impracticable.

Legal.

St. Helens Corporation Summoned.

THE St. Helens Corporation was summoned at the local court on September 14th, by two residents, Messrs. V. Hanratty and W. Leather, for a breach of its Electric Lighting Order. It was stated that Mr. Leather applied to the Corporation on July 13th for a supply of electricity, having had his house wired. The Corporation, however, although written to twice, had not connected up with the main or supplied a meter, on which a deposit of £2 had been paid.

Mr. DAVIES, for this plaintiff, said that the trouble appeared to be that the house had been wired by plumbers who were not members of the E.T.U., and the E.T.U. jointers employed by the Corporation therefore refused to connect the house to the mains. He directed attention to the decision given on November 14th last, when a fine was imposed on the Hackney Borough Council, which pleaded *force majeure* in a case in which that Council's electricians threatened to cease work if a house wired by non-union labour was connected up.

Plaintiff said that the difficulty between the Corporation and its workmen had nothing to do with him.

Mr. GOLDIE, for the Corporation, said that the permission which had been given for plumbers to wire up houses had been withdrawn because of the unemployment amongst the electrical workers. He read a letter from the district secretary of the E.T.U. stating that if the Corporation connected up plaintiff's house, the 40 E.T.U. members employed by the Corporation would strike and would receive the support of 150 other E.T.U. men. The whole of the public supplies of electricity would then be stopped.

The Corporation pleaded that the decision in the Hackney case did not apply to the one in dispute. The Electricity Committee had tried to overcome the difficulty which had resulted in those proceedings, by getting a workman from Liverpool to do the work, but objections were raised.

The magistrates, in giving a decision against the Corporation, imposed a penalty of 1s. per day.

Notice of appeal was given.

Reviews.

Ether and Reality. By SIR OLIVER LODGE, F.R.S. Pp. 179. London: Hodder & Stoughton, Ltd. Price 3s. 6d. net.

Sir Oliver Lodge is now an old man full of years and honours. His distinguished career in science extends over the whole period within the memory of most men now living and, as may be gathered from the title-page of the book before us, almost every scientific society of note has been proud to receive him. A doctrine therefore in which he firmly believes, and to which he has been constantly faithful, is a doctrine which must be treated with respect.

The doctrine which Sir Oliver Lodge proclaims is the reality of the ether of space. He thinks it is the fundamental substance of the material world, and the connecting link which unites it with the spiritual world. Now the difficulty about believing in the reality of the ether is that we have to ascribe to it properties of fluids and properties of solids which are mutually exclusive. It must be lighter and vastly more fluid than any gas, in order not to retard our motion round the sun or deprive the earth of its atmosphere by friction; on the other hand, it must behave like a solid vastly more rigid and dense than any metal, in order to transmit the radiation of light. These are examples of the contradictory properties with which it is necessary to endow the ether, in order that it may fulfil the functions ascribed to it by the interpretation of phenomena. These contradictions strain belief—even the belief of scientific men, which of late has been assuming the elasticity at one time peculiar to that of theologians. As Prof. Lodge says:—"We used to try to explain the properties of the ether in terms of matter. Lord Kelvin made a life-long effort in that direction, and at the end of his life he had to announce failure. The failure was due to no defect of his; such an explanation is impossible. Ether is not to be explained in terms of matter."

At this point it would occur to most people to conclude that the time has, therefore, now come to abandon the ether; but this is not the conclusion reached by Prof. Lodge. He goes on: "We have learnt that the problem lies in the opposite direction; and modern physics, since Lord Kelvin's time, may be said to be devoting itself to the explanation of matter in terms of ether."

One is, somewhat inconsequentially, reminded of Mahomet, who, when the mountain would not come to him, decided that it would be the same thing if he went to the mountain. And the mountain is, in this case, a mountain shrouded in mists, for this ether by which the whole universe is to be made comprehensible, is itself past understanding.

However, those who would like to see the case for the ether well put, ably put, better put, some would say, than the case deserves, cannot do better than peruse this book, as they may do with no great pains to themselves; because it is well written in the easy style of one who is a past master in the use of the expository pen. They will be interested to learn that he makes the density of ether, compared with water, to be "one followed by twelve o's—or of that order of magnitude." From which it may be inferred that if we compared its density with that of steel, eleven o's after the 1 might suffice to represent it. Truly we need faith that will move mountains.

The China Year Book, 1925-6. Edited by H. G. W. WOODHEAD, C.B.E. Pp. 1,349. Tientsin: The Tientsin Press, Ltd. London agents: Simpkin, Marshall, Hamilton, Kent and Co., Ltd. Price 42s. net.

The many phases of China and Chinese life with which this large volume deals make it of interest to almost anybody into whose hands it may come. Geography, geology, natural history, mineralogy, trade, and history are only a few of the subjects which are dealt with in a masterly way either by the Editor himself (who is also the editor of the *Peking and Tientsin Times*) or able collaborators. Interesting as the matter is, we must reluctantly confine our attention to the electrical and trade sections in this short review. Among many other matters in the part dealing with engineering is a list of electricity undertakings arranged by provinces alphabetically. This shows that there are few Chinese towns of any size which are unprovided for in this respect. There are about 230 undertakings in the list, most of them of very small capacities; in fact, only about 20 (including the Shanghai undertakings) have plant of more than 1,000 kW. The particulars given in each case are the name of the operating company or other authority, the capital employed, and the capacity of the station. Brief mention is made of the fact that tramways are operated in a number of the principal cities, including Dairen, Hong-Kong, Shanghai, Tientsin, and Peking.

A brief history of the Chinese telegraph system appears in another part of the work and details are given of the conventions which exist between the Chinese Government and the cable companies and other countries. This is followed by some statistics relating to the service, *e.g.*, it is stated that the length of land lines is 55,331 miles, the length of wires 78,852 miles, and that 5,197,596 "domestic" telegrams were transmitted in 1919. It will be judged from the last statement that the figures are not very recent ones, but there are good reasons for this, as all who have read the newspapers during the last two or three years are aware. The information upon radio-telegraphy is more up-to-date, and a list of stations is given showing the type of equipment, the power employed, the controlling authority, &c. Forty-five stations are listed.

The section dealing with Chinese commerce is particularly interesting, as it traces China's trade with the outside world from the earliest records (B.C. 1122) to the present day. A separate note is devoted to England's trade with China, dating from the sixteenth century since when this country has held the principal position in China's foreign dealings. The existing commercial treaties are reviewed, and the section closes with a chapter on trade during 1923-24. This shows that the value of imports during that year was very little below the record level reached in 1922, while the exports were practically on the 1913 plane in actual values.

The year book contains a great deal of matter relative to the political and military situation which should prove of service to the general reader to whom the average newspaper report is very obscure.

Electrical Machinery Erection. By TERRELL CROFT. Pp. ix+314; 334 illustrations and drawings. London: The McGraw-Hill Publishing Co., Ltd. Price 15s. net.

There are many problems which are met with when transporting and erecting any kind of heavy machinery, but electrical machinery presents many peculiar problems of its own. For example, a lathe is always erected on the floor of the workshop, but the electric motor driving the line shaft may be bolted to the girders of the floor above, to the columns supporting the roof, or, indeed, in any convenient position which may be available. Thus, while in the book under review the author discusses many problems which might arise in any

engineering works, a number of them are peculiar to the electrical industry. It is to be noted, however, that the title which he has chosen does not do justice to the ground which he has covered, as in addition to the problems of erection he discusses the question of transporting machinery from the manufacturer to the user, while he also includes a useful section on the maintenance and upkeep of electrical machinery.

The work is divided into five sections and although the questions discussed in certain of these are somewhat similar to those met with in other sections of the book, the division seems to be an eminently wise one. The first, which is called "Unloading and Moving Electrical Machinery," deals with the problems of transferring a machine from the test bed to railway truck or wagon, and thence transferring it to a wharf for shipment or depositing it in the works of the user. The question of slinging is discussed, including the problem of strutting, &c., to prevent the bedplates bending under their own weight, and the protection of windings during slinging. Useful tables are included, giving the strength of slings and approximate figures for the cost of handling machinery are also given. The book, it should be noted, is of American origin, so that the costs which are given in dollars can only be considered in a comparative sense. The next section is entitled "Supporting Electrical Machinery," and in it will be found details of a number of useful forms of brackets and girder arrangements for securing motors on walls, ceilings, columns and beams, or on the framework of machine tools, &c. Tables giving the strengths of beams and girders of different sections and spans are included in this section. The third section, which is called "Erecting Electrical Machinery," deals more particularly with the construction of temporary supports and staging for transferring heavy machinery from the crates or wagons to its final foundations. There are certain parts in this section which are similar to those in Section I, but it contains much information of a useful character, while the question of shrinking on flywheels, &c., is of value because it is seldom met with in text books. It may be mentioned that the problems of erecting generators, motors, and heavy transformers are all considered in this section. In the fourth section, the machine being on its foundation the final work of alignment and securing to the foundations is considered, the problems discussed ranging from small motors with pulleys to be correctly set relative to the pulleys on a countershaft, to the alignment of a large turbo-alternator. The final section, which is, perhaps, rather out of place in a book of this kind, deals with the maintenance of electrical machinery, such problems as re-mettling bearings, care of roller and ball bearings, the removal of dust from windings and commutators being discussed. The importance of routine inspection is mentioned and useful maintenance charts are given.

The author is to be congratulated upon having put into book form a great many useful facts and some valuable data dealing with a phase of engineering practice which, despite its importance, has not received the attention it deserves. The book is very carefully illustrated, a feature being the perspective line drawings which convey at a glance the author's meaning. A very complete index is appended which greatly facilitates reference to any particular problem, while for the earnest student of the book a number of questions are given at the end of each section which cover thoroughly the subject matter of that section. Altogether it is a book which we can thoroughly recommend to every engineer who has to deal with the transport or erection of electrical machinery.

The Elements of Machine Design. By S. J. Berard and E. O. Waters. Pp. x+323; figs. 244. London: Blackie and Son, Ltd. Price 10s. net.

There are certain branches of knowledge which cannot be taught, they can only be slowly acquired in the hard school of experience. We are inclined to think that machine design must be regarded as coming in this category. Not that it is impossible to prepare a young engineer to become a draughtsman and a designer, but no matter how complete that preparation may have been, it will generally be conceded that such a person could hardly be qualified to prepare the designs for, say, a 25-h.p. motor which could be manufactured on a competitive basis with the designs prepared by a man who has had years of experience in this particular branch of engineering work. It seems to us, therefore, that the authors of this very excellent book have rather misjudged its purpose when they suggest that it should fill a gap between engineering drawing and advanced machine design, although they are on less debatable ground when they express the hope that it will serve as a guide for students in technical schools and for young draughtsmen. For this purpose it is certainly one of the best books we have seen for many years, and the young engineer who has thoroughly grasped the various principles explained in the course of its 323 pages should be able to solve in the most satisfactory manner those practical problems with which he will be faced as soon as he commences the most simple design work in a commercial drawing office. It may be questioned as to how far it is possible in a text-book to lay down the fundamental economic principles governing the production of any work on a commercial basis, but certainly in this book no attempt is made to attack this vitally important side of the problem at all, and to that extent it must be deemed to fall short of fulfilling the requirements of advanced design. With this reservation, however, we may at once assert that the authors have produced a book which is particularly well suited to guide the student or the young engineer who is desirous of becoming a designer.

It will be admitted that a knowledge of the materials used in engineering construction is of great importance to the designer, and hence the authors rightly give prominence to this part of the subject in their opening chapters, and not only do they deal with the simple ideas of stress due to direct loads, bending and torsion, but a brief outline of the method of production of the various constructional materials is also given, including such processes as tempering, case hardening, and the production of malleable-iron castings. We note here, however, that while combined bending and torsion is dealt with, the strength of material subjected to combined compression and bending, *i.e.*, the familiar strut as represented by the connecting rod of an engine, has been overlooked. After these preparatory chapters, the design of various fastenings is considered, the problems of rivets, bolts and nuts, keys and cotters being dealt with in accordance with the principles of the strength of materials enunciated in the earlier part of the book. This is followed by a number of chapters on what is sometimes known as millwrights' work, *viz.*, shafts, bearings, pulleys, belting, &c., after which four admirable chapterms on gearing are given. In these four chapters toothed gears of all kinds are dealt with, including worm gears and an excellent design of enclosed worm gear suitable for a low-speed drive from an electric motor is worked out. The book concludes with a treatment of the various reciprocating steam engine details, including pipes and valves. A brief survey of the elementary problems of structural design using rolled sections is also given.

Thus, within a comparatively small compass the authors have succeeded in covering the whole of the syllabus usually set for examinations in this important subject. They have also included a number of tables for standard dimensions of various fittings, and numerical examples illustrating the various problems in design are also given. The book, we ought to mention, is of American origin, and some of the standards included, as well as some of the symbols employed, are different from those used in British practice, but the work hardly suffers on that account, as the tables of standards are available in the majority of engineering pocket books, and these can be very easily obtained. A word of praise must be given to the producers of the book. The drawings are extremely well done, being clear and of large scale, no attempt having been made to include too much within the compass of a page of a text-book as is so frequently the case in books of this kind. Moreover, where necessary the ordinary orthographic views are assisted by carefully-drawn perspective views as well as half-tone photographs, so that little or no difficulty should be experienced in understanding the exact shape of any machine detail under consideration. The whole book has been printed on smooth-surface art paper, which adds greatly to the clearness of both text and drawings, and at the price given above the book must be regarded as an exceptionally good production. We can recommend it to the young draughtsman and to the technical student with the utmost confidence.

The Theory of Electric Cables and Networks. Third edition. By Alexander Russell, M.A., &c. Pp. xii+356; figs. 88. London: Constable & Co., Ltd. Price 24s. net.

As in the previous editions, the work commences with a *résumé* of the fundamental principles pertaining to the design of networks and the distribution of electrical energy, and deals with the highly theoretical considerations of dielectric strengths and stresses. Although the book is, in the main, a theoretical treatise, it is written throughout with a view towards the conditions met with in practice. Much practical information, for instance, is given in the chapters on distributing networks and faults in networks. The chief addition to this edition is in the appendix, where the question of how far the position of the power station site is affected by the cost of the copper for the requisite feeder mains is discussed.

The Small Cost of Power.—Power salesmen are often confronted with the statement by a prospective customer that the power rate is too high. An effective answer to this objection has been found by many salesmen in the statement that the cost of power is a very small percentage of the total manufacturing cost, whereas the many desirable and valuable features of purchased power make its use an important advantage to a manufacturer. The relation of power costs to the total manufacturing cost in specific industries is frequently helpful in convincing a prospective power user. A recent study of power cost and its relation to total manufacturing costs of twenty-one industrial power users showed that, with very few exceptions, the cost of power was less than 3 per cent. of the average manufacturer's production expenses.—*Electrical World.*

Hydro-Electric Development in the United States.—A recent report of the United States Geological Survey states that at March last the total capacity of hydro-electric plant installed in the United States was 10,038,000 h.p. This figure includes only machines of 100 h.p. or more. The greatest development is in the State of New York (1,713,550 h.p.), while the next in order are California 1,531,480 h.p., Washington 560,693 h.p., North Carolina 534,600 h.p., and Maine 476,627 h.p. It is estimated that the undeveloped power in these states will permit of the installation of the following amount of plant:—New York 4,734,000 h.p., California 7,145,000 h.p., Washington 9,672,000 h.p., North Carolina 526,000 h.p., and Maine 920,000 h.p.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Employment in the Engineering Industry.—The September *Ministry of Labour Gazette* states that employment in the engineering industry during August remained bad on the whole and showed a further slight decline. Conditions in the electrical engineering branch remained fairly good. While the proportion of unemployed in the industry as a whole was 11.8 per cent., the proportion for the electrical engineering branch was only 5.9 per cent., a decrease of 0.1 per cent. as compared with the July figure. In the electrical wiring and contracting industry there was a decrease of 0.8 per cent. in the number of unemployed, and there was a fall of 0.3 per cent. in the electrical cable, wire and electric lamp manufacturing group.

Threatened Tramway Strike at Salford.—A dispute arose last week in the Salford Corporation Tramway Department owing to the employment of four non-unionists. Strike notices, due to expire on September 20th, were served. Three of the men who were the cause of the dispute agreed to join the Transport and General Workers' Union, while the fourth man, who refused to join the union, went on holiday and the strike notices were suspended until his return.

For Sale.—Messrs. Knight, Frank & Rutley will sell by auction, on September 29th and following days, at the Alpine Club Hall, 23, Savile Row, W., a quantity of new electric lighting fittings, &c. Dundee Corporation Electricity Supply Department has for disposal two 2,000-kW Willans-Parsons steam turbines coupled to Dick Kerr 3-phase alternators, complete with condensers, air pumps, &c. Mr. H. J. Shaw will sell by auction on September 29th at 13, High Holborn, W.C., the stock of an electrical and wireless goods factor. The Burgh of Oban electricity department has for disposal steam generating plant. The Chief Engineer, H.M. Office of Works, invites offers for the whole of the plant and equipment of H.M. power station, Beachley, near Chepstow. Preston Corporation electricity department invites offers for surplus turbo-generators, boilers, &c. (See our advertisement pages to-day.)

The Radio Industry: The Question of Protection.—It is reported by several daily papers that application is being made to the Board of Trade for the safeguarding of the British radio industry. According to statements attributed to Mr. Guy Burney, whose retirement has lasted for quite as long a period as those who know him would have anticipated, the brief of the trade (he is chairman of the National Association of Radio Manufacturers and Traders' Committee) is now completed. He states that for the year ended December 31st last radio manufactures to the value of not less than £850,000 came into this country. Germany, Austria, and France (and America, in a lesser degree) were the chief invaders of the British market, and so far their competition had been most harmful in the matter of headphones. Not less than 2,000,000 pairs of these were sent into the British market last year, at prices approximately 50 per cent. below the price at which we can afford to market them in this country. Dealers declare that they can sell ten foreign headphones to one British because the low prices appeal to the small constructor.

Lead. — Reporting on September 19th, Messrs. James Forster & Co. stated:—"There are reports of lessened consumption on the Continent, due to the high price of the metal and credit difficulties, particularly in Germany. Here consumers have not been much in evidence this week, but consumption is on a very heavy scale, and consumers, as a rule, are not well bought forward. The Board of Trade returns for August are:—Imports, 23,414 tons; exports, 2,161 tons; leaving for home absorption 21,253 tons. The total of the last for the eight months to the end of August is 162,627 tons."

A Wireless Exhibition Criticism.—The Wireless Retailers' Association recently addressed a communication to the National Association of Radio Manufacturers and Traders protesting against a particular retail firm being permitted to announce in the Albert Hall Exhibition catalogue that wireless sets and components were available for immediate purchase and delivery at their stand, and to further state that the productions of any of the exhibitors on the ground floor could be supplied for immediate delivery to the public. Exhibitions of this character, said the W.R.A., were organised by the trade to enable trade buyers to inspect exhibits and to place orders, and to afford the public opportunities to inspect manufacturers' products, the names of intending purchasers of these being passed on for handling through retail channels.

The British Industries Fair.—We have received from the general manager of the Birmingham section of the British Industries Fair an advance prospectus of the 1926 display. This will be held at the Castle Bromwich Aerodrome from February 15th to 26th. At the head of the prospectus is a statement that the Government has agreed to spend a sum of money not exceeding £25,000 for the purpose of publicity for the Fair at home and abroad. It is stated that the results of the last Fair were so satisfactory that many participants have already applied for increased stand accommodation, and it is worthy of note that the price of space has been reduced by a substantial amount (20 per cent). Special arrangements for low-priced small stands for firms that are unable to take much space have been made. The Birmingham Section is divided into eleven classes, *viz.*:—Brassfoundry, hardware and ironmongery; metals; construction, building and decoration; power, lighting, heating, cooking, and ventilating; engineering; agriculture; mining; motors, cycles, &c.; guns, saddlery, &c.; brewing, &c.; and "services." The list of members of the Council includes the names of Mr. G. P. Achurch (Parker, Winder & Achurch); Mr. J. Belliss (Belliss & Morcom, Ltd.); Mr. F. Forrest, M.I.E.E., and Dr. C. C. Garrard (General Electric Co., Ltd.). The Fair Management Committee includes Mr. R. A. Chattock, the city electrical engineer, and Mr. Alfred Baker, general manager of the Corporation tramways.

The Sale of Appliances by Supply Authorities.—The feeling expressed at this year's I.M.E.A. Congress that electricity supply authorities should have power to sell electrical appliances (and exercise it) has its counterpart in the United States. The National Electric Light Association is endeavouring to impress upon its supply company members the importance of undertaking the sale of electrical appliances. In a recent issue of the *Electrical World* the president of the N.E.L.A. stated: "Every power and light company should have an efficient sales organisation, an advertising department directed by someone who has made a study of advertising, and should obtain the advice and utilise the ability of a person who knows how to decorate and trim windows properly and forcibly."

Trade Announcements.—The telephone numbers of the "FERROWATT" ELECTRIC LAMP WORKS (GREAT BRITAIN), LTD., 72, Oxford Street, W.1, are "Museum 5053-4."

MR. E. T. KING, of Messrs. Bass & Co., 120, High Street, Rickmansworth, informs us that he has taken over the business at that address and is responsible for all debts.

MR. H. STANLEY SMITH, of the Silchester Electric Stores, 2, Silchester Road, Hastings, has taken larger premises at 45, London Road, Hastings.

MR. T. BRERETON, formerly with Carrington & Button, has commenced business with his son at Evleston Road, Crewe, as electric lighting specialists.

MR. L. J. WOLF has commenced business on his own account at 116, Putney Bridge Road, London, S.W.15, where he will act as sole distributor for the Robbins & Myers Co., of Springfield, Ohio, U.S.A. Mr. Wolf was until 3½ years ago managing director of the original Wilson-Wolf Engineering Co., Ltd., and subsequently he managed the small motor department of Messrs. Pooley & Austin.

The business of the ASTRO ELECTRIC, LTD., in its entirety has been purchased by the B.I. Syndicate, Ltd. It will be continued at the same address (45-48, Carlton House, Lower Regent Street, London, S.W.1). Mr. R. Rook-Jones continues as sales manager and practically all the old staff has been retained. A folder has been issued giving reduced prices of certain types of reflectors.

On October 1st the telephone numbers of the POWER EQUIPMENT CO., LTD., of Hendon, will be altered to: "Colindale 6196 and 6197."

Sales Development.—An all-day conference of members of the Incorporated Society of British Advertisers on the problem of increasing sales in the home and oversea markets is to be held at the Hotel Cecil on Thursday, October 29th, to be followed by a banquet in the evening. It has been arranged that on the second Wednesday evening in each month, commencing in November, there shall be a dinner at the Old Colony Club, Aldwych, followed by a business meeting.

Bankruptcy Proceedings.—WM. REGINALD GRIGSBY, dealer in electrical goods, &c., 184, Gray's Inn Road, W.C.—This debtor carried on business as the Wenham Lighting Corporation. He failed in June, 1925, with liabilities £2,577 against assets valued at £909, and on September 15th he attended for public examination before Mr. Registrar Hope at the London Bankruptcy Court. Questioned by Mr. Wheeler, Assistant Official Receiver, the debtor stated that in August, 1911, he purchased his father's business of gas lamp manufacturer and subsequently opened a branch for the sale of electrical goods and took up contracts for electric lighting. In 1924 he entered into a partnership with a Mrs. Clark in relation to a contract for electric lighting at the British Empire Exhibition, which involved him in a heavy loss. The debtor also attributed his failure to lack of capital, bad debts, and depreciation of stock. The examination was concluded.

T. W. CRAWFORD, merchant, 32, Victoria Street, S.W.1.—Under a receiving order made on August 31st upon the petition of a creditor, the first meeting of creditors was held on September 16th, Mr. Walter Boyle, Senior Official Receiver, presiding. According to the debtor's statements in preliminary examination, he started business in December, 1923, under the style of The Despina Company, at 41, Cheapside, dealing mainly in electric lamps. The British Thomson-Houston Company, Ltd., obtained an injunction against him in June, 1924, restraining him from infringing its patents, and as a result of that action he closed down the business, together with a branch

which he had opened in Liverpool. In the following September the debtor took offices at 32, Victoria Street, S.W., and there carried on a similar business in the name of T. Wheatley and Company, but in consequence of bad trade and the lack of financial support, he had to close the business last April. The failure was further attributed to illness and heavy overhead charges. No accounts were lodged but the chairman reported that the liabilities were roughly estimated at £700 and the assets were very small. The estate was left in the hands of the Official Receiver.

THOMAS BARTON, Electric Works, Ainsworth Street, Blackburn, electrical engineer.—The public examination of this debtor was held on September 16th at the County Court, Blackburn. The statement of affairs showed gross liabilities of £8,833, of which £3,813 was expected to rank, against assets of £5,793, leaving a surplus of £1,980. The Official Receiver said that debtor commenced business at Ainsworth Street in 1886 with £600 capital lent him by his wife. In June last he executed a deed of assignment for the benefit of his creditors, at which time the liabilities were shown at £3,686, while the assets were estimated at over £4,000. Questioned by the Official Receiver, debtor said that at first he did not consider he was solvent, but on reconsideration he was now quite satisfied that he was perfectly solvent. The examination was closed.

F. J. TIZZARD and N. TIZZARD, trading as Tizzard Bros., 27, Dalkeith Street, Barrow-in-Furness, and 121, Market Street, Dalton-in-Furness, electrical engineers and contractors.—The receiving order in this matter was made on the debtors' own petition. The first meeting of creditors was held on September 12th, at the Official Receiver's office, Barrow-in-Furness, when the case being a summary one was left with the Official Receiver as trustee. The following are creditors:—

	£		£
Chloride Electrical Storage Co., Ltd.	21	N.W.E., Ltd.	31
Marsoleus	71	Thornton, W. R., & Son, Ltd.	124

ARTHUR KITSON, 1, Central Hall Buildings, Westminster, electrical and mechanical engineer.—The adjourned first meeting of creditors was held on September 21st at the London Bankruptcy Court, before Mr. Wheeler, Official Receiver, when a resolution was passed appointing Mr. Thomas Langley Judd, 40, King William Street, E.C., trustee to administer the estate in bankruptcy. The debtor stated that he was not prepared to submit any offer to the creditors at present. He was now working on a scheme for the reorganisation of the Kitson Engineering Co. (London), Ltd., and if his efforts were successful he would be able to pay all his debts in full.

W. H. MURAD (W. H. Murad & Co.), wireless manufacturer, 126, Princess Street, Manchester.—Application for discharge to be heard October 26th, at the Court House, Manchester.

A. WOOD, electrical agent, 67, Bradford Avenue, Cleethorpes, and 161, Cleethorpes Road, Great Grimsby.—First and final dividend of 9d. in the £, payable at the Official Receiver's office, St. Mary's Chambers, Great Grimsby.

C. E. F. PARKER, electrical engineer, Greendale, Privett Road, Gosport.—Receiving order made September 11th, on debtor's own petition.

C. F. LINDOP (C. F. Lindop & Co.), electrician, late of 62, Dale Street, Liverpool.—Application for discharge to be heard on October 16th at the Court House, Liverpool.

J. COWAN (Cowan & Fox), merchant of electrical appliances, 35, Dickinson Street, Manchester.—First and final dividend of 8½d. in the £, payable September 29th at 30, Belgrave Place, Stalybridge.

B. E. DIXON (Creswick Dixon Electric Co.), electrical engineer, Bodega Buildings, High Street, 101a, Albert Road, 451, London Road, and 63, Chesterfield Road, Sheffield; and Electric House, Knifesmith Gate, Chesterfield.—First and final dividend of 5¾d. in the £, payable at the offices of Messrs. Popplewton, Appleby & Turner, 155, Norfolk Street, Sheffield.

Company Liquidations.—M.E.L., LTD., mechanical and electrical engineers, 45-7, King's Road, Camden Town.—The statement of affairs in this case shows liabilities of £12,331 against assets valued at £2,575. The following are creditors:—

	£		£
Abingdon Works, Ltd.	524	Reliance Electrical Wire Co.	40
Booth, J., & Co., Ltd.	192	Smith & Sons	220
Burton, H., & Co.	51	Swift, Levick & Sons, Ltd.	681
Castle, T. L.	61	Sankey, J., & Sons, Ltd.	141
Connollys, Ltd.	97	St. Pancras Elec. Dept.	32
Cundell, Eve & Co.	97	Sun Electrical Co., Ltd.	29
Curtis, P., Ltd.	40	Stokes, C. H.	377
Dacier, Ltd.	28	Sheffield Magnet Co.	260
Dyson & Co. (Enfield), Ltd.	119	Warner, W. G., Ltd.	276
Davis & Timmins, Ltd.	31	King, Sir A. F., W. Rogers, E. D. Pearcy	195
Ebonestos Insulators, Ltd.	728	Pearcy, E. D.	152
Evans, Jarvis & Sherry	126	Rogers, W.	4,381
Gas Light & Coke Co.	56	King, Sir A. F.	158
London Electric Wire Co. and Smiths, Ltd.	47	Earle, W., Exors of	573
L.P.S. Electrical Co.	95	Goulding, T. W.	631
Bankers	350	Brown, S. H.	52
Phillips (Patent Agents)	22		

WILL SMITH, LTD., electrical engineers, 281, West Derby Road, Liverpool.—A meeting of creditors was held recently at the offices of Messrs. R. Duncan French & Co., Liverpool, when a statement of affairs was submitted which disclosed liabilities of £2,028, and net assets of £43, leaving a deficiency as regarded the creditors of £1,985. The company was registered in March, 1920, with a nominal capital of £2,000, of which £1,901 had been issued, to take over an existing business, the purchase price being £600, of which £50 was payable in cash and the balance in shares. During the year ended March, 1921, there was a profit on the trading of £75, but in the following twelve months there was a loss of £295, and in the succeeding twelve months a loss of £1,100. For the twelve months to March, 1924, the loss exceeded £1,000, whilst for the year to March, 1925, there was a loss of £487. Since March last there had been further losses. Last May £200 was lent to the company on the security of a debenture. A receiver had since been appointed on behalf of the debenture holder. It was suggested that the debenture holder's claim should be withdrawn and the assets divided amongst the other creditors. The Receiver stated that he would see his clients on the matter, and the meeting was accordingly adjourned. The following are creditors:—

	£		£
General Electric Co., Ltd.	597	Rowe Bros. & Co.	88
Preston, C., & Co.	25	Loze, A., & Co.	73
Copeland, Green & Co.	35	Blakeborough Outdoor Publicity Co., Ltd.	119
Corfax Co., Ltd.	43		

HOLBORN RADIO CO., LTD.—Liquidator, Mr. G. D. Pepys, Official Receiver, Carey Street, W.C., released September 15th.

FORD ELECTRICAL CO., LTD.—A meeting of creditors is called for October 20th at 10, Norfolk Street, Manchester, to hear an account of the winding up from the liquidator, Mr. J. F. Stott.

Private Arrangements.—B. H. WISHAW and N. S. ETHELL, trading as Wishaw & Ethell, electrical and radio engineers, Bakewell Road, Matlock.—A meeting of creditors was held recently at the offices of Messrs. Heny & Heny, Matlock, when an approximate statement of affairs was submitted which disclosed liabilities of £832, all due to unsecured creditors. In addition, there were fully secured creditors for £84, who held securities valued at £100, leaving a surplus of £16. The net assets were valued at £708, leaving a deficiency of £124. Complete books of account had not been kept, so that trading figures could not be prepared. The deficiency was stated to be due to loss on trading. It was decided that a deed of assignment should be executed in favour of Mr. Charles Turner, C.A., of Sheffield, as trustee, provided the execution creditors withdrew from possession. A committee of inspection was also appointed, consisting of the representatives of the General Electric Co., Ltd., and Metro-Vick Supplies, Ltd., and Mr. J. F. Warburton, accountant, representing creditors.

Catalogues and Lists.—ACCUMULATORS OF WOKING, LTD., Maybury Hill, Woking.—Illustrated pamphlets giving particulars of accumulator batteries for house lighting, train lighting, radio work, &c.

"M.K." ELECTRIC, LTD., Wakefield Street, Edmonton, N.18.—An illustrated and priced catalogue of "M.K." switches, connectors, wall-plugs and sockets, &c.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—A descriptive list of three-phase induction motors. Illustrated.

MESSRS. A. J. STEVENS & CO. (1914), LTD., Wolverhampton.—A series of illustrated and priced pamphlets dealing with amplifiers and loud speakers. Also two pamphlets dealing respectively with hire-purchase and insurance schemes for radio receiving sets.

MESSRS. DAVID BROWN & SONS (HUDDERSFIELD), LTD., Park Works, Lockwood, Huddersfield.—An illustrated brochure describing the company's works and products.

MESSRS. RICHSON & CO. (1925), LTD., 113, Oxford Street, W.1.—A well-printed catalogue containing numerous illustrations, many in colour, of electric lighting fittings mainly of glass and art metal ware. Priced.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Folders H.3764, 3765, and 3766, dealing respectively with "Magnet" electric cookers, electric fires, and domestic appliances. Illustrated and priced. Leaflet O.S. 3731, containing particulars and prices of "Osram" gasfilled lamps.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Leaflets Nos. 35/5-1 and 35/6-1, illustrating and describing "Type C K B" high-torque, high-efficiency, squirrel-cage motors; and a price list of "Cosmos" vacuum and gasfilled lamps.

MESSRS. FALK, STADELMANN & CO., LTD., 83, 85 and 87, Farringdon Road, E.C.1.—An illustrated catalogue (No. 549) of "Lucifer" portable electric lamps and "Efesca" batteries; and Catalogue No. 547, dealing with electric bells and telephones. Both publications are fully priced.

THE CABLE ACCESSORIES CO., LTD., Tividale, Tipton, Staffs.—A priced pamphlet of tumbler switches, wall plugs, bells, &c.

MESSRS. NALDER BROS. & THOMPSON, LTD., 97A, Dalston Lane, E.8.—An illustrated brochure dealing with "N.C.S." relays for use in connection with the distribution of electricity.

DICTOGRAPH TELEPHONES, LTD., Aurelia Road, Croydon.—An illustrated booklet, advertising the firm's intercommunication system.

MESSRS. JOHN BELL & CROYDEN, LTD., 50-52, Wigmore Street, W.1.—List No. 6, containing an illustrated description of the "Arnold" osteoscope, an X-ray device for use in the fitting of boots and shoes. Priced.

MESSRS. C. A. VANDERVELL & CO., LTD., Warple Way, Acton, W.3.—Publication No. 7, containing prices and details of radio transformers, loud speakers, accumulators, &c.; and Publication No. 3, dealing with automobile lighting equipment.

Mr. L. J. Wolf, 116, Putney Bridge Road, S.W.15.—A series of illustrated pamphlets dealing with various patterns of fractional h.p. motors and fans made by the Robbins & Myers Co. (United States).

The Sun Electrical Co., Ltd., 118, Charing Cross Road, W.C.2.—A priced leaflet advertising "Radiobat" h.p. dry batteries.

Mr. A. Morgan, 138, Gower Street, London, W.C.1.—Priced leaflets relating to jack-up trucks and Osram lamps.

Book Notices.—We have received a copy of the first number of *The Wireless Dealer and Manufacturer*, a shilling monthly journal edited by Mr. J. Scott-Taggart and published by the Radio Press, Ltd. The outstanding articles are: "Tendencies in Radio Design," by Major James Robinson; "Selling Radio in America," by Mr. Percy W. Harris; "Organising the British Trade," by Mr. W. Witt Burnham; "A Talk on Demonstrating," by Capt. H. J. Round; and "Price-cutting and the Remedy," by Mr. A. H. Clifford. A good deal of space is devoted to the Wireless Exhibition and to matters of general interest to wireless dealers.

"The Decimal Educator," Vol. VIII. No. 29. September, 1925. Price 6d.—Included in an unusual number of interesting articles is one on foreign currencies and others on the accuracy of weighing in early days and Egyptian mathematics. This number also contains a *résumé* of the recently issued B.O.T. report on its work under the Weight and Measures Act.

"*Journal* of the Institution of Electrical Engineers." Vol. LXIII. September, 1925. No. 345. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"More Things that Matter," by Lord Riddell. Pp. viii + 319. London: Hodder & Stoughton, Ltd. Price 7s. 6d. net.

"Rewinding Small Motors," by D. H. Braymer and A. C. Roe. Pp. xiv + 247; figs. 210. London: McGraw-Hill Publishing Co., Ltd. Price 12s. 6d.

"Fournier's Theorem and Harmonic Analysis," by A. Eagle. Pp. xiv + 178; figs. 25. London: Longmans, Green & Co. Price 9s. net.

British Trade-mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from September 16th:—

Dri-ac (lettering and design). No. 458,263. Class 8. Electrical secondary cells or accumulators (not for surgical purposes) in which a non-liquid electrolyte is used.—Charles George Smith, "Woodville," Oakland Road, Cheltenham.

Ammonome. No. 460,719. All goods in Class 8.—The Paterson Engineering Co., Ltd., Windsor House, 83, Kingsway, London, W.C.2.

Electrola. No. 451,070. Class 8. Instruments and devices for the recording, reproducing, transmission, or reception of sound.—The Gramophone Co., Ltd., Hayes, Middlesex.

Spartan. No. 450,073. Class 13. Electric lamps (ordinary).—Palmer, Ferris and Co., Ltd., 63, High Holborn, London, W.C.1.

Spartanite. No. 458,715. Class 40. Goods manufactured from india-rubber and gutta-percha for use in wireless telephony. No. 458,824. Class 50. Electrical insulating substances, battery jars, vents, covers, &c.—Fuller's United Electric Works, Ltd., Woodland Works, Grove Road, Chadwell Heath, Essex.

South Wales Exhibition.—The South Wales Institute of Engineers is organising an engineering exhibition to be held at the Drill Hall, Cardiff, from November 26th to December 5th. The preliminary list of exhibitors includes the following:—Daniel Adamson & Co., Ltd., Anderson Boyes & Co., Ltd., Edward Bennis & Co., Ltd., Blackstone Engine Co., Ltd., British Arca Regulators, Ltd., British Brown, Boveri, Ltd., British Engine, Boiler and Electrical Insurance Co., Ltd., "Ceag" Miners' Supply Co., Ltd., Cowlishaw, Walker & Co., H. & T. Danks (Netherton), Ltd., Davey, Paxman & Co., Ltd., De Laval Chadburn Co., Diamond Coal Cutter Co., Ltd., Electro-Mechanical Brake Co., Ltd., Evershed & Vignoles, Ltd., Film Cooling Towers (1925), Ltd., Gent & Co., Ltd., Haslam & Stretton, Ltd., Mavor & Coulson, Ltd., Oldham and Sons, Ltd., A. Reyrolle & Co., Ltd., Switchgear & Cowans, Ltd., and Turbine Furnace Co., Ltd.

Australian Preference for British Goods.—The House of Representatives has passed the Customs Act Amendment Bill, legalising the imposition of a condition that goods, in order to enjoy full preference, must be 75 per cent. of British manufacture, and granting a preference on goods, 25 per cent. of which are of British manufacture, if the preference does not clash with established Australian industries.—*Reuter* (Melbourne).

New Italian Companies.—Among the undertakings recently organised in connection with the electrical engineering industry in Italy are the Società Italiana Porcellane Elettrotechniche Pohl, formed in Milan, with a capital of 125,000 lire; the Società di Costruzzioni Elettricita Friuli Orientale, Trieste, 1,000,000 lire; and the Società Utenti Energia Elettrica, Milan, 30,000 lire.

German Electrical Combine.—It is reported from Stuttgart that a new concern has lately been formed in that town with the title F.M.O., to effect an amalgamation of the interests of three manufacturers of electrical apparatus—C. and E. Fein, of Stuttgart; Paul Meyer, of Neu-Isenburg; and the Albert Obermoser Gesellschaft, of Bruchsal. The object is to establish a joint material purchasing and sales office and the prevention of overlapping in the classes of goods produced.

New Municipal Showrooms.—Southport.—The offices of the Electricity Department have been transferred from Eastbank Street to the Glaciarium, Lord Street, which has been improved for the purpose. The premises include new showrooms.

Swansea.—On September 17th the Mayor formally opened the Electricity Department's new showrooms and offices in Oxford Street. The showrooms are arranged as a series of rooms each with its appropriate electrical equipment.

Czecho-Slovakian Company.—The West Bohemia Electricity Co. has been formed in Pilsen with a capital of approximately £74,000.

Electricity Supply Association of Ireland.—The annual meeting of this Association was held in Dublin on September 17th, when Mr. W. Hewat was elected president for the ensuing year. Among the matters discussed was the Shannon hydro-electric scheme. Mr. P. A. Spalding (Dundalk) said that while the contractors were endeavouring to pay labourers 8d. per hour, the men claimed 1s. 3d. per hour. It was estimated that 3,000 men would be employed on the scheme, and therefore the extra cost involved would be £125,000 per annum. As the carrying out of the scheme was expected to occupy three years, the total additional cost would be £375,000 for labour costs alone. Mr. Spalding asked whether the contractors or the Government would be responsible for that.

Brazilian Electrical Imports.—According to *Commerce Reports*, imports of electrical goods into the port of Rio de Janeiro during June last were considerably below normal, totalling 101 metric tons, or 819 cases. The United States and Germany, normally large suppliers of electrical goods, showed decreases as compared with the previous month's figures. The United States supplied 28 metric tons; Great Britain, 13 tons; Germany, 26 tons; the Netherlands, 14 tons; Italy, 16 tons; and other countries, 4 tons.

The Wood Market.—A timber trade correspondent writing on the present position of the wood market, says:—"In the electrical trade timber is a necessity as it is in all trades. Our own forests are so sparse that approximately nine-tenths of our wood requirements are brought from overseas. Our principal and most generally used imports are sawn softwoods, *i.e.*, pine and spruce deals, battens, scantlings and boards. Finland, Russia and Sweden, in the order named, send us the largest quantities of these, followed by Latvia, Canada, Poland, the United States, &c. Sawn softwoods are used in house construction, joinery, box and packing case work—indeed, they may be termed the 'general utility' woods, called into requisition for all kinds of work from a rabbit hutch to the carcassing of a mansion. And they are shipped to this country in almost every conceivable size for the work they have to perform. The timber market here is at present so depressed that consumers should be getting their raw material, and their clients their made-up wooden articles, more cheaply than, say, in January last. The fall in prices is due to over supplies on the market, the dull state of the staple industries of this country and their lack of call for timber, and the poor demand from Continental consuming countries. If it were not for the small boom in house-building (this *is* a record year for housebuilding), the north of Europe shippers would have made still heavier losses than those already entailed by them this season. Some authorities in the trade, however, believe that the market has now reached bottom; others, on the other hand, think timber may go a little lower in price yet. It is certain, however, that the foreign wood manufacturers are suffering heavy financial losses, which will mean restricting output and a general rise when opportunity permits. That is the general position to-day of our imported 'general utility' woods. These must not be confounded with hard woods—mahogany, oak, ash, walnut, &c., for the furniture and cabinet trades and for interior decorative work, nor with shipbuilding woods such as East India teak, pitch pine, &c. All these are firm in value and likely to get stronger."

A Valve-Selling "Campaign."—Following upon its scheme for stimulating the sale of "Osram" lamps, the General Electric Co., Ltd., has drawn up plans for a similar "campaign" in connection with its radio valves. A brochure has been prepared for the use of sellers of these valves in which particulars are given of the publicity matter which is available, as well as details of a widespread advertising scheme.

Unemployment.—After a series of increases there was a reduction in the number of unemployed during the week ended September 7th. The total at that date was 1,345,500, 8,800 less than a week earlier, but 181,850 more than at September 8th, 1924.

Sales Engineers' Luncheon.—On Friday, September 11th, the sales engineers of the London office of Metro-Vick Supplies, Ltd., were entertained to luncheon at "Simpsons" Restaurant by their district manager, Mr. E. Myhre. The principal guests were Mr. P. F. Crinks, managing director, and Mr. A. E. Iliffe, sales manager. The luncheon was arranged to take place on the same day as the visit of M-V.S., Ltd., sales staff to the E.L.M.A. Lighting Bureau to hear a lecture on "The Shop-window Lighting Campaign." The guests were afterwards entertained at the "Victoria Palace."

Army Technical Training.—The authorities announce that there will be vacancies for between 200 and 250 boys at various military technical establishments in November next. The selection of boys for the vacancies will be made by means of a competitive examination. Among the trades which are taught are electricians' work, fitting, and radio operation

Chinese Notes.—The official *Chinese Economic Bulletin* says that there has been an enormous decrease in the consumption of kerosene oil in Canton, the principal cause being the wider use of electricity for lighting in the city and neighbouring towns.

The Electrical Enterprise Co., Ltd., Harbin, is planning to start the construction of a tramway in the city at an estimated cost of $2,730,000. The Siemens (China) Co. is reported to have received the contract for the engineering work.

Copper, Lead and Rubber Prices.—Messrs. F. Smith and Co. report September 22nd:—Copper (electrolytic) bars, £68, 15s. decrease; do. do. sheets, no change; do. do. wire rods, £78, 15s. decrease; do. do. h.c. wire, 9¾d., ¼d. decrease.

Messrs. James & Shakespeare report September 22nd:—No change in the prices of copper bars (best selected), sheet and rod; English pig lead, £41 5s., 30s. increase.

Messrs. Edward Till & Co. report September 22nd:—India-rubber, Para, fine, 3s. to 3s. 1d.

Limerick Dock Scheme.—The *Financial Times* reports that it is stated in Limerick that a sum of £150,000 has been guaranteed under the Trades Loan Act for carrying out the extension of Limerick docks and the construction of a western entrance. The work, which will probably be undertaken by Siemens-Schuckert, of Berlin, will provide further facilities for the docking of vessels of large tonnage.

New Belgian Companies.—Among the recently-formed Belgian companies are the following: l'Electricité Industrielle Belge, capital one million fr., for all industrial, commercial, or financial operations relative to electricity supply undertakings, &c.; the Société Co-operative pour l'Exploitation du Halage Electrique, to establish and work electric haulage on the Liége—Antwerp canal and elsewhere, and to produce and distribute electricity; and the Société d'Electricité de la Région de Malmedy (Serma), Brussels, capital 40 million fr., to develop the hydro-electric resources of the Warche.

Electrical Association for Women.—ST. HELEN'S WORKS VISIT.—On September 19th, in spite of the very bad weather, a large party of members visited the St. Helen's Cable and Rubber Co., Slough, and was very interested in seeing the rubber as it was received in its raw state from Central America, and the large number of operations that were necessary before it was finally ready to be used as cable covering. Tea was taken at the canteen, when a vote of thanks was proposed by Mrs. Llewelyn Atkinson to Mr. Brooking and his staff for their kindness in giving up a Saturday afternoon to show the members of the E.A.W. round their works. Before leaving each member of the party was presented with a St. Helen's hot-water bottle. This was the first visit of the E.A.W. to a cable factory.

Lighting and Power Notes.

Ayrshire.—ELECTRICITY SUPPLY.—Under the Ayrshire Electricity Board scheme an electricity supply is now being given to Dalmellington by the Dalmellington Iron Co., Ltd., from its power station. The company is now carrying out an installation at Burnfoothill and Lethanhill.

Blackhall (Co. Durham).—STREET LIGHTING.—After lighting the streets of the district free of cost since the opening of the colliery 12 years ago, Horden Collieries, Ltd., has informed the residents that it will be necessary in future to make a charge of £3 per lamp per annum for 139 lamps. This includes the cost of extra installations and maintenance.

Brazil.—SAO PAULO POWER SHORTAGE.—According to *Commerce Reports*, conditions in Sao Paulo, Brazil, have become more serious, due to continued power shortage, which has reduced the output of factories to approximately one-half their normal production. It is stated that work on the new hydro-electric plant at Rasgao is progressing satisfactorily, and construction work on the Cubatao plant, near Santos, is also going forward, and it is expected that within one year Sao Paulo will receive power from this source.

Canada.—ELECTRICAL DEVELOPMENT.—The fifth unit of the Stave Falls plant of the British Columbia Electric Railway Company, Ltd., Vancouver, B.C., has been completed. The addition of this 25,000-h.p. unit completes the enlargement of the Stave Falls plant, which now has a total capacity of 75,000 h.p. The plant, originally built by the Western Power Company, consisted of three units with a capacity of 39,000 h.p. when it was taken over by the British Columbia Electric Railway Company at the end of 1920. The latter installed a fourth unit bringing the plant's capacity up to 52,000 h.p.

The town of Antigonish, N.S., is considering installing a municipal electrical plant. The cost will be about $60,000.—*Electrical News.*

Chester.—YEAR'S WORKING.—The report on the working of the city electricity undertaking (engineer, Mr. S. E. Britton) for the year ended March 31st last, shows a total revenue of £57,048, as compared with £54,218 in the preceding year. Working expenses totalled £30,077, as against £23,840, leaving a gross surplus of £26,972 (£30,378), to which was added a grant from the Unemployment Grants Committee of £215, making a total of £27,187. Capital charges absorbed £17,547, and there was a net profit of £9,639. The result of the previous year's working was a profit of £14,704. The capital expenditure amounted to £37,482, and included £10,007 for property in Northgate Street, £9,137 for mains, and £8,962 for plant and machinery. The electrical energy sold increased from 4,238,246 to 4,883,378 kWh, and the maximum supply demanded from 2,710 to 3,191 kW.

Continental.—JUGO-SLAVIA.—A new 15,000-h.p. turbo-generator is being added to the Faal hydro-electric power station near Marburg. Work is also in hand on the erection of a permanent 10,000-V transmission line, in place of the temporary one at present connecting the plant with the nitrogen factory at Maria-Rast.

SPAIN.—La Sociedad Riegos y Fuerza del Ebro, of Barcelona, has decided to extend the plant at its Camarasa hydro-electric power station by the addition of a 14,060-kW alternator, three 4,700-kW transformers, four 8,333-kW transformers, and two synchronous condensers of 5,000- and 2,000-kW capacity respectively. The contract for the material has been placed with the General Electric Co. through its Spanish representative, the Sociedad Iberica de Construcciones Electricas, of Bilbao.

AUSTRIA.—The Teigitsch hydro-electric power station which has been erected by the Steirischen Wasserkraft und Elektricitats Gesellschaft and at present is equipped with two 13,000-h.p. sets, was recently put in operation. Electricity is being supplied at 60,000 V to the town of Gratz and Central Styria, and when a third 13,000-h.p. set is installed and the necessary transmission lines completed, part of the power will be reserved for industrial establishments in the Murz Valley and other districts of lower Austria.

GERMANY.—The Inn hydro-electric works was completed on September 6th. It is situated in the vicinity of Muhldorf and has been established by the Government of the Reich, by Bavaria, and by three large firms in the electrical and chemical industries. The works is intended to supply electrical energy for the production of aluminium and nitrogen. The constructional works have extended over five years. At present the power house has in operation seven sets, each of 5,750 kW, for supplying the aluminium smelting furnaces, and eight units each of 8,200 kW for the production of nitrogen, the total machinery installed, including a small generator, being 128,000 h.p. The average production per annum is estimated at 500,000,000 kWh. It is stated that the output of the works will amount to 10,000 tons of aluminium and 20,000 tons of nitrogen per annum.

DENMARK.—According to a recently-issued Government report there were 95 municipal central electricity stations, 40 other large stations, and 374 small country stations in operation in Denmark at the end of 1923. The total power available was 190,595 h.p., of which 101,910 h.p. was supplied by steam engines, 62,684 h.p. by Diesel plant, and the balance by miscellaneous types of machinery. The production of electricity during the year in question amounted to 194 million kW, of which nearly 80 millions was required for Copenhagen alone, where the generating stations have a capacity of 53,000 h.p. The number of electric lamps and motors in use in Denmark represented 277,000 kW and 441,000 kW respectively.

Dalkeith.—PURCHASE OF UNDERTAKING.—It was announced at a meeting of the Town Council on September 14th, that the Electric Supply Corporation, Ltd., had decided to accept the Council's offer of £18,000 for the purchase of the local electricity undertaking.

Darlington.—OPPOSITION TO ORDER.—The Rural District Council is to lodge a protest against the Darlington Corporation Electricity Extension Order unless the Corporation is prepared to include in the area of compulsory service the parishes of Haughton-le-Skerne, Blackwell, and Croft, and to exclude nine parishes which the Rural Council considers can be more favourably served by the Cleveland and Durham Electric Power Company. The Corporation has, so far, declined to accede to the Rural Council's request, and does not agree that the minimum price per kWh should be reduced from 1s. to 10d.

Dover.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £3,000 for mains.

Easingwold (Yorks.).—STREET LIGHTING.—After considering terms for street lighting offered by the Easingwold Gas, Light & Coke Company, Ltd., and by Messrs. John Charles Bannister & Co., Ltd., from Easingwold electric power station, the Urban District Council has decided in favour of the electric lighting offer. Both undertakings offered the lighting at £2 per lamp during the period of the lighting season, but the electrical offer included all maintenance costs.

Grimsby.—NEW PLANT.—Owing to the increased demand for electrical energy required for the tramway undertaking, it is proposed to move the existing converter used for this purpose to West Marsh sub-station, and to install a new converter with a capacity of from 400 to 500 kW. The cost of the scheme is estimated at £2,700, and application is to be made for sanction to a loan to cover the cost.

Hamilton.—PURCHASE OF UNDERTAKING.—At a recent meeting of the Town Council the Electric Lighting Committee reported on negotiations with Messrs. Edmundson's Electricity Corporation, Ltd., regarding the proposals for the taking over of the electricity undertaking by the Council. As to the sum to be paid by the Council for loss of profits between January 1st and May 15th next, the proportion based on last year's profits was about £1,500, but it was arranged with Mr. Rye, general manager of the company, that £1,400 should be paid by the Council on January 1st next, and that the undertaking should be taken over as from that date. The report was adopted.

Haslingden.—ELECTRICITY IN BULK.—The Corporation has decided to ask the Accrington Corporation to reconsider its terms for supplying electricity in bulk.

Hawaii.—WATER-POWER RESOURCES.—According to the *Electrical World* the Department of the Interior has prepared an estimate of the potential water-power of Hawaii based on

a study of the flow and the fall of the streams. This potential power is estimated at 174,000 h.p. for 50 per cent. of the time and 72,000 h.p. for 90 per cent. of the time. The latter is divided among the islands as follows: Kauai, 34,900 h.p.; Oahu, 5,300 h.p.; Molokai, 1,700 h.p.; Maui, 15,800 h.p.; Hawaii, 14,700 h.p. The rated capacity of the waterwheels and turbines now in use is about 25,000 h.p.

Hayward's Heath.—Special Order.—Application is being made by Mr. A. A. Hunt, engineer of the Burgess Hill and District Electric Supply Co., Ltd., and the Haywards Heath and District Electric Supply Co., Ltd., for a Special Order to supply electricity in Hurstpierpoint, Hassocks, Keymer, and Ditchling. It is proposed to erect transmission lines and obtain a bulk supply from Brighton Corporation.

India.—Trichinopoly Electricity Scheme.—The Government of Madras has authorised the Trichinopoly Electric Power Co. to commence operations and the company has been actively proceeding with the survey, demarcation and acquisition of the lands necessary, for the water-power works on the Kollimlais in order that an initial supply of 500 h.p. may be made available at Trichinopoly in the course of next year. The company will complete this work shortly and afterwards carry out the demarcation and survey of the conduit channel and emergency reservoir.—*Indian Engineering.*

Irish Free State.—Clonmel (Co. Tipperary).—The electricity scheme which has been provided at a cost of £12,500, was formally inaugurated on September 10th. Lamps of from 100 to 400 candle-power have been installed for street lighting and the scheme is working satisfactorily. Messrs. Tierney and Co., Dublin, were the engineers. The power house was built by Messrs. Roche, Morrissey & Kennedy, Clonmel; the Siemens-Schuckertwerke, Berlin, supplied the alternators, the Western Electric Company the switchgear; Messrs. Ruston and Hornsby, Lincoln, the three engines; and the Irish Electricity Supply Company, Dublin, the distribution plant. The system is so arranged as to fit in with the Shannon scheme. Some 120 business and private houses are at present receiving a supply, and it is anticipated this number will be greatly increased before the end of the year.

Keighley.—Electricity Extensions.—On September 19th, Mr. Philip Snowden, M.P., formally inaugurated extensions at the Corporation electricity station, the chief feature of which is a new 5,000-kW generating set, bringing the capacity of the plant to 15,000 kW. Mr. Harry Webber, the borough electrical engineer, in the course of the 24th annual report on the undertaking, states that this is by far the largest extension made at any time by the department. In June, 1902, after the first fifteen months' running, there were 92 consumers, in 1920 there were 967, and at the end of last March there were 2,031 consumers, who took 10,340,784 kWh. Last year's revenue was £74,069, as compared with £1,409 in the first fifteen months' period. The Corporation is still developing the electricity supply in out-districts.

Kirkintilloch.—Electricity Scheme.—The Strathclyde Electrical Supply Co., Ltd., has given statutory notice to the Town Council of its intention to exercise the powers under the Kirkintilloch and District Electricity Supply Order and to carry out the necessary work. A cable has been brought into the town and a sub-station is to be erected.

Leeds.—"All-Electric" Houses.—The Electricity Committee proposes to contribute £10 per house towards the cost of wiring the new houses which it is surging the Improvements Committee to equip, experimentally, with electrical fittings. This offer, it is stated, extends to a block of fifty of the new dwellings which the Corporation has in contemplation. It is intended that electrical appliances should be provided for cooking, lighting, and washing. The scheme is now being considered by the Improvements Committee.

London.—Islington.—The Electricity Committee has approved an estimate of £15,000 for replacing with paper-insulated lead-covered cables the rubber-insulated cables at present in use. Some of these cables were laid down when the electricity supply was first commenced.

St. Pancras.—The Electricity Committee has received the approval of the Unemployment Grants Committee to a grant of 50 per cent. of the interest on loans raised to meet the expenditure on schemes not exceeding £18,400 for linking-up the St. Pancras and Islington power stations, the re-arrangement of mains in the southern area of the borough, and the installation of h.p. mains from King's Road generating station to the Highgate sub-stations.

The Committee has requested the chief electrical engineer to report on the possibility of converting the whole of the street lamps from gas to electricity for the purpose of a grant under the Unemployment Relief Scheme.

Lowestoft.—Electricity in Bulk.—The Electricity Committee is negotiating with the Great Yarmouth Corporation respecting a bulk supply of electricity from Yarmouth.

Extension of Supply.—The Electricity Committee is arranging to give a supply of electricity to Pakefield, subject to its securing the necessary fringe Order for the purpose.

Maldon (Essex).—Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising Messrs. J. Sadd & Sons, Ltd., to supply electricity in the urban district and certain parishes in the rural district of Maldon.

Mexico.—Hydro-Electric Development.—*Commerce Reports* states that a contract has been entered into between an electric power company and the Mexican Government fixing the terms of a concession granted to that company for the use of the Conchos River for generating hydro-electric power. The present contract, which supersedes three other contracts, authorises the company to construct a dam, 70 metres high, on the Conchos River, and the necessary hydraulic works to provide power; and a dam and the necessary hydraulic works to utilise the waters of the Rio Conchos. The duration of this concession will be 85 years, beginning December 10th, 1909.

Northern Ireland.—Ballyshannon (Co. Donegal).—The Town Commissioners have accepted the offer of Messrs. Myles and Co. for the electric lighting of the main streets.

Oxenhope.—Electricity Supply.—The Urban District Council, on September 11th, decided to ask Keighley Corporation to provide a supply of electricity to the district.

Peebles.—Electricity Supply.—The Town Council is to confer with the Galashiels and District Electric Supply Company regarding a supply of electricity for the town.

Preston.—Street Lighting.—The Town Council has decided to illuminate all tramway routes and streets where electric mains are laid by electricity, and application is to be made for sanction to borrow £15,800 for the work.

Loans.—The Electricity Committee has recommended that application be made to the Electricity Commissioners for sanction to borrow £3,814 for the purchase of a rotary converter and switchgear, and £5,000 for meters.

Electricity in Bulk.—The Committee reports the receipt of a letter from the Electricity Commissioners announcing their approval of an agreement between the Corporation and the Lancashire Electric Power Co. for a bulk supply of electricity to Leyland, &c.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

St. Albans.—*North Metropolitan Electric Power Supply Co.*—Lighting: Flat rate from 7d. to 6d. per kWh; maximum demand rate, from 10d. and 2d. to 10d. and 1½d. per kWh. Heating and cooking: Flat rate from 2½d. to 2d. per kWh. Lighting, heating and cooking, annual service rate: The meter rental of 2s. 6d. per quarter to be discontinued.

Edmonton.—*North Metropolitan Electric Power Supply Co.*—Lighting: Flat rate from 6d. to 5½d. per kWh; maximum demand rate, from 9d. and 2d. to 10d. and 1d. per kWh. Heating and cooking: From 2d. to 1½d. per kWh. The surcharge of 10 per cent. on motor and industrial power rates is to be discontinued.

Tunbridge Wells.—Lighting: Flat rate, 4½d. per kWh. Heating, cooking and power: Flat rate, 1d. per kWh, or at the option of the consumer, a fixed charge of 18s. per annum for each living room and hall, and 6s. per annum for other rooms, plus ¾d. per kWh for electricity consumed, or a fixed annual charge of £1 for houses of the rateable value of £10 or under, or a fixed charge of 10 per cent. of the rateable value for houses rated at over £10, plus in each ¾d. per kWh for electricity consumed.

Mansfield.—Lighting: From 7d. to 6½d. per kWh. Power: From 3½d. to 3d. per kWh.

Scarborough.—Purchase of Undertaking.—The proposal of the Town Council to purchase the electricity supply undertaking of the Scarborough Electric Supply Co., Ltd., as from December 31st next has been agreed to by the company.

Stirling.—Year's Working.—The accounts of the burgh electricity undertaking (engineer, Mr. W. R. Murray) for the year ended May 15th last, record a total revenue of £16,310, as compared with £14,284 in the preceding year. Working expenses amounted to £11,324, as against £9,033, leaving a gross profit of £4,986 (£5,251), to which was added a profit on hire-purchase motors, making a total of £4,988. This was distributed as follows: Interest on and instalment of principal of money borrowed, £2,913; sinking fund, £1,394; taxes and bad debts, £681. The sales of electrical energy increased from 843,043 to 986,180 kWh, and the maximum supply demanded from 600 to 640 kW.

Straits Settlements.—Penang.—According to *Commerce Reports*, the submarine cables which are to supply Penang, Straits Settlements, with current from the new power station at Prai are said to be the longest submarine power cables that have been manufactured in one length. Each cable is 4½ miles long, and consists of six conductors, each of 0.075 sq. in. sectional area, forming a three-phase feeder of 0.15 sq. in. sectional area of conductor per phase. They are four inches in diameter, paper insulated, lead sheathed and armoured. The total weight of the submarine section is 270 tons. The normal pressure of these feeders will be 12,400 V, 50 cycles, and the test pressure will be 28,000 V.

Tanfield.—Inauguration of Sub-Station.—The new sub-station which has been erected by the Urban District Council was formally inaugurated on September 23rd.

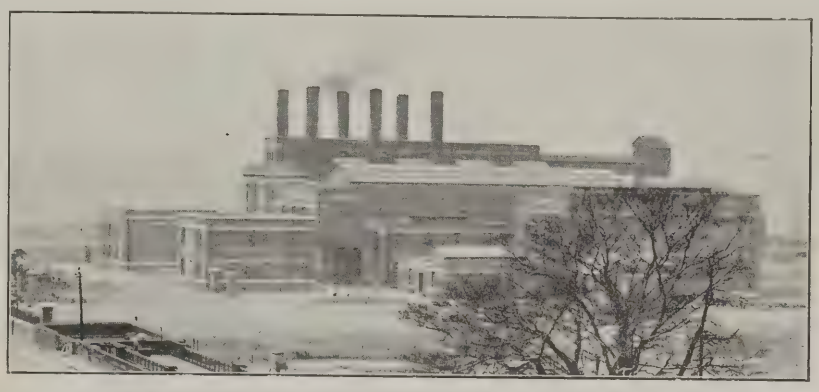
Winchcombe.—Electricity Scheme.—Mr. John Atkins, electrical engineer, of Tewkesbury, proposes to carry out an electric lighting scheme for the town. The cost of the scheme is about £4,380, towards which £2,000 has been promised, and he proposes to supply electricity at a charge of 1s. per kWh. If the necessary approval and support are forthcoming a supply of electricity will be available early next year.

Yarmouth.—Loan Sanctioned.—The Town Council has received sanction to a loan of £120,000 for extensions to the generating station, sub-stations, mains, and plant. The extensions include the installation of a 3,000-kW turbo-generator.

Electricity Supply in Salford.

The Agecroft Power Station.

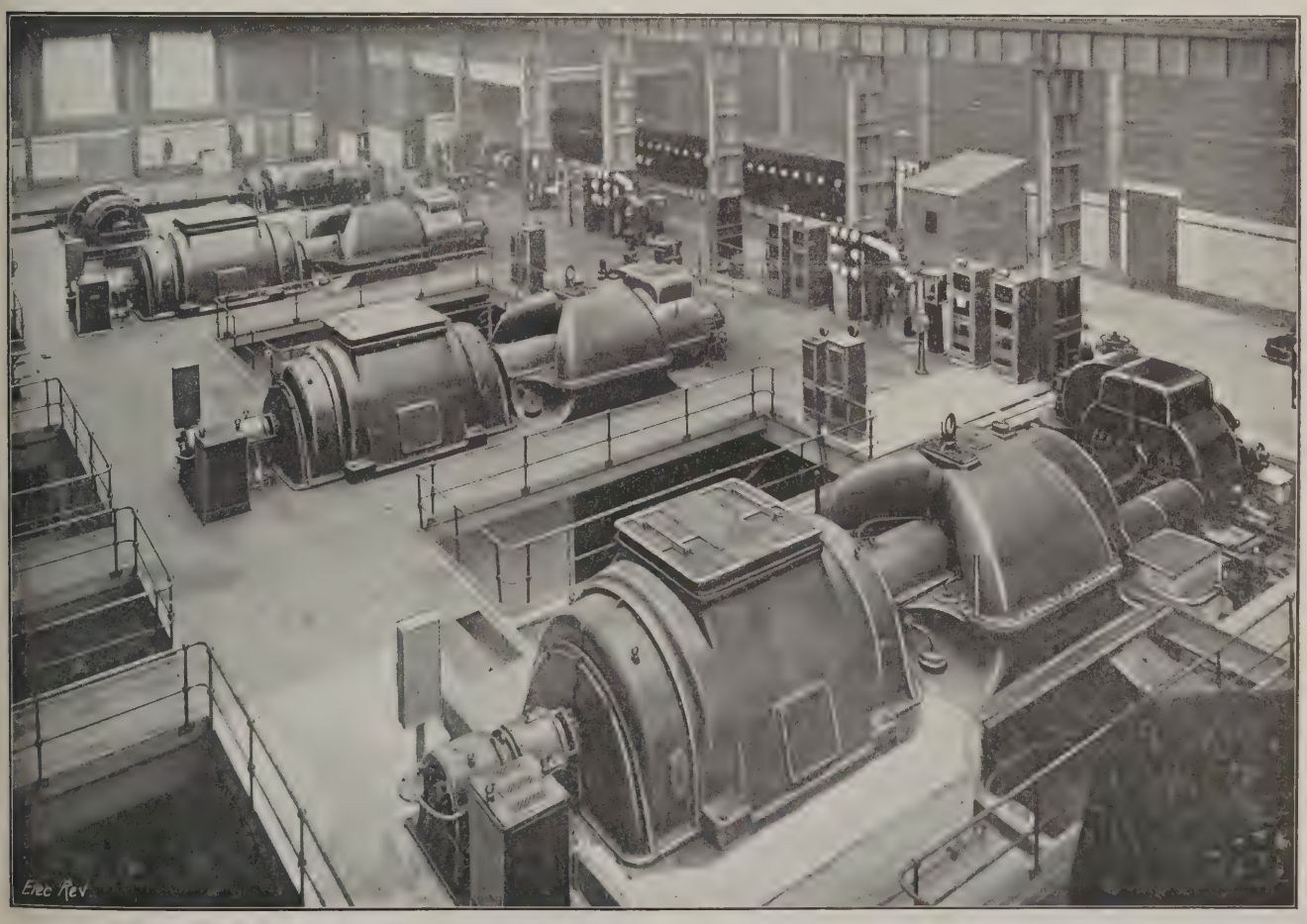
The Royal Borough of Salford, though it takes just pride in its ancient Charter (dating from about 1230 A.D.), has advanced with the times, and will not brook dependence on others for the supply of that essentially modern commodity—electrical energy. Thirty years ago it commenced operations in a small way, with a 360-kW single-phase a.c. plant, of which a description appeared in our pages at the time. The distribution pressure was 3,300 volts, reduced by house transformers to 100 volts. In 1897 the central district was changed to direct-current supply at 220 and 440 volts, and the Frederick Road station, described in our issue of June 27th, 1902, was built for a capacity of 6,400 kW. Later on, turbo-generators of 3,000 kW were installed; in 1912 a bulk supply of 2,000 kW was obtained from the Lancashire Electric Power Co.; and in 1914 a turbo-alternator of 5,000 kW was added, followed by two others of the same capacity in 1915 and 1917, the three-phase system of transmission at 6,600 volts being adopted. The output capacity of the plant on the Frederick Road site was thus brought up to 18,000 kW. In 1918 the contract with the Power Co. was terminated, and a bulk supply of 5,000 kW was obtained from the Manchester Corporation, at 33,000 volts—the highest pressure used up to that date for underground transmission; the cables were put to work in October, 1919, and have proved entirely satisfactory. In 1920 a fourth generating set was installed, but it was decided to build a new power station on the River Irwell at Agecroft, and a scheme was prepared for a station of 50,000 kW initial capacity by Mr. J. A. Robertson, then borough electrical engineer, which was approved by the Council and the Electricity Commissioners in 1922. The main contracts were placed in September of that year; the first three generating sets were to have a total capacity of 37,500 kW, and the design provided for extensions up to 100,000 kW.



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Fig. 1.—Exterior of Agecroft Power Station.

While the station is intended primarily to serve the borough of Salford, it is also one of the capital stations scheduled in the South-East Lancashire Electricity Scheme, and will be linked with other capital stations to supply districts outside the borough.



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Fig. 2.—Interior of Engine Room.

The site, which covers 65 acres, is bounded on the east by the River Irwell, from which ample supplies of condensing water can be obtained; on the west it adjoins the Manchester, Bolton and Bury Canal, and the main

railway line between Bolton and Manchester. There are several large collieries in the vicinity from which supplies of coal can be obtained by road. The low-lying north portion of the site provides ample ground for the disposal of ashes. A thick bed of sandstone

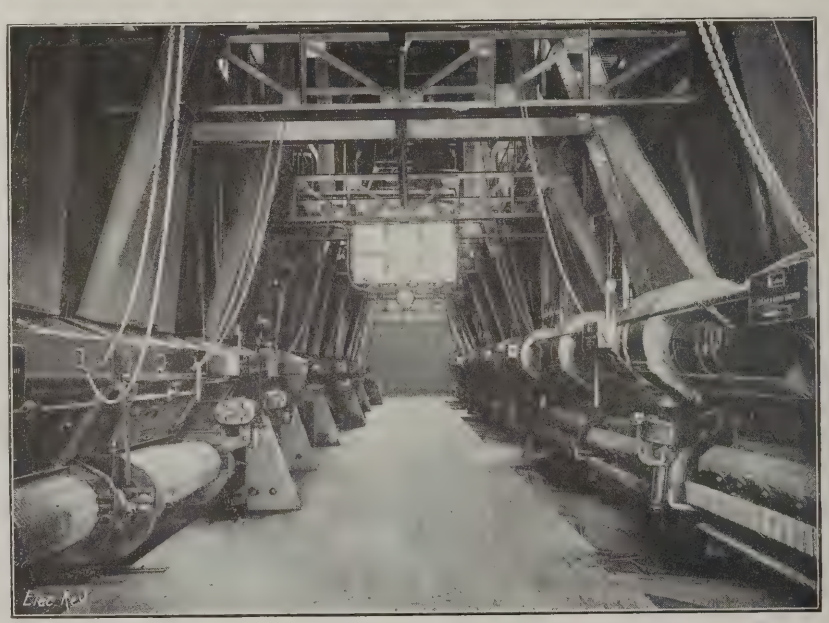


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Fig. 3.—Coal Elevator.

extends over the site at a depth of 12 to 15 feet, affording good foundations. The geographical position is suitable for linking-up with other large stations, the distance from the Manchester Barton station being about five miles, from Manchester Stuart Street station about six miles, and from the Radcliffe power station of the Lancashire Electric Power Co. about 4½ miles.

Condensing water is taken from the River Irwell at a point about 150 yards from the power house, whence it is conveyed through a tunnel 8 ft. 6 in. in diameter, bored through the rock, to the basement of the turbine house. After passing through the condensers, the water is returned by way of a junction chamber, through a similar tunnel to a spillway lower down the river. A screening chamber at the inlet is equipped with four circular motor-driven screens each



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Fig. 5.—Boiler House.

To guard against periods of abnormal drought, four cooling towers have been erected by the Premier Cooling Co. to the north of the power station; they are capable of cooling 1,200,000 gallons of water per hour from 100 deg. to 80 deg. F., and are erected on concrete



Cross-Courtenay, Ltd.

Fig. 6.—Cooling Towers.

piers in the water-storage reservoir, which is capable of storing 2,500,000 gallons of water. When it is desired to bring the cooling towers into operation, the penstocks on the discharge side of the junction chamber can be partially or wholly closed and water pumped back through duplicate pipe lines over the cooling towers. The flow of water from the reservoir is regulated by two electrically-operated penstocks controlled from the power station. A water tunnel has been bored between the reservoir and a junction chamber on the main tunnel between the screening chamber and the power house. The water tunnels throughout are double brick lined, and the branches to the main condensers are of cast iron.

The canal is situated between the railway and the power-station site, and in view of the expenditure neces-



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Fig. 4.—Belt Conveyor.



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Fig. 7.—Part of the Screening Plant.

27 ft. in diameter, supplied by Messrs. F. W. Brackett and Co. Separate compartments are provided, controlled by penstocks, so that any screen may be closed down for examination or repair.

sary to construct bridges for sidings over the canal, it was decided to unload coal from both railway and canal at the Clifton Junction siding about half a mile away, and convey the coal by light railway to the power house.

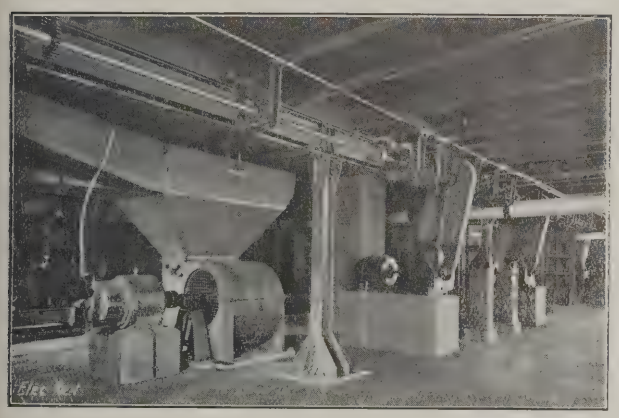
Rail-borne coal is unloaded from a railway siding by an electrically-operated wagon tippler, which is combined with a coal-weighing machine, and delivers to a belt conveyor, whence it is discharged to a common receiving hopper on the canal bank. Canal-borne coal is unloaded by a jib crane travelling on rails on the canal bank, and is delivered to the receiving hopper. From this point a second belt conveyor transports the coal over the canal and delivers it into the dispatching hoppers, which discharge into steel trucks of about $2\frac{1}{2}$ tons capacity. The trucks are then hauled in trainloads to the power house by an electric locomotive, supplied with direct current from overhead trolley wires at 220 volts. The capacity of the system is 80 tons per hour.

At the power house the coal is emptied to the main receiving hopper and elevated by duplicate bucket conveyors to horizontal belt conveyors, which extend over the full length of the overhead bunkers, and also provide for the additional bunkers which will be required when an extension is made to the boiler house.



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Fig. 10.—Basement of Engine Room.



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Fig. 8.—Basement of Boiler House.

To the north of the power station branches from the light railway have been constructed to permit delivery of coal direct to the storage ground. To stack and reclaim coal a jib crane, of 30 ft. radius, and travelling on a standard-gauge railway, is employed. The crane lifts the wagons, which are provided with flap doors, from the light railway and empties them on to the stack. When reclaiming, a 2-ton grab is used which delivers coal from the stack to the light wagons. The system of weighing the coal permits of a complete check throughout, including coal taken from the storage ground.

The removal of ashes from the boiler-house basement is effected by wet conveyors comprising chain-driven links immersed in water-filled troughs, which receive the ashes from the boiler furnaces and deliver to enclosed bunkers at the end of the boiler house.



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Fig. 11.—Bus-bar Room.



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Fig. 9.—Control Room.

At present motor wagons are employed for the removal of ashes to the adjoining tip, but it is intended to utilise the light railway system for this purpose, and gradually to fill up the whole of the low-lying ground to the north of the site.

The main portion of the buildings consists of two bays—the turbine house and boiler house. The switch house is a separate building about 20 ft. from the turbine house, the space between being occupied by the 6,600/33,000-volt step-up transformers. The main buildings are of steel framework with brick filling, the external face of the walls having a dressing of Accrington brick and artificial stone. Two detached blocks provide office accommodation and workshops and stores.

The boiler house is 162 ft. long, 82 ft. wide, and 87 ft. in total height. At present six boilers have been installed, out of eight for which accommodation has been provided. The boilers are of the Babcock & Wilcox

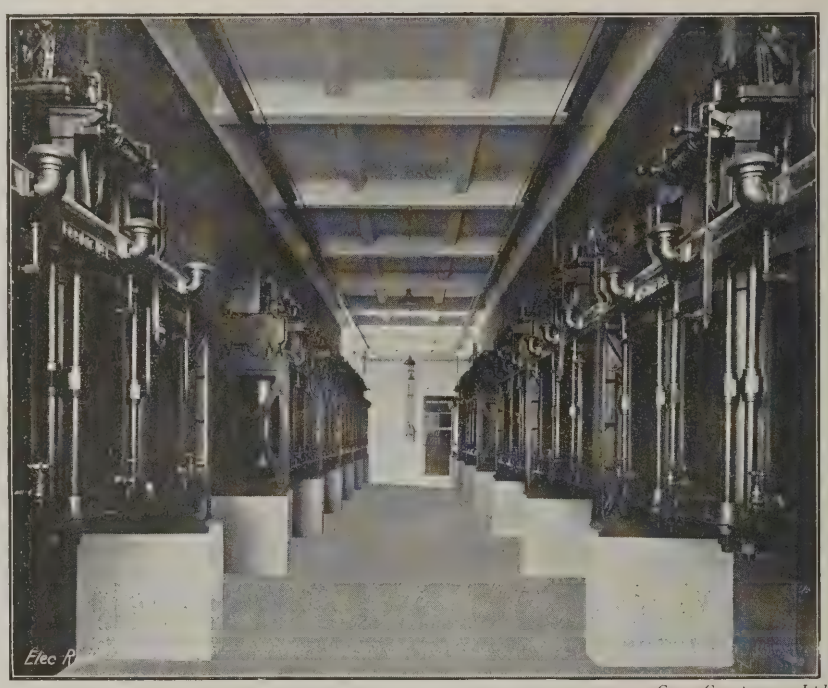
marine cross-drum type, each rated at 65,000 lb. evaporation per hour when fired with coal having a calorific value of 10,500 B.th.u. The overload capacity is 78,000 lb. per hour for two hours. Each boiler unit is complete in itself with economiser, superheater, forced and induced draught plant, and steel chimney.



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Fig. 12.—Battery Room.

The plant is constructed for a normal working steam pressure of 325 lb. per sq. in., and the superheaters raise the temperature of the steam to 720 deg. F. at the stop valve. The heating surface per unit is 9,234 sq. ft., and the economiser heating surface 7,460 sq. ft. Diamond soot blowers are fitted to each boiler. A complete set of measuring instruments, including CO_2 recorders, draught gauges, &c., is provided for each unit, and Lea coal meters are fitted to each stoker.



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Fig. 13.—Oil Switchgear : 33,000-Volt Circuit Breakers, without Cubicles.

Three of the boilers are fitted with Babcock & Wilcox compartment-type chain-grate stokers, driven from a shaft in the basement. The remaining three boilers are equipped with travelling grates of the Underfeed stoker type. In both cases the grate area per unit is 340 sq. ft.

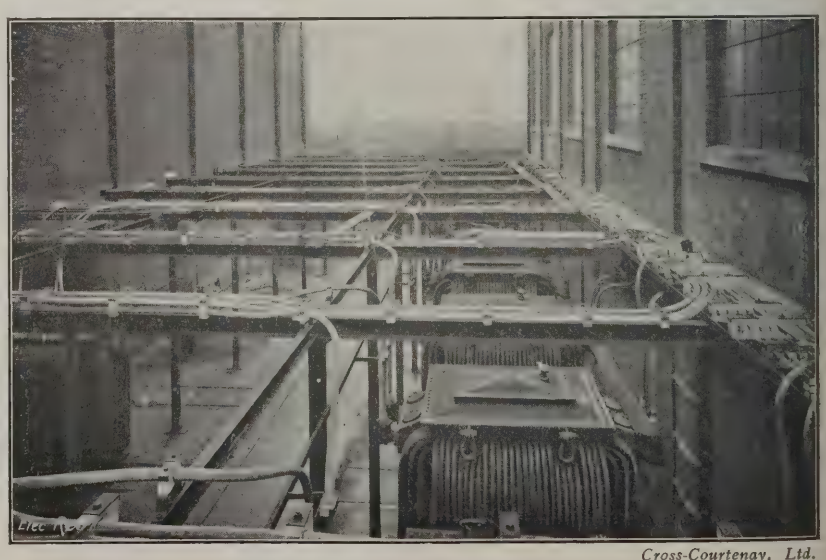
The boiler feed pumps are situated in the turbine house basement, and comprise two steam turbine-driven pumps of the Weir type, and two electrically - driven variable - speed pumps by Messrs. Mather & Platt. Each pump is capable of delivering 24,000 gallons of water per hour against the maximum boiler pressure. The steam and feed piping is laid out on the unit system, with interconnecting valves between the various sections. The whole of the boiler-house plant, feed pumps, and steam and water piping has been supplied by Messrs. Babcock and Wilcox, Ltd. The turbine house is 194 ft. in length by 90 ft. wide and 75 ft. in height, and includes a loading bay at the permanent end of the building. Three turbo-alternators have been installed, and space is provided for a fourth set. Each set is of 12,500 kW capacity at 0.9 power factor when delivering three-phase energy at 6,600 volts, 50 periods, and running at 3,000 r.p.m.

Turbines Nos. 1 and 2 are of single-cylinder design, embodying the Baumann multi-exhaust stages. During the manufacture of the first two sets, it was decided to construct No. 3 turbine as a two-cylinder machine, and to incorporate certain improvements. All three turbines are designed so that no cast-iron parts are exposed to high-temperature steam. They are fitted with the usual over-speed safety devices and oil relays for operating the valve gear.

A special arrangement of oil filtering and oil storage has been provided for the turbo sets. Each set is equipped with a Fox patent oil filter capable of dealing with 100 gallons per hour, and a general storage tank is fitted in the basement, a pump being arranged on the tank with selector valves by which make-up oil can be pumped to any turbo set.

The alternators represent the best modern practice. The stator frame is an iron casting in one piece with an air discharge outlet at the top and bottom. The windings are of the concentric type, ample bracing being provided. Ventilation is effected by air forced through the machine by fans on the rotor and also by a separately - driven blower. Air cooling is on the closed-circuit system, the coolers being situated directly under the alternators.

Each main condenser has a cooling surface of 13,000 sq. ft., and is capable of giving a vacuum of 29.05 in. with a barometric pressure of 30 in., when supplied with 11,000 gallons per minute of circulating water at 53 deg. F. The auxiliaries are driven by d.c., 220-volt motors, and comprise two circulating water pumps for each set, each capable of delivering 8,800 gallons per minute against a total head of



Cross-Courtenay, Ltd.

Fig. 14.—Outdoor Transformers.

30 ft. One motor-driven air pump of the Le Blanc type coupled in tandem with an extraction pump is provided for each set, and a two-stage steam air ejector is employed as a stand-by with a separately-driven extraction pump. It will be seen that the auxiliary plant is completely duplicated throughout.

The boiler feed water is dealt with by a completely closed system. The condensate is pumped through an integral feed-water heater and a Venturi meter into a bus main supplying the boiler feed pumps, or alternatively it can be by-passed into a special bus main connected to measuring tanks for test purposes. Above the bus main there are special surge tanks which maintain a constant pressure head on the feed pump suction. The make-up water is controlled by a ball valve which supplies direct to the condenser. Special arrangements are provided to furnish a full supply to the feed pumps in the event of an interruption of the flow of the condensate.

(To be concluded.)

Tramway and Railway Notes.

Blackpool.—TRAMWAY EXTENSIONS.—The improvements authorised by the Corporation's new Parliamentary Act include the extension of the new South Shore Promenade tramway to join the St. Annes line in Squires Gate Lane, linking up the Promenade and Fleetwood routes by a line along Queen's Square and Queen Street, a new line from Queen Street to Abingdon Street, and new lines linking up the Blundell Street depôt with Lytham Road.

Continental.—POLAND.—The construction of the first inter-urban electric tramway line between Warsaw and Zyrardow, a distance of 15 miles, which is being financed by British capital, is progressing rapidly. It is hoped to open it for traffic in December. The rolling stock, which has been manufactured in Great Britain, will arrive next month.—*Reuter* (Warsaw).

GERMANY.—The scheme which was first brought forward 20 years ago for the construction of an electric railway in Rhenish Westphalia has been revived by the formation by eleven towns in the district of a " study company " to which a concession has been granted for the carrying out of the project. In its present form the scheme contemplates the construction of a main line from Cologne-Dortmund, *via* Dusseldorf, Duisburg, and Essen to Bochum. It is estimated that the building of the lines would occupy a period of four years and involve an expenditure of £17,600,000. The Reich railway authorities have withdrawn from the scheme.

ITALY.—The Italian Government has sanctioned the expenditure of 60,000,000 lire on the electrification of the Bolzano-Brennero line (Trentino), and work will commence shortly.—*Reuter's Trade Service* (Milan).

THE TYROL.—An arrangement has recently been completed, according to *Die Wasserwirthschaft*, between the Austrian State Railway authorities and the Tiroler Wasserkraftwerke Gesellschaft, whereby the latter will, from the winter of 1927-28, supply from the Achen Lake hydro-electric power station, at present in course of construction, the electrical energy necessary for the operation of the Innsbruck-Brenner, Innsbruck-Kufstein, and Worgl-Saalfelden railways. It is stated that the contract calls for the supply of 20 million kWh per year, which represents between 25 and 40 per cent. of the output of the Achen Lake plant.

Heywood.—NEW ROUTES.—Having received from the Manchester Corporation tramway manager plans of the suggested tramway route from Hebers to Heywood, the Electricity and Tramways Committee has decided to make representations for a double line to be laid in Middleton Road and Coronation Avenue.

Newcastle-under-Lyme.—ABANDONMENT OF ROUTE.—The Potteries Electric Traction Co., Ltd., has given notice to the Rural District Council of its intention to apply to the Ministry of Transport for an Order to abandon certain tramways, including the Chesterton and Silverdale lines, which are mainly in the Council's area.

Oldham.—YEAR'S WORKING.—We have received from Mr. W. Chamberlain, general manager of the Corporation tramway undertaking, a copy of his report, together with the statement of accounts for the year ended March 25th last. The total revenue amounted to £215,615, as compared with £219,892 in 1923-24. Working expenditure was £178,852, as against £176,985, leaving a gross profit of £36,763 (£42,907). To this was added interest on investments, &c., making a total of £42,054. After providing for capital charges and rent of leased lines, a net surplus of £3,835 remained, as compared with £9,388 in the preceding year. The capital expenditure amounted to £22,750, the chief item being £16,490 on tramcars. The number of passengers carried increased from 33,410,901 to 36,364,299, and the number of car-miles run from 2,620,805 to 2,654,196. The total revenue per car-mile fell from 20.137d. to 19.496d. During the year powers were obtained to operate a system of railless cars between Oldham and Ashton-under-Lyne.

Scarborough.—PURCHASE OPTION NOT EXERCISED.—The town clerk recently drew the attention of the Corporation to the fact that the option of purchase by the Corporation of the Scarborough tramway undertaking might be exercised in 1926. The Council has decided not to exercise the option of purchase.

Telegraph and Telephone Notes.

China.—RADIO RIGHTS DEADLOCK.—The Washington correspondent of *The Times* reports that the question of the future development of radio communication in China and of the conflicting claims which arise out of the contracts between the Chinese Government and American and Japanese interests is still unsolved, and it appears as if no agreement can be reached before the holding of the conference on tariff questions next month. The Chinese proposal was to create a radio system with the aid of American and Japanese interests, but as this involved the cancellation of existing agreements with these groups, there was considerable opposition to it. A solution may be found in the formation of a consortium in which Great Britain and France would also be concerned.

Esthonia.—THE REVAL TELEPHONE SYSTEM.—It is reported that the telephone system of the capital, Reval, is to be modernised by the installation of a 10,000-line exchange. The estimated cost is given as 170 million Estmarks, and it is proposed to commence the work next year, 54 million marks being allocated to it in the Budget for that year.

France.—STRIKE.—All telegraph and telephone communication between London and Paris ceased owing to a strike of Paris operators, which took place just before noon on September 21st, when the operators left their instruments. The staffs in Paris and the provinces came out on strike for two hours by order of their trade union, to protest against the decision of the Salaries Commission in giving the maximum salary of 12,000 francs to schoolmistresses while women telegraphists and telephonists were given 9,200 francs. The strike commenced at eleven o'clock and lasted until one o'clock.

The Telephone Service.—The latest Post Office statistics for the whole country show that the increase in the number of telephones for the last quarter was 29,678, or 2.3 per cent. This figure is rather lower than that for the two previous quarters. While the volume of traffic continues to increase, as a result of connecting up new subscribers, the calling rate per line shows a tendency to fall. The number of trunk calls made during one month was 6,699,876, an increase of 580,9[illegible] calls, or 9.5 per cent. more than the figure for the corresponding month last year. The average number of calls made per working day was 273,464—the highest on record.

STREET KIOSKS.—Public street telephone kiosks, the first in the town, are about to be erected in several places in Barrow-in-Furness.

Radio Notes.

Australia.—REDUCTION OF LICENCE FEES.—The *Melbourne Age* announces the reduction of the fees for broadcasting licences as from August 1st. The new rates, if paid for twelve months in advance, are stated to be 27s. 6d. for Zone 1, 25s. for Zone 2, and 22s. 6d. for Zone 3. It is also said that, if desired, the fees may be paid in two six-monthly instalments; in this case, states our contemporary, instalments will be 15s., 12s. 6d., and 10s. respectively. We think that we can guess which system will be favoured by listeners in Zone 3!

NEW STATION.—Most of the additional apparatus required for increasing the power of 3LO to its licensed power of 5 kilowatts has been completed at the factory of Amalgamated Wireless (Australasia), Ltd., in Sydney. The *Industrial Australian and Mining Standard* expects that the new high-powered apparatus will be installed at Braybrook and transmission resumed on full power about the middle of next month. When the wavelength of 3LO was reduced from 1,720 metres to 371 metres about two months ago, the modulation system was considerably altered to improve the signal strength and the quality of the modulation. The new station being erected by the Associated Radio Co. at Essendon is nearly completed, and it was hoped that the services from 3AR would be carried out from it this month. Apparatus for the transmitter is completed, and the aerial system at the station is erected. The power will be 1,600 watts, the present licensed power of the Melbourne station, but it is expected that signals from Essendon will be much louder than they were from the station in the city. In addition to the alterations at the station, extended alterations to the studio of 3AR are being carried out, and it is the intention of the Associated Radio Co. to apply to the Postmaster-General for a licence to use five kilowatts at the new station.

Austria.—NEW STATION.—It is reported from Berlin that the Telefunken Gesellschaft has secured the order for the construction of the new broadcasting station in Vienna, in competition against American and British tenders. According to the *Daily Mail*, before placing the order, the Austrian Government consulted an international college of 24 experts as to which system was the best in practice. The Vienna station is to be two and a-half times as powerful as the station just erected in Berlin.

Licences.—Warning to "Pirates."—The Postmaster-General has issued a further warning to those who possess unlicensed receiving sets. He states that the short Act passed a few weeks ago places beyond doubt a legal obligation upon listeners to take out a licence. He intends to institute proceedings in any case of unlicensed reception which may come to his notice in the future.

Philippines.—Radio Development.—*The Telegraph* and *Telephone Age* states that radio has made tremendous strides in the Philippines during the past year, and has proved an ideal means of communication in this immense group of islands stretching 1,000 miles north and south and over 600 miles east and west. The Philippines legislature has granted a fifty-year concession to the Radio Corporation of America and the Far Eastern Radio, an affiliated company, and installations to cover the whole country are proceeding rapidly. The terms of the concession provide that within a year the radio company must have in operation a broadcasting station that will reach every part of the archipelago. The company is authorised to handle all ship-to-shore and shore-to-ship business as well as commercial wireless business to and from other countries.

United States.—Radio on the Farm.—The American Department of Agriculture, basing its conclusions on a national survey, has just declared that to-day 550,000 American farms are equipped with radio receiving sets, compared with 365,000 a year ago, and 145,000 in 1923. The State of Illinois leads with 46,000 farm sets, and New York and Iowa each possesses 39,000. Delaware is at the bottom of the list with 200.—*Manchester Guardian.*

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—Melbourne.—P.M.G.'s Department. November 17th. Magneto-automatic junction material.*

Dublin.—September 29th. Port and Docks Board. 28 pairs of tramway-type switches (chilled iron with manganese steel tongues). Specifications from the Engineer's Office, East Wall, Dublin.

Edinburgh.—October 16th. Corporation. 12 electric tramcar trucks, electrical equipment of cars, and air-brake equipment. Specifications from the manager.

Edmonton.—October 13th. Board of Guardians. Electric lighting and power installation at Enfield House. (See this issue.)

Greenock. — September 29th. Corporation. Electric lighting of 104 houses. Schedules from Office of Public Works, Municipal Buildings.

India.—India Store Department. October 14th. L.p. turbine-driven d.c. generating set, condensing plant, and accessories. (September 18th.)

Leeds.—September 23rd. Board of Guardians. Electric lighting installation at the Institution, 3, Green Hill Road, Armley. Form of tender from Mr. J. H. Ford, clerk to Guardians, Poor Law Offices, South Parade.

Lichfield. — October 19th. Electricity Department. Transformers, switchgear, and cable connections; e.h.p. and l.p. cables, boxes, and roadwork; e.h.p. overhead transmission line. (See this issue.)

London.—London County Council.—Highways Committee. October 12th. H.p. and l.p. switchgear for Shoreditch L.C.C. tramway sub-station. (September 18th.)

Islington.—November 11th. Electricity Department. 3-phase, 6,000/6,600-V and two-phase or single-phase 2,500/2,000-V switchgear and accessories. (See this issue.)

H.M. Office of Works.—October 14th. Dismantling wiring and rewiring in conduit at Charity Commissioners' office, Ryder Street, W. (See this issue.)

Manchester. — October 7th. Electricity Department. One 10-ton hand-operated overhead travelling crane and gantry. Specifications from Mr. H. C. Lamb, manager, Electricity Department.

New Zealand.—Wellington.—Post and Telegraph Department. October 27th. Rubber-insulated wire.*

Public Works Department. November 24th. Neutral earthing reactors.*

December 8th. Steel transmission line supports for the Waikato power scheme.*

Portsmouth.—September 30th. Board of Guardians. Three months' supply of electrical fittings and lamps. Forms of tender from the Guardians' Offices, St. Michael's Road, Portsmouth.

Rochdale.—September 29th. Paving Committee. One 4-in. Stereophagus centrifugal sludge pump and motor. Motor to be direct coupled and pump to be fixed on cast-iron bedplate. Borough Engineer, Town Hall.

Rosslynlee.—September 26th. Midlothian and Peebles District Asylum. Stores, including electrical fittings, &c. Forms of tender from Mr. C. L. A. Smith, clerk, 19, Heriot Road, Edinburgh.

South Africa.—Johannesburg.—S.A. Railways. October 29th. Electric cables and wires.*

Cape Town.—October 14th. Electricity Department. Electric motors.*

Stoke-on-Trent.—October 12th. Electricity Supply Department. Two sets of steam air ejectors, and one centrifugal oil purifier. (See this issue.)

Workington.—October 3rd. Corporation. L.p. cables and services. (September 18th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Aylesbury.—Town Council. Accepted:—
400 yd. of cable (£174).—Enfield Cable Works, Ltd.
Service apparatus (£53).—General Electric Co., Ltd.

Blackburn.—Education Committee. Accepted:—
Installing electric light at the Four Lanes' End Council school.—Farquhar and Heys.

Burnley.—Board of Guardians. Accepted:—
Electrical goods.—Frank Thornton & Co.

Government Contracts.—The following Government contracts were placed during August, 1925:—

Admiralty Contract and Purchase Department.

Electric boxes.—Player & Mitchell.
Cells.—London Battery & Cable Co., Ltd.; General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.; Fuller's United Electric Works, Ltd.
Aerial coils.—Radio Instruments, Ltd.
Inductance coils.—H. W. Sullivan, Ltd.
Electric travelling crane.—Marshall, Fleming & Co., Ltd.
Heating elements.—Electric Heating Co., Ltd.
Magazine lamp fittings.—Oliver Pell Control, Ltd.
Electric incandescent lamps.—Edison Swan Electric Co., Ltd.; British Thomson-Houston Co., Ltd.; General Electric Co., Ltd.; Siemens and English Electric Lamp Co., Ltd.; Metro-Vick Supplies, Ltd.
Switch and fuse panels.—General Electric Co., Ltd.; W. McGeoch & Co., Ltd.; Switchgear & Cowans, Ltd.
Platinum wire.—Johnson, Matthey & Co., Ltd.
Electrically-driven log band saw.—A. Ransome & Co., Ltd.
Switchgear.—British Thomson-Houston Co., Ltd.
Table fans and spares.—General Electric Co., Ltd.
Electric tractors.—British Electric Vehicles, Ltd.
Transformers.—Foster Engineering Co., Ltd.

War Office.

Aluminium alloy and ingots.—British Aluminium Co., Ltd.
Cable drums and stands.—Ruston & Hornsby, Ltd.
Telephone cable.—W. T. Glover & Co., Ltd.
Negative and positive carbons.—General Electric Co., Ltd.
Watch receivers.—Phœnix Telephone & Electric Works, Ltd.

Air Ministry.

Inert batteries.—Siemens Bros. & Co., Ltd.
200-V battery.—Alton Battery Co., Ltd.
Electric meters (Iraq).—Nalder Bros. & Thompson, Ltd.
Switchboard (Catterick).—Switchgear & Cowans, Ltd.
Wiring quarters (East Camp, Halton).—T. Clarke & Co., Ltd.
Electric shock absorber cord.—Whiteby Exerciser, Ltd.
Motor generators.—Newton Bros. (Derby), Ltd.; Small Electric Motors, Ltd.
Hand-driven generators and spares.—Evershed & Vignoles, Ltd.
Magnetos.—British Thomson-Houston Co., Ltd.
Masts and spreaders.—McGruer-Hollow Spar Co., Ltd.
Receivers.—Gambrell Bros., Ltd.
Switch boxes.—General Electric Co., Ltd.

Post Office.

Repairing batteries.—Stockport Telephone Exchange: Alton Battery Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Lee Green-Eltham and Wanstead-Woodford Junction: Johnson & Phillips, Ltd. Primrose Hill-North, Sloane-Paddington and City East: Callender's Cable and Construction Co., Ltd. Holborn-City-Central Junction and Holborn-Royal Junction, Museum-Victoria Junction: W. T. Henley's Telegraph Works Co., Ltd. Marlborough-Wroughton (Wilts) and Hull-Bridlington: Western Electric Co., Ltd. Nottingham-Basford-Kimberley: B. I. & Helsby Cables, Ltd.
Conveyors (Glasgow H.P.O.).—H. Simon, Ltd.
Private branch exchange equipment.—Simons & Co., Ltd. (Glasgow); Appleyards (Leeds), Ltd.; Price's Patent Candle Co., Ltd. (Battersea); Barrow, Hepburn & Gale, Ltd. (S.E.1): Relay Automatic Telephone Co., Ltd.
Telephone exchange equipment.—Harrow, Eltham, Finchley, Mill Hill: Automatic Telephone Manufacturing Co., Ltd.
Telephone repeater station repeater equipment.—Gloucester and Newport (Mon.): General Electric Co., Ltd.
Testing and protective apparatus.—Chamberlain & Hookham, Ltd.; Telephone Manufacturing Co., Ltd.
Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; British L. M. Ericsson Manufacturing Co., Ltd.; Cable Accessories Co., Ltd.; General Electric Co., Ltd.; International Electric Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Sterling Telephone & Electric Co., Ltd.; Telephone Manufacturing Co., Ltd.; T. Watson; Western Electric Co., Ltd.
Wireless apparatus.—General Electric Co., Ltd.
Battery stores.—Chloride Electrical Storage Co., Ltd.
Cables (various).—British Insulated & Helsby Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Enfield Cable Works, Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Loading coils.—Western Electric Co., Ltd.
Cords for telephones.—British Insulated & Helsby Cables, Ltd.
Electric hand lamps.—Cable Accessories Co., Ltd.
Earth plates.—Bullers, Ltd.
Distribution cable plugs.—Siemens Bros. & Co., Ltd.
Electric battery trucks.—W. Goodyear & Sons, Ltd.
Bronze wire.—Johnson & Phillips, Ltd.
Enamelled copper wire.—Concordia Electric Wire Co., Ltd.
H.d. copper wire.—Nevill, Druce & Co., Ltd.
Lamps.—A. C. Cossor, Ltd.

H.M. OFFICE OF WORKS.

Ministry of Pensions, Bristol.—Electric lift: W. Wadsworth.
Wiring, Imperial College of Science.—H. J. Cash & Co., Ltd.
Battery, National Physical Laboratory, Teddington.—D.P. Battery Co., Ltd.
Wiring Victoria and Albert Museum, S.W.: T. Clarke & Co., Ltd.
Watford Research Station, laying cables, wiring, &c.—T. Clarke & Co., Ltd.
Erection of plant.—G. Hopkins & Sons (Clerkenwell), Ltd.

CROWN AGENTS FOR THE COLONIES.

Underground cables, &c.—W. T. Henley's Telegraph Works Co., Ltd.
Overhead electric travelling crane.—Vaughan Crane Co., Ltd.
Electric materials.—St. Helens Cable & Rubber Co., Ltd.
Electric pneumatic hammer.—B. & S. Massey, Ltd.
Insulators.—Doulton & Co., Ltd.
Electricity meters.—Ferranti, Ltd.
Rotary converters.—Mather & Platt, Ltd.
Telegraph ironwork.—Bullers, Ltd.
Telegraph instruments.—Walter's Electrical Manufacturing Co., Ltd.
Automatic telephone apparatus.—Relay Automatic Telephone Co., Ltd.; Siemens Bros. & Co., Ltd.
Static transformers.—Brush Electrical Engineering Co., Ltd.; English Electric Co., Ltd.
Copper wire, &c.—Richard Johnson, Clapham & Morris, Ltd.; Elliott's Metal Co., Ltd.
Bronze and copper wire, &c.—Shropshire Iron Co., Ltd.
Wiring materials.—Callender's Cable & Construction Co., Ltd.

METROPOLITAN POLICE

Electrification of lift, New Scotland Yard.—Express Lift Co., Ltd.

Grimsby.—Electricity Committee. Accepted:—

Battery, booster, and switchgear (£7,037).—Tudor Accumulator Co., Ltd.
Spare transformer (£275).—Hackbridge Electric Construction Co., Ltd.

Irish Free State.—DUBLIN.—Commissioner of Public Works.

Electric lighting, McKee Barracks.—Haden's Engineering Co., Ltd.

The following contracts were placed by the Controller of Stores, Department of Posts and Telegraphs, during August, 1925:—

Dry batteries.—Ever-Ready Co. (Gt. Britain), Ltd.
Dry cells for batteries.—Tyer & Co.
Cable.—British Insulated & Helsby Cables, Ltd.
Ducts.—Standard Brick Co.; Oates & Green, Ltd.
Fuses.—Phœnix Telephone & Electric Works, Ltd.
Insulators.—W. J. Kellie.
Insulator rings.—MacIntosh & Co.
Switchboards.—Western Electric Co., Ltd.
Wire.—British Insulated & Helsby Cables, Ltd.
Creosoted wood troughing.—Eustace & Co.

—*Irish Builder and Engineer.*

Kettering.—Electricity Committee. Accepted:—

Cooling tower and tank (£2,800).—Davenport Engineering Co., Ltd.
Circulating-water pipes (£1,250).—Brightside Foundry & Engineering Co., Ltd.

Lamp Contracts.—The Stores Department, General Post Office, has placed contracts for 12 months' supplies of electric lamps with Edison Swan Electric Co., Ltd., Metro-Vick Supplies, Ltd., and Siemens & English Electric Lamp Co., Ltd.

London. — ISLINGTON. — Electricity Committee. Recommended:—

50-ton electric crane (£8,155).—Babcock & Wilcox, Ltd.

ST. PANCRAS.—Electricity and Public Lighting Committee.

One 10,000-kW turbine, with alternator, condensing plant, steam and water circulating pipes, &c.

Fifteen complete tenders and six tenders quoting for the condensing plant only were received. Five tenders were from foreign firms, and the Committee, being of opinion that the Council would desire the set to be of British manufacture, has given consideration to the offers made by British firms, and recommends the acceptance of the tender of the Brush Electrical Engineering Co., Ltd., at £40,660.

Oswaldtwistle.—

Electrical installation at Holy Trinity Church.—Mr. W. Kirkham.

Southend-on-Sea.—Town Council. Accepted:—

Spares for Diesel engines:—
12 exhaust valve boxes (£420), three inlet valve boxes (£96), and one set of intercoolers (£135).—Belliss & Morcom, Ltd.
One cylinder head cover (£140).—Thompson, Watts & Co., Ltd.

Stoke.—Stoke and Wolstanton Board of Guardians. Accepted:—

Electrically-driven pumping plant (£775).—Couzens & Akers, Ltd.

Swansea.—Electricity Committee. Accepted:—

Grit catcher at sub-station (£430).—Tipton Tub and Tube Co.

Yarmouth.—Electricity Committee. Accepted:—

Cable (£8,936).—British Insulated & Helsby Cables, Ltd.
3,000-kW turbo-generator (£21,220).—Brush Electrical Engineering Co., Ltd.

Forthcoming Events.

Birmingham Electric Club.—Friday, September 25th. At the Grand Hotel, Colmore Row. At 7 p.m. Lecture on "The Theory and Application of the Thermionic Valve," by Mr. G. C. Marris.

Faraday Society.—Thursday and Friday, October 1st and 2nd. At Jesus College, Oxford. Discussion on "Photochemical Reactions in Liquids and Gases."

Junior Institution of Engineers.—Friday, October 2nd. At 39, Victoria Street, S.W. Lecturette, "Problems of Broadcasting," by Mr. H. Bishop.

Electrical Power Engineers' Association.—October 2nd. Lecture by Mr. J. T. Ruddock, "Notes on Boiler and Chain-grate Operation." At the Institution of Electrical Engineers, Victoria Embankment, W.C.2.

Smoke Abatement Conference.—Friday, October 2nd, to Monday, October 5th. At Buxton.

Notes.

Electric Iron Test.—We learn that at one of the hotels at Ullapool, Ross, a laundry-maid by mistake left a "Magnet" electric iron switched on at about 8 o'clock at night and it was still on at 9 a.m. next morning. The iron had burned through a two-inch deal table and dropped right through and was hanging by the flexible cord in the morning. On examination the elements of the iron were found to be in good condition.

Fatality.—In the London City Coroner's Court, on Monday last, Dr. F. J. Waldo, the City Coroner, held an inquest with reference to the death of Valentine George Sinden, aged 36 years, fireman sub-officer at East Greenwich station, who was killed when a fire broke out on Friday last at 2, Byron House, Finsbury Street, E.C., premises occupied by Mr. Max Kracke, a toy and fancy goods dealer. It was stated that the deceased man was playing water on the fire when his helmet came in contact with an electric wire, and he fell back groaning, and was taken unconscious to St. Bartholomew's Hospital, where he died shortly afterwards.

Station-Officer Stonestreet, attached to the Redcross Street station, was asked by the Coroner: "Do you take special precautions when you are aware that there are live wires about?"

Witness: No, sir, we accept the risk, especially if the wires are only for lighting purposes.

Giving further evidence, he said that the metal part of Sinden's helmet came into contact with a tube containing a live wire.

Mr. Martin, house physician at St. Bartholomew's Hospital, said that artificial respiration was tried for an hour and a half, and injections were made, but without result.

Sir Bernard Spilsbury gave evidence that he could find no natural cause of death, and he had come to the conclusion that death was due to electric shock. The witness was asked by Mr. Pawlyn, who appeared to represent the L.C.C., if he had ever known a voltage of 210 volts to kill a man, even if his clothes were wet. In reply, Sir Bernard said that such cases were, of course, very rare, but there had been fatal cases from even a lower voltage. He was of opinion that if the current were transmitted through a man's head the risk would be materially increased.

Mr. Pawlyn: I am told that nearly every man in the Fire Brigade from time to time receives shocks from electric wires, and this is the first time we have heard of one having fatal results.

At the request of the Coroner, the jury then viewed the premises, and on their return Mr. Roberts, electrical engineer to the City Corporation, said that, so far as he had seen, and from what he had heard from the witnesses, he did not think the fire was caused by electricity. In this building slip tubing was used, but the Institution of Electrical Engineers had now agreed that only screwed tubing should be used. The man must have been standing in some water, which would have intensified the shock.

In summing up, the Coroner said that the L.C.C. should take precautions in future against firemen using helmets that could conduct electricity, as he knew that some firemen used leather helmets, which were safe.

The jury returned a verdict of "Accidental death caused by electric shock," and added that, in their opinion, electrical installations should be brought up to date, and steps taken to prevent further accidents.

The Second World Power Conference and Executive Committee Meetings.—A meeting of the International Executive Committee was held in London on July 27th-30th. Twenty countries were represented and the representatives welcomed Mr. O. C. Merrill, Executive Chairman of the American National Committee, who crossed the Atlantic for the express purpose of being present. Plenary meetings of the International Executive Committee and meetings of Sub-Committees were held throughout the period July 27th-30th. After the chairman, Mr. D. N. Dunlop, had made a formal report regarding the publication of the Transactions of the First World Power Conference, and other matters arising out of the first Conference, various questions relating to the future activities of the movement were discussed.

An invitation was presented on behalf of the Swiss National Committee by Dr. E. Tissot, to hold the Second World Power Conference at Basle in 1926, on the occasion of the International Exhibition for Inland Navigation and Utilisation of Hydraulic Power. It was, however, the unanimous opinion of those present that a longer period than one or two years was necessary between each plenary session of the World Power Conference, and that probably 4-6 years was the proper interval. But with a view to keeping interest alive between plenary conferences and to securing general progress in the fulfilment of the objects of the World Power Conference, it was decided to hold sectional meetings under the auspices of the International Executive Committee. These sectional meetings, which should originate on the initiative of individual National Committees, may be held in different geographical areas to discuss a programme of specific subjects within the general conference programme, and general invitations to participate will be extended through the central office in London to all the National Committees and representatives. An invitation was accordingly transmitted to the Swiss National Committee to hold a sectional meeting at Basle in 1926. The International Executive Committee recommended that this meeting should deal with the following subjects:—The development of hydro-electric power combined with inland navigation; the inter-exchange of electric power between countries, to be studied particularly from the financial and legal points of view;

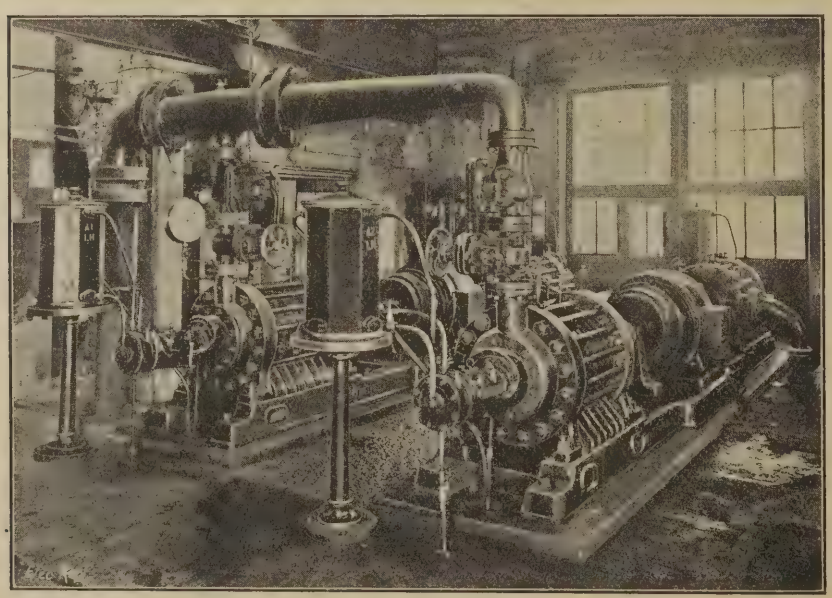
the economic relation between hydro and thermal power; electricity in agriculture; and railway electrification.

It was further recommended that the programme of the sectional meetings at Basle should lay stress upon the financial and economic aspects of these subjects. The question of a properly constituted international form of organisation was considered by a sub-committee appointed for that purpose. It drafted a constitution which was approved by the International Executive Committee and will be submitted to the National Committees for consideration, and if possible will be finally approved with whatever amendments are suggested at the next meeting of the Committee which it is proposed should be held at the time of the Basle sectional meeting in 1926.

To facilitate the carrying out of the objects of the World Power Conference and to maintain contact between the various National Committees and representatives of the participating countries, the International Executive Committee recommended that a "Journal of the World Power Conference" should be published at fairly regular intervals under its auspices. It envisaged that this journal would contain articles, statistical information, reports and data regarding progress in matters coming within the objects of the World Power Conference, and the committee placed it on record that the journal, as the official organ of the World Power Conference and the medium for the exchange of information between the constituent National Committees, should not conflict with nor overlap the functions of existing technical publications or journals published by scientific and technical institutions.

It was decided, subject to reconsideration, that the Second World Power Conference should be held in 1930, and on the invitation of the Italian Government that it should be held in Rome if conditions at that time were comparable to those at present existing.

Electrical Plant at the Southampton Docks.—In our last issue we published an abstract of a paper upon the above subject, which was read by the Dock Electrical Engineer (Mr H. Wauchope) before the Engineering Section of the British Association. In this abstract mention was made of the pumping plant supplied by Messrs. Mather & Platt, Ltd.; we have now received a photograph of some of this plant, and it is reproduced herewith. The equipment illustrated comprises two 17-stage turbine pumps which are installed in the No. 3 pumping station to provide the necessary hydraulic power for the pumps used for de-watering Nos. 1, 2 and 3 dry docks. Each pump is designed to deliver 200 gal. of sea water per minute against a pressure of 750 lb. per sq. in. The pumps are driven by 3-phase slip-ring induction motors rated at 165 b.h.p., and running at 1,450 r.p.m., with supply at 415 V. The starting and stopping of the pumps is automatically controlled by tappets on the hydraulic accumulator.



Mather & Platt Pumping Plant at Southampton.

Lecture.—Mr. Harry Moss is to deliver a lecture on "Modern Developments in Electric Lighting for Industrial Purposes" before the Bradford Engineering Society at the Technical College, Bradford, on October 12th.

Association of Special Libraries and Information Bureaux.—A conference is to be held at Balliol College, Oxford, during the week-end September 25th-28th, under the auspices of the above Association. The subjects to be considered include the present position of the Special Library movement; informational work in the spheres of politics, business, science, engineering, transport, medicine, and patents; public and university libraries, and so forth. Amongst those intending to be present are representatives of Government departments, learned societies, research associations, the technical and general Press, public libraries, the leading electrical manufacturing companies, &c. Papers are to be read on "Decimal Classification" (Prof. A. F. C. Pollard), the "Co-ordination of Technical Intelligence" (Major W. E. Simnett), "Efficient Filing" (Mr. R. Borlase Matthews), "Research as the Basis of Advertising" (Mr. S. Wood), "Patents and Special Libraries" (Mr. H. E. Potts), and many other subjects. The address of the organising secretary is 38, Bloomsbury Square, London, W.C.1.

Collisions on the Southern Railway.—Reporting on three buffer-stop collisions which occurred at Guildford station on the Southern Railway in July last, Major G. L. Hall states that they were not due to any defect in the brake equipment, but to lack of experience in the working of the Westinghouse brake. The collisions were of a minor character, and of the type which would be eliminated by further experience.

Appointments Vacant.—Shift engineer, for the Borough of Southport electricity department; clerk (50s.), for the Basingstoke Corporation electricity department; showroom attendant (£250), for the Borough of Mansfield electricity department.

Nottingham Electricity Supply.—Last week one or two minor disturbances took place in the supply of electricity to Nottingham, and on Saturday evening the supply was cut off for some time. The mishap had no relation to the operation of the plant in the new power station at North Wilford, which has run quite satisfactorily from the commencement; we understand that it was due primarily to a faulty connection on the switchgear at the Talbot Street station, which is being converted into a sub-station receiving a 3-phase supply at 11,000 volts from North Wilford. The low-pressure three-wire system was also temporarily disorganised on Saturday in the central area.

North Swedish Copper Deposits.—In connection with the recent Swedish discoveries of copper and pyrites ore, prospecting has been going on since 1920. Loose lumps of copper pyrites have been found for 20 years or more in the district, which has led to the registration of claims on different occasions. The mother lode was discovered in 1920, and proved to be the centre of a new ore field extending some 40 miles east and west, being about 6 miles broad. Investigations carried on by the Geological Survey and the Centralemissions concern led to the discovery of important lodes, but the work is by no means concluded. In parts, *e.g.*, at Bjurfors (owned by the Government) there is pure copper ore, but for the rest the copper and sulphur pyrites ores alternate, or are mixed together, containing in places gold, silver, and arsenic in economically workable quantities. The Government and Centralemission Banking Syndicate own the ground and claims in practically the whole district, although there appear to be some outsiders owning stray claims. The prospecting has cost the bank about a million kroner and it has been made possible by the Lundberg electrical ore detection method. The practical value of the method is said to have been proved. Nearly the entire district is covered by a layer of earth, in general about 60 ft. thick, the rock being but rarely seen and the cost of removing such great masses of earth would have been almost prohibitive, but when the probable extent of the ore bodies had been determined by the electrical method, it was comparatively easy to carry out the necessary deep drilling. The ore is present at the very surface of the rock, underneath the layer of earth, and all that will be required before starting operations is to remove the earth. The deposit to be worked immediately was not discovered until about six months ago; it lies within reach of a sea port, the distance to Skelleftea being about 18 miles. The pyrites here contains some 5 or 7 per cent. of copper. The larger deposits, however, depend for their operation on the construction of a railway branch line. Negotiations are now being conducted for leasing both the bank's and the Government's deposits to a mining company, which is to commence operations after a railway has been built. The deposits already located should be sufficient to cover the present Swedish importation of copper and pyrites. This is one of the most important ore finds in Europe in recent years.—*Swedish Export.*

Birmingham Electric Club.—The first event of the half-session is the delivery to-night, Friday, of a lecture on "The Theory and Application of the Thermionic Valve," by Mr. G. Chris Marris. Subsequent events in the programme are:—October 16th, "Power Factor Improvement as Affecting the Economical Running of Works Plant," by Mr. F. C. Hall; November 13th, "Submarine Cable Manufacture and Laying," by Mr. H. Gurney Wood. All of the foregoing will be illustrated by lantern slides and the meetings will be held at the Grand Hotel, Colmore Row, Birmingham, at 7 p.m.

Midland Electrical Engineers' Ball.—It has been decided to hold the Midland Electrical Engineers' Ball this season at the Grosvenor Suite, Grand Hotel, Birmingham, on Friday, November 20th. Mr. R. A. Chattock is the president, and Mr. W. H. Heaton the chairman, and Messrs. N. A. Collard, Daimler House, Paradise Street, Birmingham, and W. Y. Anderson, 14, Dale End, Birmingham, are acting as joint honorary secretaries. Tickets are one guinea each, and may be obtained from any of the above-mentioned gentlemen.

Alleged Practical Joke Fatality.—On September 18th, an inquest was held into the death of Charles Angus, Glasgow, who received a fatal electric shock as the result of an alleged practical joke. Deceased was employed in the Tollcross works of Brown & Macfarlane, iron and steel merchants, and on August 25th he met his death by touching the handle of a door to which a "live" wire had been attached. The manager of the works said the current passing had a pressure of 250 V. A formal verdict was returned by the jury. A 17-years' old boy named Gray is in custody in connection with the tragedy.

Liverpool Electro-Harmonic Society.—This Society enters upon the second year of its existence on October 23rd. The increase in membership has enabled the Society to transfer its meetings to the Bear's Paw in the Rotary Room, but in order to secure further success a very much larger membership is necessary and gentlemen connected with the electrical trade in the district are urged to get into touch with the secretary, Mr. E. Y. Wilkinson, c/o The British Thomson-Houston Co., Ltd., 14, South Castle Street, Liverpool, with a view to joining. The Society holds monthly meetings—on the fourth Friday in the month, excepting in December, when the third Friday is the appointed day. The first concert takes place on October 23rd. Old friends have been engaged, including the Zingara Quartet, Mr. Ben Woods, comedian, and Mr. Wm. Cross, pianist. The subscription is 10s. 6d. per annum.

Works Visits.—On September 10th a party of members of the Iron and Steel Institute paid a visit to the Witton Works of the General Electric Co., Ltd. The company entertained the party at luncheon; Dr. Railing occupied the chair, supported by the president of the Institute, Sir Frederick Mills, and Sir Robert Hadfield.

On September 16th members of the Manchester Association of Engineers visited the works of the British Insulated and Helsby Cables, Ltd., Prescot. During the tea which followed the tour of the works, the president, Mr. R. Onions, expressed the thanks of the visitors, and Col. Bates, the works manager, briefly responded.

Wood Separators for Accumulators.—Some experiments with regard to the electrical resistance and mechanical strength of storage-battery separators have recently been carried out by the United States Bureau of Standards. The life and internal resistance of accumulators depend largely upon certain properties of the separators, which are usually made of wood. In the tests the electrical resistance of the separators was measured by placing a specimen in an electric circuit consisting of two branches supplied by a transformer having two secondary windings. The current from one of the secondary windings was passed through a known area of the separator to be measured. The current from the other winding was passed through a slide wire and resistance box which served as a potentiometer. The accuracy of the method was within 1 per cent., which was sufficient for the purpose, since the resistance of the different samples of the same kind varied by as much as 15 per cent. The results of the measurements of the resistance and mechanical strength show the effects produced by the different conditions to which the samples were subjected. The results, in general, were as follows:—Electrical Resistance.—(*a*) The resistance was found to change for some time after immersion, but became practically constant after two or three weeks. (*b*) The resistance was proportional to the resistivity of the acid in which the sample was immersed. (*c*) The resistance of the separators treated by the caustic-soda method was lower than for like samples treated by the steam method. (*d*) The temperature coefficient of resistance was approximately the same as the coefficient of resistivity for sulphuric acid solutions of the same density. (*e*) The resistance of samples of different thicknesses, but identical in other respects, was approximately proportional to their thickness. (*f*) The resistance of the sawn separators was smaller in most cases than that of the rotary cut samples. Mechanical Strength.—(*a*) Immersion in acid solutions was found to weaken the wood fibres. The strength decreased with time of immersion and concentration of the solution. When the specific gravity exceeded 1.300 the action was severe. (*b*) The strength decreased with increase of temperature of the acid solution. (*c*) The strength was approximately proportional to the thickness of the samples.

Street Lighting.—Mr. R. F. Brown, a surveyor of Clacton-on-Sea, has invented and patented a method of illuminating electrically the white lines used at dangerous street corners. The Ministry of Transport has expressed appreciation of the idea, and is having an experiment made at Whitehall, while the practicability of the invention is also to be tested at Brighton and Clacton. Mr. Brown's novel idea consists of the use of channelling carrying a line of white marble with a strip of thick plate glass down the centre, electric lamps being placed at intervals below the glass.

Electricity Supply Association of Ireland.—THE SHANNON SCHEME.—At the annual meeting in Dublin of the Electricity Supply Association of Ireland, the report, which was adopted, stated that the Association was not in agreement with the Shannon scheme as formulated and directed by the Government, regarding it as objectionable and not in the best interests of the country, to allocate a contract to any firm without the usual open competition. The Council had come to the conclusion that the scheme would entail an expenditure that would not be warranted by the condition of the country, or by the possible demand for power, and it was of opinion that the better course would have been to retain independent expert consultants of repute in the first instance to survey the main sources of power and to investigate the probable demand. On the report of these consultants would be based the programme for the future. If the State then decided to embark on national power supply, the contracts for the works decided upon would be allocated by public tender, on the basis of specification prepared by the independent consultants.

The country was now definitely committed to State electricity supply from the Shannon, and the Association was prepared to co-operate fully in the work of getting the best possible results out of the scheme adopted, whilst at the same time assisting to safeguard the interests of its members.

Boiler Litigation in the United States.—In the United States District Court of New York recently the Babcock and Wilcox Co. alleged the infringement of its patents by the Springfield Boiler Co. and the Superheater Co. The judge held that while the boiler in question (which was installed in the Hell Gate station of the United Electric Light and Power Co., New York) was of a construction which might bring it within the reading of the claims of the Pratt patent and, if a liberal interpretation was given, of the Bell patent, the question whether such readings should be made necessitated reference to the development of the boiler art of the present day. According to the *Electrical World*, in delivering his decision, the judge said:—"The net result of my examination of the facts in this case is that defendants have constructed a type of superheater water-tube boiler that differs materially from that shown and claimed by the patents in suit, and that it is accomplishing results which, if they were contemplated by Pratt and Bell, are brought about by a construction that avoids any valid claim of infringement of the patents granted upon their inventions. It follows that the claim must be dismissed." An appeal may be entered by the plaintiffs.

The Passing of the Ampere.

I am the cunning Ampere, swift as light
I speed along my copper bands and fling,
Burning, my vital force to move great deeds.
Great is my master Volta, it is he who moves
On our swift path my brethren and myself,
Braving the hostile Ohms who stay our flight
In vain; mocking and burning them awhile
To the full square of our numbers; anon,
The children of our sojourn, born methinks
In fields of force, now linking hand with us,
Cast wide their potency and urge to life
Amperes new-born along some other line.
Seductive Millihenries hail—we stay,
Lagging behind our master; and to haste
Errant these footsteps, summon to our aid
Fierce Microfarads from their house of power,
Quickening our laggard feet. Now race ahead,
Speed on my brethren—death to yonder fuse!
Burst we these copper bands, vanquish in fire
Delicate instruments sapping our strength!
Now glow these copper fiends, they cannot hold
Aught of our mightiness; on, brethren, on!
Smoke rises round us . . . they fail! we triumph!
(*Crash! The breakers come out.*)

. . . . . .

Brethren, I'm failing; fast wanes my power.
Volta is dead, and life's cord is broken.
I'm waning and dying—dying—dying—
The circuit's at an end. . . .

—A. G. H. DENT.

An Electric Refractory Furnace.—There has been erected at Gustafsberg, near Stockholm, an electric tunnel kiln for use in the firing of teacups. It is 6 ft. long by 2 ft. wide and into it is placed a truck about 2 ft. wide and 2 ft. long with a capacity of 3,000 cups. It is stated that the cost of energy is two or three times less than would be the case if a directly-fired coal kiln were used for the purpose. Moreover, the control of the heat, and the temperature obtained are such that the ware is in the heat zone only a quarter to half the time necessary with a coal-fired kiln, whilst the temperature is only limited by the risk of cracking the pottery as it goes through the hot zone. Some interesting features are claimed in the design of the electrical control arrangements.

An Abortive Electricity Commission.—Some time ago the Government of New South Wales appointed a State Commission to inquire into the question of the supply of electricity in Sydney and its surrounding districts, as well as the whole of the State. Last month, however, the Premier (Mr. Lang) announced that the Commission had not functioned and the appointments had not been gazetted. The Commission had therefore been allowed to lapse.

Institution Notes.

Institute of Metals.—The programme for the session 1925-26, which begins in October, shows that six lectures on metallurgical subjects are to be given during the winter months before each of the Institute's six local sections. The programme also includes particulars of the meetings of the parent Institute in London; one of these is the 1926 May lecture, to be given by Professor H. C. H. Carpenter, F.R.S., on "Single Metallic Crystals and their Properties." A copy of the programme can be obtained from the Secretary of the Institute, 36-38, Victoria Street, S.W.1.

Institute of Transport.—The programme of meetings includes the following:—

Friday, September 25th.—North-Western Local Section, at Midland Hotel, Manchester. Discussion, "Underground Railways for Manchester."

Monday, October 5th.—Ordinary meeting at Institution of Electrical Engineers, London. Presidential address by Col. Sir Joseph Nall, D.S.O., T.D., M.P. Yorkshire Local Section at Town Hall, Leeds. Chairman's address, "Canals," by Sir John Eaglesome, K.C.M.G.

Saturday, October 10th.—North-Eastern Local Section, at Town Hall, Newcastle-on-Tyne. Paper, "Electric and Petrol Transport of Passengers in America," by Walter Jackson.

Friday, October 16th.—North-Western Local Section, at Midland Hotel, Manchester. Paper, "Electrically-propelled Vehicles for Road Transport," by F. Ayton.

Tuesday, October 20th.—Lecture for Graduates and Students at Institution of Electrical Engineers, London. "Electric and Petrol Transport of Passengers in America," by Walter Jackson.

At the meeting on October 5th, Sir Lynden Macassey will present the premium awards in respect of the 1924-25 Session.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

At the meeting of the Hackney Borough Council on Wednesday of last week, Mr. Alfred Charles Bostel, sales engineer to the Croydon Electricity Supply Department, was appointed to the position of sales manager in the Borough Electricity Department. Of the twenty-eight applicants, three were asked to appear before the Council for the purpose of final selection. Before the applicants were introduced in the Council Chamber, Alderman Morrison asked that the Council be informed as to the number of marks gained by each candidate at the examination. Councillor Langton said that the disclosure was not desirable, also that an examination was not the only criterion of the right man, there were other qualifications to be considered. Alderman Morrison said he was not going to vote for a man on his appearance, he had a public duty to perform, there must have been an order of merit and he moved that the Council go into committee to consider the matter; he was of the opinion that there was something "going on." The motion was lost and the choice made as stated above. Alderman Morrison did not vote.

At a recent meeting of the Walsall Town Council, a recommendation of the Electric Supply Committee to increase the salary of the manager of the undertaking (Mr. H. A. Howie) from £810 to £900 per annum was carried.

M. Alexis E. Duvaux, general director of the Compagnie Générale d'Electricité, of Paris, has been recently appointed a Chevalier of the Légion d'Honneur.

Lieut.-Col. F. V. Willey, the president of the Federation of British Industries, sailed in the *Aquitania* last week for New York. He is to stay in the United States for a month, thereafter visiting Canada.

Mr. L. Marshall Jockel has been appointed station superintendent, not boiler-house superintendent, at North Wilford power station, as stated in the Electrical Reriew for September 18th, p. 468. Mr. D. H. Brown, A.M.I.E.E., is the boiler-house superintendent.

Mr. W. A. Sycamore, who recently resigned his position as London manager of the Keighley Gas and Oil Engine Co., has joined Vickers-Petters, Ltd., and will be attached to their London office, 75b, Queen Victoria Street, E.C.4.

Mr. T. T. D. Geesin, who was appointed general manager of Messrs. Walter Gee & Son, Ltd., engineers, Paisley, in February last, has now been appointed to a seat on the board of directors.

Mr. S. E. Povey, formerly resident engineer at the Formby power station of the L.M.S. Railway Co., is shortly leaving this country to take up a position at Bombay.

Mr. Percy H. Naftel, A.M.I.E.E., who has just retired from the position of installation engineer of the Liverpool Corporation Electric Supply Department, entertained his staff to a complimentary dinner at which he was presented with a silver cigar casket. His successor is Mr. Samuel Lowey, who commenced his employment with the department in November, 1900.

Mr. S. Hann, borough electrical engineer, Stoke Newington, has been in poor health for some time past. The Electricity Committee reports that it has granted him four months' leave of absence, dating from July 13th, as recommended by his medical adviser.

Mr. A. H. Pott, consulting engineer, is removing on September 28th from Bishopsgate to 150, Dashwood House, Old Broad Street, E.C.2. 'Phone No.: "London Wall 4310."

According to Sydney newspapers just to hand it is likely that Mr. Forbes Mackay, the general manager of the Sydney City Council's electricity department, will leave for London shortly in connection with arrangements for the purchase of the equipment for the new power station. The Sydney *Sun* hints at the possibility of his being retained in London as the Council's representative, heavy consulting and inspecting fees being saved in consequence. Whether Mr. Mackay will stay here for one or for two years is not clear, but it is remarked that while he is away from Sydney the power house will be built by the Council's engineers in consultation with Mr. H. E. White, a well-known city architect and engineer.

Mr. J. H. Rider, whose portrait is reproduced herewith, was born at Bristol in 1864, and served his engineering apprenticeship with the firm of Paterson & Cooper, of Dalston; in 1887 he became electrical engineer to another well-known pioneering firm—Blakey, Emmott & Co., Ltd., of Halifax—but six years later he turned his attention to the supply side of the industry, being appointed borough electrical engineer by the Bolton Corporation. From 1896 to 1901 Mr. Rider occupied a similar position at Plymouth, where he designed and built a new power station. His next appointment was that of electrical engineer to the London County Council Tramways, which position he retained until 1910, when he went to South Africa as consulting electrical and mechanical engineer to the Central Mining & Investment Corporation, Ltd., of Johannesburg. In 1915 he returned to this country and became a partner in the firm of Preece, Cardew & Rider, consulting engineers, London. Mr. Rider is a member of the Institutions of Civil Engineers and Mechanical Engineers, and a past vice-president of the Institution of Electrical Engineers; he is also a past-president of the South African Institute of Electrical Engineers, and of the Incorporated Municipal Electrical Association. In 1909 he read a paper on "The Electrical System of the L.C.C. Tramways," for which he was awarded the Willans premium and the Institution premium of the I.E.E.; and in 1915 for his I.E.E. paper on "The Power Supply of the Central Mining—Rand Mines Group," he was awarded the Ayrton premium. In the course of his long professional career he has advised 36 municipal corporations and companies on questions relating to electricity supply, and he is well known as an expert engineering witness before Parliamentary Committees, at local inquiries, &c. One of his most recent achievements was the design and construction of the super-power station of the Nottingham Corporation at North Wilford, a description of which is concluded in this issue.

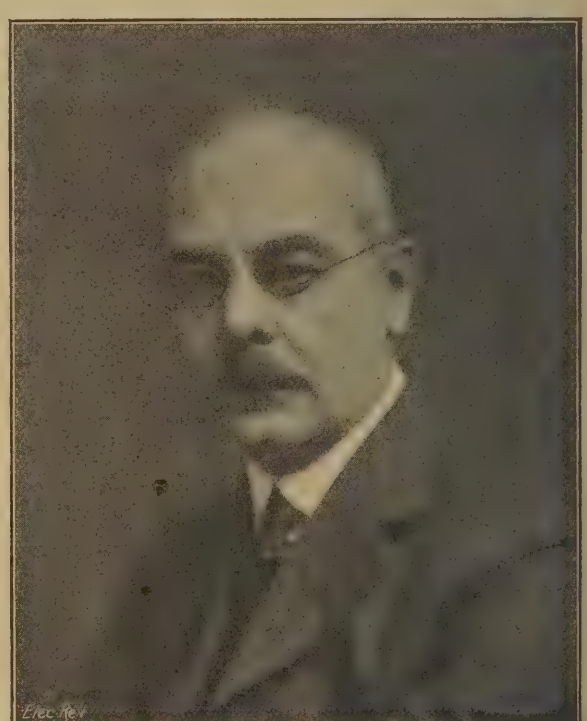


Photo by] [Army & Navy C.S.L. Studios.

Mr. J. H. Rider, M.Inst.C.E., M.I.E.E.,
Consulting Electrical Engineer.

Obituary.—Herr C. Schwennicke.—The death is reported from Berlin of Herr Carl Schwennicke, who was with the Siemens & Halske Co. for 50 years. The deceased, who was 86 years of age and was well-known in connection with telegraphy, electrical signalling, and electrical measurement, was a co-worker with the late Werner Siemens.

Mr. A. W. Gattie.—We regret to record the death at the age of 69 years of Mr. Alfred Warwick Gattie, the inventor of the railway clearing house traffic scheme for London which was publicly discussed several years ago and was reported adversely upon by a Departmental Committee.

Mr. G. McCluskey.—The death occurred on September 16th of Mr. George McCluskey, for many years outside electrical engineering manager to Messrs. J. H. Holmes & Co., Newcastle.

New Companies Registered.

Koda (London), Ltd. (208,414).—Private company. Registered September 15th. Capital, £25,500 in 25,000 3 per cent. cumulative preference shares of £1 and 10,000 ordinary shares of 1s. Objects: To adopt an agreement with G. Weissman to acquire and sell under patents Nos. 14,797, of 1922, 4,813, of 1923, and 463, of 1924, electric cell and battery and other electrical appliances and accessories in Great Britain and Ireland. The provisional directors are:—P. Shepherd, 22, Wellesley Road, Croydon, secretary; C. N. Blackburn, 43, Guildford Avenue, Surbiton Hill, chartered accountant. Qualification, £1. Solicitors: Windsor & Brown, 228, Bishopsgate, E.C.2.

Vaprost, Ltd. (208,428).—Private company. Registered September 16th. Capital, £5,500 in 3,000 10 per cent. cumulative preference and 2,000 ordinary shares of £1 and 10,000 founders' shares of 1s. each. Objects: To carry on the business of manufacturers and letters out on hire of and dealers in generators or any apparatus for the manufacture, generation or supply of gas, electricity, cooking apparatus and accessories, &c. The subscribers (each with one preference share) are:—E. G. Scott, 33/4, Broad Street Avenue, E.C.2, solicitor; L. C. Crick, 33/4, Broad Street Avenue, E.C.2, articled clerk. The first directors are to be appointed by the subscribers. Qualification, £100 shares. Remuneration, £100 each per annum (chairman, £50 extra). Solicitor: E. G. Scott, 33/4, Broad Street Avenue, E.C.2.

Blackadda Radio Co., Ltd. (208,465).—Private company. Registered September 18th. Capital, £3,000 in £1 shares. Objects:—To acquire the invention and letters patent No. 185,180 of 1921 for improvements in standardised and interchangeable component parts for construction of wireless apparatus, &c. The subscribers (each with one share) are:—C. A. Newton, Park Lane House, Littleover, Derby, electrical engineer; F. Newton, Weston Bank, Rodbourne Street, Derby, engineer. C. A. Newton is the first managing director and chairman. Qualification, 100 shares. Remuneration as fixed by the company. Secretary: F. Bond. Solicitors: Robotham and Co., 3, St. Mary's Gate, Derby.

Beaver Accumulator Co., Ltd. (208,463).—Private company. Registered September 18th. Capital, £100 in £1 shares. Objects:—To carry on the business of manufacturers of, agents for, and dealers in accumulators, electric batteries and parts and accessories therefor, wireless instruments, &c. The directors are:—C. Manning, 80, Wigmore Street, W.1; J. K. Nethercoate, "Umgeni," Wimborne Road, Bournemouth; G. Laird, 190, Lauderdale Mansions, Maida Vale, W.1. Qualification, 1 share. Solicitors: Horner & Horner, Fitzalan House, Arundel Street, W.C.2.

Official Returns of Electrical Companies.

Yeovil Electric Light and Power Co., Ltd. (186,456).—Return dated May 25th, 1925. Capital, £10,000 in £1 shares. All shares taken up. £10,000 paid. Mortgages and charges, nil.

Sennybridge Electric Supply Co., Ltd. (174,920).—Return dated June 30th, 1924 (filed April 18th, 1925). Capital, £1,500 in £25 shares. 48 shares taken up. £1,200 paid. Mortgages and charges, nil.

Lamp Caps, Ltd. (185,691).—Return dated July 24th, 1925. Capital, £50,000 in £1 shares. 12,000 shares taken up. £12,000 paid. Mortgages and charges, nil.

Witton-James, Ltd. (110,693).—Return dated July 27th, 1925. Capital, £6,100 in 2,000 preference and 4,000 ordinary shares of £1 each and 2,000 deferred shares of 1s. each. All shares taken up. £2,000 paid on 2,000 preference shares. £4,100 considered as paid on 4,000 ordinary and 2,000 deferred shares. Mortgages and charges at date of return, nil. Particulars filed of £25,000 debentures authorised September 1st, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

London Electric Stores, Ltd. (185,651).—Return dated February 22nd, 1924 (filed February 14th, 1925). Capital, £1,000 in £1 shares. 750 shares taken up. £750 considered as paid. Mortgages and charges, nil.

Marshall Electrical Co., Ltd. (185,795).—Return dated March 6th, 1925. Capital, £3,000 in 2,300 preference and 700 ordinary shares of £1 each. 2,300 preference and 682 ordinary shares taken up. £2,300 paid. £682 considered as paid. Mortgages and charges, nil.

R. F. Winder, Ltd.—Particulars filed of £5,000 debentures authorised June 26th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Elco Electric Manufacturing Co., Ltd.—J. P. Emett, of 18, St. Nicholas Street, Bristol, ceased to act as receiver or manager on August 14th, 1925.

Santon, Ltd.—Mortgage on 34, Bridge Street, Newport, Mon., dated August 27th, 1925, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £1,400.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

International Telephone and Telegraph Corporation.—100,000 new shares of $100 each issued at par, partly paid and fully paid. Fractional warrants to bearer.

Application has been made to the Committee to allow the following to be quoted officially:—

Ever-Ready Co. (Great Britain).—249,000 ordinary shares of £1 each, fully paid, Nos. 200,001 to 449,000, and 165,892 7 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 165,892.

The undermentioned have been ordered to be officially quoted:—

Shropshire, Worcestershire and Staffordshire Electric Power Co.—117,375 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 350,001 to 450,000, and 1,100,001 to 1,127,375.

Havana Electric Railway, Light and Power Co.—A plan for the readjustment of the share capitalisation of the company through the exchange of existing stock for the stock of the Havana Electric & Utilities Company has been formulated by Speyer & Co., of New York. Stockholders of the Havana Electric Railway, Light and Power Co., are offered the right of exchanging their stock for stock of the Havana Electric and Utilities Co. and cash.

Quebec Power Co.—Dividends of $1½ per share on the common shares and $1¾ per share on the preferred shares have been declared in respect of the quarter ending September 30th.

J. G. White & Co., Ltd.—The directors announce, states the *Financial Times*, that in view of certain important negotiations which are proceeding and may materially affect the position of the company, they consider that it will be in the best interests of the shareholders to postpone the presentation of the accounts and balance-sheet for the year ended February 28th last. A formal meeting will be held to-day (September 25th) to comply with the requirements of the Companies Acts.

Shawinigan Water and Power Co.—The company has declared a dividend of $2 per share on the common shares for the quarter ending September 30th.

The directors have authorised the issue of $1,279,800 of common stock; it is offered to existing stockholders in the proportion of one new share to every 20 held.

Kaministiquia Power Co.—The company has received an offer for the sale of its undertaking to the Fort William Paper Co. The consideration is the payment of $145 per share—$95 in cash and $50 in 7½ per cent. cumulative preferred stock in a new power company to be formed. The offer is subject to the redemption of the Kaministiquia Co.'s first mortgage bonds.

International Telephone and Telegraph Corporation.—The stockholders of the Corporation have approved of the proposals to increase the company's capital to 100 million dollars and to purchase the Western Electric Company.—*Financial Times.*

Italian Company.—*The Terni Steel, Iron and Electrical Co.*—It has been decided to raise the capital of this company from 350 to 600 million lire.

Northern General Transport Co., Ltd.—An interim dividend of 2½ per cent. has been declared on the ordinary shares, as in 1924.

P. & W. Maclellan, Ltd.—An interim dividend at the rate of 6 per cent. has been declared on the 6 per cent. cumulative preference shares for the six months ended June 30th last.

Folkestone Electricity Supply Co., Ltd.—The ordinary shares are to receive a dividend at the rate of 8 per cent. per annum, free of tax, for the past half year.

Electric Supply Corporation, Ltd.—A dividend at the rate of 8 per cent. per annum, less tax, has been declared in respect of the past half year.

German Company.—*Lloyd Dynamo Works Co.*, Bremen.—The board proposes to increase the company's capital by the issue of preference shares to the value of 1,200,000 marks.

Bruce Peebles & Co., Ltd.—The directors have declared the dividend on the 7½ per cent. cumulative participating preference shares in respect of the first half of the current year.

County of London Electric Supply Co., Ltd.—The directors announce that the outstanding 5½ per cent. one-year notes are to be repaid at par on and after September 30th.

Hoffman Manufacturing Co., Ltd.—An interim dividend of 4 per cent., free of tax, has been declared on the ordinary shares for the six months ended June 30th last.

Parker, Winder & Achurch, Ltd.—A dividend at the rate of 5 per cent. per annum has been declared on the ordinary shares for the first half of the current year.

Howard & Bullough, Ltd.—A quarterly dividend of 6d. per share, less tax, has been declared on the ordinary shares.

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange expectation looks forward hopefully to a fall in the Bank Rate to 4 per cent. this week. If the reduction should not be made on Thursday, there will be mild disappointment, though, doubtless, the anticipation will simply be carried over for another week. Money stocks, however, are influenced by the ease that prevails in banking circles. There is substantial buying in progress of all first-class investment securities, and the effect of this is seen in a strengthening of sound investment issues of various kinds. The labour and industrial position continues to be unsatisfactory. Further falls in Home Railway stocks witness to the uneasiness of proprietors of these investments. Money realised by the sale of Home Rails is being diverted into Industrials, and in the market for the latter, noticeable activity prevails. The feature for the moment is the strength of rubber shares, in consequence of the firmness displayed by the price of the product. This latter factor lays a hand of restraint upon the buoyancy of shares in the cable construction and similar concerns, the prices of which, after their recent material advances, have shown a tendency to react.

The electricity supply market is steady, changes being few and far between. St. James's are again the outstanding feature of strength, with another rise of 5s., this taking the price

to 14¾. The shares are amongst the very few of the £5 denomination that remain in the London list, Kensingtons being the other best-known example. Lancashire Light & Power shares are easier at 26s.; otherwise, the provincial group is unchanged. The Folkestone Electricity Supply Company has declared an interim dividend of 8 per cent. per annum tax free payable on October 1st. The price of the shares is £2 middle, at which a few bargains have recently been transacted. Last year the dividend was the same, 10 per cent. tax-free being paid for the full period of twelve months. Folkestone 5 per cent. preference stand about 17s. 6d., but have not changed hands for six months. An important extension of electrical supply came into operation last week, when the Nottingham Corporation opened a new super-power generating station. This proposes to supply the city and district, and also to form a link in the general scheme of the East Midlands supply, connecting Leicester, Derby and other centres. The Midland Electric Corporation for Power Distribution is going to pay an interim dividend of 5 per cent. actual. The ordinary shares stand at 2⅝ and the 7 per cent. preference at 25s.

The County of London Electric Supply Company announces that its outstanding 5½ per cent. one-year notes to bearer will be repaid at 100 on Wednesday, September 30th. It may be recalled that the issue of 1½ million pounds was readily subscribed by the shareholders at 99¾ last August. There has always been a market in the notes, although, owing to their short-dated character, they were suitable, of course, only for investors who required something that was in the nature of a gilt-edged bill.

The Home Railway flatness extended into the Underground section, causing falls in Metropolitans, Districts and the three classes of the Underground Electric Railways. A campaign is on foot for the attempted restoration of confidence in Home Railway stocks, attention being called to the overdone nature of the fall in prices. This has had some slender effect in rallying quotations from the worst, but there is no escaping from the obvious fact that investment is afraid of Home Rails owing to trading and labour conditions, coupled with which is the animation shown by many Industrials, which come into sharp competition with the stocks in the senior market.

Brazilian Tractions are again amongst the liveliest stocks in the house. Momentarily the price touched 76½, but this brought in sellers, and the Tractions subsided to 75. It is hinted that more than an expectation of an increased dividend lies at the back of the recent heavy buying, and some people in close touch with Montreal surmise that there may be buying that has for its object the obtaining of control of the company. Amongst other foreign issues, Tokio Electric Sixes are dull at 89, in consequence of the latest fire that has occurred in the Japanese city. Indian electrical issues are also inclined to be heavy, Tata Power 7½ per cent. "B" debenture changing hands the other day at 92. River Plate Electricity ordinary came to market at 202. Most of the dollar stocks are strong, Pennsylvania Water and Power capital stock, for instance, showing a rise of 10 points at 165. The Shawinigan Water and Power Company is about to make an offer of common stock at par on the basis of one share for each 20 shares now held. The whole of the money will be called up at once. As the price of the existing shares stands at 167½, the value of the rights is substantial.

The Electric Supply Corporation has declared an interim dividend at the rate of 8 per cent. per annum, less tax, the same as that of a year ago, and the price of the shares remains at 31s. 3d. Electric Constructions are better at 32s., showing a gain of 1s. 6d., and British Aluminium recovered to 1¾.

Cable manufacturing shares, as already noticed, are slightly easier, for which the rise in the price of raw rubber is again assigned as the reason. Siemens at 29s. 6d., India Rubber at 21s. 3d., Johnson & Phillips at 48s. 9d., and Callenders at 3¼ are all a trifle lower. General Electrics and Henleys have not moved. British Electric Transformer Preference strengthened to their par price of 20s. Babcocks are steady at 2½, though the iron and steel group is disposed to yield ground in consequence of the depression prevailing in trade circles.

Amongst cable stocks and shares, the Eastern group remains placid, Eastern ordinary, with a point decline, being the only member to exhibit any change. Indo-Europeans are £1 higher. Great Northerns strengthened to 32¾, part of the demand being attributed to Copenhagen. Direct Spanish remain at 9; the interim dividend is again to be 4 per cent., free of tax. The company's 10 per cent. preference are quoted at 7½; both classes are of £5 each. United River Plate Telephones have gone back a trifle.

Marconis hold their rise to 28s. 9d. Main interest in wireless shares is transferred, for the time being, to Canadian Marconis. The price of these has gone up to 6s. 3d., and is being industriously "talked" still better. Marconi debenture rose to 104. The wireless market has come to life again; it is showing more vitality than it has done for months past. But the liveliest section amongst industrials is that devoted to rubber shares. There, the business at present afoot is, to quote one broker's statement, absurdly enormous.

Share List of Electrical Companies

Home Electricity Companies

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Sept. 21. 1925.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	13	14	3	—	4 13 4
Brompton Ordinary	1	10	10	1½	—	*5 14 3
Charing Cross Ordinary	1	14½	15	20/-	—	6 2 5
do. do. 4½ Pref	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	12	1⅝	—	6 8 0
City of London	1	15	15	48/3	—	6 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	29/-	—	5 10 4
County of London	1	15	15	57/-	—	5 5 3
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12⅝	—	5 18 8
Lancs. Light and Power	1	7½	7½	26/-	—6d	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5⅛	—	5 7 10
Metropolitan	1	10	11	39/6	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	23/3	—	6 0 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	£⅛	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	14¾	+ ¼	6 1 9
South London	1	15	15	2½	—	6 0 0
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/-	—	6 16 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6

Home Rails.

Central London Ord. Assented	Stock	4	4	66	—	6 1 3
Metropolitan	,,	4	5	66	—1	7 11 6
do. District	,,	3½	3½	42½	—1	8 6 8
Underground Electric Ordinary	10	Nil	Nil	2¼	— ⅛	Nil
do. do. "A"	1/-	Nil	Nil	6/6	—6d.	Nil
do. do. Income Bonds	6	6	6	95	—1	*6 6 4

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	108½	—	5 15 11
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	3	6	47/6	—	2 10 7
Chili Telephone	5	6	5	5⅝	—	*4 8 11
Cuba Sub. Ord.	10	5	5	6¾	—	7 8 2
Eastern Extension	10	10	10	17½	—	*5 15 11
Eastern Tel. Ord.	Stock	10	10	171½	—1	*5 16 7
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 12 8
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	22	32½	+ ½	6 15 4
Indo-European	25	7	8½	42½	+1	*5 2 5
Marconi	1	10	10	1 1/16	—	6 19 2
Marconi Marine	1	10	7½	⅞	- 9d.	8 11 6
Oriental Telephone Ord.	1	12	12	2 1/16	—	*5 16 4
United R. Plate Tel.	5	8	8	7⅝	— 1/16	5 4 11
Western Telegraph	10	10	10	16½	—	*6 3 1

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	3⅜	—	8 3 0
do. do. 2nd Pref.	5	6	6	5⅜	—	8 17 10
do. do. 5% Deb.	Stock	5	5	76½	—	6 10 9
British Electric Traction Ord.	,,	6	6	120	+2½	5 0 0
do. do. 6% Pref.	,,	6	6	107	+2	5 12 2
Brazil Traction	100	4	4	75	+1½	5 6 8
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	88⅜	—	5 11 9
do. do. Preferred	,,	96/-	96/-	89⅜	+1	*5 6 5
do. do. Deferred	,,	129/5	129/5	109⅜	—	*5 18 3
do. do. Deb.	,,	4½	4½	76⅜	—	5 11 1
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	42⅜	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	62⅜	+1	8 0 0
Mexican Light Common	100	Nil	Nil	3⅛	—	Nil
do. Pref.	100	Nil	Nil	£5	—	Nil
do. 1st Bonds	—	5	5	75⅛	+5	6 12 5
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8

Manufacturing Companies.

Babcock & Wilcox	1	12	12	2⅛	—	*4 16 0
British Aluminium Ord.	1	5	10	1¾	+ 1/16	5 14 3
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3½	—	4 12 4
Brush Ord.	1	10	10	1⅜	—	8 17 10
Callenders	1	15	15	3½	— ⅛	4 12 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅜	—	... ...
Edison-Swan	4/-	10	10	9/-	—	4 8 11
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	31/-	+1/6	6 5 0
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	18/3	—6d.	5 9 8
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	27/-	—	5 11 1
Henley	1	15	16	3½	—	4 18 6
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1 1/16	- 9d.	*4 14 1
Johnson & Phillips	1	10	10	48/9	—9d.	4 2 0
Met-Vickers, Ord.	1	8	8	24/3	—	6 10 8
do. Pref.	2	8	8	23/3	—	6 14 9
Siemens Ord.	1	—	7½	29/3	—6d.	5 1 8
Telegraph Construction	12	20	20	26½	— ¼	4 10 9

* Dividends paid free of Income Tax.

Exports and Imports of Electrical Goods and Machinery in August, 1925.

Why the Exports Fell.

In making a study of last month's foreign trade statistics, two or three points have to be borne in mind if a true impression is to be gained. In the first place, the August Bank Holiday period naturally affected the whole of industry; then, in addition, numerous firms, particularly in the North and Midlands, were shut down for a week or more. Another thing which made an appreciable difference was the incidence of five week-ends (Saturdays and Sundays). With these facts in view, the reduction of about 5.8 per cent. which occurred in the general export total as compared with July is seen to be less than one might reasonably have expected. The exports of electrical goods in particular were in actual fact very little lower than in July if the foregoing considerations are taken into account, and when compared with the general export trade the position is seen to be favourable; the decline only amountd to about 2.5 per cent.

Probably the real criterion is August, 1924; when last month's total is put against the figure for that month, an increase of £77,872 is to be observed. While as regards the individual items in the export list, the reductions predominated, there were also one or two large increases. The principal decline, both in actual value and proportionately, occurred in the case of insulated wires and cables, which showed a fall of over 30 per cent. The only other notable decreases were shown by unenumerated electrical goods and apparatus, and telegraph and telephone instruments and apparatus. The increases included a rise of £54,895, or over 27 per cent., in the value of unenumerated electrical machinery; one of £14,491 (71 per cent.) in meters and instruments; and one of £12,313 (32 per cent.) in glow lamps. The chief increases as compared with August, 1924, occurred in the cases of glow lamps, batteries and accumulators, unenumerated electrical machinery, railway and tramway motors, and submarine telegraph and telephone cable. The only important decreases occurred in the items insulated wires and cables and non-submarine telegraph and telephone wires and cable.

The import list is a tale of increases as compared with the previous month's figures and also in comparison with those of August, 1924. Thus, the increase in the total is well distributed, only two items reaching above the £10,000 mark, *viz.*, batteries and accumulators and unenumerated electrical machinery. The only two decreases occurred in the items meters and instruments, and switchboards (not telegraph or telephone).

In the re-export section, which is not of very large dimensions, there was a drastic reduction, the July total being almost halved, although the figure was not far below the August, 1924, total. The reduction was general, although three increases occurred, the most important one being connected with glow lamps.

It will be observed that the increases in all three sections for the first eight months of the year are in the neighbourhood of twice the August totals, the export increase being rather less than this amount. The actual increase in the value of exports as compared with the first eight months of 1924 is 20 per cent.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Aug., 1925.	Inc. or dec. as compared with July, 1925.	Inc. or dec. as compared with Aug., 1924.	Electrical imports for Aug., 1925.	Inc. or dec. as compared with July, 1925.	Inc. or dec. as compared with Aug., 1924.	Electrical re-exports for Aug., 1925.	Inc. or dec. as compared with July, 1925.	Inc. or dec. as compared with Aug., 1924.
Electrical goods and apparatus (unenumerated)	£140,121	— £18,353	— £6,208	£89,533	+ £64	+ £9,767	£5,285	— £1,472	+ £541
Insulated wires and cables ...	155,821	— 44,913	— 30,078	39,678	+ 6,612	+ 3,715	114	— 1,467	— 284
Glow lamps	50,484	+ 12,313	- 31,908	41,852	+ 2,407	+ 26,705	733	+ 603	+ 157
Arc lamps and parts	736	+ 438	— 148	638	+ 359	— 115	62	+ 57	+ 42
Batteries and accumulators ...	83,984	— 3,791	+ 27,680	56,952	+ 10,896	+ 33,490	517	— 1,360	+ 279
Meters and instruments ...	34,759	+ 14,491	+ 1,016	28,356	— 579	+ 11,761	705	— 193	+ 531
Carbons	4,693	+ 3,793	+ 1,465	8,785	+ 2,265	+ 5,230	23	— 97	— 102
Electrical Machinery—									
Electrical machinery (unenumerated)	253,576	+ 54,895	+ 93,605	106,132	+ 12,731	+ 25,094	4,203	— 683	— 1,138
Railway and tramway motors	54,719	+ 855	+ 26,458	—	—	—	—	—	—
Other motors and generators ...	180,111	— 3,143	— 8,739	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	5,933	— 2,182	+ 1,913	3	— 157	— 3	—	— 187	— 7
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	40,987	— 262	— 71,188	14,851	+ 3,154	+ 841	347	+ 29	+ 87
Submarine telegraph and telephone cable	39,730	— 9,917	+ 19,546	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	220,516	— 37,775	— 9,358	43,624	+ 8,164	— 10,658	3,080	— 7,832	— 572
Totals	£1,266,170	— £33,581	+ £77,872	£430,404	+ £45,916	+ £105,827	£15,069	— £12,602	— £466

Increases for the eight months ended August, 1925	Exports. £2,027,536	Imports. £845,539	Re-exports. £42,697

The Electrical Imports of New Zealand.

The following table shows the values of electrical and allied goods imported into New Zealand in 1924, according to the recently-issued official trade returns. The figures for 1923 have been given for purposes of comparison, and notes of increases or decreases added :—

	1923. £	1924. £	Inc. or dec. £
Electric batteries and cells—			
Total	88,000	81,000	— 7,000
From United Kingdom ...	23,000	18,000	— 5,000
,, United States	49,000	59,000	+ 10,000
,, Canada	—	2,000	+ 2,000
,, Denmark	2,000	1,000	— 1,000
Generators, motors and transformers—			
Total	352,000	525,000	+ 173,000
From United Kingdom ...	221,000	334,000	+ 113,000
,, United States	94,000	119,000	+ 25,000
,, Sweden	10,000	23,000	+ 13,000
,, Canada	11,000	10,000	— 1,000
,, Belgium	8,000	12,000	+ 4,000

	1923. £	1924. £	Inc. or dec. £
Insulated cable and wire—			
Total	460,000	666,000	+ 206,000
From United Kingdom ...	325,000	615,000	+ 290,000
,, United States	17,000	7,000	− 10,000
,, Canada	14,000	21,000	+ 7,000
,, Australia	13,000	16,000	+ 3,000
Electric lamps (incandescent filament)—			
Total	85,000	106,000	+ 21,000
From United Kingdom ...	55,000	67,000	+ 12,000
,, Netherlands	21,000	23,000	+ 2,000
,, United States	6,000	10,000	+ 4,000
Other electric lamps—			
Total	12,000	33,000	+ 21,000
From United Kingdom ...	2,000	5,000	+ 3,000
,, United States	8,000	25,000	+ 17,000
Carbons in blocks—			
Total	34,000	38,000	+ 4,000
From United Kingdom ...	15,000	26,000	+ 11,000
,, United States	11,000	10,000	− 1,000
,, Australia	1,000	1,500	+ 500
,, Canada	6,000	1,000	− 5,000
Cooking and heating appliances—			
Total	*	14,000	—
From United Kingdom ...	*	3,000	—
,, Canada	*	10,000	—
,, United States	*	1,000	—
Telegraph material and apparatus—			
Total	*	48,000	—
From United Kingdom ...	*	19,000	—
,, United States	*	14,000	—
,, Belgium	*	13,000	—
Telephones and accessories—			
Total	239,000	88,000	− 151,000
From United Kingdom ...	56,000	28,000	− 28,000
,, United States	44,000	22,000	− 22,000
,, Sweden	1,000	5,000	+ 4,000
,, Belgium	34,000	27,000	− 7,000
Other electrical material—			
Total	419,000	546,000	+ 127,000
From United Kingdom ...	223,000	344,000	+ 121,000
,, United States	148,000	152,000	+ 4,000
,, Japan	1,000	—	− 1,000
,, Australia	8,000	10,000	+ 2,000
,, Canada	31,000	25,000	− 6,000
Electricity meters—			
Total	44,000	64,000	+ 20,000
From United Kingdom ...	39,000	60,000	+ 21,000
,, Holland	—	1,000	+ 1,000
,, United States	2,000	1,000	− 1,000
Recording and testing instruments for meters—			
Total	51,000	57,000	+ 6,000
From United Kingdom ...	37,000	34,000	− 3,000
,, United States	11,000	16,000	+ 5,000
Iron telegraph and telephone wire—			
Total	12,000	*	—
From United Kingdom ...	12,000	*	—
Gas, oil, and hot-air engines, exceeding 100 b.h.p.—			
Total	15,000	19,000	+ 4,000
From United Kingdom ...	13,000	19,000	+ 6,000
,, Sweden	1,000	—	− 1,000
Steam engines, stationary, exceeding 200 b.h.p.—			
Total (all from U. Kingdom)	16,000	3,000	− 13,000
Turbines, steam and water, and Pelton wheels, exceeding 200 b.h.p.—			
Total	89,000	32,000	− 57,000
From United Kingdom ...	83,000	29,000	− 54,000
,, Switzerland	2,000	—	− 2,000
,, Sweden	4,000	3,000	− 1,000

* Not specified.

Electricity Supply in Germany.—Herr W. Majerczik, of Charlottenburg, is advocating the introduction of a uniform system of production and distribution of energy by the Reich Government, as he says that only under such a system will it be possible to get a cheap supply of energy. Not only Prussia, but also the States of Bavaria, Wurtemberg, Baden, Saxony and Thuringia, in recent years have begun to develop the production and distribution of energy, while various provinces, such as Brandenburg, Pomerania, and East Prussia, have also embarked on the same path, and to these have to be added the numerous communal works both of a private nature and those under joint proprietorship. An electrical map of the present time is said to resemble the political map of the Middle Ages, when there were hundreds of large and small States, for there are now thousands of supply undertakings with areas overlapping one another. It is argued that out of this state of chaos it is necessary to bring order, and apart from about a dozen of the largest towns all the other works should be consolidated under a uniform Reich undertaking.

Canadian Electrical Notes.

(By Our Special Correspondent.)

THE Provincial Government of Ontario has recently publishe a pamphlet bearing the title "List of Water Powers in th Province of Ontario." The greater part of this pamphlet co sists of a tabulation giving the names of the various rivers c which power is available; the district in which the draina area lies; the actual power sites; the available head in feet; th estimated capacity in horse-power at 80 per cent. efficienc both at ordinary minimum flow and at ordinary six month flow, and the present installed horse-power, if any. For th last three items the totals are given for each individual river

In the foreword it is pointed out that "High accuracy the estimate of water power requires continuous stream flo records over a long period of time, and as such long-ter records are available for only comparatively few of the rive of the Province, many of the estimates are subject to revisi as more is learned of the run-off characteristics. Nevertheles the estimates will give a fairly close approximation of th power possibilities of the Province and serve as a starting poi for the more detailed study of individual sites."

In the introductory text preceding the tabulation referred above, the following table is given:—

TABLE I.—AVAILABLE AND INSTALLED WATER POWER IN ONTARI

Drainage Basin.	Estimated Capacity in H.P. at 80% efficiency. At ordinary minimum flow.	At ordinary six-months' flow.	Installed H.P.
Hudson Bay ...	26,759	53,513	—
James Bay	525,862	950,982	117,085
Lake Winnipeg ...	199,944	328,696	36,645
Lake Superior ...	180,787	303,822	90,600
Lake Huron	221,502	413,000	168,993
Lake Erie	3,292	8,923	11,367
Lake Ontario ...	1,054,935	1,101,060	1,030,705
St. Lawrence River	791,308	956,561	17,671
Ottawa River ...	423,763	708,986	112,267
Totals	3,429,152	4,825,143	1,585,333

It is stated that the totals of available power shown abo "include only the amount of power in the Niagara Riv which is equivalent to the diversion of water permitted treaty." There is little doubt that before long application w be made to Ottawa and Washington respectively for permissi to divert considerably more water for power purposes from t Niagara River than is allowed by the present treaty. If t total power possibilities of the Niagara River were made ava able for development, the provincial totals would rise to so 5,330,000 h.p. at ordinary minimum flow and 6,940,000 h.p. ordinary six-months' flow. That there is plenty of scope the installation of hydro-electric plant in Ontario yet may seen from the statement that studies have indicated th throughout Canada generally installed power is about 30 cent. greater than the corresponding six-months' power. this basis, therefore, the water-power resources of Onta would permit of an installation of 6,270,000 h.p. or, if the to potential power of the Niagara River is included, an installati of 9,000,000 h.p. The water-power resources of the Provi may thus be said to be from 18 to 25 per cent. developed. T estimated water powers are in all cases on the basis of c tinuous twenty-four-hour power.

There is no doubt that owing to some of the water powers Ontario being situated in uninhabited, and in some cases cidedly inhospitable, regions, it will be long before all of th are utilised, but fortunately a very considerable proportion the available power is located in the St. Lawrence and Otta River basins and on Lake Ontario, where use can be m of it as the need arises.

There has recently been developed in Canada a new elect furnace process for the manufacture of sodium sulphide, paper on which subject was read at the Dominion Conventi of Chemists which was held at the beginning of June. T paper is reported in full in *Canadian Chemistry and Met lurgy*, but, unfortunately, no electrical data whatever given. The account is very interesting, however, as anot instance of the industrial application of electricity. Canada Carbide Company is now advertising sodium sulph of a purity of 85 per cent., which is much higher than attainable by former processes, and in the development of t process some extraordinary difficulties had to be overcome the substance is liquid at a relatively low temperature but s and extremely refractory at higher temperatures (*i.e.*, ab 1,000 deg. C.). At the lower temperature it was not possi to obtain the substance above about 60 per cent. purity. research leading up to the development of the process o commercial basis was carried out under the auspices of (Canadian) Honorary Council for Scientific and Indust Research. The manufacturing development was undertal by the Canada Carbide Company at Shawinigan Falls. Sodi sulphide is largely used as a solvent for sulphur dyes; i employed as a depilatory for hides and as a sheep dip; an has other minor uses such as in the precipitation of silver the regeneration of cyanide in mining operations.

The Wireless Exhibition, 1925.

An All-British Display of Radio-Telephone Apparatus and Accessories.

(*Continued from page* 450.)

British L. M. Ericsson Manufacturing Co., Ltd.

In addition to numerous examples of its well-known telephones and loud-speakers, this company displayed a number of receiving sets. One of these, a miniature crystal set, is illustrated in fig. 11. As will be seen, this is of an extremely compact nature, and it is only about two inches in diameter. The rectangular knob on the left is for the adjustment of the crystal, while the centre knob bears the cat's-whisker. The tuning knob on the right-hand side of the set operates a slider upon a tapped inductance. The aerial and earth terminals are diametrically opposite on the side of the case. A four-valve set (fig. 12) was shown in various combinations



Fig. 11.—The Ericsson Miniature Crystal Set.

enclosed panel and cabinet forms). This has a tuned anode circuit and two power valves. Each valve is provided with a dual filament resistance to enable either bright or dull emitters to be employed. A wave-trap is incorporated, but this is easily disconnected when not required. A switching arrangement to permit of the use of two, three, or four valves is provided.



Fig. 12.—An Ericsson 4-Valve Set.

A notable feature of these four-valve sets is that the panel is of wood—oak, mahogany, or walnut. This is quite as suitable as ebonite if, as in these sets, the spindle holes are bushed with good insulating material. One of the cabinets shown was an excellent piece of workmanship and incorporated every convenience for radio work. The exhibit also included numerous components.

Edison Swan Electric Co., Ltd.

Being a valve manufacturer, the company has added to its series since the last exhibition, and amongst the bright types one "A.R." is specially made for h.f. and l.f. work, the distinguishing marking being a red or green lines respectively along the bulb from the cap to the tip. Another interesting point about the company's valves is the new method of sealing which ensures that the purchaser receives an absolutely new valve; the device consists of a glass tube fitted over the anode pin, to which it is attached by means of a sealed thread. Amongst the array of Ediswan sets and components we were interested in a new two-valve receiver (fig. 13) which the company is just placing on the market. Its circuit consists of a detector and one l.f. stage with reaction and it is claimed that excellent loud speaker results are obtained up to 25 miles and with headphones stations over 100 miles away are received well. The set is of a circular pattern in moulded insulating material, the valves being mounted close together on a central raised pillar, the l.f. transformer and connections being inside the pillar. All controls are arranged radially from the central pillar, a flat type condenser being contained in the base; the filament is arranged for dual control so that either bright or dull emitter valves may be used, and the coils are of the plug-in type. Another interesting item is the intermediate stage coupler for super-heterodyne circuits. It contains the coupling



Fig. 13.—Circular Ediswan 2-valve Receiver.

transformers and a filter circuit, suitably spaced and mounted on a common spindle, all connections being made to terminals on the two longest edges of the base. The long-range radiophone is a four-valve set of the reflex type, and sets finished in a variety of styles in Chinese lacquer are shown with support-

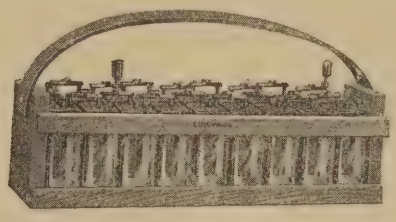


Fig. 14.—New Ediswan H.P. Accumulator.

ing tables and loud speakers to match. The company has introduced a high-pressure accumulator (fig. 14), the units of which have been specially designed for the purpose. Other exhibits were dry h.p. batteries, dry batteries for use with dull-emitter valves, and headphones.

C. A. Vandervell & Co., Ltd.

This display stand consisted chiefly of components. The whole of the movement of the "C.A.V." crystal detector was shown mounted in a moulded circular base 1⅞ in. in diameter and enclosed in a glass case 2¼ in. high. A hornless type of loud

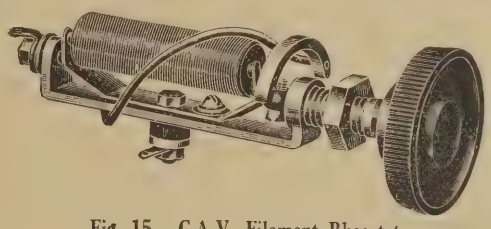


Fig. 15.—C.A.V. Filament Rheostat.

speaker has been designed for those requiring an instrument to harmonise with the furnishings of a room. It is encased in a polished mahogany cabinet measuring only 15½ in. long, 9¼ in. wide and 9 in. high. The filament resistance, fig. 15, is of an unconventional type; it is mounted on spring sup-



Fig. 16.—C.A.V. Multiple Fixed Condenser.

ports, its length behind the panel being 3 in., and the resistance is made to revolve with the rotating helical contactor. An interesting multiple fixed condenser is shown in fig. 16; by combining several condensers in one case, with convenient

tapping points, it is possible to obtain any required capacity value within the stated limits by simply connecting the tappings in parallel. The component is totally enclosed in an ebonite casing, and screened from stray capacity effects; its overall height is 2¼ in. and length 2¾ in. Attention has been paid to the production of a tuning inductance which combines mechanical strength, small losses, and a pleasing appearance. C.A.V. tuning coils, fig. 17, for the broadcast range, are wound with bare copper wire, 22 s.w.g., air spaced on special formers, and are protected by a strong casing. As a further refinement, the block carrying the plug and socket is cut away to reduce the capacity between the metal portions, and all the coils are 4 in. in diameter by 1 in. wide. The company's valve holder sockets are constructed of helical springs kept at the correct tension by means of an absorbent cushion ring which method ensures contact and prevents the transmis-

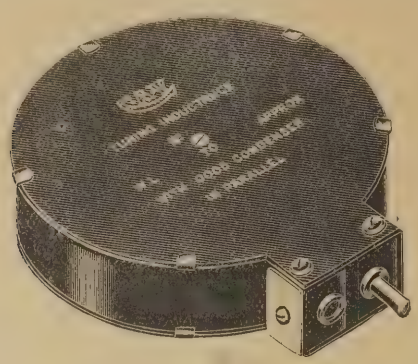


Fig. 17. C.A.V. Tuning Coil.

sion of vibration or shock to the valve. The moulded casing is slotted between the metal portion in order to reduce inter-socket capacity. A gramophone attachment, various patterns of transformers, and h.p. and l.p accumulators, were also on view, including a combined set, the assembly of which comprises two separately crated H.T.2 sets, giving a total of 120 volts, and a 6-E.L.5, 6-volt, 50-amp.-hr. (actual) l.p. ebonite accumulator, all encased in a polished rosewood container. The specially shaped hinged lid exposes the plates of front cells to view and permits easy inspection of all connections. Valve protection is afforded by a fused connecting link between the two h.p. groups, which also serves for testing each two-volt cell. Feed wires enter the back of the container, the dimensions of which are 25 in. by 13 in. by 8½ in. in height, handles and clips projecting.

Sun Electrical Co., Ltd.

Upon this stand were displayed examples of the products of numerous radio apparatus manufacturers. Receiving sets of the leading makes were shown in great variety, one of the principal being an "Acme" 7-valve super-heterodyne receiver with a single-knob control. All kinds of components were exhibited, and the accessories included a wide range of loud speakers, telephones, valves, and batteries.

Alfred Graham & Co.

The well-known "Amplion" products were shown in the centre of the main hall, and as last year demonstrations were given "under home conditions" at a special depôt in Kensington Palace Mansions near by, representative ranges of loud-speaker models being on view at both places, including the "Dragon" and "Junior" types. Recent constructional improvements were described in our pages last month.

A notable innovation, first shown at the Exhibition, was the new series of "Radiolux Amplions." The "Radiolux" is

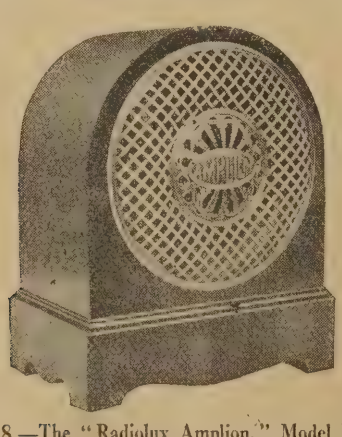


Fig. 18.—The "Radiolux Amplion," Model RS20.

an apparently hornless cabinet loud-speaker, of which one pattern is illustrated in fig. 18 herewith; it somewhat resembles a bracket clock in shape and size, and is made in two patterns, with five cabinet styles, all of very handsome appearance. In place of the usual horn, there is an acoustic duct, bent as shown in figs. 19 and 20, so as to occupy the minimum space, and passing through the wall of a reflecting bowl; the mouth of the duct faces the specially shaped bottom of the bowl, which has a flaring mouth (fig. 20). The electromagnetic system has a threaded nozzle, which screws into a rubber brush in the small end of the duct below a perforated supporting plate; the plate and the whole of the acoustic system are insulated from the cabinet by rubber washers, and every care is

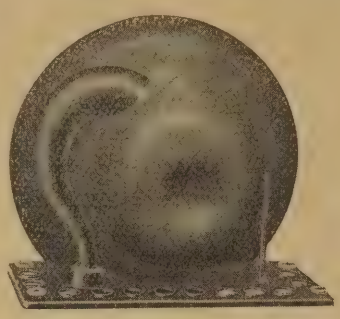


Fig. 19.—Acoustic System from the Rear.

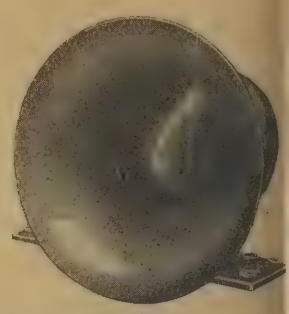


Fig. 20.—Front View of Bowl.

taken to avoid the presence of unwanted resonance. The electromagnetic system is of new design, the rear plate carrying the whole of the mechanism, the adjusting device, and the terminals, which are of a patented spring type. The grille seen in fig. 18 is bulged, for acoustic reasons, and the effect is very pleasing. It is claimed that the new type gives great volume of sound with purity of tone and absence of objectionable resonance.

The new "Swan-Neck" type of Amplion was also exhibited.

Metro-Vick Supplies, Ltd.

Among a number of receiving sets shown by this company was a new 3-valve set of very novel construction. This departs entirely from the usual lines, and in this way becomes a set of small dimensions. Resistance-capacity coupling is employed; this, it is claimed, ensures distortionless amplification of speech and music. The operation of the set is simplified by its only having two controls—a main tuning condenser with vernier adjustment and a variable reactance coil. A dual rheostat, a battery switch, and spring valve holders are incorporated. The coil units cover wavelength ranges of from 230 to 550 metres and from 1,300 to 3,000 metres with an average aerial. The two control knobs are so arranged that by half a turn contact is broken—thus the set can be left ready for operation at any time on any particular station without fear that the set will be switched on accidentally. A dust-proof cover of dark red moulded composition can be supplied with this set. The cover has a flat top upon which a loud-speaker can be placed. The compact "Cosmos" crystal set, described in our issue of August 28th (p. 356), was also exhibited. This, it will be remembered, has condenser tuning and arrangements for receiving the high-power station. It can be hung up on a wall if required. Other exhibits were a new low-loss, slow-motion condenser, valves, rheostats, potentiometers, and the "Cosmos" strip inductance coil. The last is put up in a highly-polished moulded casing rendering it impervious to moisture.

Radio Communication Co., Ltd.

A competition was arranged by the Radio Communication Company in connection with a display of window-dressing designs. Two lady artists engaged on the staff of the company arranged 12 alternative displays in a special window, which were changed sufficiently frequently to cover each of the twelve selected displays daily. Those wishing to enter the competition were to place on a form provided for the purpose the twelve displays in what they considered to be their relative order of merit, and those who most nearly selected the order decided by the voting in the competition were to receive prizes of £25, £15, and £10 respectively. The competition was open to all visitors to the Exhibition, whether engaged in the trade or not.

(To be continued.)

Trade with Turkey.—The September *Journal* of the British Chamber of Commerce of Turkey contains an article upon British trade in Turkey. It deals mainly with methods of business, stating that there are four salient points to be borne in mind in dealing with this market, *viz.*, that cheapness, not quality, is required; that the requirements of the market are to be considered instead of the market being offered unsuitable goods; that competition is very great; and that competitors grant credit. A brief summary is given of the methods employed by competitors to secure Turkish business; among these are mentioned personal visits by manufacturers, the appointment of reliable agents, regular visits by travellers, facilities in shipment and delivery, and equal attention to both large and small orders. It is said that although Turkey is at present a small market, the country is developing and likely to become an increasingly good customer for many years to come.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

An Improved Electric Soldering Iron.

The accompanying illustration, fig. 1, is of an electric soldering iron which is marketed by MESSRS. MAY & PADMORE, LTD., Wharfedale Road, Tyseley, Birmingham. The hot-forged copper point is specially shaped to reach places which are difficult of access, while the overall diameter is such that it easily permits the operator to "get at" the connections. It can be connected to an ordinary lamp socket.



Fig. 1.—The Maymore Soldering Iron.

A Field Mule Pack Radio Set.

MESSRS. STUART TURNER, LTD., 43-47, Market Place, Henley-on-Thames, have recently designed and built for the War Office a special petrol-driven generating set, fig. 2, for mule transport for wireless signalling in the field. The set comprises an air-cooled engine and a direct coupled dynamo mounted on a tubular frame for carriage by a pack mule. The engine is of the twin-cylinder opposed type, air cooled, 1,760 r.p.m. The cylinders are of cast-iron with side-by-side valves and detachable heads. The flywheel acts as a centrifugal fan and is surrounded by an aluminium case conducting the air on to the cylinders to cool them. The crankshaft runs on ball bearings and is machined from the solid. The connecting rods have roller bearing big ends with 18 rollers in each, and the gudgeon pin bushes are of bronze. The pistons are aluminium with three cast-iron rings, the gudgeon pins being of the floating type. The camshaft runs on ball bearings and is driven by a gear wheel; it operates the valves by means of tappets. The magneto is driven at half the engine speed by a gear wheel from the camshaft. The governor and oil pump are operated by a shaft, skew driven off the crankshaft. The carburettor is of the patent Stuart design whereby the correct admixture of air and petrol is obtained at all throttle openings. The petrol tank is fitted with a special valve by which the vent hole in the filler cap is closed when the petrol supply is shut off so that it may be carried in any position. At the same time the petrol is not turned on until the vent hole is open. The silencer receives the exhaust from both cylinders and is fitted with an exit pipe to which can easily be attached a flexible exhaust pipe for conveying the exhaust right away from the set. Starting is effected by a handle operating an epicyclic gear with dogs engaging the end of the crankshaft. The gear gives a 3 to 1 increase for starting. The dynamo, made by Newtons, Derby, is direct driven by a flexible fabric coupling and has two outputs generated simultaneously—1,200 V, .08 A, and 12 V, 8.0 A. The framing is of steel tubing completely covering the outside dimensions of the set to provide some protection whilst carried on the pack animal. The set weighs 84 lb. and its dimensions are, length 2 ft. 7 in., width 1 ft. 6 in., height 1 ft. 3 in.

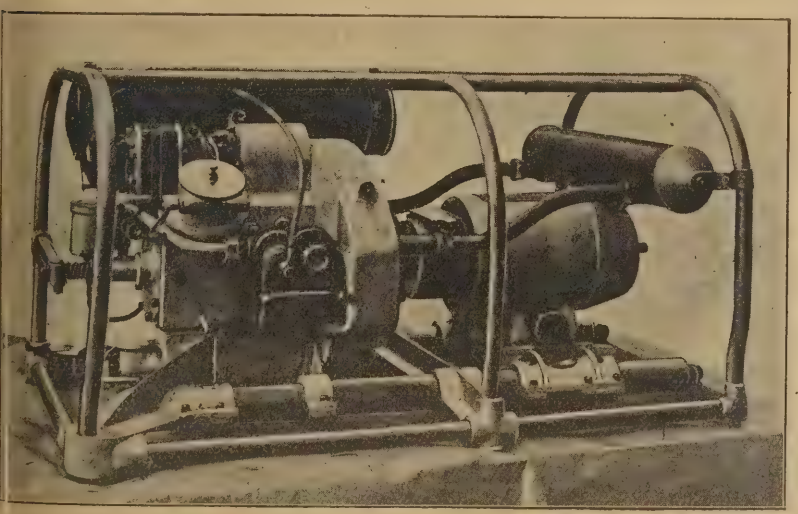


Fig. 2.—The Turner Field Radio Equipment.

The "Crescent" Dish-washer.

In our recent report on the Bakers' Exhibition at the Agricultural Hall we mentioned that the HOBART MANUFACTURING CO., LTD., Charterhouse Street, E.C.1, included in its display a "Crescent" dish-washing machine. This appliance, which is illustrated in fig 3, contains a rack into which the plates and dishes are inserted. They are then subjected to numerous jets of hot water from a revolving sprayer. After this cleansing operation, water from stationary sprays is projected on to the ware, rinsing it clean. The model illustrated has a height of 56½ in., and it is 27 in. long and 28½ in. wide; it is capable of dealing with from two to three thousand pieces per hour.

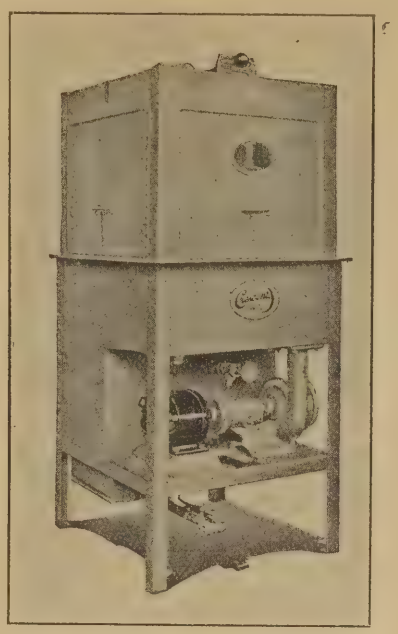
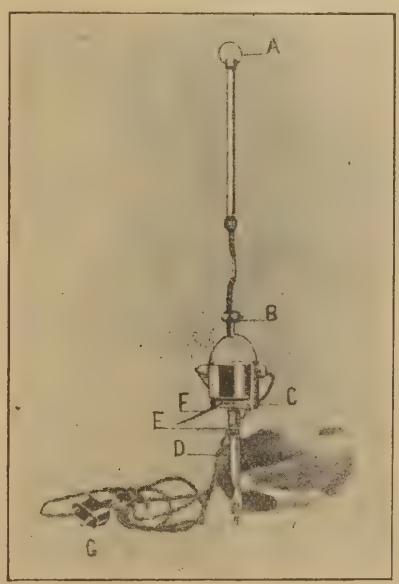


Fig. 3.—The "Crescent" Dish-washer.

An Electric Drawing Copying Machine.

An interesting electrical apparatus by which copies of drawings may be made by perforation on paper, cloth, wood, glass, &c., has recently been put on the market by M. R. LERESCHE, of Vevey, Switzerland. The device (fig. 4) which can be operated from any electric light circuit, comprises an electro-magnet adapted to give an alternating magnetic field so causing a small disk to vibrate, the vibrations being converted into a rapid to and fro motion of a needle which pierces a series of small holes in the drawing to be copied. The original is then placed over another sheet of wood or glass, on which it is desired to produce the copy of the drawing which is done by spreading a special coloured powder over the original; the powder in passing through the perforations giving an exact and sharp copy of the original.



A. Suspension hook.
B. Adjustable support for varying height.
C. Needle working in conjunction with vibrator.
D. Tube adjusting length of perforating needle.
E. Needle adjustment lock nut.
F. Speed regulator.
G. Connection plug to electric circuit.

Fig. 4.—An Electrical Copying Machine.

The Institution of Public Lighting Engineers.

Annual Conference at Leeds.

The second annual conference of the Institution of Public Lighting Engineers took place on September 14th, 15th and 16th at Leeds, and was attended by some 200 members, ladies, and friends directly or indirectly connected with the public lighting profession.

The business meetings were held in the Philosophical Hall, Park Row. On the evening of September 14th, the visitors were entertained to an "At Home" and civic reception at the City Art Gallery by the Rt. Hon. the Lord Mayor of Leeds (Councillor C. G. Gibson) and the Lady Mayoress; afterwards they were conveyed by motor coaches on an hour's tour of the main features of the Leeds lighting system, under the guidance of Mr. C. S. Shapley, Leeds city gas engineer and head of the Street Lighting Department, and various members of the staff. A special feature of the tour was the fact that a considerable number of street sections had been fitted with various manufacturers' lamps and other fittings, both electrical and gas, to show in actual and normal use (not specially-arranged display lighting) appliances which were on view at an exhibition of street-lighting appliances held at the Leeds Town Hall throughout the duration of the Conference.

On September 15th the visitors were entertained to luncheon at the Town Hall as the guests of the Leeds Gas and Lighting Committees, and were subsequently taken on an enjoyable motor drive to Templenewsam and Harrogate. On the Wednesday morning, before resumption of the last business session, a wreath was deposited at the Leeds War Memorial Cenotaph by the newly-elected President of the Institution (Mr. C. S. Shapley, of Leeds), who was accompanied by members of the Council and of the Institution generally.

At the opening of the business on the 15th, the chair was occupied by the retiring president, Mr. S. B. Langlands, Lighting Superintendent of Glasgow, and the members were given an official welcome by the Lord Mayor of Leeds (Councillor C. G. Gibson), who expressed the hope that the Conference would be fruitful of benefit to the profession and through the profession to the public. Mr. Shapley, the president-elect, said the Lord Mayor was to be congratulated on the progress that had been made with public lighting in Leeds.

Mr. C. S. Shapley was then installed in the chair by Mr. Langlands, and Councillor E. J. Clarke, chairman of the Leeds Corporation Street Lighting Committee, in an address couched largely in a humorous vein, added his welcome to that of the Lord Mayor. As a layman, he recognised that lighting engineers performed not only an important public duty, but one the value of which was seldom appreciated by the public as it should be.

Thanks to the retiring President were proposed by his successor, and seconded by Mr. J. F. Colquhoun (Sheffield), both speakers pointing out that Mr. Langlands had borne the brunt of presidential work by taking office in the first and probably the most difficult year. Mr. Langlands, in reply, said he was glad to see evidence of that recognition which was the due of the new Institution in the presence of Mr. R. B. Mitchell, President of the Incorporated Municipal Electrical Association; Mr. C. F. Botley, President of the Institution of Gas Engineers; and other representatives of kindred associations.

The meeting resolved unanimously to send a cablegram of greeting to the Illuminating Society of America which was in conference at the same time.

The President then delivered his address, of which an abstract will be given later.

Commenting on the address, Mr. Shapley said public lighting had immensely improved in recent years, but there was still plenty of room for further improvement. The address was illustrated by a number of lantern slides, showing both electric and gas lighting in Leeds; and by a very large map, erected in a wooden frame across a corner of the room, which when lighted up from behind, with the lights of the room extinguished, was seen to have been punched with holes to represent all the street lamps in the major portion of the Leeds lighting system. The map showed how congested was the population, and the need for adequate lighting, in the industrial aras, and how population became much more sparse some two miles from the centre of the city. The Leeds lighting department, Mr. Shapley pointed out, for a population of some 470,000, had to light 587 miles of streets, which was about sixty miles more than in the case of Glasgow, though the population of Glasgow was much greater. By the pasting of coloured paper behind the map, the electric lighting of Leeds streets was shown by red lights, high-pressure gas by green lights, and low-pressure gas by ordinary white lights. Mr. Shapley spoke of a certain wet roadway and a point policeman who had been nearly knocked down by motorists six times. That policeman was on duty on a well-lighted road, in a white coat. Mr. Shapley made a test and found that, owing to the sheen of the road, the policeman was much better visible, even at night, in his blue uniform than in the white coat. Turning to the question of lamps for marking danger points, Mr. Shapley strongly urged lighting engineers not to overdo the number of these, or they would reduce their value seriously. In consultation with the Chief Constable of Leeds, he had found that in 587 miles of lighted streets and roads there were only 40 points at which a danger lamp was really justifiable. Mr. Shapley asked members to bear in mind that the paper had been written two months before the Conference, and that some points might need a little modification in view of recent lighting developments as seen in the exhibition at the Town Hall.

The thanks of the meeting were accorded to the president for his address, after which Mr. Edward C. Lennox, in order to leave more time for discussion on the next day, read his paper, which was on the programme for the final day, the subject being "Electric Street Lighting in Rural Areas."

Mr. Lennox, like the president, observed that since preparing the paper the development of lighting progress had been such that there were already one or two points on which, if he were writing the paper again, he would make some modifications.

The President proposed a vote of thanks to Mr. Lennox for his paper, and said he had been particularly struck by the excellent design of overhead transmission cabling network, and its neatness.

Councillor H. F. A. Edmonds, vice-chairman of the Camberwell Works Committee, seconded the vote and endorsed the admiration of the neat network.

Mr. C. F. Botley, president of the Institution of Gas Engineers, congratulated the Institution of Public Lighting Engineers on its valuable work in bringing gas and electrical men together to further the common interests of better public lighting. He thanked the Institution for electing as its second president Mr. Shapley, a member of the Council of his own Institution. Many of the points given by Mr. Lennox he could confirm from his own experience. He felt that the reader of the paper was a thorough master of his subject.

Mr. R. B. Mitchell, president of the Incorporated Municipal Electrical Association, said he fully endorsed the remarks of Mr. Botley, and particularly emphasised the value of the two great industries of gas and electricity working together in the public lighting service. He paid a tribute to the excellent address given by the president, and offered his best wishes to the Institution for its future work.

(To be continued.)

The Municipal Tramways Association—II.

Annual Conference at Brighton.

On Thursday, September 10th, Mr. Dalrymple's paper on "Tramway Stopping Places" was discussed, and a paper by Ald. R. A. Smithson, chairman of the Leeds City Tramways Committee, on "Tramway Finance" was read and discussed. In the afternoon the general meeting, reported in our last issue, was held, and in the evening the annual dinner of the Association took place at the Hotel Metropole. Ald. C. Higham presided over a gathering of about 400. Proposing "The Municipal Tramways Association," the Mayor of Blackburn, Councillor J. Stanworth, thanked the Mayor of Brighton, the chairman of the Brighton Tramways Committee, and Mr. W. Marsh, engineer and manager of the tramways, for the excellent arrangements that had been made. He paid a tribute to the work of the general secretary, Mr. J. Beckett, and said that the keen competition that they met with must be countered with a cheaper, quicker, and more comfortable service. Ald. Higham responded, claiming that transportation was a public service that ought to be in the hands of the local authorities, but ought not to be used to make a profit and relieve the rates. Mr. P. Priestley, President-elect, proposed the "Corporation of Brighton and the Tramways Committee," and the Mayor of Brighton responded; the toast of "The Visitors" was proposed by Mr. W. Chamberlain, general manager of the Leeds tramways, Mr. Marshall Harriss, general manager of the Dublin United Tramways Co., responding.



A Group of well-known Members.



Leaving Arundel Castle.

The dinner was followed by an informal dance, which was very enjoyable.

Friday, September 11th, was devoted to tours in the adjoining country. The weather was delightful, and a motor-coach trip during the morning through Worthing to Arundel, where the castle and grounds were open for inspection, was thoroughly enjoyed. In the afternoon there was a circular motor-coach tour through Tunbridge Wells and East Grinstead, the two journeys taking the company through much of the most delightful scenery in Sussex.

The Royal Pavilion was thrown open in the evening on the occasion of a reception by the Mayor and Mayoress of Brighton, and the dance which followed was attended by a large number of members and friends.

The Conference was considered to be a most successful one, the attendance being a record.

Municipal Tramways and Motor Omnibuses.

Discussion.

Councillor J. Peach (Chairman, Northampton Tramways Committee) proposed a vote of thanks to Mr. Fearnley for his paper. Councillor D. W. Beaton (Chairman, Aberdeen Tramways Committee), who seconded, said that the municipalities would have to adopt the determined attitude outlined in the paper. They had been compelled to municipalise the supply of gas, water and electricity, and the transport service was no less important than any of those three. Councillor J. H. Whittaker (Chairman, Todmorden Tramway Committee) urged the necessity for co-operation between the municipal tramway authorities in connection with the provision of services as connecting links between their various tramway systems. If the local authorities did not, either jointly or individually, provide such services, they could not reasonably object to private enterprise being allowed to provide them.

Councillor F. Burt (Sub-Convener, Glasgow Corporation Tramways Committee) said he was a thorough tramway man, but considered that the tramway undertakings wanted some brushing up. The tramway departments were inclined to look upon themselves as being the ultimate end of everything in the way of street transport. The public did not travel by tramcar instead of the 'bus because of the lower fares on the tramway, but they preferred the 'bus because of its higher speed. He suggested the use of single-deck cars, because the present-day double-deck monstrosities could not run along a country road at high speed. He also suggested sidings in parts of the city, where the slow cars could deposit passengers and allow the fast cars to pass.

Mr. H. Mattinson (General Manager, Manchester Corporation Tramways) said it must be acknowledged that the companies were here, and had a field of operation which could never be handed over to the municipalities. On the other hand, municipal transport officers, and their committees, claimed, and would insist upon, their right to provide transport facilities within their spheres of influence, which were not necessarily limited to their particular boundaries. The solution of the competition problem was for the Association to promote a Bill to bring about adequate laws to regulate the motor transport of the country, both public and private enterprise; there should be an adoptive Act. He saw no reason for despondency with regard to competition, and had not the slightest doubt that the tramway was *the* instrument and that there was nothing even remotely likely to oust it from its position as the prime mover of the public.

Mr. C. J. Spencer (Honorary Member) said the street transport problem was how to carry the maximum number of people in the shortest possible time at certain times of the day, and the vehicle which would do that most satisfactorily was the one with the largest capacity, within reason. He criticised Mr. Fearnley's figures, which showed that in 1919 the cost per seat provided on a motor 'bus was 114.1 per cent. more than the cost per seat on a tramcar, whereas for the four months ended July 18th, 1925, the difference was only 27 per cent. The 'bus did not pay towards road maintenance a sum commensurate with the damage it caused; the tramways were contributing large sums to the maintenance of the roads used by their competitors, and the Association, by allowing that to go on, helped their competitors in no small measure. The way out of the present difficulties was to develop tramways more. Referring to the common talk that the public preferred the 'bus to the tramcar, he said recent statistics showed that, when tramcars and 'buses were operating at the same fares on the same route, the average passenger took the vehicle that came first.

Alderman T. Woffenden (Deputy Chairman, Huddersfield Tramways Committee) said that every municipality should have powers to enter into through-running agreements, and those powers could only be obtained by co-operative action between all municipalities, led by the Association. The small councils which were now refusing to give municipal tramway authorities permission to go through their districts would, in time, have to develop, and if the powers referred to were not obtained by the municipalities, those small councils would have to buy the existing undertakings and would have to pay for the neglect of to-day.

Councillor J. G. Frazer (Chairman, Dundee Tramway Committee), referring to the lack of efficiency of municipal tramways, pointed out that the managers were subject to municipal and political expedience.

Councillor V. L. McEntee (Chairman, Walthamstow Tramways Committee) said that efficiency and publicity was the keynote of success in the future, and suggested that the local

Press in the various districts might be used by tramway authorities for publicity purposes.

Mr. J. S. D. MOFFET (General Manager, Salford Corporation Tramways) said he would not hesitate to recommend the scrapping of tramways if he could find something better, but for certain classes of traffic he did not think there was anything better. Speeding up the tramcars had its limits, because the convenience of the public must be studied, and higher speed might defeat the object of the tramway authorities in connection with the short-distance traffic. The tramcar was the most efficient vehicle for the door-to-door or street-to-street traffic, but at present there was nothing but the motor 'bus for the non-stop or limited non-stop type of service for carrying passengers outside the towns. He urged the Association to find some general clause which could be inserted in general Acts, giving municipalities running powers outside their boundaries.

Mr. W. MURRAY (Manager, Walthamstow U.D.C. Tramways) criticised the Association for its lack of vision with regard to motor 'bus competition. The Association had demanded equality of opportunity, but that was no use. The peculiar thing was that, whilst the Association was asking for equal opportunities, those in power were willing to give more. Sir Henry Maybury (Head of the Roads Department of the Ministry of Transport) had said that Parliament was going to protect the tramways, whilst a Departmental Committee of the Ministry, dealing with this question, in its interim report, had recommended that the licensing authority should have power to limit the number of licences issued and to revise them where an adequate and satisfactory service of suitable vehicles was already being given. He recommended that the Association should revise its attitude and policy, because equal opportunity would not save the tramways.

Mr. R. S. PILCHER (General Manager, Edinburgh Corporation Tramways) said that if 'buses were allowed to compete over the long distances, it would not be long before they would compete in the centres of the cities for the short-distance traffic. Comparing the 'bus with the tramcar, he said the modern 'bus was commodious, well lit, well sprung, it ran on pneumatic tires, and had all the latest appliances on it. On the other hand, many tramway systems had plant which was 25 years old. Appealing for higher speed, he said the cars at Edinburgh ran at 24 m.p.h. on the level, but that was not the limit, because the cars were fitted with 50 h.p. motors. It was his intention to apply to the Ministry of Transport for permission to run at a higher speed still. Finally, he urged the scrapping of old equipment.

Councillor A. STARK (Member of the Hull Tramway Committee) said it was no use attempting to fight motor transport; it was up to the municipalities to own and control it. As to speed, it was not so much a question of speeding up the tramcars as of preventing the 'buses exceeding the speed limit, because a safe speed limit for any city was a speed which any municipal tramcar could do easily.

Councillor S. F. JOHNSON (Chairman, Southend-on-Sea Tramways Committee) agreed that the 'buses could not be fought altogether, and that in many districts they were fulfilling a public need because the municipal tramways were not allowed to do it. If the trams were scrapped, 'bus fares would eventually go up, and it seemed to him that the cry for the scrapping of the trams was raised in order to put the 'bus companies in a better financial position in the future. When the 'buses had had as long a life as the tramways, unless they put by a good deal for depreciation, they would meet with the same difficulties as the tramway undertakings were meeting.

Alderman R. T. FLETCHER (Chairman, Wigan Tramways Committee) suggested that the title of the Association should be "The Municipal Transport Association," because the last word was not spoken when they had dealt with tramways.

Alderman W. C. FENTON, J.P. (Deputy Chairman, Sheffield Tramways Committee) said that when the new Ministries were instituted, the municipalities lost a lot of their local authority; with the disappearance of the Local Government Board they lost a certain amount of local autonomy, which they should regain. He disagreed that all the tramway concerns had shown lack of vision; with an astute, far-seeing and energetic manager, and a sympathetic and enterprising tramway committee, they could do a great deal more than they were doing.

Mr. FEARNLEY, replying to the discussion, said it rested with the municipal tramway authorities to see that the ideal of public service was properly catered for and carried out. The proposed joint board for the working of the tramway systems in the fringe towns of Lancashire and Yorkshire was a great idea, and should be pushed for all it was worth. The opinion that the public would ultimately support the system which gave the best service was certainly sound. It was not true that the present double-deck tramcars could not be speeded up. The single-decker was not the solution of the problem; it had been tried out in many towns, including Sheffield, where the Corporation had been glad to get rid of them to tramway companies at a very low price. As to competition, if the 'buses would keep to the sphere left to them after the municipal tramways had covered the sphere outlined in the paper, the latter would keep to theirs and be satisfied. The 'bus could take the place of the tram only if the tramway men allowed it. Mr. Fearnley submitted that the 78-seater tramcar did not provide the comfortable accommodation which the modern 'bus provided. The latest type of tramcar must be compared with the latest type of 'bus, and that was done in the paper. As to obtaining powers to run omnibuses without the necessity for going to Parliament, these powers could be obtained if the 98 municipalities represented by the Association made up their minds to get them. It was the intention of the paper to show that it was the competing vehicle which was making the most progress, and that it was necessary for tramways to make more progress. They must be quietened, brightened and painted. Mr. Murray had said that London had been up against the difficulty of competition for years; if that were so, why had not the London area moved and helped itself? The whole of the London local authorities had operated in splendid isolation and that had in a great measure brought about the position in which they found themselves to-day. If the London municipal areas had demanded with one voice, 15 or 20 years ago, the right to operate motor 'buses in connection with their tramways, would not they have got it?

As to the suggestion by Councillor Stark that the speed of motor 'buses should be restricted, that was absolutely the wrong way to deal with the matter. The tramways did not want to pull the other people back, but to beat them. He did not think Parliament would decide which system would survive as the local passenger system; the public would do that. Although Alderman Fletcher had said that the Committee had moved with the times, yet he had three systems of transport in Wigan. He (Mr. Fearnley) would ask those who had three systems to think over the question: "Can anything but the motor 'bus hold the motor 'bus?" That was the crux of the whole matter.

Tramcar Stopping Places.

By JAS. DALRYMPLE, C.B.E.

(*Abstract.*)

If we are to compete successfully with the motor omnibus, we must tighten up our schedules, and one way to do this is undoubtedly to abolish some of our car stops. I have got some valuable information from a number of managers regarding the number of stopping places on their respective systems. On some systems the average distance between stops is given as 160 yards, and on others the figure is as high as 400 yards. I would like, very soon, to go more particularly into this question with the managers who can successfully operate a city tramway system with an average distance between stops of 400 yards. Speaking generally, I think that for many years the tendency has been to increase the number of stopping places. Tramway committees and managers are continuously receiving requests for additional stops.

In Glasgow this question of increased speeds has only come to the front during the past six months, and it has been raised solely on account of the speed of the omnibuses running in competition with the cars. Six months ago the average distance between stops was 184 yards. In rearranging the stops we endeavoured to have not more than four stops for each fare stage, the average length of the fare stage being about 1,200 yards. This, however, could not be rigidly adhered to, especially in the central areas. Altogether we were able to abolish about 600 stops, and the average distance between stops is now about 240 yards instead of 184 yards. It is not possible to say exactly what effect the abolition of stops has had on the schedule speeds. There is no doubt, however, that it has been considerable. On one route we increased the average speed by on-and-a-half m.p.h.—one mile of this was an actual increase of speed and the remaining half-mile was the result of having fewer stops.

The present average speed may be stated as:—

From depôt to depôt, 8.56 m.p.h.; from terminus to terminus, including lie-over, 8.86 m.p.h.; and from terminus to terminus, excluding lie-over, 9.20 m.p.h.

The alteration in speed has meant practically an increase of one mile per hour; and this increase of one mile per hour has been made possible partly by the abolition of 600 stopping places. One very striking result of this increased schedule speed has been to release 70 cars from service. I do not know that we have always fully appreciated the full effect of even a slight increase in schedule speed. I think it is generally admitted that the only advantage the motor omnibus has over the tramcar is in the matter of speed, and even this advantage can only be got by the driver of the omnibus breaking the law.

You are, no doubt, aware that we have had in Glasgow a by-law in operation since 1912 which reads as follows:—

"When a tramway car is standing at a tramway stopping place, as such stopping place is indicated by a notice on the side of the street, every driver of a vehicle who intends to pass on the left or near side of such car shall draw up immediately before arriving at such stopping place until the roadway is clear of passengers entering or leaving such car."

It is now very seldom that the driver of a vehicle of any description attempts to pass between a car which is standing at a stopping place and the footpath when any person is boarding or leaving the car. The by-law has been carried out to the entire satisfaction, not only of the drivers and motorists, but also of the Tramways Department and the travelling public. I am also satisfied that this by-law, as administered in Glasgow, has the unqualified approval of the police, the Automobile Association and the carting contractors in the City. So far as I can ascertain, no section of the community would approve of this by-law being rescinded. The operation of the by-law works with perfect smoothness, and I have never heard it suggested that it causes the slightest unnecessary obstruction. There is no doubt that many lives must have been saved through the operation of the powers conferred by this by-law.

Discussion.

Alderman CAPTAIN D. CRICHTON (chairman, Belfast Tramways Committee), who proposed a vote of thanks to Mr. Dalrymple, said that the way to make tramway systems efficient and keep them up-to-date was to act on such solid advice as that given in the paper. In the matter of tramcar stops, some

ople were most unreasonable, and his view was that in all atters the advice of the manager should be taken.

Mr. H. Mattinson (general manager, Manchester Corporation Tramways), who seconded, said that no hard and fast le could be laid down, but he had found that eight stops per ile on roads which had no distinguished features was quite acticable. This gave a reasonable distance to enable the car accelerate, and not an unreasonable distance for the public walk. It was almost a revelation to imagine that, merely the adjustment of stops, 70 cars could be removed from the rvice, if that could be done without detriment to the service.

Mr. E. H. Rayner (general manager, Hull Corporation amways) said that one of the outstanding features of the per was the value of studying small things; managers often erlooked the value of seconds and minutes. Ten per cent. the speed made a tremendous difference to expenditure. e great trouble was the congestion of the streets with unecessary traffic, and efforts must be directed to controlling That was the only way in which to get full advantage of the improvements introduced into the tramway systems.

Mr. J. K. Bruce (general manager, L.C.C. Tramways) said at in 1912 the average speed on the L.C.C. tramways was 14 m.p.h. The average speed to-day was 9.6 m.p.h.—the stest speed, he believed, of any urban tramways in the untry. The result had been to retain the goodwill of the blic, and to enable a bigger service to be run without addinal cars. By increasing the speed from 8.44 to 9.6 m.p.h., 0 cars were saved, representing about £700,000 (present ices). The average distance between stopping places was w 220 yards, which distance, having regard to all the circmstances, approximated to the 240 yards in Glasgow. If, his system, the time lost at stopping places could be reced on the average by one second, a further saving of proximately £20,000 a year in operating expenses could be ected. By the use of high-power motors, which enabled e car to get quickly into its stride again after stopping, other affic which would get back on to the track again through e car stopping had not the time to do so, and the car was layed less in traffic, thus effecting further saving.

Mr. W. V. Morland (manager, St. Helens Corporation amways) expressed the opinion that, as rolling stock 25 years d was still in operation on some systems, it would be madness increase the speed of many cars without providing a new stem of braking. There was far too much physical effort curred in the stopping of tramcars, even with present speeds, ing to the use of the old type of hand-brake. In many cases eeding up would involve the adoption of the air system of aking with track shoes.

Councillor W. J. Armstrong (Leeds Tramways Committee) ggested that it was possible to give practically the same rvice with greater speed, and yet to maintain practically the existing stopping places, by letting each alternate car op at alternate stopping places, so cutting down the number stops made by each car. The stopping places could be rked with various colours, and the cars which stopped at ose places could bear a similar coloured sign. He hoped t the Executive Council of the Association would continue i efforts to prevent other traffic passing standing tramcars, d that those interested in tramways would do their best to icate public opinion against that practice.

Mr. W. Murray (general manager, Walthamstow U.D.C. amways) uttered a warning against speeding up, and thereby rlucing working costs, at too big a sacrifice. He asked Mr. lrymple whether, if he had three or four motor-'buses runng for every tramcar he put on the road, he would persist i cutting out his stopping places. The conditions of operation a tramcar and a 'bus were so vastly different that they could t both be dealt with in the same way, but a great deal of ne might be saved on the tramways by more alertness on t part of the conductors in starting cars.

Mr. Dalrymple, replying to the discussion, said he believed t the reduction of stopping places had had no effect on ther the number of passengers or the revenue; if it had had y effect at all, it had increased both the number of passen-rs and the revenue. The public were insisting upon speed, d if they did not get it, the tramways would lose business! h was satisfied that, whatever took place in the tramway rld, the cars must be speeded up, and that could be done the simplest possible way by eliminating stops. He agreed t some cars were not built for speed, and that, in order to t it, the equipment must be changed; that would involve a at deal of expense, but it would be absolutely necessary if mways were to continue as the means of street locomotion rough cities.

Opening of the North Wilford Station.

Any features of interest marked the proceedings at the opening, on September 17th, of the first section of the Nottingham rporation's new super-power station at North Wilford. e Mayor, in opening the proceedings, confessed that ce the first generating station was opened locally ttingham had not progressed with the times with regard electrical developments. Now, however, they would be le to supply, not only the city, but 17 urban districts in vicinity, covering a total area of 47 square miles. Alderan Huntsman then set in motion the No. 1 turbine, and, bsequent to a tour of inspection of the works, the company was entertained to luncheon. The chair was occupied Alderman Huntsman. The toast of the "Mayor and Corporation was proposed by Alderman W. Walker, of Manchester, who expressed the hope that the new station would be the means of substantially aiding Nottingham's industries; the Mayor acknowledged the toast.

Sir John Snell proposed "Success to the Nottingham Electricity Undertaking," recalling the fact that it was in Nottingham that the Commissioners held their first inquiry. He was confident, seeing that to-day they were selling only some 80 kWh of electricity per head of the population, that there was a very big expansion of business before them. He hoped that the Corporation would follow up its enterprise by a bold policy of low tariffs, which would attract new consumers. With regard to the new works, he desired to pay a tribute to his old friend, the consulting engineer, Mr. J. H. Rider. No doubt they had hoped he would be able to say something about the Government's electricity proposals, but he must disappoint them on that score. He could say, without indiscretion, that the North Wilford station, situate in proximity to an important coalfield and upon the principal waterway of that part of the Midlands, was in such a strategic position that, given the willingness of the Nottingham Corporation to extend it as might be required, it would become one of the largest stations in the country.

Preceding Alderman Huntsman's reply, a presentation was made to him by his *confrères* on the Nottingham Corporation Electricity Committee of a silver electric lamp, a rose bowl being also given to him which had been subscribed for by members of the East Midland Electricity Industrial Council (No. 7 Area) and the East Midland Electricity Joint Board, together with the engineers and other employés of the several undertakings, as a token of their appreciation of his valuable services.

In reply to the toast of the consulting engineers, which was proposed by the Town Clerk (Mr. W. J. Board), Mr. J. H. Rider emphasised the consideration that the new station would reduce in a very substantial measure the cost of generating electricity in Nottingham. The old stations ought to have been scrapped 20 years ago. Had the Nottingham output last year been generated at North Wilford, it would have meant a saving of £50,000 on coal alone. Whilst he did not know the price at which the Nottingham authorities would dispose of electricity, he advised them to encourage new industries by selling power at rock bottom rates. These might, at the moment, appear to be below cost, but a bigger load would bring the cost down right away, and everyone would benefit from a larger output. When the new machine to be ordered within a week or two was installed and they produced another 20,000 kW, the cost would come down again and Nottingham would attain the premier position among electrical undertakings in that area. On behalf of his firm Mr. Rider presented a loving cup to Alderman Huntsman, whose work and that of the Committee he eulogised.

The toast of "The Visitors" was acknowledged by the Mayor of Leicester, and Mr. Geo. Balfour, M.P., that of "The Contractors," which was proposed by Major W. E. Walker, vice-chairman of the Electricity Committee, being responded to by Mr. J. P. Gregory (of the British Thomson-Houston Co., Ltd.) and Mr. H. J. S. Mackay (of the Stirling Boiler Co., Ltd.).

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Rural Electricity Supply.

Your work on behalf of rural electrification deserves the thanks of all who are interested in the increased use of electricity. Those of us who have done what we can by speaking, writing, and by making ourselves a nuisance to the Post Office officials, and even to the Electricity Commissioners' staff, know how valuable the publicity you give to these matters will be in securing relief from our position as the most regulated industry in the world. A railway company may run express trains through a countryside within the enclosure of a mere rail fence; canals often have no fences; rivers never have them. The sea, the cliffs, the sidewalks are unrailed, and gas has its carbon monoxide content increased, and no one troubles. Suicides may kill themselves in any way they like, except by electricity. This is the one public utility service which must be regulated and hampered to its detriment, while the politicians tell us everyone must use electricity if the country is to be saved from ruin. Even the Electricity Commissioners are liable to think that regulations are more important than rural lines. Their personal experiences have been confined to work in cities and densely populated areas, and they cannot be expected to see our difficulties unless they are forced under their notice.

Mr. Borlase Matthews asks: "What does it cost to tap a power line—say, at 33,000 volts"? The answer is: "Tell me what precautions I have to take and I will tell you how much it will cost." There are no regulations dealing with the subject, but I understand some busybodies have their eyes on this one bright patch and are burning to draw up some more regulations.

The Mid-Cheshire Electricity Supply Company, which has a primary distribution system at 33,000 volts, can and does tap

its lines—protected by oil-break switchgear between it and the source of supply—at a cost (single-phase) of under £60, excluding land and the transformer, using an air-break switch and horn-break fuses. Our newer tappings will cost less than that. Repeated negotiations with manufacturers have produced a single-phase transformer as small as 25 kVA at a cost of £75 to £85, according to the low-pressure voltage. Smaller sizes are as yet tendered for with reluctance, and the cost is almost the same. Three-phase tappings and transformers cost about 33 per cent. more, but three-phase lines are too expensive for rural work. A single-phase 3,300-volt tapping and transformer of 5 kVA costs only £30.

We await permission to try a single-phase, 3,300-volt, single-wire line with earth return, and the longer this experiment is delayed the longer the villager and farmer will have to wait for their cheap and abundant supply of electricity. With the single-phase earth return line we can go to farm, village, and mansion, at 3,300 volts, but with 2-wire lines we can only take farms, &c., *en route* to large villages and mansions. Until we are freed from the shackles of over-regulation and the blight of the "Post Office" we cannot reach the purely farming areas on a commercial basis.

It is often presumed that the Post Office, being a Government Department, has a prior right to the use of the air and the earth, and that any other user must obey its orders. This is incorrect, and it is the duty of every distribution engineer to resist the monstrous and increasing claims of the Post Office, which, in fact, has no power to dictate. The Electricity Acts prescribe arbitration in all cases of difference, and concerted action should be taken to enforce the rights of electricity undertakers. The smaller undertakings cannot afford to fight this battle by themselves. The power companies will, it is hoped, see that the increased use of extra-high-pressure lines is hampered if every paltry interconnecting telephone circuit is to be kept overhead and the power line broken and carried underneath, or carried over on steel towers and guarded with heavy rod cradles at a cost of £250 per crossing in the case of 33,000 volts. The Post Office can, and do, put their lines underground when they wish; for instance, in cities and when leading into exchanges. Their talk of speech efficiency limits is a device to save themselves trouble—regardless of the enormous expense their refusal imposes on other utility undertakers, and therefore upon the users of electricity. If the Post Office trunk and interconnecting lines are so near the speech limit that a few yards of underground line will make them unusable, the sooner they are improved the better for the community.

A few cases like the famous Liverpool case will demonstrate the Post Office to be no more privileged than other public utility undertakings.

W. Fennell,
General Manager and Engineer.

Mid-Cheshire E.S. Co., Ltd.,
Northwich, *September 17th*, 1925.

The Roman Baths at Bath.

On August 7th last we published in the Electrical Review (supplement p. 11) an advertisement in which we drew a moral from the durability of the lead used by the Romans sixteen or seventeen centuries ago in the famous Roman baths at Bath.

We are pleased to note from your issue of this week (page xxxiii) that this advertisement has been paid the tribute of the sincerest form of flattery.

For the benefit of any others who may wish to use this particular idea, we may say that we have been courteously informed by the baths director at Bath of an error in our statement regarding the thickness of the sheet of Roman lead used for the floor of the bath.

We stated that this sheet of lead was ½ in. thick, but the director informs us that it is actually 1¼ in. thick. Naturally this fact does not affect the cogency of our argument in any way, but in the interests of archæological accuracy we think it well to draw attention to it.

Johnson & Phillips, Ltd.
Charles Stewart, *Director.*

Charlton, *September 18th*, 1925.

Current Literature.

I would like to suggest to you that it might be of considerable interest to your readers if you would publish weekly a digest of current literature on electrical and allied engineering subjects. You will probably know that this is done by the *Electrical World*, and also by the *Revue Générale de l'Electricité*, and I think that if you adopted a similar scheme it would be very much appreciated.

The *R.G.E.* prints the weekly digest on one side of the page only, the back being devoted to advertisements. This allows one to cut out any reference of particular personal interest, and paste it on to an index card.

If you are at all doubtful whether the scheme would be successful, I would suggest that you invite your readers' opinions on the subject.

P. Gilman Ashley, B.Sc.

Jarrow, *September 9th*, 1925.

[We are obliged to our correspondent for his suggestion. The matter has been considered from time to time, but is not so simple as it might appear to be.—Eds. Elec. Rev.]

Technical Training in Nigeria.

The art of teaching is not often appreciated outside a schoo
I had found my station engineer a resourceful man during th
start-up of this plant, and here is his way of instructing th
native shiftman.

One alternator was running on the system, controlled by th
voltage regulator, when a dead short tripped the main circui
breaker, and the machine voltage soared upward. The chi
at once took the regulator off, and Sam asked, in due cours
"Why?" The answer came pat:—

"Busbar speak to Regulator, he say: 'We want mo
volts.' Regulator, he speak to Alternator, say, 'He give mo
volts.' Alternator he agree."

"When voltage be right, Busbar he tell Regulator 'finish
Regulator tell Alternator 'finish.'

"But when that switch (*i.e.*, the main C.B.), he be ou
Busbar no fit speak to Regulator. Regulator he no savvy wh
to do, so he tell Alternator 'more volt.' Alternator no savv
he keep giving volts until *you* put Regulator switch off."

Sam said, "I savvy, Sir," and proved it by doing it himse
next time.

Such men keep stations running.

John F. Shipley.

Kwall Hydro-electric Plant, W. Nigeria,
August 24th, 1925.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the print
specification.
The numbers in parentheses are those under which the specifications will
printed and abridged, and all subsequent proceedings will be taken.

1923.

20,025. "Microphonic transmitters." E. A. Graham. June 4th, 19
(238,585.)

1924.

4,818. "Protective arrangements for a polyphase alternating electric curre
circuits and the like." British Thomson-Houston Co., Ltd., and A. S. Fi
gerald. February 25th, 1924. (238,911.)

10,386. "Circuits for electron discharge tubes." Western Electric Co., L
May 16th, 1923. (216,114.)

10,407. "Automatic telegraph devices." F. McKay. April 28th, 19
(238,922.)

12,886. "Thermionic tubes or valves." C. Seymour, H. G. Hughes, a
H. R. Cantelo. May 26th, 1924. (238,934.)

13,054. "Brakes for tramway vehicles." M. A. Blanchard. May 28
1924. (238,950.)

13,067. "Metal-clad electric switchgear." A. Reyrolle & Co., Ltd.,
Coates, and H. W. Clothier. May 28th, 1924. (238,951.)

13,088. "Metal-clad electric switchgear." A. Reyrolle & Co., Ltd., H.
Clothier, and A. Allan. May 28th, 1924. (283,952.)

13,140. "Electrolytic process and apparatus." G. B. Ellis. May 28th, 19
(Roessler & Hasslacher Chemical Co.). (238,956.)

13,253. "Electrochemical treatment of copper ores." H. S. Mackay. M
29th, 1924. (238,962.)

13,312. "Eletric fuse boxes." A. Reyrolle & Co., Ltd., and H.
Clothier. May 30th, 1924. (238,963.)

13,313. "Electric wall plugs and like fittings." A. Reyrolle & Co., Lt
H. W. Clothier, and H. F. Secretan. May 30th, 1924. (238,964.)

13,329. "Submarine signalling systems." Western Electric Co., Ltd. Ju
30th, 1923. (218,261.)

13,333. "Leading-in means for wireless telegraphy and telephony." J.
Fairlie. May 30th, 1924. (238,965.)

13,676. "Indicating or switching device actuated by the movement of
rotary member." English Electric Co., Ltd., and H. J. Few. June 4th, 19
(238,972.)

15,224. "Crystal detectors for wireless receiving sets." L. Grossma
June 24th, 1924. (238,975.)

15,310. "Holders for electric lamps." H. Marryat and R. G. Willian
June 25th, 1924. (238,997.)

16,062. "Variometers for wireless circuits and the like." W. Joughin a
T. Hough. July 4th, 1924. (239,002.)

16,585. "Tuning coils used in wireless telegraphy and telephony."
Turner. July 10th, 1924. (239,007.)

17,089. "Keyboard telegraph machines." D. Murray. July 17th, 19
(239,011.)

18,974. "Vacuum electric tube amplifying apparatus." A. S. Cachemai
(Westinghouse Electric & Manufacturing Co.). August 9th, 1924. (239,029.)

19,083. "Electrical commutators or distributors." A. L. Isaac. Aug
11th, 1924. (239,031.)

19,475. "Oil-break switches" Sachsenwerk Licht-Und Kraft Akt. G
October 23rd, 1923. (Patent of addition not granted.) (223,874.)

20,438. "Telephone systems." Western Electric Co., Ltd. October 24
1923. (223,877.)

21,195. "Sparking plug." T. W. Warren. September 8th, 1924. (239,04
21,940. "Electrical relays." J. J. Rathbone. September 17th, 19
(239,053.)

22,515. "Imitation candle lamps." W. Griffin. September 24th, 19
(239,058.)

23,807. "Electric intermittent switches." F. W. Sturgess. October 8
1924. (239,066.)

24,489. "Photo-electric devices." British Thomson-Houston Co., L
November 13th, 1923. (224,874.)

25,554. "Variable electric condensers." Dubilier Condenser Co., L
(formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27
1924. (239,072.)

25,809. "Electrical condensers." Dubilier Condenser Co., Ltd. (forme
Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 29th, 19
(239,073.)

26,921. "Electric furnaces." M. Gjersoe. November 12th, 1923. (224,89
27,131. "Armatures for electric dynamos, motors, and like machinery
C. A. McEldowney. November 13th, 1924. (239,076.)

1925.

537. "Thermionic valves." E. Hatann. January 11th, 1924. (227,45
3,025. "Grid for electron discharge tubes." E. Schrack. February 3
1925. (239,110.)

5,345. "Buffing and draw gear for railway, tramway, and like vehicles
A. Spencer. February 26th, 1925. (Addition to 204,181.) (239,118.)

5,918. "Thermionic valves." A. E. Beattie. March 4th, 1925. (239,12
7,352. "Electric insulation-testing devices." H. Michel. March 26th, 19
(231,473.)

8,671. "Means for clamping together electric transformer coils." T. Mah
April 1st, 1925. (239,132.)

13,594. "Electric regulating systems." British Thomson-Houston Co., L
August 18th, 1924. (238,513.)

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International Electrical Relations.

ONE of the principal financial daily newspapers published in London has rendered a service recently by publishing a series of articles on German Economic Conditions based upon material collected by its Managing Editor during a visit to Germany.

The sixth article of the series possesses a direct electrical interest because it advances the views expressed by Herr Kommerzienrat Paul Mamroth, a director of the Allgemeine Elektrizitäts Gesellschaft, on the question of foreign co-operation in the provision of capital for assisting economic recovery in Germany. This, it will be remembered, is not a new subject so far as the columns of the ELECTRICAL REVIEW are concerned, for we have already given somewhat full information showing to what a large extent American capital has been found during the past eighteen months for development work in connection with German electrical undertakings and manufacturing concerns.

Before referring to the statements credited to Herr Mamroth, however, we may make parenthetical allusion to a singular error into which Mr. R. J. Barrett, the interviewer, has fallen. As the accredited representative of a leading financial newspaper, who we should presume to be somewhat closely in touch with the electrical security market in London, one would hardly have expected him to be under the impression that the Allgemeine Elektrizitäts Gesellschaft was "better known in England as the General Electric Company." If he were moving immediately in British electrical circles he would know that the German company is better known here by the initial letters "A.E.G." than by the name quoted. Indeed, he would not have to inquire far in order to discover that there are in this country and in the States two very large concerns each of which has the right to be known as the General Electric Company. The letters "G.E.C." have been a household word here and throughout the British Empire for many years as relating to the General Electric Company, Limited, of London, Witton, and elsewhere. Some confusion occasionally arises here by reason of the fact that the letters "G.E." or "G.E.C." are an equally well-known household description for manufactures emanating from Schenectady. Perhaps when the new Monomark idea comes into use the postal authorities may overcome the difficulty of

deciding whether communications received in London are intended for Kingsway or for Aldwych, but we can hardly conceive of their passing on to the A.E.G. in London communications addressed to either the General Electric Company, Limited, or to the General Electric Company either with or without the use of Monomarks. It may be a pity that the names of competing concerns should be so similar, but at this late date we have to accept such things as they are and leave it to the reader to see that he understands the real differences.

The article in our financial contemporary does not become less interesting because of this error, for Mr. Barrett does not proceed to express his personal opinions regarding the general subject of foreign capital for German electrical industry; he is content to pass on the views of Herr Mamroth, to which we now turn.

It seems that there is no investing public in Germany to-day; the rank and file have not yet begun to accumulate money; foreign investors show no inclination to buy German industrial shares; therefore German shares "are to-day quoted at prices far below their true value." As soon as investment money accumulates in Germany, the public will begin to buy, the prices of the shares will rise, and British investors, if they come in now, will benefit by the rise. Simultaneously they will benefit Germany by providing the country with working capital.

Not less interesting than this is the statement that "short-term" loans are of no use to German industry, which for modernising plant needs "long-term" loans, repayable when the new machinery is running and paying dividends. Yet from almost every export market we are continually hearing that German traders are able to grant "long-term" credits to clients and so defeat the foreign competitors, including the British. Industry seems to obtain the funds from German banks or somewhere else to enable it to grant long-term credits, and it simultaneously invokes the aid of British investors to enable it to develop, modernise, and render more efficient competitively the organisations which already grant these favourable facilities to overseas customers.

Herr Mamroth obviously sees difficulties in convincing the hard-headed British investor, for he hazards a second possibility which is that foreign industry should buy works and plant in Germany and thus participate in production. Let it not be forgotten that he is speaking as a director of the A.E.G. What does he mean by the expression "foreign industry?" As we have said already in these pages, nobody can foretell what may be the developments that the future has in store in respect of international electrical relations, either financial or trading, but can it be that Herr Mamroth has thought of such a possibility as British electrical companies buying up the works and plant of the A.E.G. in Germany? Perhaps we have named the extremest possible case that occurs to us; of course Herr Mamroth and his friends will hardly be unmindful of the likelihood that there might be a less pronounced antipathy to German manufactures if ever such a thing, or any development approaching it, occurred.

The matter stretches far beyond the borders of the investment world; it becomes one of interest to all manufacturers and exporters, and has a bearing upon wages and hours and conditions of labour as Trade Unions would see in pondering their predilections for international labour organisation. It is true that the article before us says that in a "particular instance" (the motor-car industry) there would be no fear that either America or England, by assisting Germany financially as suggested, would suffer from the development of German industry, yet it is also recognised that when some kind of co-operation between German and foreign capital is found, German prices of motor-cars will fall. This case is taken because Germany is not a large exporter of motor-cars and cannot be at present. But the suggestion is made that "without injury to the investing country, foreign capital could be profitably invested in many other German industries not engaged in export," and that the increase of efficiency in production would increase the purchasing power of the German market for imported goods. The A.E.G. has a large motor-car production branch. So that, after all, though Herr Mamroth speaks as a director of the A.E.G., he can hardly be seriously thinking of British investors finding the wherewithal to develop the electrical manufacturing operations of Germany, for custom has not described these as an industry "not engaged in export." Perhaps it is intended that foreign funds if found for the Berlin Company would be earmarked for motor-car work and not for the electrical industry, though it is easy to see that benefit brought to the motor-car works would also assist the electrical operations.

Herr Mamroth favours long-term loans from England rather than from America, because "New York is so far away." He holds that only when there is close international co-operation will Central Europe really recover; that when the sluggish economic life in Europe is accelerated, "foreign capital will . . . have a direct interest in the prosperity of German industry, and will fructify it through working for its modernisation and rationalisation"; and, finally, that "the exchange of technical experience between rival countries that proved so fruitful before the war will again become a recognised part of our international economic system."

We quote the foregoing views, as it has been our habit for many years past to place before British electrical readers the reported opinions of leading electrical men in Germany regarding industrial affairs. We do not know that they really carry us very far, but they may assist British electrical and allied manufacturers in the deliberations in which we believe they are constantly engaged regarding possible adjustments of relations between this country and parts of Central Europe.

Municipal Tramway Matters.

The Municipal Tramways Association is to be congratulated on the very successful conference, of which a report is concluded in this issue; doubtless, as in the case of the I.M.E.A., the attractions of Brighton contributed to the popularity of the occasion, but apart from that factor, the conference gave abundant evidence of vitality and confidence in the future of tramways as the most efficient means of urban transport, which we believe to be fully justified.

It may be suggested that the change of name to "The Municipal Tramways and Transport Association (Incorporated)" is ominous of a coming change of transportation methods; but this is not the case. It merely implies that the municipal tramway managers have no intention of relying solely upon railed tracks, but are determined to move with the times and to adopt whatever aids to locomotion may present themselves. Already many undertakings possess considerable fleets of motor-omnibuses, and not a few have adopted the railless trolley-bus on certain routes; as trading undertakings they are logically entitled to avail themselves of all such auxiliaries as will increase the efficiency of their services and minister to the convenience of their customers. Tramways have been attacked in certain organs of the lay Press with a ferocity only equalled by the ignorance and irresponsibility of the allegations, but the Ministry of Transport, the London Traffic Advisory Committee, and the municipal authorities generally have declared their confidence in the soundness of the tramway system of transport, and the chairman of the Advisory Committee has explicitly stated that on the instruction of Parliament the Committee will give protection to tramways. We may point out in passing that if the tramways were relieved of the unfair burdens that are still thrust upon them, they would need no protection.

But it must not be thought that tramways and tramcars have reached perfection or anything like it; in

truth, as Mr. A. R. Fearnley indicated in his paper, tramway engineers have much to learn from the makers of motor-'buses, and we were pleased to publish recently particulars of notable improvements that were being introduced by the London Electric Railways on their tramway system. Mr. C. J. Spencer has on previous occasions pointed out in detail the wide scope for improvement that there is in tramway practice, and we should recommend other managers to "keep an eye on Spencer."

It must be borne in mind, too, that the handicaps under which the motor-'bus has hitherto laboured are being gradually lightened; its increased carrying capacity and speed, the introduction of covers on the upper deck, improved brakes, and comfortable seating, are factors which cannot be ignored, and at the same time its running costs have been brought down so far that they are not greatly in excess of those of tramcars. There is all the more reason, therefore, for the tramway associations to do their utmost to obtain relief from the cost of maintaining the pavement in good order for the benefit of other traffic, and from the other disabilities to which they are exposed.

One effective method of reducing operating costs was well illustrated by Mr. Jas. Dalrymple's paper on stopping places and speeds. There can be no doubt that the maintenance of high average speed is essential to the success of a transport service nowadays, and so much time is inevitably lost at every stop that the fewer the stops there are the better—within reasonable limits. The significance of this factor was driven home by Mr. J. K. Bruce, who stated that on the L.C.C. system alone, if one second could be saved on the average at each stop, an economy of £20,000 a year would be effected; and an increase of the average speed from 8.44 to 9.6 m.p.h. had resulted in a saving of 230 cars, representing a capital outlay of £700,000.

With regard to tramway finance, we cannot endorse the view of Alderman R. A. Smithson that the bleeding of the tramways for the relief of the rates is justifiable, unless it be to repay rate assistance already received. Here, again, the fact that the tramways maintain the roadway and thus relieve the rates to an important extent must be considered; were it not so, the paving would have to be maintained out of the general rates. Moreover, in many cases the tramways are compelled to carry workmen at reduced fares, involving a heavy loss of income which ought to be borne by the town as a whole; and in some instances they have been debited with part of the cost of street improvements. These burdens having been imposed upon the tramways, which nevertheless are often called upon to meet the competition of motor-'buses, it is unjust to deprive them of the profits which ought to be devoted to reserve and to the renewals that are now so urgently needed, the useful life of cars and rails in many undertakings having expired. As Mr. H. P. Stokes pointed out, one sees corporations borrowing money for renewals at a high rate of interest and at the same time allocating sums from tramway profits to the relief of the rates!

In view of the overloading with unfair charges, the milking of the profits, and the competition of motor-'buses subjected to neither handicap, it is a wonder that tramways ever show a profit at all. But when they do, let it be remembered that those profits have been provided by the passengers, mainly drawn from the poorer classes of the community that owns the tramways. Is it right to tax them in particular for the benefit of the general body of ratepayers?

Mining Electric Locomotives.

The announcement of the result of the competition for a prize of £1,000, offered by Mr. Charles Markham for the best type of locomotive for use underground in coal mines, was an event of considerable interest and importance not only to electrical engineers but also to the mining industry. As stated in our issue of September 18th, the judges decided to award the undivided prize to Messrs. Joseph Booth and Brothers, Ltd., whose design was the best of those submitted; but we have reason to believe that several of the competing locomotives possessed valuable features, and therefore we are publishing descriptions of them all, commencing, of course, with the winning design in this issue.

In the United States, we believe, electric locomotives have long been in extended use for mining, but the conditions generally prevailing there are very different from ours. The coal seams are much thicker, and gas is less prevalent, so that the use of trolley locomotives is practicable. In this country, on the other hand, most of the best seams have been worked out; the seams now worked are usually thin, the gradients are severe, and the presence of gas forbids the use of the trolley. Hence storage battery locomotives are the only alternative to rope haulage and animal power.

The necessity for the utmost economy in mining, for reducing to a minimum the use of muscular effort, whether human or animal, and for speeding up transport, led to the initiation of this competition, which has been very fruitful of result. We do not anticipate that there will be an immediate revolution in underground transportation—the use of electric locomotives is not unknown in British collieries—but the door has been opened, and we hope that steady progress will be made towards the general adoption of battery traction. Not least of its advantages will be the release of the pit ponies from their gloomy environment, which will gladden the hearts of all lovers of animals.

Electrical Benevolence.

The approach of the annual Festival Dinner of the Electrical Trades Benevolent Institution is brought to mind by the receipt of a circular letter from the President of the Festival—Mr. Edgar S. Barralet—appealing for support to the funds of the Institution, and pointing out that the ever-widening development of the electrical industry makes it certain that increased calls will be made upon its resources.

Fortunately the expansion of the industry, though it brings greater liabilities, also brings with it a larger field from which to derive support to meet them; but it cannot be expected that these new areas will bear fruit in due season unless the seed is sown, and it is incumbent upon us all to scatter that seed as widely and efficiently as possible. We would not reproach our readers with indifference to this duty—doubtless many of them already do their bit, and we know that some of them do a great deal of work for the cause; but it is certain that what is done is as nothing compared with what might be done by hearty goodwill. The electrical industry, even in these days of dull business, is comparatively prosperous, but its Benevolent Fund is absurdly small in comparison with the magnitude of the industry and the demands that must surely be made upon its benevolence in the near future. A fund of £100,000 would not be a penny too much.

We would also urge those who are in a position to do so to bring the matter to the knowledge of their associates, the majority of whom have probably never heard of the E.T.B.I., and have no notion that its existence is of direct concern to themselves; let them post notices in their offices explaining the objects of the fund, and summon meetings of employés—those who are not otherwise provided for—and thus sow the seed which will result in a large crop of new members. The cost to the members is very small compared with the benefits that are offered, and we believe that the only reason why the roll of actual members is not much larger is that the potential members have never been told about it. In this way, with little effort and less expense, employers, managers, and foremen can do good service not only to the Institution, but also to the employés.

Surely it is a small thing to ask of them! They go to great lengths in promoting the physical welfare of the workpeople by providing canteens, clubs, sports grounds, &c. Let them also give them the opportunity to protect themselves against penury in time of sickness and adversity by becoming members; and we further claim their support for the capital fund, to provide pensions for the old and disabled.

Electricity in Decorative Art and Applied Industry.

The Paris International Exhibition.

By T. RICH.

An International Exhibition of Decorative Art and Applied Industry is at present being held in Paris; it will remain open until the end of October. It occupies some of the open spaces around the Alexander Bridge, near the Place de la Concorde; it includes the Grand Palais where the annual Art Salon is usually held, covers the Invalides Gardens, and stretches to the west along both banks of the river for several hundred yards. It is not nearly as big as the Exhibition of 1900 or as imposing as Wembley, but all the same there is a good deal to be seen of interest. The Exhibition is backed by the French Government and the Municipality of Paris, a great deal of the cost being covered by the sale in advance of numbered "bons," containing a number of admission vouchers, the bearers of the "bons" having the right to a chance in prizes in lottery drawings; without lotteries or lotteries disguised as guessing competitions it seems to be difficult to run exhibitions nowadays.

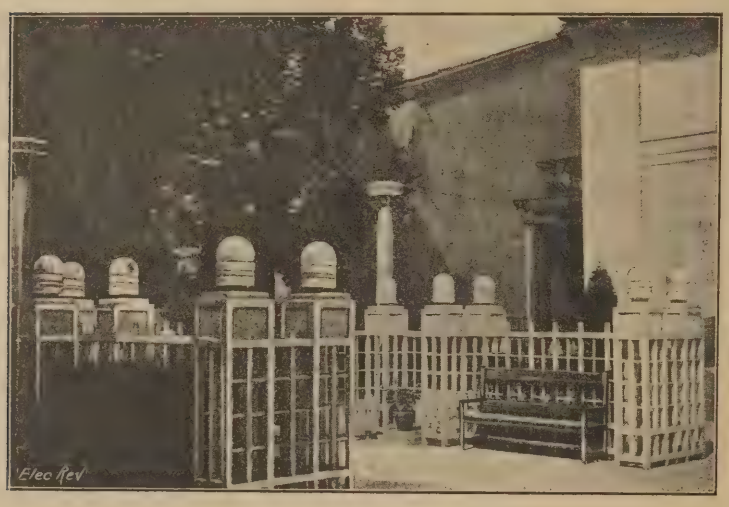


Fig. 1.—Garden Illumination.

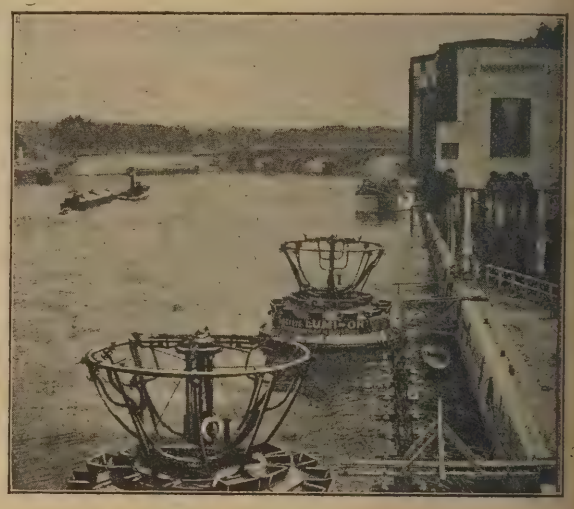


Fig. 2.—Floating Electric Fountains.

Illumination and Motive Power.

A great feature of the Exhibition is the tasteful way in which it is illuminated at night, many of the lighting fixtures attached to independent buildings being of a pleasing character. The general lighting is assured by 40 double-arm standards with two lights each of 1,500 c.p., 100 single standards each of 1,500 c.p., and 200 gas standards of 1,200 c.p., many of the latter apparently having been in place before the Exhibition was built. Many of the standards are of armoured concrete; they look clean and neat. Besides the lamp standards, many of the buildings and gardens have special illumination effects. Fig. 1 shows one of the courts in the Invalides Garden section, lighted by hemispherical opalescent globes placed on the top of an ornamental trellis work; the effect is very pleasing. There have been very few cases where the intensity of illumination installed at this Exhibition has been approached by exhibitions or other public attractions elsewhere, a total of 9,000 kW being arranged for over an area of 30 hectares or about 70 acres. Apart from gas mains, more than 16 kilometres (about 10 miles) of trenches have been opened for the laying of high, medium, and low-pressure mains, and more than 150 branches have been put in to various sections, buildings, pavilions, and kiosks. Ten sub-stations connected to 12,300-V mains have been constructed, and 40 transformer points for 3,000 volts.

The distribution generally is alternating current at 41⅔ periods, 110 volts and 220 volts (Paris and the Mediterranean districts being exceptions to the usual 50 periods), either single-phase or two-phase, the maximum voltage in the ordinary way between any two conductors being 220 volts. Where, however, motors of 3 kW consumption and upwards are used, either single-phase at 220 volts or a two-phase system with 220 volts across each phase is arranged for. In general, the regulations of the French Union of Electrical Associations have been applied to the electrical wiring and installations. In cases where the power requirements of any particular building exceed 25 kW, a separate transformer is installed in a brick cabin or compartment.

For the purposes of comparison, it is interesting to note that electricity is supplied to private owners of stalls and pavilions at the Exhibition at 93 centimes a kWh for lighting and 67 centimes for other purposes, based on a coal cost of between 125 and 135 fr. a metric ton, subject to an increase or decrease of 2.7 centimes for each ten francs by which the cost of coal varies above or below these limits. Those buying electricity at high pressure have a rebate of 20 per cent. Consumers have to guarantee for a minimum of 250 hours, the output of the meter installed, and have to pay a small fee, 5 cts., for lighting and 3 cts. for power for the current not taken up to that quantity.

Illuminated Cascades.

In the Middle Ages, Italy with her supplies from mountain streams was the home of many fountains, and in France in the palmy days of the Monarchy a number of ornamental fountains were constructed. Many of those who visit Versailles and see the fountain display on special occasions do not realise that the water is pumped up from the Seine by means of waterwheel-driven ram pumps installed over 150 years ago, the foundry work and general engineering work being, for their date, truly remarkable.

It might be remembered also that practically the first display of an electrically illuminated fountain was at the later exhibitions at South Kensington in the 'eighties, when an arc lamp, with changing coloured slides, was used to light a single jet, the arrangement forming one of the principal attractions at the Exhibition for the fashionable world at night.

At the Paris Exhibition an illuminated cascade has been arranged on both sides of the Alexander Bridge: also two circular floating buoys and two barges have been

arranged to give illuminated floating fountains; there is in addition an illuminated fountain in the Invalides Gardens. The cascades and floating fountains and barges have been designed and constructed under the supervision of Mons. E. Vedovelli, who was also responsible for the illuminated fountains at the Paris Exhibition in 1900.

To supply the cascades, a transformer station of 300 kW is arranged on the south bank of the river under the bridge; power at 12,000 V two-phase is transformed down to 220 volts with the neutral earthed, some of the cables connected up being under water. Two motors, each of 200 h.p., 800 revs., made by the Cie. Générale Electrique, of Nancy, directly coupled to centrifugal pumps, are arranged, one for the up-stream side and the other for the down-stream side of the bridge. On each side water is drawn from the Seine and pumped through a main 300 mm. dia. (11.8 in.) at a pressure head of 18 metres (59 ft.), the water pumped amounting to about 400 litres a second (88 gallons). Sixty secondary branch mains are placed along the face of the bridge, each with 150 holes 3 to 5 mm. diameter, that is to say, there are 9,000 jets on each face; the flow in each secondary main is regulated by means of valves.



Fig. 3.—Regional Transformer Cabin.

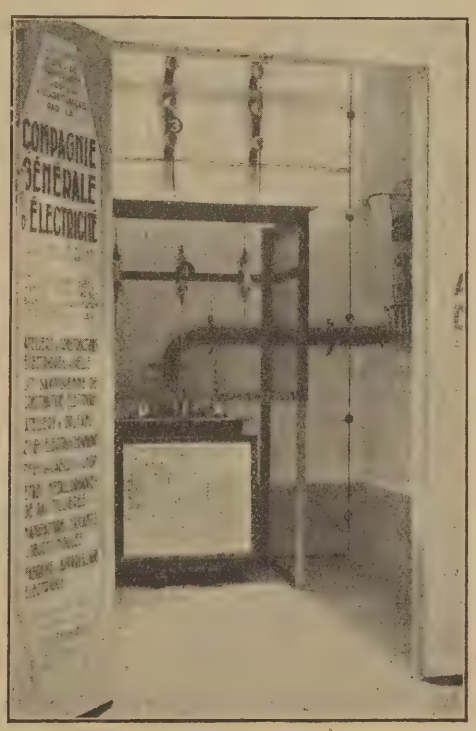


Fig. 4.—Interior of Village Transformer Cabin.

In the rear of the jets, in a position so that the direct light is shaded from the eye, a series of 70 reflectors are placed; these, which are made of silvered copper, are parabolic in shape and 40 cm. (15¾ in.) in diameter; in the focus of each is placed a "Luxor" incandescent lamp of 2,000 candle-power.

Many of these projectors are covered with coloured glass disk screens so that various colour effects can be given at will. Those projectors which are not fitted with coloured screens are provided with white glass front windows to protect the mirrors from the sulphurous smoke from passing tugs. Owing to the heat from the high-powered lamps, each reflector has a double wall in which cooling water is circulated, the reflectors' circulation being arranged in series on each side; a special pump is provided for the purpose, taking its water from the cascade mains. The lamps are arranged in groups on each side so as to balance on the two-phase mains. The cascades are started at nightfall and continue until the close of the exhibition; they are stopped when a boat has to pass, although some barges like the excitement of passing under the dazzlingly illuminated cascade.

Floating Electric Fountains.

Each fountain consists of a buoy-shaped vessel made of sheet steel, 7 metres (about 23 ft.) in diameter, drawing 1 metre of water (see fig. 2); it is arranged with a deck, on which are placed the various pipes and jets, access being obtained to the interior by means of a hatchway. There are three electrically-driven pumps inside each buoy, one of 200 h.p. which can give a pressure up to 70 metres head (100 lb. per sq. in.), a second of 60 h.p. with 30 metres, and a third of 6 h.p. for 6 metres.

The large pump is used to supply (1) a sheaf jet 80 mm. in diameter; (2) an effect like that of a sea shell; (3) an effect produced by eight inclined jets on a revolving ring, the turning moment being produced by the reaction of the jets; (4) eight parabolic jets.

Special precautions have been taken to prevent water-hammer when operating the various changes.

The second pump operates a sun effect and two crown-shaped water rings. The valves controlling all the different effects are of a special character, the actual operation being carried out with the aid of a sort of barrel-organ equipment of cams and plungers which can be arranged in the required sequence in advance. The third small pump is used to prime the pipes when starting, and to act as an auxiliary pump for some of the effects. For use in conjunction with the fountains illumination effects are produced by means of port-holes placed in the deck of the floating buoys. Eighty-four projectors are used, with elliptic mirrors giving an angle of dispersion of 60 deg. Each projector is fitted with a "Luxor" incandescent lamp of 3,000 candle-power; the mirrors, which are 30 cm. (11¾ in.) in diameter, are also arranged for water cooling, the circulating system branching off the main from the 60-h.p. pump. Each projector is surmounted by an arrangement of red, blue and yellow glasses mounted in slides, the 252 coloured glasses being operated with the aid of mechanical gear.

A special system of ventilation is used owing to the large output in a confined space; there is also electrically-driven mechanical gear by which some of the moving effects on the deck are operated.

Owing to the noise in a confined space, the telephone system by which instructions can be given to the operator has been the subject of a special study. The De Las Telephone Company supplied special telephones, the operators wearing special headpieces. A difficult problem has been to find a means by which the buoys can be swung into mid-stream, the running position of one being mid-stream above the bridge, the other being in a similar position below. The first is hauled into place and back by means of cables laid on the bed of the river and operated by a suitable windlass. The latter, which is laid up to the bank up stream in the day time and which is placed down stream when under operation, is hauled back up stream by means of a cable attached to the first buoy, the force of the current being at first considered sufficient to carry it into place down stream; owing to the lowered force of the stream, arrangements have been made by which a large jet of water under the water line is provided by the large pump, so that the buoy can be propelled into its place. Another problem to be solved was the cable connection of each buoy to the shore, as it would be inconvenient to place the cable on the river bed. Owing to the large horse-power required, the cables are in multiple; they are supported by a series

of floats (apparently made up of a number of large steel oil cans placed upright) fixed in frames, the floating frames being spaced 2 m. 50 (8 ft. 3 in.) apart.

There are two barges with fountains on their decks; each barge is 20 metres long, 3 metres wide, and about 80 cm. above the water level. All the apparatus for the operation is placed on the deck. Each barge has one motor of 60 h.p., directly coupled to a large pump giving a pressure head of 35 metres, and a motor of 40 h.p., giving a pressure head of 15 metres.

Each barge has a number of jets, some of which are arranged so as to obscure the actual shape of the barge. The hydraulic effects are fixed once and for all, but the lighting effects, which are arranged by means of "Luxor" lamps of different colours, are varied by means of continuously operating automatic gear for switching groups in and out. One must say that it is difficult in a description to do adequate justice to the remarkable effects obtained, though few of those who enjoy the spectacle would realise the ingenuity in design and skill in construction necessary to obtain the beautiful combinations of multiple water jets and colour which can be produced and changed so rapidly.

Transport.

There are two long narrow buildings on the left bank devoted to transport, the decoration and lighting of railway carriages and steamer cabins being special features. The six great railways in France, the North, the Western State, the Paris-Lyons and Mediterranean, the East, the Orleans and the Midi, have carriages on view. The last four carriages are of the first class; the lighting arrangements, especially of the last two, are more artistic than those generally met with in railway-carriage design.

In the steamship section, several of the leading French steamship lines show furnished and decorated "cabins de luxe." There again the artistic lighting is a feature. In one of the cabins the lights are placed behind ornamental white glass screens over cupboard and other doors; lights are also placed in one case in a chamber in the ceiling.

Transformer Cabins for Overhead Mains.

There is a section termed the Model Village, with school, mairie (town hall), an inn, and various shops, a feature being two transformer stations for connection to overhead lines, one being for a village, and the other for the connection of a district to branch district distributing mains. These transformer posts were designed and equipped by the Compagnie Générale d'Electricité, of Paris. Both posts are made of armoured concrete, high enough for the high-pressure mains to enter through round holes in glass panes, the panes being sheltered by deep overhanging cornices. Both posts are arranged as exhibits only, not being connected to any mains. The village transformer post is arranged on the incoming h.p. 3-phase, with leads to earth, lightning arresters and resistances on a branch; then on the mains, choking coils, section links, tubular fuses, and then connected with the h.p. transformer, 15 kVA, 5,000 V to 190/110. On the low-pressure side there is a small switchboard with a pilot lamp and multiple pilot switch (the pilot lamp can naturally be exchanged for a plug for a portable voltmeter when required), fuses, and a low-pressure switch. It is to be noted that there is no h.p. auto-oil switch and no ammeter on the l.p. side. If the l.p. switch is opened, the only current remaining is that due to the magnetising current of the transformer that the section links can look after quite safely (see fig. 4).

In the regional station the incoming mains are 22,000 V; there are two transformers, 22,000 V to 5,000 V, and two high-pressure auto oil switches, with the necessary links and arresters (see fig. 3). This cabin is designed to deal with two 5,000-volt overhead distributing mains. In both cabins the h.p. bare conductors are supported on insulators, wire guards being used to protect a visiting operator. The arrangements are distinctly neat, though in the former case perhaps more expensive than many small French communities can afford, the use of pole transformers being certainly on the increase in France. The cabins in question are distempered white inside, and for the purpose are roomy; they are arranged so that they can easily be kept clean.

On the ground floor in the "Salon" exhibition building there is a small section devoted to French makes of artistic electric lighting fittings, bronze and gilt brass standards, pendants and brackets, with cut glassware forming a number of the exhibits. The exhibits in this section are inclined to be too ornate and somewhat heavy; some fittings of simple artistic design in black, made up with square cow-bell shaped shades, exhibited by M. Max Le Verrier, are, however, particularly pleasing.

Arts and Crafts Schools.

On the first floor there are a number of rooms devoted to French secondary arts and crafts schools. In the former a number of cubicles are to be seen designed, decorated, and in some instances furnished by schools in various parts of France, local activities showing their influence on subject and design. In the sections allotted to craft schools, the displays devoted to electricity and the making of electrical machines and fittings are somewhat disappointing as compared with those of schools devoted to iron and brass foundry work, smithy work, carpentry and joinery, turning and fitting, although some of the electrical craft schools in France are noted for the good work they do. If these exhibits are anything to go by, then the French people, in their preparation for the supply of skilled workers to meet world competition, are not allowing the grass to grow under their feet; it should be remembered in this respect that during the war many industries sprang up in Southern and South-Eastern France, with corresponding demands for electric power supply, and many peasants in those parts have turned out very industrious workpeople. An instance of this can be seen in the electrical engineering industry started since the war at Tarbes, on the foothills of the Pyrenees. The section devoted to manual instruction tends to show that the French workers, instead of crying out for their alleged rights, and waiting for the moon to assist in the growing of corn that has not been sown, are setting to work to train up young people so that their nation can rapidly make up for the ravages of war by the skill and industry of its operatives.

Taking the Exhibition as a whole, one would think that the "Cubist" cranks of France had got together and called in to assist them the cubist enthusiasts from a number of different countries, as with the exception of Italy, Spain and Japan, in architecture, sculpture, decorative and textile art, it would in a number of instances be difficult to imagine exhibits so uniformly unrepresentative of the true spirit and mentality of the peoples and countries concerned. This applies especially to the design of the British Building; if it were not for the Royal Arms outside the building, few people, British or otherwise, would know what it was intended to be, although the long-suffering British taxpayer has to foot the bill.

In matters connected with electric lighting, while at Paris there is nothing to compare with the "skew-whiff" globes of Wembley, the native talent has broken through the veneer of morbid impressionism which can be seen in so many sections, and effects are produced which are highly artistic and pleasing; in engineering, the rolling stock section, and the machinery required for the operation of the fountains are evidences of healthy progressive design. One cannot travel through Northern France to Paris by day without noting electrical and engineering works in progress, which illustrate the true mentality of the people.

The Exhibition is worth a visit, especially as the lighting effects show up to greater advantage now that the nights are darker. For those who are visiting Paris for the first time it may be noted that by travelling *via* Newhaven one lands at the St. Lazare station in the West End close to the Exhibition, and within easy reach of a number of reasonably priced hotels.

Electricity Supply in Salford.

The Agecroft Power Station.

(*Concluded from page* 503.)

The supply of energy for auxiliary power and for lighting is obtained from one 600-kW geared turbo generator and two motor-generator sets of 600 kW each. The supply to the motor-generators is taken from the main 33,000-volt system through transformers which step down to 6,600 volts. An electric storage battery having a capacity of 1,720 ampere-hours at a three-hour discharge rate, and an emergency discharge rate of 2,000 amperes for fifteen minutes, has been supplied by the Chloride Electrical Storage Co. The battery, which is controlled by reversible boosters, is also used to operate the high-pressure switchgear.

The whole of the turbine-house plant, comprising main generators, house-service plant, condensers, switchgear, transformers, and auxiliaries, has been supplied by the Metropolitan-Vickers Electrical Co., Ltd.

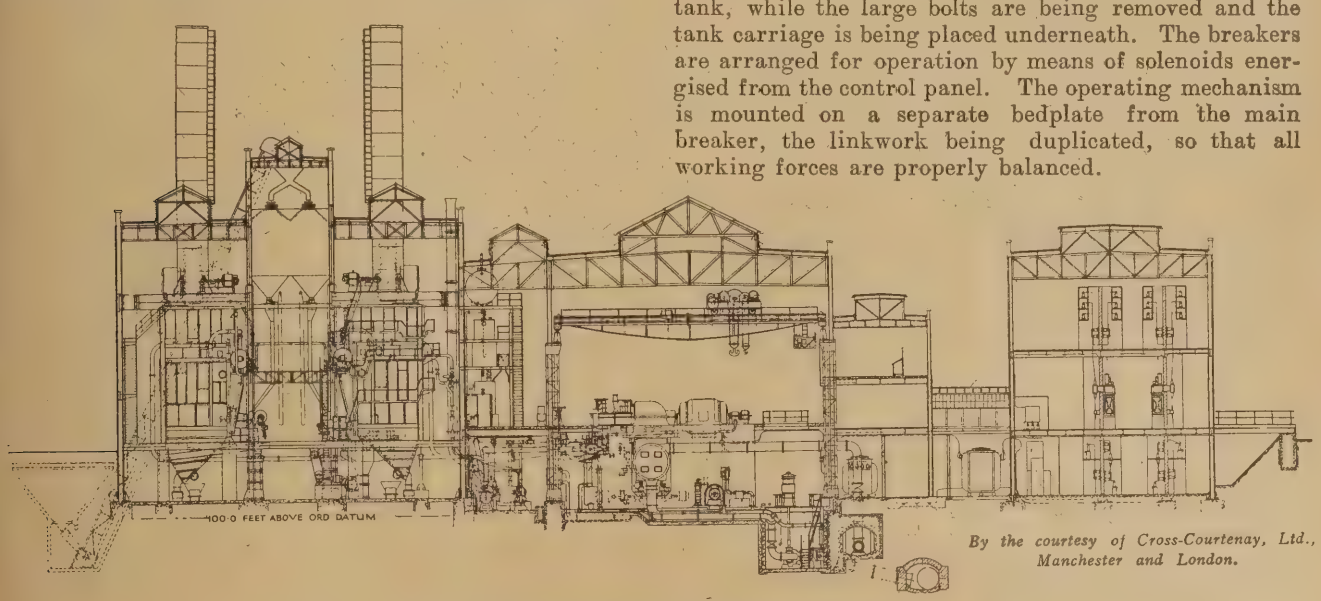
The main transformers comprise ten single-phase units of the outdoor oil-immersed self-cooling type, mounted on rollers whereby they can be rolled out on to a bogie carriage running on a sunken track at the correct level for easy removal. The units are of 4,667 kVA per phase, and are arranged to form three 3-phase banks of 14,000 kVA per bank with one single-phase unit as spare. The banks are delta-star-connected and are wound for 6,600/33,000 volts. Each bank of transformers is connected direct in the cable line between the 6,600-volt terminals of the alternator and the 33,000-volt switchgear. Two transformer units for stepping-down from 33,000 volts to 6,600 volts are employed for local service and auxiliary plant.

The switchgear is noteworthy in two respects, namely, it is one of two or three stations in this country in which all the switching for the main circuits is carried out at 33,000 volts; and the oil circuit breakers are amongst the largest installed from the point of view of short-circuit rupturing capacity. The whole of the high-pressure switchgear is contained in a three-storey detached building, 101 ft. long by 49 ft. wide by 64 ft. high. The 33,000-volt switchgear is accommodated in two rows of cubicles running longitudinally along the building, and the auxiliary and local service gear at 6,600 volts is mounted in a set of cubicles placed at right angles to the main gear, and situated at one end of the switch room.

The 33,000-volt gear is mounted in cubicles constructed of brickwork, fitted with moulded stone barriers and shelves to maintain phase separation. The top floor of the building carries the main and auxiliary bus-bars, with the circuit isolating and selective switchgear. The middle floor is reserved for the main oil circuit breakers, while the potential and current transformers required for instruments, with the cable isolating switches, are situated on the ground floor.

The oil circuit breakers are of a new design, embodying the results of extensive short-circuit tests. They are arranged on the middle floor in a central aisle, and as the design obviates the necessity of any cubicle structure, a compact and neat arrangement is obtained. The breaker is built round a single top frame, to which the oil tanks are secured by substantial hanger bolts. The design of the top frame is such that a separate air chamber is formed for each pole, and each chamber is fitted with a special vent to ensure that all gases are expelled after the breaker has operated under fault conditions.

The steel oil tanks are of circular shape, arranged so that when removing the tanks four small bolts hold the tank, while the large bolts are being removed and the tank carriage is being placed underneath. The breakers are arranged for operation by means of solenoids energised from the control panel. The operating mechanism is mounted on a separate bedplate from the main breaker, the linkwork being duplicated, so that all working forces are properly balanced.



By the courtesy of Cross-Courtenay, Ltd., Manchester and London.

Fig. 15.—Sectional Elevation of Agecroft Power Station.

Special provision has been made to deal with the great electromagnetic forces that may be transmitted to the operating gear without reducing the sensitiveness of the trip gear. The estimated rupturing capacity of the breakers under fault conditions is 1,500,000 kVA.

The isolating switches are of the pole-operating type, and are fitted with locking catches to prevent them from being blown open by the magnetic forces set up under heavy current conditions. The control board is situated in a room overlooking the turbine house, and is of the desk type, constructed of enamelled slate on wrought-iron framework. Each panel is equipped with the necessary instruments, control switches, and the indicating lamps required for the various circuits. The circuit breakers are operated by push-button switches in conjunction with indicating lamps and, in addition, separate lamps indicate to which set of bars a circuit is connected. These indicating lamps are combined with an arrangement of miniature bus-bars mounted on the sloping section of the desk, which enables the operator to determine at a glance the connections of the circuit. Duplicate synchronising gear is provided, and an automatic voltage regulator controls the machines and maintains the voltage of the system at a constant value.

A set of Chadburn's ship's telegraph instruments provides communication between the control house, the turbine house, and the boiler house.

The alternators and transformer groups are fitted with the Merz-Price circulating-current system of protection, which automatically disconnects the machine and transformer from the bus-bars in the event of an internal fault, and also operates the automatic field-breaking switch, limiting any damage to the machine to a minimum.

The feeder circuits are fitted with a balanced system of protection of the Merz-Beard type, in which the pilot cables are compensated to increase the sensitiveness of the system by reducing the effect of capacity current on the relays.

The neutral points of both the 6,600-volt and the 33,000-volt systems are earthed through resistances. The switches controlling the earth connections are electrically operated from the control desk, and indicators show which generator or transformer neutral is connected to earth. A bell alarm device is fitted to each resistance to announce when any appreciable current is passing through the earth circuit, while an automatic annunciator indicates the system upon which the fault has occurred.

The instrument transformers are of the oil-immersed type. Limiting resistances are fitted in all potential transformer circuits to prevent a rush of current in the event of failure. The bus-bars are in duplicate, divided by bus-bar sectionalising switches. At this point, reactances of the air-core concrete type are inserted to limit the amount of energy which can pass between the sections. Provision is made for the addition of further reactance between sections as the station is extended.

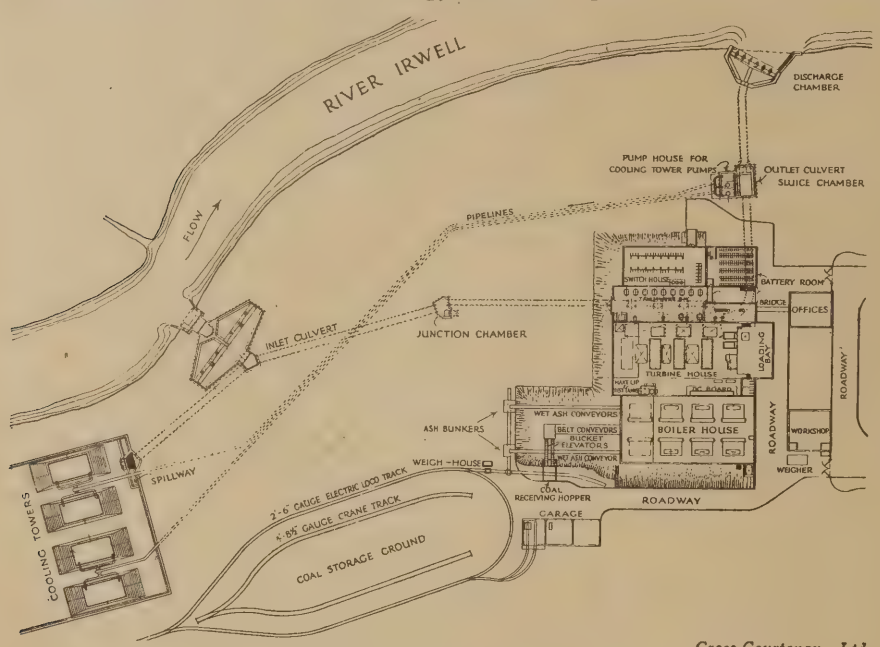


Fig. 16.—Layout of Agecroft Power Station.

Cross-Courtenay, Ltd.

The auxiliary plant is controlled from a 27-panel switchboard on the turbine floor in the power station. The panels are fitted with air-break circuit breakers, knife switches, and instruments. Duplicate bus-bars are provided, and all circuits are arranged so that they can be connected to either set of bus-bars, or the bars can be coupled in parallel should this arrangement be required.

At present three main lines for transmission at 33,000 volts are laid to the Frederick Road works, where energy is delivered through step-down transformers to the 6,600-volt distribution system. The transmission lines comprise three-core cables, each conductor having a sectional area of .3 sq. in. The cables were manufactured and laid by the British Insulated & Helsby Cables, Ltd. The step-down transformers are arranged in three banks of 18,000 kVA capacity per bank.

The power station has been constructed to plans and specifications prepared by Mr. J. A. Robertson, consulting engineer, who has also been responsible with his staff—with Mr. T. Brighouse as chief assistant—for supervising the construction and equipment.

Messrs. C. S. Allott & Son have acted as consulting engineers to Mr. Robertson, for the civil engineering work and buildings. Mr. D. E. Laing has acted as resident civil engineer.

During construction, and in the starting-up of the station, the consulting engineer has had the active co-operation of Mr. S. J. Watson, the borough electrical engineer, and his staff, of whom Mr. E. H. L. Dickson is deputy engineer, and Mr. J. Collinge and Mr. L. Romero, works superintendent and distribution engineer respectively.

The area of supply in the borough of Salford covers 5,202 acres, with a population of 239,000. In 1907, the Prestwich Provisional Order was leased to the Corporation for a term of 21 years, and has since been extended, thus adding to the supply area 2,448 acres with a population of 18,750.

The output last year was about 6 million kWh for lighting, &c., 28 millions for power, 10 millions for traction, and ¼ million for street lighting—the total being nearly 45 million kWh. There were 9,824 consumers, and the maximum load was 18,647 kW. For power purposes 1,038 consumers have installed 3,564 motors having an aggregate capacity of 43,317 h.p.

Fifty transformer sub-stations are connected to the 6,600-V system, with a capacity of 16,530 kVA of static transformers for alternating-current supply, and 16,850 kilowatts of rotary converters for direct-current supply. Twenty-seven sub-stations having a total capacity of 1,329 kVA are in use for converting the 3,300-volt single-phase supply to low pressure for distribution.

The capital expenditure at March 31st, 1925, amounted to £1,682,398, of which the sum of £709,354, equal to 42 per cent. of the total outlay, has been redeemed. The net capital liability was therefore £973,044. The total sums transferred from the net profits to the reserve and renewals fund, or accumulated by the investment of this fund, amount to £206,645. Of this sum £78,168 has been appropriated for work which would otherwise have necessitated an increase in borrowing powers, £66,848 has been utilised to improve the efficiency of the plant, and the balance of £61,629 remains in hand.

In addition to repaying certain deficits which occurred in the early years after the undertaking was established, a total sum of £154,584 has been transferred to the rate fund in relief of the rates.

The foregoing particulars are derived from a handsome souvenir which was issued at the opening ceremony.

Diesel-Electric Locomotives in Canada.—A special correspondent of *The Times Trade and Engineering Supplement*, at Montreal, states that the Canadian National Railways have been testing new types of cars operated by electricity developed by a generator within the body of the car. The cars are of two types—one small, with a body 60 ft. over all in length and capable of drawing a trailer; and the other heavier and with an articulated body, 102 ft. in length, which really consists of two bodies set on three four-wheel trucks. One of the new cars of the light type made the trip from Toronto to Montreal, a distance of about 335 miles, in only a little more time than is required for the regular trains drawn by steam locomotives. The experiments with these Diesel-electric cars represent an endeavour to escape the high fuel cost of locomotives dependent upon coal. Petrol-operated cars and, later, storage battery cars were built and put into operation on some short lines, but did not prove altogether satisfactory. The next step has been the Diesel-electric car, and the management of the Canadian National Railways claims to have proved from tests made over a period of months that it represents a type of motive power economical and serviceable in operation and well suited to suburban, inter-urban, and branch-line traffic, and that it may prove an effective competitor of the motor omnibus and lorry. In a recent test the fuel consumption of the lighter Diesel-electric car averaged one gallon per 4.6 miles, representing about 10 per cent. of the cost of fuel for similar steam operation.

Mining Electric Locomotives.—I.

The Markham Prize Battery-Propelled Machine.

The Brodsworth Colliery, near Doncaster, was the centre of great interest in May last when five electric storage-battery locomotives were tested in competition for the £1,000 prize offered by Mr. Charles Markham for the most suitable model for use in mines. The Mines Department took charge of the experiment, issued the technical requirements and competition conditions, and appointed Mr. A. M. Clegg to act as secretary. The adjudicators were: Messrs. J. A. B. Horsley, H.M. Electrical Inspector of Mines, representing the Mines Department; Roger T. Smith, of the Institution of Electrical Engineers; Roslyn Holiday, of the Mining Association; and Sidney Bates, of the Institution of Mining Engineers. Mr. Herbert Smith, of the Miners' Federation and the Yorkshire Miners' Association, was prevented by illness from acting as adjudicator. An official report on the tests is to be issued by the Mines Department.

The competition was international, but the machines which took part were all of British manufacture; of the ten models submitted five entered the final competition, and for the tests track rails were laid in a field and conditions were created approximating as nearly as possible to those of the underground pit workings. Preliminary to the running tests exhaustive battery tests were carried out by the Doncaster Collieries' Association. The prize-winning locomotive is described below, while the four others, each of which possesses points of merit, will be referred to in a later article.

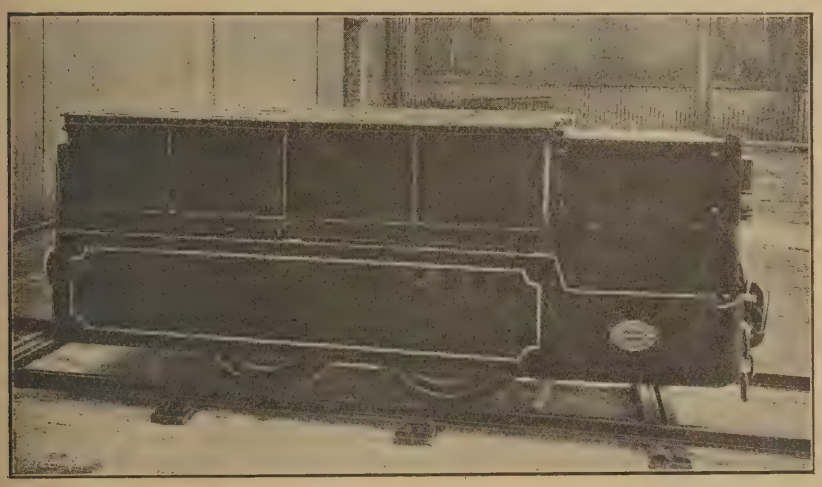


Fig. 1.—Side View of Prize-winning Locomotive, complete.

The "Union" Mining Locomotive.

This electric accumulator-driven machine was designed and built by Messrs. Joseph Booth & Bros., Ltd., of Rodley, Leeds, who have been building cranes since 1847, and have marketed several types of rubber-tyred industrial trucks. Although the machine illustrated in fig. 1 was specially designed to fulfil the conditions of the specification drawn up by the promoters of the competition, it cannot be said to be a new development of Messrs. Booth's, who have supplied locomotives for various classes of work both at home and abroad.

The radius of action of a locomotive is limited by the capacity of the battery; to reduce the loss of time which would be involved, in many cases, should the battery require to be re-charged during the working shift, which might result in the disorganisation of the whole haulage scheme, Messrs. Booth have patented a method of mounting the batteries. The cells, which are mounted in groups in hard wood crates, are housed in flame-proof mild steel boxes that are supported on rollers mounted on the locomotive frame, and locked in position by two pivot bars, one on each side of the locomotive, running the full length of the boxes, each being securely clamped by a single hinged bolt; the cables are taken in and out of the boxes by quick-releasing plugs. Should the battery become discharged at any inconvenient time, all that is necessary is to release the plugs and the one clamping nut, pivot the locking bar over, and roll the discharged battery off the machine, as indicated in fig. 2. A fully-charged battery can then be rolled into position on the locomotive and securely locked. The complete operation can be performed in less than five minutes.

The subject of a further patent is the fact that the locomotive consists of two units, *viz.*:—(*a*) The mechanical unit, consisting of the two axles and brake gear mounted on an inner frame, and (*b*) the electrical unit, comprising an outer frame carrying the motor, controller, resistance, circuit breaker, and all the electric cables. The outer frame is rigidly cross-braced with channels, which are carried on springs mounted in guides on the inner frame; tie bolts are provided through the springs to secure the two units together. This method of mounting relieves the electrical equipment, including the battery and also the driver, of shock due to the track, whilst for the purpose of overhaul the two units can be separated by unskilled labour, as no electrical connections are interfered with by the separation, and each unit can be dealt with by the department concerned. In the case of breakdown, the faulty unit can be replaced and repaired without the whole locomotive being placed out of action. When the battery has been rolled clear of the machine, the whole of the mechanism is visible for inspection, and each individual unit may be removed with a minimum of time and labour, while the simplicity of the whole construction is worthy of special note.

Power is derived from a single motor, manufactured by Messrs. Booth, and specially designed to fulfil the conditions laid down in the specification; it is of the four-pole type and the armature and commutator are of their standard type, being provided with pure mica insulation. The armature shaft is mounted on Hoffman ball- and roller-bearing, totally enclosed in dust- and water-tight housings. The motor is placed at the end remote from the driver, and transmits power through two flexible couplings and a cardan shaft to a free coasting worm and wheel on the axle nearest to the driver. This axle is of special alloy steel, oil hardened and ground to accurate limits, and is supported on Hoffman ball- and roller-bearings. The worm wheel is keyed to the middle of the axle and the worm is also supported on Hoffman ball-bearings, the whole being totally enclosed in a dust- and water-tight cast-steel case, the worm wheel being provided with an oil well. The projecting ends of the axle are tapered to fit the tapered bore of the wheels, which are secured by two keys at right angles and a clamping nut at the ends; they have cast-steel centres with rolled-steel tyres shrunk on.

The two axles are coupled together by connecting links placed at right angles and accurately balanced, and are provided with two substantial Hoffman ball-bearings at each end, mounted in dust- and water-tight housings. The coupled axle also consists of special alloy steel, oil hardened and ground, and supported on Hoffman ball- and roller-bearings in dust- and water-tight housings.

The brake gear, which operates on the rims of all four wheels, and is provided with a three-fold equalising device, is powerful and quick operating. The cast-steel shoes are lined with Ferodo, or similar material, and operated by the action of equalised cams, ensuring

equal pressure on all wheels by means of a screw and nut mechanism. A separate sand box is provided for each wheel, the valve construction of which is very simple, and the sand is conducted to the rails by means of india-rubber pipe, which cannot be damaged by derailment, or by striking any projecting object.

The inner frame consists of two steel castings, to which the axle housings and brake gear are bolted. Machined guides and detachable wearing strips are provided to receive the outer frame, and cross channels and sockets are also provided to receive the springs on which the outer frame is supported. Tie bolts pass through the centre of each spring, securing the two frames together, and subjecting the springs to sufficient compression to ensure easy riding. Should one or more of the springs fracture, the operation of the locomotive can be continued until such time as it is convenient to replace the broken spring. The spring-mounted draw hooks and buffers are important, as they reduce the shock to the locomotive, and especially the battery, when starting and stopping, as well as the strain on the links connecting the loaded tubs.

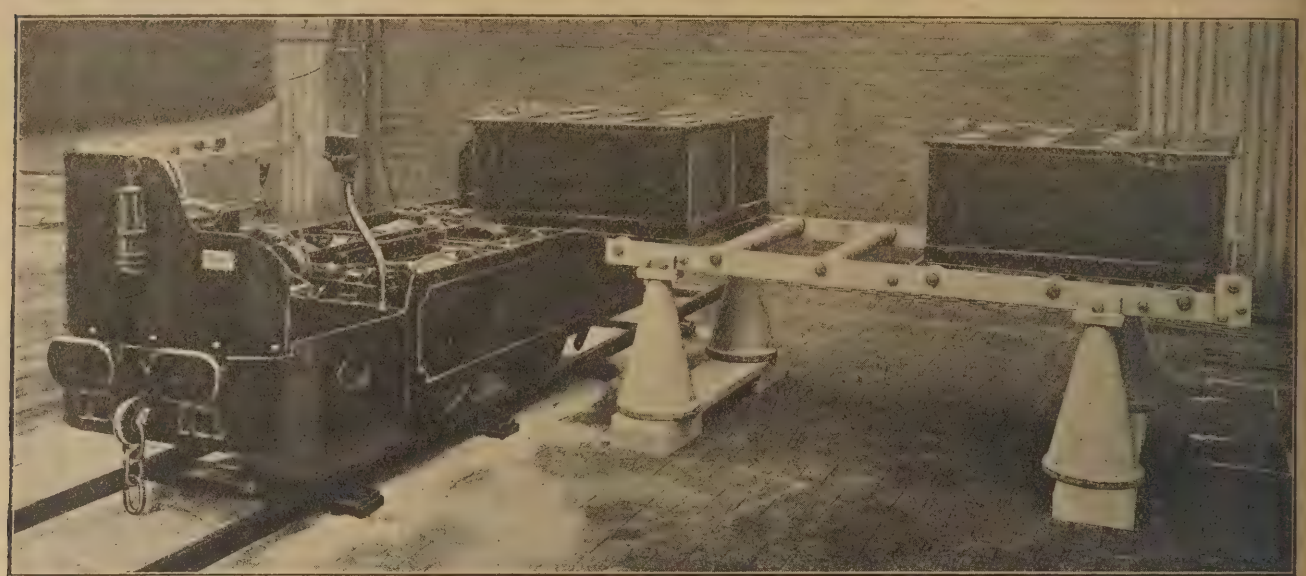


Fig. 2.—View showing one Battery Box off and one in process of removal.

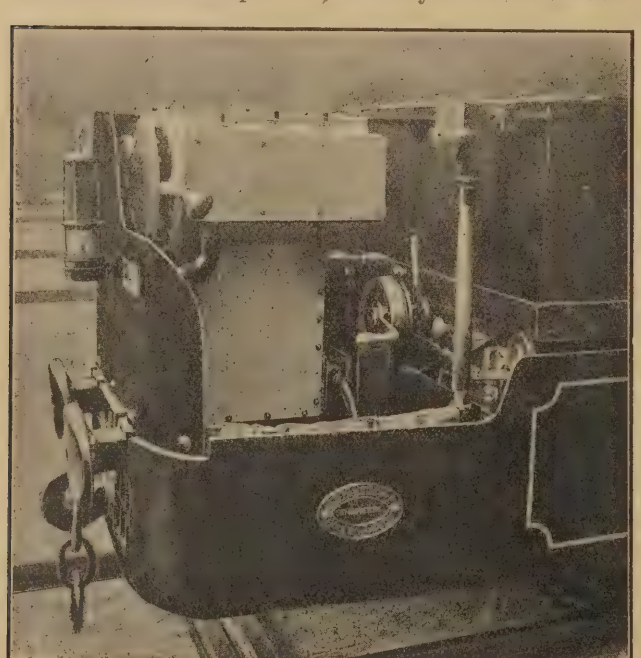


Fig. 3.—Driver's Well, showing Controls.

A circuit breaker of the quick-break, double-pole, free-handle type is mounted in front of the driver and the controller is immediately above it, being so designed that the drum fingers and finger bar inside can be removed as a whole without disconnecting any wires. This means that when it is necessary to clean the contacts, or to make any repair, a spare unit can be inserted in a few minutes without interfering with the duty of the locomotive while the necessary attention is being given to the damaged part.

The resistance, which is also supported on the outer frame unit, is of the "unbreakable" grid type, constructed of easily detachable units mounted in a flame-proof welded mild-steel case. The grids are insulated with special heat-resisting mica and cable connections are made by gunmetal sockets and lugs clamped to the grids.

The battery is housed in two units, which are supported on independent rollers. Each unit consists of two compartments having a ventilating space between them and rigidly riveted together, the object of dividing the battery being that a great radiating surface is obtained to dissipate the heat generated and to minimise the liability of a violent explosion occurring inside the battery compartment, as an explosion which may occur inside any one of the containers is localised to that container only. To facilitate ventilation and internal pressure relief, wire gauze and valve plates are provided in the cover plates. This point is also covered by one of the patents taken out for the machine. The Kathanode batteries were made by the D.P. Battery Co., Ltd.

Care was taken to produce a thoroughly flame-proof construction. All the electrical units are equipped with flame-proof terminal boxes, fixed insulated studs being provided for carrying the conductors from the terminal boxes into the main housings. All the cables are totally enclosed in steel tubing screwed into the terminal boxes on each unit. The whole machine is fire-proof, as any material which is liable to catch fire, or be affected by excessive heat, is encased; should any part take fire, it is impossible for the flame to reach the external air.

The general design of the locomotive has been somewhat improved since the competition was conducted, the overall dimensions now being:—Length 10 ft, width 3 ft. 6 in., and height 3 ft. 6 in. The road clearance between the wheels above the top of the rails is 5⅞ in. The machine is capable of hauling a load of 5 tons on the level at a speed of approximately 6 m.p.h., or 20 tons at approximately 3 m.p.h., and has a starting pull of approximately 2,000 lb.

Electricity Supply in the United States.—The *Electrical World* recently published statistics of the output of electricity in the United States during the first six months of the current year. The total amount generated during this period was 29,104,105,000 kWh, as compared with 26,837,908 kWh in the equivalent period of 1924—an increase of 8.4 per cent. The revenue increased in approximately the same proportion to $716,400,000. The proportion of the energy generated by hydro-electric plant was 38.4 per cent. The production of hydro-electricity increased to a slightly greater extent than the output of steam stations.

The Electrical Industry of Mexico.

The Prospects of Revival.

By PERCY F. MARTIN, F.R.G.S.

One of the most interesting features in the electrical industry of Mexico is the fact that the same powerful influences that established, in 1892, the first power station in that Republic, still control one of the more important enterprises supplying light and power in that country. The pioneers in the transmission of hydro-electric power have maintained their interests through good years and bad, even amid what appeared to be altogether hopeless conditions. The organisation has been thorough and complete, and conducted with so much discernment that, with a revival of Mexican industries in general, the prospects of which have been considerably enhanced by the recent resumption of diplomatic relations between that country and the United Kingdom, the electrical industry in practically all branches should prominently participate.

Commencing with the construction of a hydraulic installation for the supply of power to a jute mill on the Rio Blanco, belonging to Lord Cowdray (then Sir Weetman Pearson), in 1892, a number of electrical companies providing light and power organised under the same or other British influences, have come into existence, having been nursed through Mexico's most troublous times, and, fortunately, having sustained very little damage. Moreover, the demand for the supply of electrical energy has remained constant with the growth of the chief Mexican commercial centres, and these are numerous. With its abundant water-power, Mexico should enjoy a long period of industrial success.

Amounting at first almost to a monopoly, granted under the ægis of the Diaz Government, Mexican electric light and power utilities have not been seriously interfered with by its successors. Endowed with sufficient reserves to undertake such costly enterprises, any capitalist or body of financiers would now receive equal encouragement. The equitable attitude of the authorities in granting moderate rate increases, together with the decrease in operating costs, have put existing working companies upon a sounder footing, and have greatly improved the value of their properties.

The Callés Administration, while retaining the power, set out in the original concessions, to supervise rates, prescribe uniform systems of keeping accounts, direct any new financing deemed necessary from time to time, and generally to control electrical undertakings in the country in the public interest, allows ample latitude to the respective managements of such utilities. These, upon their part, continually work for a better service while naturally seeking for a decrease in the cost of producing electricity. They have found that this can be best effected by interconnection of the several large stations by extensive transmission systems.

The Mexican Telephone and Telegraph Company, one of the oldest foreign enterprises formed in Mexico, established more than 37 years ago, has been granted a concession by the Congress of the State of Tamaulipas to install an automatic telephone system in the city and port of Tampico, which is also the capital of that State. The company, which already possesses 32,000 miles of line, distributed over ten different States of Mexico, is enabled by the terms of the new concession to take over several small independent lines—mostly at present unremunerative—and to connect them up with its existing lines. The company gained its present valuable concession in the face of very severe competition. Its nearest and most powerful rival is the Swedish-owned Ericsson Telephone Company (Telefonktiebolaget L. M. Ericsson), which has already gained a strong footing in Southern Italy, and is endeavouring to secure and maintain equal influence in Mexico and other Latin-American States.

The Government of the State of Coahuíla has granted a Torreón firm, Messrs. Figueróa y de la Mora, a concession to construct and operate a telephone system in that important commercial and mining city, with a monopoly for twenty years. The company, at the same time, is authorised to extend its lines to any part of the State that it chooses. Exchanges will be constructed at Torreón, Matamóros and San Pédro, in the State of Coahuíla, and at Gomez Palacio and Lerda, in the adjoining State of Durango. Underground cables will be laid in the business district of Torreón, and between 800 and 1,000 telephones of the latest approved type will be installed. With the exception of the necessary poles, which will be supplied locally, the concessionary company will purchase the whole of its equipment abroad. Notwithstanding the advantageous proximity of the United States, British manufacturers should become interested, and those desirous of competing should communicate (either in Spanish or English) with Messrs. Figueróa y de la Mora, Callé Valdez Carillo, Torreón, State of Coahuíla, Mexico.

In the Province of Chihuahua there is under consideration a concession for the construction of a large irrigation and hydro-electric project. An expenditure of 20,000,000 pesos (about £2,000,000) is involved in the scheme, and it is proposed that, besides providing irrigation for 200,000 hectares (approximately 500,000 acres) of new land, the undertaking will furnish electric power in the neighbourhood.

The town of Comayagula, virtually a suburb of Tegucigalpa (Mexico), has decided upon establishing an electricity supply. Inasmuch, however, as the total population to be provided for does not exceed 10,000, the installation would be but a small one.

For many years past the Conchos River has been regarded as a possible source of electric power. After passing Presideo del Norte (Ojinaga), this river and other tributaries supply the Rio Grande with water, thus enlarging its stream and rendering it especially suitable for commercial exploitation. At length, after several years' negotiations, the Government has consented to the employment of the river's waters for a hydro-electric generating plant, and has granted a concession to an electric power company which already commands practically the largest of the water-power installations of the country. The new contract supersedes three others granted at various periods, and will date back from 1909. The terms of the contract call for the construction of a dam 70 metres in height, capable of impounding the waters of the Conchos River to the extent of 1,000 million cubic metres. There will also be a second dam of smaller dimensions, as well as some highly-important hydro-electric works to utilise water for power up to 50,000 litres per second as a maximum.

There are now four radio broadcasting stations of considerable size in the Republic of Mexico, in addition to six of smaller dimensions. Government licence, regulation and inspection are necessary for all receiving as well as transmitting stations. It is estimated that there are 20,000 sets in the capital alone, while 12,000 others are distributed about the country. Ninety-five per cent. of the whole supply has been received from the United States, since British manufacturers, following the disruption of political relations with Mexico, have troubled little to maintain the small amount of electrical trade that they formerly held. Perhaps now that friendly relations have been resumed—the probable effects of which must not be exaggerated from a trading point of view, however—renewed efforts to furnish radio, among other electrical supplies, from the United Kingdom will be made.

The Designer and Initiative.

By W. ROLAND NEEDHAM,

It is the claim of many that they do not get their chance. In some cases, at all events, this is rather an excuse than anything really valid. There is rightly an opportunism which is not compromise; it is the legitimate expression of initiative, being the opportunism of those who see clearly and act promptly. Keenness of vision and spontaneity of action are doubtless to a certain extent instinctive and intuitive, but they are trained faculties also. The man of initiative seems to make opportunities. This is largely an illusion. What he really does is to seize what offers as soon as ever it does offer; and he acts decisively.

Alertness, foresight, and longsight, determination, and concentration of purpose are all just normal characteristics of the man who keeps eyes keen, brain active, and will straining at the leash. Intuition is not all. Ideas are not all. This kind of genius reveals itself where the intuition is guided rightly, and the idea is turned to useful practical account.

It is not only in industry, nor in any one direction, that scope and opportunity exist for men of insight and action to make good. In all directions, and in every branch of industry, the rule obtains.

Great opportunities exist now, no less in engineering than in other industries. They pertain to each separate branch of engineering. The great essentials are these: (*a*) Wide-awakeness; (*b*) the knowledge which can appreciate a need and appraise a remedy; (*c*) concentration of mind, and the self-control this occasions; and (*d*) the ability to give form and content and a body to the offspring of the mind. One must be prepared on occasion to cut right across one's habits of comfort and love of ease; be willing, even eager, to descend from the airy realm of ideas to the humdrum world of actualities; be all out to produce something really workable and which will work well, and be a commercial proposition. Thought is necessary equally with action. One must be able to make up one's mind at the right time, and have the grit to carry the thing through.

It is never well, except under special circumstances, to show one's hand too soon. Extreme care should be taken not to inform the wrong party. If he be convinced that his idea or scheme is sound and valuable, a man should remember that his idea may be stolen, his scheme wrecked, if he entrust it to the hands of a time-serving intermediary. A note to the chief, outlining what the scheme is expected to do (not so much what it is), and asking for an interview, will in many cases ensure a fair hearing.

A caution is often necessary to such persons as are naturally of an impetuous and over-optimistic disposition. They should proceed carefully and thoughtfully. In their case it may well be good to curb the inclination to act impulsively. This is by no means contradictory to the injunction already insisted upon. A man must be able to act promptly at the right time. The psychological moment at times depends more upon the man than even upon the occasion. The over-cautious may need encouragement; often the ultra-confident man is all the better by reason of a little wholesome restraint. A creature of impulse must temper his nervous energy with that knowledge which is principally of himself.

"Fools rush in where angels fear to tread."

Men of real initiative, however, first face their problems fairly and squarely. They then seek a reasonable solution, and with great care satisfy themselves that it is at once workable, reasonable, and economical. After that they act. But there is no mistake about the quality of their action: it is decisive.

There is another essential characteristic which it is well to mention. A man must be prepared not only to act, but, where necessary, to act alone. He may seek advice; unless, indeed, he be the veriest fool, he will. But he never needs a prop. He should be most careful in his selection of friends and advisers, choosing men whose honour is irreproachable as their judgment is sound. He will be able to scrutinise his ideas in the light of their criticism. A true friend is a fearless but constructive critic; and his opinion is always well worth while. None can afford to stand severely aloof, least of all the proud sensitive man. All are the better for sincere, disinterested criticism. The real mark (perhaps that most distinctive of all) of the man of initiative is that, having probed the matter bone deep, having compared and, where necessary, corrected his own ideas by reference to the views of others equally competent, he then carries on, if needs must, single-handed, once the time for action arrives.

It is probably quite impossible to sketch in brief skeleton outline a process involved which shall be applicable to all cases. In general and fairly elastic terms, however, the cycle of events may not greatly depart from the hypothetical procedure suggested below.

A man goes about his daily work attentive to the demands of his own immediate task. If he be at all a keen man, and not off his beat, then he will think in terms not merely of his own bit, but he will seek to understand something of how his bit is related to that of his neighbour, and also how their joint contributions affect the entire product. Specially will he cultivate his powers of observation, strengthen his faculty for reflection and deduction. He will notice how the activities of one man dovetail into those of another, how inter-dependent are the various departments. Time and his own watchfulness will make him sensitive to defects, responsive to needs. Once he becomes conscious of either the one or the other, he will concentrate upon that. Half-an-hour's serious thought in his leisure time will often be sufficient to confirm him in his original opinion or to rebut it. Then he will apply himself to the remedy. He will examine most carefully the existing framework, as it were. Possibly only a faulty member needs replacing by one which will function effectively. At times it may be a radical change of design offers the most promising solution. As, however, he may well expect powerful opposition to too drastic a change, he will also explore the possibilities which offer by way of lesser innovations which possibly have more reasonable chances of survival. Thus he may devise two schemes.

Scheme A, which will improve matters, and be worth while, occasions the least interference with existing arrangements. It is conservative and relegates as little as ever possible to the scrap-heap. Scheme B, whose initial cost will be considerably greater than that of Scheme A, is practically an all-new design. The final results, however, are estimated to justify its adoption even by comparison with the alternative suggestion.

Then he will doubtless approach competent men whom he can trust and whose opinions are valuable. He will recall that adverse criticism, if kindly offered, is often of the utmost service. He will most probably modify his original drafts in virtue of the comments and suggestions so made. He will next think out most carefully how best to secure that his proposals are given a reasonable and impartial hearing. He should know the type of men in charge, and will approach the one whose sympathies and interests are all out for efficiency. He will carefully study his men, and seek not to transgress the canons of good taste and prudence. If the scheme be of that order of things he will probably already have taken the precaution of having it protected. He must expect that, unless he have himself prepared models, the management may suspend judgment until these are in hand.

Should his own employers prove unsympathetic, their competitors may be ready to negotiate. He will, of course, if he be wise, go over the various points again to satisfy himself that things are really as he wishes them to be. In that case, one rebuff need not place him *hors de combat*.

New Electric Fires.

Designs for the Coming Season.

As with books, of the making of many fires there is no end, and the opening of the heating season heralds the coming of many new designs of electric heating apparatus. As a general rule, the novelty lies not so much in the elements and the methods of distributing their heat as in the metal work in which they are embodied. There are, however, a few fires which depart somewhat from the hitherto accepted lines, as will transpire from the ensuing notes.

The market for electric fires is a growing one, for people are beginning to appreciate the worth of heat, without fumes or fuss, which can be obtained by the mere touch of a switch. In addition, electricity supply authorities are making electric heating possible by instituting special rates, and there is every prospect of continued expansion. Whether a wide variety of patterns is the best way of meeting the demand is perhaps questionable, but for the present we must take things as we find them, and confine our attention to a few examples of fires which are now being put on the market for the first time.

The Arora Co.

Among the fresh models which this firm has produced is the "Victoria" fire which is made with two or three 750-W bars. The three-bar pattern is illustrated in fig. 1. It has a handle for carrying purposes and two rotary switches, and is produced in three finishes—matt black, oxidised copper, or bright silvery white. The last finish is obtained by the provision of a non-corrosive metal in place of the more usual polished steel. The "Reflex" fire, shown in fig. 2, is another new design. This is constructed of sheet metal, with a bright silvery white finish, and wrought iron, and is said to give perfect reflected heat and direct radiant heat. It is 12-in. square in plan and has a height of 23 in. There are two 750-kW fire bars which are independently controlled. This fire is also made in a 3-bar pattern.

May & Padmore, Ltd.

Fig. 3 illustrates the "No. 10009" fire which is being made by the above company. It is of simple design with an antique brass front, embellished with a key pattern, and a hammered copper reflector. The company's standard 1,000-W fire bar is fitted. The fire only weighs 5 lb. and is 16 in. high, 11¼ in. wide, and 6 in. from back to front.

Electric Fires, Ltd.

The new patterns introduced by this company are principally developments of its "Electricoal" design, which, as will be inferred, employs imitation coal to obtain the psychological effect of the domestic hearth. The one illustrated in fig. 4 is modelled as a brazier with two fire-bars fitted in the front. To obtain the maximum effect the switches are put in an unobtrusive position. The loading can be either 2 or 3 kW as desired. The body has a black satin finish while the front and mouldings are brightly polished. Another example (fig. 5) has the "coal" arranged in the front, while the heating elements (1 or 2 kW) are fitted in the top at the base of a curved repoussé polished brass reflector. The elements are of the "plug-in" type, and the fire is obtainable in five different finishes.

Credenda Conduits Co., Ltd.

Among the new "Creda" electric fires are the "Wellwin" and "Unique" patterns. The former (fig. 6) is a handsome design, although utility has been the first consideration. It is intended to fill the space formerly occupied by a coal grate. There are three 1-kW elements and the switching arrangement enables one, two or three bars to be used as required.



Fig. 1.—The "Victoria" Fire.

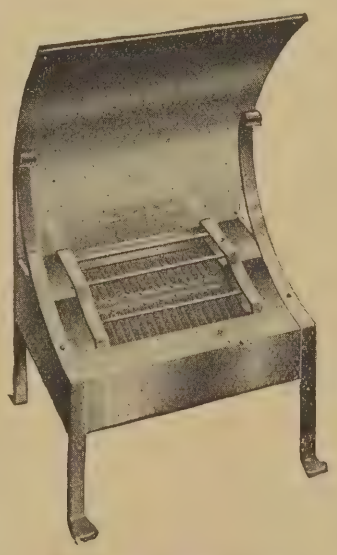


Fig. 2.—The "Reflex" Fire.

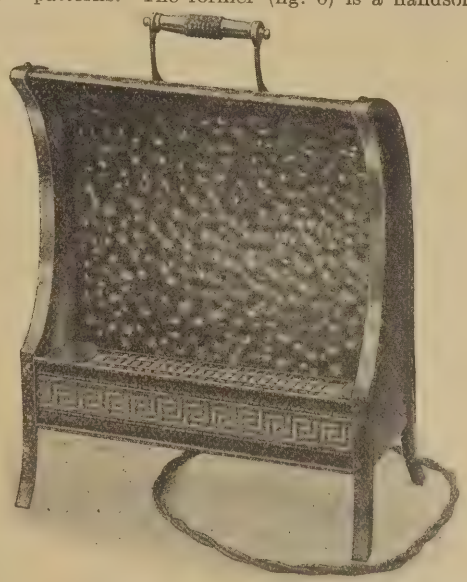


Fig. 3.—The "Maymore" Reflector Fire.



Fig. 4.—A "Heatrae Electricoal" Fire.



Fig. 5.—The "Electriglow" Fire.

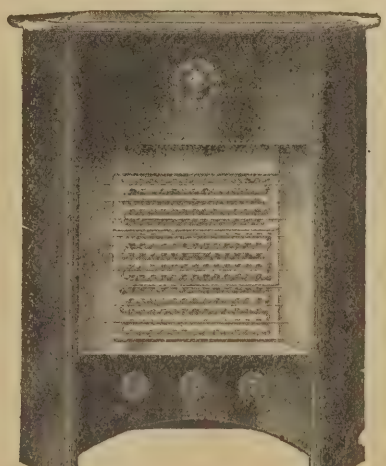


Fig. 6.—The Creda "Wellwin" Fire.

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The body has a polished black finish and the fire bars are mounted in a polished copper "well" which reflects heat which would otherwise be absorbed by the body. The fire is 27½ in. high, 22½ in. wide, and 6 in. "deep"; it weighs 22 lb.



Fig. 7.—The Creda "Unique" Fire.

The other type, the "Unique" (fig. 7), seems to deserve its name. The heating element is in a concealed position at the top of the fire and the heat is reflected downwards on to a polished copper back giving a very fine effect. The flat top makes the fire suitable for keeping food, &c., warm. The loading of the elements is 2 kW in two equal sections. The fire has a weight of 27 lb. and a height of 16 in. Two kinds of finish are provided.

L. G. Hawkins & Co., Ltd.

This company has produced the "Blazor" fire (fig. 8) for the season. This is another example of the imitation coal pattern and it is combined with a reflector back of polished copper. The total loading is 2,250 W, but this is switched in two sections. The body is of heavy cast metal and is given an antique brass, oxidised copper, or polished aluminium finish. Its height is 21½ in. and its width 18½ in.

The Hotpoint Electric Appliance Co., Ltd.

Several fresh designs are being produced by this company one of them being a handsome Adam model (fig. 9). This is fitted with three 1-kW "knife-edged" refractory heating elements which are controlled by two foot-operated switches at the front of the fire. The body is of sheet metal and can be produced in any one of four finishes—electro-bronze, rustless steel, copper, or brass. Another fire by this firm is the "No. 160" pattern illustrated in fig. 10. This is primarily designed to fit into an existing fireplace. So far as the elements and their control are concerned the fire is very similar to the foregoing model. The usual finish is black, but any of the company's standard porcelain finishes can be executed. A smaller pattern of this type with only two fire bars is also manufactured.

Carron Company.

Fig. 11 depicts one of the latest of this company's designs, the "No. 256" fire. It is provided with two 1,000-W fire bars with well distributed wire elements. One or two bars can be switched on as required. The fire is 14 in. wide and 15½ in. high, and is supplied in four finishes, *viz.*, art black, armour bright, porcelain enamelled, and electro-bronze.

General Electric Co., Ltd.

Several new types have been added to the comprehensive range of "Magnet" electric fires produced by this company for the current season. A form of electric heater which is greatly increasing in public favour is the pedestal type, of which an illustration appears in fig. 12. It is a light pattern with black japan finish and a polished copper reflector. It is fitted with a special canting device, by means of which the reflector can be tilted and fixed at almost any angle, and the heat accordingly directed to any required position.

An entirely new pattern of radiator fire has also been produced. This fire (fig. 13) is constructed of polished brass and copper, and fitted with three helix elements, situated at the base. The control switch enables the heat to be regulated, and the design of the reflecting back plate ensures that the maximum heat is thrown forward.

Another model has an iron body with new-pattern grid elements vertically fixed. It is not only supplied in black matt finish, but also in oxidised copper or oxidised silver. Various period designs, Adam, Sheraton, &c., are also included in the new range of "Magnet" heaters.

(To be continued.)



Fig. 8.—The "Blazor" Fire.



Fig. 9.—A Hotpoint "Adam" Fire.



Fig. 10.—The Hotpoint "No. 160" Design.



Fig. 11.—The Carron "No. 256" Fire.

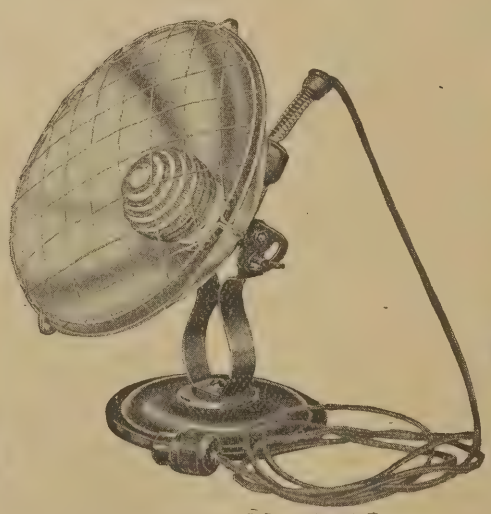


Fig. 12.—The G.E.C. Pedestal Fire.

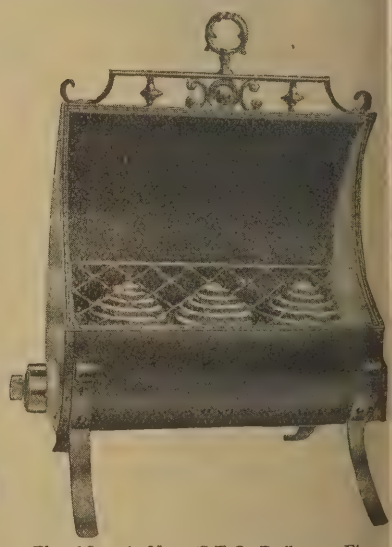


Fig. 13.—A New G.E.C. Reflector Fire.

Japanese Notes.

Electrification of the Central Railway.—The opinion is said to be gaining ground among the railway authorities that it would be more advantageous to electrify the Central Line instead of the Numadnu-Akashi section of the Tokaido Line, and this is likely to be realised. It was originally intended to completely electrify the Tokaido Line by the end of the fiscal year 1928-1929, to coincide with the completion of the Tanna Tunnel on the Atami Line, but the work of building of the tunnel has not made very satisfactory progress, and it is not expected to be completed as previously arranged. The opinion is held that electrification will be more effective on the Central Line, which has many steep gradients, than on the Tokaido Line, which is comparatively level. Moreover, on the Central Line coal is expensive and hard to obtain. It is proposed to take power from the Shinanogawa hydro-electric station.

Decline of Japanese Electrical Production.—The electric power industry having made marked development, foreign electrical machinery and apparatus have been imported in increased quantities, while their production in Japan has decreased and amounted only to 19,000,000 yen in 1923, as against 35,000,000 yen in 1912 and 20,000,000 yen in 1921. In view of this the Japanese Electrical Association is making exhaustive investigations into the possibilities of encouraging and reviving the industry.

The increase in the imports of foreign electrical machinery and apparatus is said to be due to technical progress and commercial activity, and the question of home production and the buyers' purchasing policies are likely to keep up a severe competition between the foreign and Japanese products and between the foreign products themselves. Of the foreign manufacturers, who are most extensively interested in the competition, we may mention Messrs. Mitsui & Co., agents for the General Electric Co. (America) and Messrs. Takata and Co., agents for the Westinghouse International Co., the latter, under new management, being practically as active as its predecessor. Messrs. Suzuki & Co. have lately entered the field as agents for the Metropolitan-Vickers Co., by taking advantage of an increased tendency to adopt steam instead of hydro power plant.

Power Plant Construction.—It is reported that the Kinugawa Hydro-Electric Company is installing an additional 8,000-kW set in its Sumida power station. The work is being pushed forward expeditiously with a view to completing it by March or April next.

The Nippon Denroku K.K. is constructing a hydro-electric power station on the upper part of the Jintsu River, Toyama Prefecture, which will house two 30,000-kVA generators. One of the generators has already been erected.

Electrification of Iron Works.—The electrification of various sections of the Government Yawata Iron Works is making satisfactory progress. The tinplate and flat steel works will be completely equipped with electrical plant shortly. At the same time a 7,500-kW power station will be completed, making the works' total output of power 42,000 kW.

An Electric Railway.—The Takarazuka-Amagasaki Electric Railway Co. was established at the beginning of 1924, with a capital of 3,000,000 yen, by persons interested in the Hanshin Electric Railway Co., for the purpose of laying an electric railway for a distance of 8¼ miles from Amagasaki to Takarazuka. The work of construction has not been commenced as official permission for it has not yet been obtained. Efforts are being made by the management to procure that permission.

Electrical Activity in Japan.—In a recent review of Japanese conditions, the United States Commercial Attaché at Tokio stated that inactivity continued in most import lines, the only notable exceptions being electrical equipment and steel products. In the electrical equipment market a considerable amount of business was pending, including substantial orders for generating units, switchgear, and railway motors. British competition was said to be increasing, one company having secured orders for more than 100,000 kW of generator equipment during July.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Electrical Commercial Travellers.—The Electrical Trades Commercial Travellers' Association is holding its first concert (Bohemian) on Saturday, October 10th, at 7.30 p.m., at the Manchester Hotel, London. The programme of subsequent events for the session has been issued and will be referred to in our next issue.

The Association held a well-attended general meeting on September 4th at the St. Bride's Institute. The chairman (Mr. C. W. Sully) referred to the continued growth and success of the Association and to the fact that already it had been able to give assistance to a member. The treasurer submitted the financial statement and the entertainment secretaries submitted details of fixtures for the winter. The vice-chairman, who had represented the Association at the British Commercial Travellers' Association conference, gave a full and interesting report of this conference to the meeting. The secretary for the newly-formed Employment Register, submitted his scheme for working, and at the same time appealed to all present to assist him in his arduous task by letting him have all the information possible that might be of help to him and the Association in this connection. The vice-chairman strongly recommended the commencement of a Sick Benefit and Thrift Society and offered his personal assistance to anyone forming a local branch. The annual meeting was fixed for November 13th.

New London Municipal Showrooms.—On Thursday next the electricity departments of two Metropolitan boroughs are inaugurating new showrooms and offices.

The Hackney undertaking is opening its new premises in Lower Clapton Road, the Committee having decided not to let labour troubles interfere with the ceremony. An article on these premises by Mr. L. L. Robinson, the borough electrical engineer, was published in our issue of June 13th, 1924 (p. 952).

Poplar is the other authority concerned, and in this instance Mr. J. W. Beauchamp, Director of the British Electrical Development Association, is to perform the opening ceremony. The date marks the 25th anniversary of the inception of the undertaking. The new premises are situated in Bow Road.

Oversea Trade Interviews.—Mr. J. H. Henderson, O.B.E., Commercial Counsellor at Rome, will shortly be visiting this country and will attend at the Department of Overseas Trade, 39, Old Queen Street, S.W.1, from October 12th to 16th. Mr. H. A. N. Bluett, Commercial Agent at Batavia, will also attend at the Department from October 5th to 16th. United Kingdom manufacturers or traders desirous of meeting these gentlemen will be able to arrange appointments by communicating with the Comptroller-General of the Department, quoting, respectively, the references 5935 T.G. and 943 T.G.

Wiremen's Strike at Hackney.—On September 23rd the wiremen employed by the Hackney Electricity Department in the wiring of its new showrooms and offices ceased work owing, it is stated, to the employment of a jointer who was not a member of the Electrical Trades Union. An endeavour was made to involve the whole of the electricians in the Sales Department, but this was unsuccessful. Notices have been tendered stating that the whole of the E.T.U. members employed in the generating, distribution and maintenance departments of the undertaking will cease work this afternoon (Friday), at 3 o'clock. Emergency action is being taken to keep the station running, but it is feared that a strike may delay the completion of the new premises.

E.D.A. Conferences.—The first of the conferences organised by the British Electrical Development Association for the 1925-26 Session takes place on Thursday, October 15th, at 7.30 p.m., at the E.L.M.A. Lighting Service Bureau. Mr. W. E. Bush will deliver an address on "Modern Lighting," and Mr. C. W. Sully will preside. As the accommodation is limited and the subject is a popular one, it is intended to hold a second session on the following night, when Mr. Bush will repeat his address, with Sir Hugo Hirst, Bart., in the chair. We shall publish particulars of the complete programme of the session in our next issue, but it is important that our readers should note that for the events of October 15th and October 16th they must make personal application for tickets, stating on which of these two dates they desire to use them. Letters should be sent to the Association at 15, Savoy Street, Strand, W.C.2.

Road Transport Lectures.—A course of twelve lectures on various phases of modern road transport operation is to be given at the London School of Economics and Political Science, in co-operation with the Institute of Transport. The lectures will be delivered by well-known members of the transport industry on Wednesday evenings, commencing on October 28th.

Unemployment.—A further decrease in the number of unemployed was shown by the Employment Exchange registers on September 14th, the total at that date being 1,327,700, as compared with 1,345,455 a week earlier and 1,163,950 on September 15th, 1924. The Ministry of Labour is inaugurating an experimental scheme for the training of unemployed young men in various trades. Four centres are to be established.

Award for Petter Oil Engines.—Messrs. Petters, Ltd., of Yeovil, have received a communication from their Portuguese agents, Fabricas Vulcano e Collares Carlos Alfredo da Silva, Ltd., of Lisbon, that at the recent Caldas da Rainha Exhibition another gold medal was awarded to the "Petter" oil engine exhibit.

E.L.M.A. Illumination Design Course.—The Electric Lamp Manufacturers' Association has decided to hold its seventh illumination design course towards the end of the current month. The course, which is intended for contractors and wholesalers, will commence on October 27th and run for four days. As far as time permits, the course will cover the whole field of electric lighting from the making of lamps to the latest devices employed in the art of illumination.

Municipal Trading.—The subject of municipal retail selling was discussed on Monday this week at a meeting of the Council of the Birmingham Chamber of Commerce. The Retail Section Committee, in a report, recalled the action that the Chamber took some years ago to oppose the sale of electrical fittings by the Birmingham Electric Supply Department, with a successful result. In the last eighteen months the Corporation had opened a new showroom in Paradise Street for the sale of electrical fittings of all kinds. In response to representations made by the Electrical Contractors' Association, the Department agreed to allow its members a considerable discount on any sale, introduced by them, or on fittings fixed by them which had been bought direct by the consumer, and the Retail Section, many of whose members stocked portable apparatus, such as vacuum cleaners, electric fires, lamp shades, electric irons, &c., asked that they should not be subject to this competition by the Corporation, where it could be shown that they were *bona-fide* dealers in the articles stocked, unless at least they had the same allowance on introduction of customers as that enjoyed by the electrical contractors. Such a system was already in operation in other towns, and with rent and rates so high, the Retail Section contended that the municipality should not enter further into trading, but should confine its attention to furthering the supply of electricity. The Retail Section expressed regret that representations which it had made to the Department with a view to fair treatment for all classes of traders had been ignored. It asked the Chamber to help it to get the matter further considered. It was decided to give this support.

Social Event.—On September 12th, the whole of the employés of the Loughborough Corporation electricity works were present at a social evening which was held at the Great Central Hotel. The Mayor and other members of the Corporation were present, and an excellent entertainment was provided. A vote of thanks was accorded to Mr. R. B. Leach, the borough electrical engineer, for arranging the function.

Trade Announcements.—Messrs. W. & T. Lock, of Bath, who were the manufacturers of cabinets distributed by Messrs. Henry Joseph & Co., Ltd., now in liquidation, inform us that they are continuing the production of these cabinets under their own name. Mr. Henry Joseph has been retained as representative for London and the Southern and Eastern Counties, and he will have offices and showrooms at 96, Victoria Street, London, S.W.1.

The Autocar Electrical Equipment Co., of Mitchell Street, London, E.C., has been appointed service agent and depôt for spare parts and repairs to E.A. electric horns and windscreen wipers.

Mr. H. E. Mayhew, 5, Billiter Buildings, Billiter Street, London, E.C.3, has been appointed sole agent in the London district for Sir William Arrol & Co. (Swansea), Ltd., who manufacture structural steel work of all descriptions at Swansea.

Mr. Albert Illing has been appointed manager of the business of C. A. Vandervell & Co., Ltd., in Yorkshire, Cheshire and Lancashire. A C.A.V. depôt is shortly to be established in Manchester.

Messrs. W. G. Perry & Co., Ltd., have moved to 13, Whitcomb Street, Pall Mall East, W.C.2. Telephone: "Regent 1426."

Messrs. B. & G. G. Bell have commenced business in Lowther Street, Whitehaven, as electrical engineers.

Catalogues and Lists.—The Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—Descriptive Leaflet No. 71/8-1, dealing with liquid controllers with an automatic acceleration device for a.c. slip-ring motors.

Swedish General Electric, Ltd., 5, Chancery Lane, W.C.2.—Two illustrated pamphlets describing refrigerating plant made by the Century Electric Co. (United States).

The Kango Co., Ltd., 78, Petty France, Westminster, S.W.1.—An illustrated pamphlet describing the "Kango" electro-mechanical hammer.

Engineering and Lighting Equipment Co., Ltd., Sphere Works, St. Albans.—Two illustrated and priced folders advertising "Interzone" reflectors for shop-window lighting, and "Lunax" lighting units.

Messrs. Bruce Peebles & Co., Ltd., Edinburgh.—A reprint from the Electrical Review, dealing with the conversion of the Eskbank carpet mills of Messrs. Stewart Bros., to electric drive.

Autoveyors, Ltd., 82-84, Victoria Street, S.W.1.—A series of pamphlets dealing with "Clix" connectors, "Radio Condit," spiral and bridge condensers, &c.; illustrated and priced. Also a cardboard panel for demonstrating "Clix" connectors and "Radio Condit."

Veritys, Ltd., Aston, Birmingham.—Publication No. 988, a priced and illustrated catalogue of "Maxlume" lighting equipment for commercial, industrial and street-lighting applications.

The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.—Pamphlets dealing with (*a*) "Mazda" electric lamp outfits for decorative purposes; (*b*) the B.T.-H. table-lamp loud speaker; and (*c*) automobile electric lamps. Illustrated and priced.

Messrs. Blackstone & Co., Ltd., Stamford.—Publication No. 374, a booklet containing particulars and illustrations of various types of "Blackstone" oil engines.

Bruntons, Musselburgh, Scotland.—An illustrated booklet describing "Tru-Lay" wire rope and "Tru-Loc" fittings.

Messrs. L. Andrew & Co., 2, Whitworth Street, Deansgate, Manchester.—A priced pamphlet advertising "Wrendal" metal-filament and "Capella" carbon-filament electric lamps.

Mr. E. Rutherford Palmer, 40½, Bristol Street, Birmingham.—A booklet containing illustrated details of "Star" and "Eve" reflectors for interior and exterior lighting. Priced.

Cryselco, Ltd., Kempston Works, Bedford.—A catalogue and a series of pamphlets dealing with "Cryselco" opal-type lamps; and a brochure containing notes on interior and street lighting.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Catalogue Section H (3), containing illustrations and descriptions of the company's heavy electric cooking equipment.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—An illustrated and priced pamphlet dealing with "Isco" service cut-outs.

The Constructional Engineering Co., Ltd., Titan Works, Charles Henry Street, Birmingham.—Pamphlet No. 138, containing an illustrated description of the "Titan" steel barrow.

The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.—A priced and illustrated catalogue of secondary batteries for radio purposes. An appendix sets forth the characteristics of many makes of valves; explains the method of choosing a battery and rheostat, and gives notes on the care of batteries.

The Economic Electric, Ltd., 10, Fitzroy Square, W.1.—An illustrated catalogue of radio apparatus of all kinds.

Pope's Electric Lamp Co., Ltd., 5, Arthur Street, New Oxford Street, W.C.2.—A pamphlet advertising "Elasta" electric lamps.

Bankruptcy Proceedings.—J. E. Wild, Bark Street, Bolton, engineer and wireless merchant.—The public examination of this debtor was held at Bolton Bankruptcy Court, on September 23rd, the statement of affairs showing liabilities of £1,236, and a deficiency of £1,016. The debtor commenced the Bolton business in 1923, and was very successful up to last May. He then took up a new receiving set which was being placed on the market. It went well until the Wireless Telegraphy (Amendment) Bill was introduced. The sales for the week previous to the Bill were £150. In the succeeding week they dropped to £20. His overhead expenses for advertising, &c., averaged £28 to £30. The Bill had caused a slump just when he had got his set into the hands of wholesalers. The Deputy Official Receiver said that he could not credit the story that the threat of a Wireless Bill stopped the sale of this set and caused the failure. Wild said it was not the sale of this set only but the sale of most wireless sets which was interfered with. The examination was closed.

F. J. Tizzard and N. Tizzard, 102, West View Road, Barrow, carrying on business at Barrow and Dalton-in-Furness, under the style of Tizzard Brothers, electrical engineers and contractors.—These debtors appeared for their public examination at the Barrow Bankruptcy Court, on September 25th. The gross liabilities were £476, of which £425 was expected to rank and the deficiency £263. The failure was attributed to the loss on the Dalton shop and a bad season in Barrow. The examination was closed after the debtors had been questioned.

J. G. Penman, electrical engineer and contractor, 37, Bath Street, Glasgow.—A dividend is payable on November 2nd, at the offices of Messrs. Dunlop & Murray, 188, St. Vincent Street, Glasgow.

C. E. F. Parker, electrical engineer, Greendale, Privet Road, Gosport.—First meeting, October 5th, at the Official Receiver's office, 87, High Street, Portsmouth. Public examination, November 2nd, at the Court House, Portsmouth.

P. L. Symonds, electrician, 4, Nelson Road North, and 4, Victoria Road, Great Yarmouth.—Last day for proofs for dividend October 17th. Trustee, Mr. C. B. L. Prior, Official Receiver, 9, Queen Street Chambers, Norwich.

H. Parr, electrician, 2, Strawberry Dale Square, and 1, Back James Street, Harrogate.—Trustee, Mr. W. A. Thompson, 11, King's Road, Harrogate, released August 19th.

S. L. Babty and N. Miles (Wireless Instrument Manufacturing Co.), wireless instrument manufacturers, Avenue Works, Avenue Road, Willesden Junction, N.W.—Last day for proof for dividend, October 7th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

F. P. Crawley, electric, radio and motor-car engineer, 6, Darwen Street, Blackburn.—Last day for proofs for dividend October 9th. Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester.

Company Liquidations.—Robins Wholesale Electrical and Wireless Co., Ltd., Fanny Street, Cardiff.—A further meeting of creditors was held recently. At the statutory first meeting of creditors a statement of affairs was submitted by the liquidator, Mr. S. E. Clutterbuck, 31, Queen Street, Cardiff, disclosing liabilities of £4,261 and net assets of £595, leaving a deficiency as regarded the creditors of £3,666. The issued capital amounted to £999. It appeared that the debenture holder had appointed a receiver, who was in possession of the assets. At the further meeting of creditors it was resolved that the creditors should recommend the continuance of the voluntary liquidation with Mr. Clutterbuck as liquidator and that he should be instructed to make a close investigation into the whole dealings of the company. It was also decided

hat the creditors should be asked to contribute in cash to he costs of the investigation on the basis of 5 per cent. on he amount of the account of each creditor. An advisory committee was also nominated consisting of Messrs. Corfield and Cripwell, Birmingham, Mr. C. J. Neale (Siemens & English Electric Lamp Co., Ltd.), Mr. T. Ridout (General Electric Co., Ltd.), the Marconiphone Co., Ltd., and Messrs. Popple-on & Appleby, of Birmingham.

Milligan's Wireless Co., Ltd., Sauchiehall Street, Glasgow.—A meeting of creditors was held recently, when a statement of affairs was submitted which showed liabilities of £2,388, all due to unsecured creditors. The net assets were given as £344, leaving a deficiency of £2,044. The company was incorporated in 1923, with a share capital of £3,525, to take over an existing business. Capital to the extent of £1,000 was subscribed in cash, and the balance was represented by the purchase price of the business, plus £500 goodwill. The company was originally in premises in Renfield Street, but were obliged to remove to their present address, which cost them a considerable sum, and also disorganised their business for a time. The following year a branch was opened in Bath Street, which venture proved disastrous. It appeared that large losses had been incurred every year on bad debts. Loss due to fire amounted to over £600, but the company had difficulty in proving the loss to the insurance company owing to the absence of a stock book. It was decided to confirm the voluntary liquidation of the company, with Mr. E. S. McFarlane, C.A., 53, St. Vincent Street, Glasgow, as liquidator, while an informal committee was also nominated.

Tele-Dis Services (Founders' Co)., Ltd.—The liquidator, Mr. G. D. Pepys, reports that the liabilities of this company, which was organised to carry on a telephone-disinfecting service, amount to £17,856, and the assets to £94. Thousands of contracts were entered into all over the country. The company's failure is attributed to the heavy advertising expenses, cost of distribution of products, lack of capital, and the general depression in trade.

P.S. Wireless Manufacturing Co., Ltd.—Particulars of claims to be sent by October 31st to the Liquidator, Mr. E. Webb, 34, Grand Parade, Brighton.

Private Arrangements.—S. C. Coley, trading as the Torbay Electrical and Wireless Co., 23, Victoria Parade, Torquay, wireless and electrical engineer.—The creditors interested herein were called together recently at the offices of Messrs Ware, Ward & Co., Torquay, when it was stated that the total liabilities were £2,980. The net assets were valued at £310. It was reported that the debtor commenced business in April, 1924. He had no capital, but obtained a guarantor to the bank, and that guarantee was still in existence for the full amount of the bank overdraft. Debtor had from time to time had balance sheets prepared, and on each occasion substantial losses had been shown. The deficiency was accounted for by loss on trade, debtor's drawings, and depreciation. Debtor was not in a position to submit any offer to the creditors, but the gentleman who was the bank guarantor and also a cash creditor consented to discharge the bank overdraft and withdraw his own claim against the estate on condition that the creditors agreed to a deed of assignment. The creditors resolved that, subject to the bank's claim and the cash claim not ranking for dividend, the debtor should be requested to execute a deed of assignment to Mr. Arthur Collins, C.A., Torquay, as trustee, with a committee of inspection.

R. H. Welsh, electrical engineer, Exeter Road, Bootle.—A meeting of creditors was held recently at the office of Mr. J. H. Hort, I.A., Liverpool, when a statement of affairs was presented which showed liabilities of £310, all due to unsecured creditors. The assets were estimated to realise £144, leaving a deficiency of £166. It was reported that the debtor commenced business in October, 1922, with £50 capital, borrowed from his father, of which £40 had since been repaid, and capital of his own amounting to £93. Complete books of account had not been kept, and no details of the turnover were available. It was decided to adjourn the meeting to enable the debtor to approach his father with a view to the latter's making an offer of 10s. in the £ to the creditors. At the resumption of the meeting it was reported that certain moneys had been handed over, and it was now possible to assure the creditors a composition of 10s. in the £, payable as to 5s. in cash and 5s. in three months. The offer was accepted, and the deed of assignment already executed in favour of Mr. J. H. Hort, 24, St. Thomas Street, Liverpool, was confirmed.

Dissolutions of Partnership.—P. Vaughan & Co., electrical engineers, 57, Fetter Lane, E.C.—Mr. S. P. Storey and Mr. W. H. Matthews have dissolved partnership. Mr. Storey will attend to debts and continue the business under the same style.

Royal Accumulator Co.—Mr. W. Johnson and Mr. J. Ingham have dissolved partnership. Mr. Johnson will attend to debts.

North Wilford Power Station.—We are informed that nine "Maxtorq" totally-enclosed squirrel-cage motors, of 75 b.h.p. at 720 r.p.m., were supplied to the Nottingham Corporation by the Lancashire Dynamo & Motor Co., Ltd., to drive the coal crushers; two of them appear in fig. 7, p. 460, of our description of the North Wilford power station. The a.c. machines driving the fans (fig. 6, p. 460) were also supplied by this company, in connection with Messrs. Davidson & Co.

British Manufacturers and Australian Tariffs.—The Sydney (N.S.W.) correspondent of the *Daily Telegraph* states that a recent meeting of the Australian Association of British Manufacturers and representatives directly concerned with the interests of British trade with Australia, passed a resolution stating that, while fully appreciative of the advantages accruing to British trade from the Commonwealth Government's maintenance of the principles of preference in the recent tariff proposals, the high duty on articles affecting the textile and engineering trades proved a serious blow to British trade in general with Australia. The Association felt that the increased tariff on British goods would prove an obstacle to further inter-Imperial relationships. It suggested that consideration should be given to the question whether relief could be granted to British trade.

A New Phase in Show-window Illumination.—The modern shopkeeper has long realised that good window lighting is a most effective form of advertising, and for some time past the managements of well-known shops and stores have adopted higher intensities of light for the illumination of their show windows. It may be said, however, in this direction that Messrs. Canda, Ltd., of Oxford Street, have created a precedent in show-window illumination. The illustration herewith is from a photograph of a window in their new Oxford Street emporium, taken by the window lighting alone, at midnight. The excellent illumination is the result of a system of lighting



The Lighting of an Oxford Street Show Window.

combining "Gecoray" reflectors and 500-watt bowl-sprayed white "Osram" gasfilled lamps. It is claimed that this is the first time in the history of illumination in this country that 500-watt gasfilled lamps have been used on a large scale for this purpose in individual silvered-glass reflectors. Before the high-wattage lamps were permanently installed in this establishment, exhaustive tests were carried out upon a number of "Gecoray" reflectors, designed to accommodate either 300- or 500-watt gasfilled lamps, with a view to determining whether they would successfully withstand the additional heat generated. The results of the tests proved that the reflector was entirely unaffected by the heat, and that it did not crack, peel, or tarnish.

From the crowds of pedestrians who gather nightly round the windows of Messrs. Canda, Ltd., it is apparent that not only is the beauty of the displays enhanced by the use of the high intensity of light, but that light as "The Silent Salesman" is more than justifying itself. It should be particularly noticed that shadows are totally eliminated. The consulting engineers in connection with the work were Messrs. Albion T. Snell & Partners, and the electrical work of the whole installation, as well as throughout the interior, showrooms, &c., was carried out by Messrs. Francis Polden & Co., Ltd., who are to be congratulated upon the excellence of their work in connection with this notable achievement.

New Indian Company.—The Shree Bhawani Maratha Mills & Electricity Supply Co. is a combined textile-manufacturing and electricity supply company recently formed at Barsi with a capital of 15,00,000 rupees.

The Salonica International Fair.—This Fair, which was to have been held during the current year, is to be held from May 15th, 1926, for a period of two or three weeks. Applications for space, &c., should be made to the Fair offices, 11, Papakiriazi Street, Salonica, by January 15th next.

Chinese Electrical Notes.—The *Chinese Economic Bulletin* states that the imports of electrical materials and fittings during 1924 were valued at 4.22 million Haikwan taels (£772,000 approx.). The slight decrease from the previous year's figure is considered to be due to the lower prices engendered by competition. Trade in this class of goods is well maintained, although competition is severe. The discontinuance of bulk supplies from the Shanghai municipal power station, during the recent strike, involved the shutting down of 1,425,000 spindles in cotton mills.

The Question of Government Aid for Industry.—The following comments appearing in *The Times* editorial City Notes, and discussing "the industrial perspective" and "Limits to Government Action," are worthy of consideration by all our readers:—"In opening the Motor-cycle Show at Olympia, Sir Burton Chadwick, M.P., Parliamentary Secretary to the Board of Trade, drew a picture of the industrial situation with a better sense of perspective than some of our industrialists are prone to do. He did not deny that there was grave cause for the gloomy forebodings of those engaged in some of our most important unsheltered industries; but the motor-cycle industry was not one of them. The history of that industry since the war was a fine story of enterprise, ingenuity, pluck, and good British workmanship. It had recovered its competitive power in oversea markets, especially in Australia. In 1920, he pointed out, Great Britain exported 21,000 motor-cycles and America 37,600. In 1924 that position was completely reversed: Great Britain exported 37,000 and America 16,800. This showed that the industry, which was fully employed, had by its own efforts worked with such purpose that its product was supreme in the home market, and was rapidly ousting its competitors in the foreign markets. It was not a case of 'muddling through,' but of carefully-thought-out plans, unremitting hard work, and co-operation amongst all concerned. No one will deny that this is the best basis on which to build up the supremacy of any industry. It conforms to Nature's law of the survival of the fittest. When things go badly, many people are apt to clamour that the Government shall do something. All experience goes to show that legislation has done more to hinder trade than to assist it. The main function of Government is to keep law and order, to look after the foreign affairs of the nation, and to administer with the utmost economy the nation's finances. The Government is not in a position to know a business as well as those engaged in it. Consequently, unless there is virtual unanimity as to the merits of a particular legislative project put forward by those engaged in a particular industry, the Government must act warily and with great caution. Even when unanimity is present the Government has to assure itself that by passing legislation with the object of benefiting one industry, it will not be doing more harm in the aggregate to others."

The Metric System in Argentina.—The Argentine Ministry of Agriculture has sent a notice to public auctioneers calling their attention to Article 18 of the regulations supplementing the law governing weights and measures in Argentina. This article provides that "persons who, in private contract, in books or commercial documents, public placards, or advertisements, employ denominations of weights and measures not authorised by the law shall be punished by fine." This article therefore prohibits the use of weights and measures not comprised in the metric system. *Commerce Reports* says that although this notice is addressed to auctioneers, it would seem applicable as well to manufacturers' catalogues. No ruling has yet been published as to the use of other measurements in cases where the metric equivalents are shown, but it is probable that no objection will be made if both units appear.

Threatened Tramway Strike at Salford.—The dispute at Salford regarding the employment of non-unionists in the Tramway Department was settled last week, the remaining man concerned having agreed to join the Transport and General Workers' Union.

Russian Electrical Imports.—A German commercial newspaper states that the imports of electrical goods into Russia during the five months from October, 1924, to February, 1925, were valued at 3,821,000 gold roubles, as compared with 1,936,000 roubles in the equivalent period of 1923-24. Included in this total were dynamos and motors, 756,000 roubles (as against 326,000); electrical appliances, 1,980,000 roubles (783,000 roubles); and incandescent electric lamps, 1,085,000 roubles (827,000 roubles). Germany's share of the total was valued at 2,117,000 roubles, as compared with 1,831,000 roubles.

Local Exhibitions.—Salford.—The exhibitors participating in the Salford Corporation electrical exhibition which concluded on September 24th were:—The British Electric Transformer Co., Ltd.; the British Thomson-Houston Co., Ltd.; the Edison Swan Electric Co., Ltd.; the Jackson Electric Stove Co., Ltd.; the Metropolitan-Vickers Electrical Co., Ltd.; the General Electric Co., Ltd.; the Hotpoint Electric Appliance Co., Ltd.; and Messrs. Ward & Goldstone, Ltd.

A radio exhibition was held at the Philharmonic Hall, Liverpool, last week, concluding on Saturday last. A comprehensive display of radio sets and components was arranged, and the public was permitted, by the courtesy of the B.B.C., to inspect the latest type of microphone used for studio work. The Liverpool Wireless Society explained and demonstrated the actual construction of wireless sets at one stall, and at another were sets made by the members. Altogether there were 26 stalls, in addition to the Wireless Society's workshop. The main trade exhibitors were:—C. Lucas (Hobbies Dept.); Jake Graham; Liverpool Radio Supplies; M. Stanley & Co.; Central Electrical and Radio Co.; F. H. Middleton; F. W. Mason; S. G. Brown, Ltd.; Sefton Electrical Co.; Brown Bros.; the British Radio Manufacturing Co.; Sel-ezi Wireless Supply Co., Ltd.; Walter C. Barraclough; James G. Ivory; John Banks & Sons; John Gaunt; F. D. Phillips; Makerimport Co.; J. D. Wireless Co.; Harding, Holland & Fry, Ltd.; the Silvertown Co.; the Wireless League, Liverpool; Radiovim, Ltd.; and the Gil-Ray Trading Corporation.

Fleetwood.—A successful exhibition of electric cookers and domestic appliances was held at Fleetwood last week. The results were good, orders being booked for 104 cookers, in addition to radiators and grills. It has been decided to arrange another exhibition next autumn.

Leicester.—At the All-Electric Exhibition which is to be held in the Junior Training Halls from October 8th to 17th, there will be a special display of good and bad lighting methods organised by the Electrical Association for Women. The fittings, we understand, have been arranged in co-operation with Mr. Beauchamp, of E.D.A. and the E.L.M.A. Lighting Service Bureau. On the opening day, Miss F. Hodge, of the E.L.M.A. Bureau, will lecture on "Home Lighting," and during the whole of the following week commencing from Monday October 12th, Miss Margaret Partridge will give a lecture each afternoon, with demonstrations on the following subjects:—The Live Wire—Mending fuses, &c.; What Electricity can do; Cooking by Electricity; Electric Radiators; and The House Without a Servant. The lectures have been arranged in co-operation with Mr. Smith, the city electrical engineer.

The Shannon Scheme Dispute.—Work has not yet commenced upon the Shannon hydro-electric scheme owing to the refusal of Messrs. Siemens Schuckert, the contractors, to pay the rates of wages demanded by the Irish Transport Workers' Union. The union rate for unskilled labour is 1s. 1d. per hour for a week of 48 hours, whereas the contractors offered 8d. per hour for a 50-hour week. A later offer by the firm provides for a flat rate of 32s. for a 50-hour week, with free quarters, and food at special prices.

New Zealand's Electrical Imports.—In a review of the imports of New Zealand during the first half of the current year, the *Board of Trade Journal* states that while the United Kingdom increased its business in a number of directions it lost ground considerably to the United States in, *inter alia*, electrical machinery and appliances. The actual figures are not yet available.

British Trade Mark Applications. — The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from September 23rd.

The Snake (lettering and design). No. 457,000. Class 8. Induction coils for use in radio-telephony and telegraphy.—R. V. Langbart, trading as the London Wireless Co., 3, London Road, Liverpool.

Tangent. No. 458,044. Class 8. Inductance coils, coil holders, rheostats, low-frequency inter-valve and telephone transformers, high-frequency transformers, variable and fixed condensers, thermionic valve holders, grid leak resistances, headphones, primary cells, crystal receivers and parts, all being apparatus or components of apparatus for use in radio-telegraphy and telephony. Pul-Syn-Etic-Electric (lettering and design). No. 460,983. Class 10. Electrical horological instruments.—Gent & Co., Ltd., Leicester.

Narron. No. 458,708. Class 8. Radio-telephonic instruments and apparatus, namely, rectifiers, detectors, condensers, telephones, loud speakers, amplifiers and electric gas discharge tubes. No. 458,709. Class 13. Electric incandescent lamps and their parts, electric light fittings, lampholders, and reflectors. No. 458,710. Class 16. Glass reflectors and globes.—Osram Gesellschaft, 11-14, Ehrenbergstrasse, Berlin, O.17. (British representatives Cruikshank & Fairweather, 65-66, Chancery Lane, W.C.2.)

Etherplus (lettering and design). No. 460,173. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—M. and A. Wolff, 9-15, Whitecross Street, E.C.1.

Hawk (lettering and design). No. 451,078. Class 8. Radio-telegraphy apparatus.—The Hawk Co., Ltd., St. Mary's Road, Surbiton.

Minstrel. No. 461,388. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—S. H. Taylor, 39, Hillmarton Road, Holloway, N.7.

Reltak. No. 461,264. Class 13. Terminals for electric lampholders, lamp sockets, and electric light fittings.—Mycromet Manufacturing Co., Clydesdale Work Street Works, Copsterhill Road, Oldham.

Magiclog. No. 459,486. Class 16. Electric fires.—Berry's Electric Co., Ltd., 85-86, Newman Street, W.1.

For Sale.—Worcester Corporation invites offers for two 95-h.p. Crossley gas engines and suction gas producer plants; Taunton Corporation Electricity Department, owing to change of system of supply, has for disposal surplus generating plant, &c. Messrs. H. Butcher & Co. will sell by auction on October 28th, at the London Auction Mart, Queen Victoria Street, E.C., valuable waterside properties situated at Stratford, E. Hull Corporation Electricity Committee invites offers for surplus generating sets. (See our advertisement pages to-day.)

Irish Free State Electrical Imports.—The imports of electrical goods and apparatus—excluding dynamos, motors, and other electrical machinery—during June last, amounted to £24,308, as compared with £27,126 in the similar month a year ago. The returns for the first six months of the year show a total of only £159,144, as compared with £216,902 in the corresponding half of 1924.

The Swiss Radio Industry.—Steadily increasing interest is being shown in radio-telephony and broadcasting in Switzerland. So far the bulk of the receiving sets in use have been imported but a home wireless industry is gradually being built up. One of the principal Swiss manufacturers is the Société Televox, of Neuchatel, which, in addition to two-, three-, and four-valve sets, is producing transformers and variable condensers. Apparatus under Marconi licences is also being turned out by Favarger & Co., of Neuchatel. The Fabrique Suisse d'Isolants, of Bretonbac, manufactures all classes of enamelled and bare wire and various insulating materials. The Société des Câbleries et Trefileries, at its works at Cossonay, turns out wires and cables from the smallest to the largest size, while the Société Leclanché, of Yverdon, is specialising on primary batteries for dull-emitters, h.p. batteries and condensers, the last being a class of goods which the company has supplied for many years to the Swiss telephone and telegraph authorities. Finally, it may be mentioned that the H. Weidmann Co., of Rapperswil, has a speciality in "Cornite" moulded insulation for valve sockets, &c.

Book Notices.—"The Electrical Contractors' Year Book, 1925-26." (Pp. 376.) London: The Electrical Contractors' Association (Inc.). Price 5s.—Apart from the doubling of the price, there is little change in this issue as compared with that for 1924-25, except in such matters of detail as must always be attended to in annuals of this kind. The legal section has been slightly revised and re-entitled "The Law of a Consumer's Right to the Supply of Electricity."

"Electro-Farming."—We have received copies of the first four issues of "Electro-Farming," a new monthly journal which has been started to deal solely with the application of electricity to agriculture and to rural industries. It is claimed that this is the only journal of the kind in existence, "although nearly a million farms use electricity." The editor is Mr. R. Borlase Matthews, Wh.Ex., whose experience both as an electrical engineer and as a practical farmer, combined with literary ability and enthusiasm for his subject, admirably fits him for the post. The purpose of the journal is "to record progress, to lead to improved methods of construction, and to stimulate the interest of both farmer and engineer in rural electrification." The first issue (dated June, 1925) contains articles on "Haymaking without Sunshine," "Wireless and the Farmer," "Electricity in the Farm Buildings," "Electric Ploughs for Small Fields," &c.; in later issues, in addition to electrical features, articles of general interest to farmers are inserted, and the standard set up in the first issue is more than maintained. Those who know the editor will not be surprised to learn that the decimal system of filing cuttings is described, and provision is made in the journal to facilitate filing, the classification reference number being printed at the head of each article. The journal is issued by Electrical Press, Ltd., price 4d., and should prove of great assistance in furthering the use of electricity in the country.

"High-Voltage Testing Equipments (1,000,000 V)," by E. T. Norris, A.M.I.E.E. (pp. 8; 6 figs.). Hollinwood (Lancs.): Ferranti, Ltd.—This brochure illustrates and describes the method of obtaining test pressures up to a million volts by use of three transformers in cascade. The construction of the transformers is detailed, and illustrations are given of million-volt arcs and discharges.

"Science Abstracts" (A and B). Vol. XXVIII. Part 9. September 25th, 1925. London: E. & F. N. Spon, Ltd. Price 3s. each.

"High-Tension Line Practice," by E. V. Pannell. Pp. xv+277; 124 figs. Price 22s. 6d. net. "The Principles of Sound Signalling," by M. D. Hart and W. W. Smith. Pp. 139; figs. 12. Price 12s. 6d. net. London: Constable & Co., Ltd.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIV. No. 9. September, 1925. New York: The Institute. $1.

"The Elements of Internal-Combustion Engineering," by T. Petrie. Pp. xi+236; figs. 61. Price 10s. 6d. net. "Photo-Electricity," by H. S. Allen. Pp. vi+320; figs. 43. Price 18s. net. London: Longmans, Green & Co., Ltd.

"Wireless Questions and Answers," by P. J. Risdon. Pp. 92. London: W. Foulsham & Co., Ltd. Price 1s. net.

Lead.—Reporting on September 26th, Messrs. James Forster & Co. stated:—"The general position is unchanged. There is still an acute shortage of prompt lead, which threatens to become worse next month, when the full effect of the shipping strike in Australia and South Africa is felt. The future of the market is difficult to read, as it is impossible to say what effect the settlement of the strike will have on prices. Although consumption is still large, particularly in the electrical trades, there is an indication that the home trade is not so busy. Consumption in Germany also is falling off, while in America the position is easier and forward lead is on offer. We still think that consumers should adopt a precautionary attitude, as a backwardation of over £3 a ton can hardly be regarded as healthy."

Electric Steel Production in Brazil.—The electrometallurgical works at Libeirao Preto (Sao Paulo) are nearing completion. The necessary electric power will be supplied by a hydro-electric works at Rio Mojos. The works will have a production of 60 tons of steel per day.

New Swiss Company.—A new company has lately been organised in Berne with the title Die Bern Radiogenossenschaft, to establish a new broadcasting station in that city.

Lighting and Power Notes.

Adwick.—Electricity Scheme Progress.—Under the Council's electricity scheme now nearing completion, a bulk supply will be taken from the Brodsworth and Bullcroft colliery companies. The Council's charge for lighting will be 5d. per kWh. A charge applicable specially to tenants of houses belonging to the colliery companies and to the Council will be made at the rate of 1s. 6d. per week for five points and 1s. 7½d. for seven points.

Australia.—Victoria.—Construction work on the transmission line from Melbourne to the Sugarloaf-Rubicon hydro-electric project of the Victorian State Electricity Commission is nearing completion. Until the hydro-electric works are completed, the line will be used for supplying electricity from Yallourn to the towns in the North-Eastern district of Victoria. Tenders will shortly be invited for the supply of plant for the hydro-electric project, and within two months it is expected that further tenders will be called for the construction of the water-races, pipe lines, and other works. The Sugarloaf-Rubicon scheme provides for the installation of generating plant with a total capacity of 40,100 h.p. The plant will be installed in the following six power houses:—Sugarloaf, 18,000 h.p.; Snobs Creek, 5,100 h.p.; Lower Rubicon, 3,600 h.p.; Rubicon, 12,000 h.p.; and two smaller ones at Royston and Rubicon Falls. The combined power houses will supply all the towns in the North and North-Eastern parts of Victoria and some of the New South Wales border towns.—*Reuter's Trade Service* (Melbourne).

Aylesbury.—Loans Sanctioned.—The Town Council has received sanction to a loan of £2,200 for converting plant in connection with the supply of electricity to the works of Hazell, Watson & Viney, Ltd., and also to £6,000 for the purchase of domestic apparatus to be let on hire.

Blackburn.—Year's Working.—We have received from Mr. P. P. Wheelwright, borough electrical engineer, a copy of his report, together with the statement of accounts, for the year ended March 31st last. The total income amounted to £162,283, and working expenses were £72,247, leaving a gross profit of £90,036, to which was added a grant from the Unemployment Grants Committee of £254, and the proceeds from the sale of old machinery of £1,370, making a total of £91,660. The previous year's figures were: Income, £152,166; working expenses, £69,223; gross profit, £82,943. The power of capitalisation of interest and suspension of sinking fund expired during the year, and consequently the full interest and sinking fund charges had to be borne. These amounted to £61,546 and £51,085 respectively, which, together with other charges, totalled £119,757, thus leaving a net deficit of £28,096. The capital expenditure during the year amounted to £124,592, the chief item being £75,698 for mains and distributing plant. The electrical energy sold increased from 17,237,626 to 21,843,041 kWh, and the maximum supply demanded from 10,170 to 12,496 kW. The average price per kWh obtained fell from 2.07d. to 1.74d. Work was commenced during the year on the laying of a transmission line between the Corporation electricity works and the Preston station.

Bradford.—Street Lighting.—The street-lighting tests now being carried out for purposes of comparison between electricity and gas involve, so far as the Electricity Department is concerned, 300-watt gasfilled lamps suspended from tramway standards designed for use on main roads, lamps of 500-watt capacity for the city centre, and lamps of 200 watts for the suburban streets.

Brighton.—Loans.—The Town Council has received sanction to a loan of £3,890 for the provision of a new switchboard at the North Road sub-station, and is applying for a further loan of £4,050 for mains and services in the Portslade area.

Mains Extensions.—The Electricity Committee is to carry out extensions to mains at an estimated cost of £4,200.

Builth Wells.—Inauguration of Supply.—The power station owned by the Builth Wells Electric Supply Co., Ltd., was formally inaugurated on September 19th. The plant consists of a 40-kW d.c. generator supplied by the Electric Construction Co., Ltd., driven by a 70-h.p. semi-Diesel engine by Messrs. Ruston & Hornsby, Ltd., and a 125-cell, 600-amp. battery supplied by Messrs. Pritchett & Gold & E.P.S. Co., Ltd. The switchboard was supplied by the Austin Lighting Co., Ltd., the overhead cables by Messrs. W. T. Henley's Telegraph Works Co., Ltd., and the insulators, &c., by Messrs. Bullers, Ltd. The resident engineer is Mr. J. B. Colbran.

Caterham.—Price Reductions.—The Urban Electric Supply Co., Ltd., announces that from October 1st the price of electricity for lighting will be reduced from 1s. per kWh to 10d. per kWh, subject to minimum charges of 12s. 6d. for the winter quarters and 8s. 4d. for the summer quarters.

Cheadle and Gatley.—Loans.—The Urban District Council has applied for sanction to loans of £6,286, £500, and £3,670, for extending its electricity supply to Adswood, High Grove Road, Gatley, and Styal Road. The electrical engineer has been asked to report on the advisability of applying for a Special Order to supply certain parts of Northern Etchells.

Continental.—Spain.—The Sociedad Canalizacion y Fuerzas del Guadalquivir, which was formed in Madrid last year, has secured a concession to utilise the water power of the River Guadalquivir at eleven different points between Cordoba and Seville and is to construct a hydro-electric power station with an annual output of 34 million kWh. The distribution of the power will be undertaken by the Compania Sevillana de Electricidad and the Sociedad Hidro-electrica de Chorra.

Switzerland.—The Société des Usines Electriques d'Olten-Aarburg recently decided to modernise its hydro-electric power station at Ruppoldingen on the Aar which has been in operation since 1896 and to change over the system of supply from two-phase, 40 cycles, to three-phase, 50 cycles. The old plant comprised ten Jonval-type axial turbines, developing 300 h.p., at 28.5 r.p.m. The contract for the work was given to the Société Motor Columbus, of Baden, for the electrical equipment and with the Société des Ateliers des Charmilles, of

Geneva, for the turbines. The Charmilles Co. has supplied nine vertical spindle turbines which develop 1,000 h.p. each at 94 r.p.m.

Italy.—Plans have been passed by the authorities for the erection of two new power stations capable of generating about 250 million kWh per annum. The cost of the construction, which is estimated at 100 million lire, will be defrayed by the Societá Elettrica Tridentina and associated enterprises.—*Reuter's Trade Service* (Milan).

A syndicate supported by the authorities of the four Italian provinces of Alexandria, Cuneo, Novara, and Imperia has drawn up plans for the utilisation of the water power of the River Tanaro. The scheme provides for the construction of five artificial lakes above the town of Ceva, and for five hydro-electric power stations, three of which would supply electricity in the Piedmont district and two in the Ligurian.

Falkirk.—Year's Working.—The report on the working of the Burgh electricity undertaking (engineer, Mr. T. M. Climie) for the year ended May 15th last, shows a total income of £32,093, as compared with £27,150 in the preceding year. Working expenses were £22,877, as against £20,559, leaving a gross profit of £9,216 (£6,591), to which was added a sum of £357, transferred from the reserve fund, making a total of £9,573. This was distributed as follows: Interest, £3,491; sinking fund, £5,089; property and income tax, £827; bad debts, £22; capital expenditure account, £144. The amount spent on capital account during the year, which included £15,782 for machinery, was £21,323. The sales of electrical energy increased from 3,303,340 to 4,356,469 kWh, and the maximum supply demanded from 2,200 to 2,380 kW.

Glasgow.—Progress during August.—The Corporation electrical engineer reports that 81 houses were wired during August, making the total to date under the scheme 1,180, and that the number of applications for the hire of appliances was 149, making the total 7,433.

Electricity Meters.—The Electricity Committee has recommended the introduction of pre-payment "penny-in-the-slot" meters into houses of tenants who have been displaced from slum properties under clearance schemes of the Corporation, the engineer to make the necessary arrangements with the Housing Committee.

Gravesend.—Loan.—The Corporation is applying for sanction to a loan of £39,858 in connection with the second 5,000-kW extension.

Irish Free State.—Newcastlewest (Co. Limerick).—The Town Commissioners propose to extend the electric lighting of the town, and have requested the local electric lighting company to prepare an estimate of the cost of the electric cables required for the purpose. The Commissioners are prepared to obtain a loan for the carrying out of the necessary extensions.

Kettering.—Year's Working.—The accounts of the Urban District Council's electricity undertaking (engineer: Mr. W. A. Walker) for the year ended March 31st last show a total income of £42,361, as compared with £37,592 in 1923-24. The working expenditure was £24,866, as against £19,807, leaving a gross profit of £17,496 (£17,785). After deducting capital charges there was a net surplus of £2,640. This was added to a balance of £9,722 brought forward from the preceding year, and £4,501 was appropriated for capital purposes, £1,080 contributed to the district rate, and the remainder carried forward. The sales of electrical energy increased from 3,932,134 to 4,502,400 kWh.

Leeds.—New Plant.—A new 26,000-kW stator, weighing 50 tons, was delivered at Leeds on September 24th and conveyed to the electricity station by a special wagon belonging to Messrs. H. Bentley & Co., Ltd., of Bradford. It was made by C. A. Parsons & Co., Ltd.

Llandovery.—Electricity Scheme.—The Urban District Council has given Messrs. Reynolds, of Swansea, permission to erect a power station in the town and to erect overhead cables to carry current at 220 V. A crude oil engine will be installed at the power station.

London.—St. Pancras.—The Borough Council has received sanction to a loan of £2,464 for additional coal handling plant at King's Road generating station.

Hammersmith.—The Electricity Committee has recommended to the Borough Council that extensions to the condensing water plant at the electricity works be carried out at an estimated cost of £18,695, and that the scheme be submitted to the Electricity Commissioners for approval.

Manchester.—Progress during July and August.—During the months of July and August the Corporation electricity undertaking showed an increase in connections of 3,208 kW, bringing the total to 268,349 kW; and the number of applications received for supply, including existing consumers for additional supplies, was 1,474, representing a total of 4,037 kW. The number of consumers connected increased by 533, and the number of hired cookers connected by 151, bringing the total actually on circuit to 932. Applications for the hire of cookers totalled 135.

Mansfield.—Electricity Supply.—The Corporation Electricity Committee has recommended that a supply of electricity be given to Rainworth. It is also recommended that the Corporation bear the initial cost of wiring and installing services, the consumer paying an increased charge per kWh to cover the cost of installation.

Northern Ireland.—Kilkeel (Co. Down).—The Rural District Council has given notice of its intention to apply to the Electricity Commissioners for Northern Ireland for a Special Order, authorising it to supply electricity in Rostrevor. It is proposed to lay mains in the district within two years from the receipt of the Order.

Oldham.—Loan Sanctioned.—The Town Council has received sanction to loans of £50,000 for mains and £15,000 for transformers.

Romsey.—Electricity Supply.—At a recent meeting of the Town Council it was reported that the Committee had been unable to make satisfactory terms with Christy Bros. and Co., Ltd., for a supply of electricity to the borough, and was in communication with Southampton Corporation and other bodies with a view to obtaining a supply.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising Southampton Corporation to supply electricity in certain parishes in the rural district of South Stoneham.

Application has been made by the Midhurst Brick Co., for an Order to supply electricity in certain parts of the rural districts of Midhurst and Westhampnett, and Major C. H. B. Prescott-Westcar has applied to the Commissioners to amend the Wiltshire Avon Electricity Order so as to include the district of Morgan's Vale and Woodfalls.

Tanfield (Durham).—Inauguration of Supply.—The Urban District Council's electricity scheme was inaugurated on September 23rd. The contractors for the overhead line, which is 14 miles long, were Messrs. Gray Brothers (Newcastle), Ltd., and the underground cable for 6,000 V, 1½ miles in length, was laid by Messrs. W. T. Henley's Telegraph Works Co., Ltd. Two transformer stations have been erected, one at Burnopfield and one at Tanfield Lea, at which points the energy is reduced from 6,000 V to 440 and 250 V.

Thornton-le-Fylde.—Electricity in Bulk.—At a meeting of the Urban District Council on September 17th, it was stated that the final terms had now been arranged with the Blackpool Corporation for the supply of electricity in bulk, and an effort was being made to secure an early supply for consumers.

West Ham.—New Electricity Charges.—The Borough Council has approved the following new electricity charges, submitted by the electrical engineer:—Multi-part tariff: A fixed charge per lamp varying from 8s. per annum, or 8d. per month for the equivalent of three 60-watt lamps installed to 4s. 4d. per annum, or 4½d. per month for the equivalent of 16 60-watt lamps installed, with an additional charge of 1d. per kWh for energy consumed for lighting, heating, and cooking. These charges include meter rent, and will be subject to a discount of 5 per cent. for prompt payment. No account will be taken of any points installed for heating or cooking purposes. Domestic house installations: A charge of 5s. or 6s. per point per annum, according to the period allowed for repayment of a loan of £5,000 which has been applied for to cover requirements under the scheme for two years. The charge covers the complete installation with plain shades, service cable, &c., and includes maintenance.

Weymouth and Melcombe Regis.—Year's Working.—The accounts of the Corporation electricity undertaking (engineer: Mr. G. Nicholson) for the year ended March 31st last record a total revenue of £26,551, as compared with £25,494 in 1923-24. Working expenses increased from £16,563 to £18,410, leaving a gross profit of £8,142, as against £8,931. After deducting capital charges, &c., there was a net surplus of £1,034, as compared with £2,392 in the preceding year. The capital expenditure during the year amounted to £18,678, the chief items being £9,373 for machinery and £8,371 for mains and services. The sales of electrical energy increased from 1,431,808 to 1,585,039 kWh, and the maximum supply demanded from 713 to 873 kW.

Wirral.—Electricity Scheme.—The decision of the Rural District Council not to accept the offer of electricity from Birkenhead but to proceed with its own scheme, will shortly give employment to 600 men in laying cables from Wallasey through the centre of Wirral to Ellesmere Port. It is hoped that some districts will have a supply before Christmas. In all, nine sub-stations will deal with the supply. It is estimated that before the end of two years 2,000 houses, as well as factories and institutions, will be receiving a supply. The policy is to avoid overhead distribution wherever possible.

Tramway and Railway Notes.

Australia.—N.S.W. Railway Electrification.—According to the *Industrial Australian and Mining Standard*, the preliminary work in connection with the electrification of the Sydney suburban railway system is nearing completion, and on August 2nd the final section of the quadruplication of the Illawarra line, between Rockdale and Hurstville, was opened for traffic. The Illawarra suburbs are now served with four tracks for a distance of nine miles, and further improvements will be effected in the train services, prior to electrification.

It is proposed that the new electric trains shall consist of units of two, four, six and eight cars, made up of motor and trailer cars alternately. The N.S.W. railway authorities state that the electrification of this railway line is making good headway. Already satisfactory progress has been made with the erection of overhead wires, signal boxes, and bridges. It is expected that electric trains will be in operation between Sydney and Sutherland by about June of next year.

Bournemouth.—New Cars.—The Corporation is to purchase 20 new tramcars.

Bradford.—Motor-Omnibuses.—The Tramways Committee has appointed a sub-committee to consider proposals for running motor-'bus services in districts between tramway routes as feeders for the tramways.

Brazil.—New Railway.—*Commerce Reports* states that a concession has been granted by the State Government of Minas Geraes to Messrs. Armando Carneiro and Phillip A. Burton, for the construction and operation of a steam or electric railway between Uberaba and Porto Feliz, a distance of approximately 400 km. The line is to be of 1-metre gauge.

Cardiff.—Year's Working.—The report on the working of the Corporation tramway undertaking (manager, Mr. R. L. Horsfield) for the year ended March 31st last, shows a total revenue of £284,155, as compared with £280,867 in the previous year. Working expenses amounted to £211,399, as against £201,993, leaving a gross profit of £72,756 (£78,874). After deducting capital charges, &c., a net surplus of £43,479 remained, of which £22,248 was contributed to the borough fund. The previous year's working resulted in a surplus of £39,314. The number of passengers carried increased from 41,123,280 to 42,985,404, a record for the undertaking, and the car-miles run from 3,012,626 to 3,220,186. The average traffic revenue per car-mile fell from 22.02d. to 20.74d.

Continental.—Austria.—According to *Commerce Reports*, preliminary plans for the electrification of the Austrian lines from Salsburg to Woergl and from Kufstein to Brenner are well under way. The Austrian Siemens-Schuckert-Werke has received an order for the construction and equipment of the sub-station at Feldkirch, and the construction of transmission lines from Ruetzwerk has been awarded to the A. E. G. Union and the Oesterreichische Bergmann-Elektrizitätsgesellschaft. The last concern is also constructing the cable from Bludenz to Feldkirch. Seven fast mountain passenger locomotives have already been shipped and are in operation between Innsbruck and Bludenz. In addition, 20 passenger locomotives have been ordered, of which 19 are already furnished. Twenty freight locomotives have been supplied and are in operation, and four fast freight locomotives for use in the valley are under construction. The total expenditure on this scheme during the second quarter of 1925 amounted to 8,525,000 schillings.

Italy.—According to *Modern Transport*, the first Italian underground railway was inaugurated at Naples on September 20th. The cost of the line was 115 million lire, and the length is 13 km.

Ilford.—Year's Working.—The report of the manager of the Urban District Council's tramway undertaking (Mr. L. E. Harvey) for the year ended March 31st last shows a total revenue of £68,036, as compared with £66,618 in the preceding year. Operating expenses amounted to £57,676, as against £57,199, leaving a gross profit of £10,360 (£12,434), to which was added rent from leased line (East Ham) and other items, making a total of £14,286. After deducting capital charges, there was a net surplus of £1,044, as compared with £2,480 in 1923-24. The number of passengers carried increased from 11,953,336 to 13,618,970, and the car-miles run from 926,183 to 958,058. The revenue per car-mile fell from 17.26d. to 17.04d.

India.—Bombay Railway Electrification.—According to *The Times Trade and Engineering Supplement*, contracts have been signed by the Bombay, Baroda, and Central India Railway with British firms for the supply of rolling stock and for the construction of equipment in connection with the electrification of its suburban system. It is expected that the electrification of the 31 miles northward from Bombay terminus, covering the suburban traffic on this route will be completed by 1927. Work on quadrupling the lines as a preliminary to electrification is proceeding. The contract for the overhead equipment has been placed with Callender's Cable and Construction Co., and Messrs. Cammell Laird have been awarded the order for the rolling-stock consisting of 160 all-steel coaches of special design to suit Bombay suburban requirements.

The Western Ghat section of the Great Indian Peninsula Railway is expected to be completed by 1929.

Preston.—Year's Working.—The accounts of the Corporation tramway (general manager, Mr. H. Clayton) for the year ended March 31st last, record a total revenue of £84,917, as compared with £85,625 in the 1923-24. Working costs totalled £70,028, as against £66,212, leaving a gross surplus of £14,889 (£19,414). After deducting capital charges, &c., there was a net deficit of £1,693, as compared with a surplus of £3,549 in the preceding year. The number of car-miles run fell from 1,229,429 to 1,214,817, and the total revenue per car-mile rose from 16.715d. to 16.776d. The number of passengers carried increased from 14,549,749 to 15,052,428.

Tramway Improvements.—The Corporation Tramways Committee has considered the laying of double tramway lines in lieu of the existing single lines at various points and has recommended that application be made to the Ministry of Transport for consent to the scheme.

Salford.—Year's Working.—We have received from Mr. J. S. D. Moffet, general manager of the Corporation tramway undertaking, a copy of his report, together with the statement of accounts for the year ended March 31st last. The total income amounted to £520,978, as compared with £534,804 in 1923-24, and working expenses were £412,312, as against £399,222, leaving a gross profit of £108,666 (£135,681), to which was added the sum of £10,290 for interest on investments, &c., making a total of £118,956. This has been dealt with as follows: Payment to local authorities for running powers, &c., £27,355; interest and sinking fund charges, £71,576; repairs, &c., to property in Church Street, £271; special reserve, outside authorities, £7,750; relief of rates, £10,000; depreciation and renewals fund, £2,005. The last two items represent the net surplus for the year. The previous year's working resulted in a surplus of £42,202. All the above amounts embody the figures for the motor-omnibus services. The number of passengers carried increased from 80,365,747 to 81,652,275, and the car-miles run fell from 6,307,301 to 6,238,336. The average total revenue per car-mile rose from 18.784d. to 18.829d.

Telegraph and Telephone Notes.

Australia.—Telegraph and Telephone Estimates.—The estimated expenditure on Federal public works for the financial year 1925-26 shows an increase of £1,608,988 for the Postmaster-General's Department. For the construction and extension of telegraphs and telephones, conduits, underground wires, land, and buildings, £6,000,000 has been allotted to the Postmaster-General's Department.—*Reuter's Trade Service* (Melbourne).

Brazil.—New Radio Station.—A wireless telegraph station, employing the Telefunken system, has been opened at Salinas, 70 miles east of Para, under the supervision of the Brazilian Telegraph Department. The charge for the transmission of messages to foreign vessels is 10 fr. for any number of words up to ten, and 1 fr. for each additional word.

China.—Wireless Controversy.—An official of the Foreign Office has stated that a French company recently opened a wireless station at Mukden, but ceased operations following a Japanese official protest. In spite of this protest, Marshal Chang Tso-lin has granted the French company authority to continue operation. The Japanese Ambassador in Washington will soon be instructed to begin conversations with the United States Secretary of State with regard to the Chinese wireless situation in the hope of reaching a compromise. The Japanese and American Governments do not favour the Chinese proposal to float a loan for taking over all wireless interests in China; international joint management is suggested as a possible solution.—*Reuter* (Tokio).

France.—Strike.—M. Chaumet, Minister of Posts and Telegraphs, has taken severe steps to punish the leaders in last week's two hours' telephone and telegraph strike. Five employés who went round the offices and pulled down switches, throwing the telephone apparatus out of action, have been dismissed. Ten others who were active in advising their colleagues to stop work have been placed on the resting list, and about 20 other men and women employés who took a prominent part in organising the strike have been changed from one office to another in the provinces, or severely reprimanded.—*Daily Mail.*

Smyrna.—Telephone Concession.—A contract was recently signed by the Minister of the Interior, acting on the part of the Turkish Government, by which a concession for the installation and operation of a telephone system was granted to the municipality of Smyrna for a period of 35 years. The municipality has agreed to obtain sufficient capital to cover all expenses, and the system will provide service for 2,000 subscribers. The concessionaire is obliged to complete the installation in the city of Smyrna within one year and three months of the procurement of the capital, and in the suburbs within two years. However, the terms of the contract authorise the municipality, upon the approval of the Minister of the Interior, to transfer the concession to a private company, provided the terms of the contract shall be observed by the transferee. The operation of the system is to be under the control of the Government, which has also retained the right to purchase the entire system and equipment within 15 years.—*Commerce Reports.*

The Telephone Service.—New Exchange.—A new telephone exchange has been opened at Cholsey, in Berkshire.

Theft of Cable.—Thirty-four London City telephones were out of order recently as the result of a theft of cable from street manholes by a gang of men.

Leeds Automatic Service.—The extension of the automatic telephone system to the suburbs of Leeds, as well as the big automatic central exchange, has been a long process, but is now practically completed, the new exchange buildings at Roundhay, Chapeltown, Headingley, and Stanningley being finished and the plant installed. Tests will occupy most of October, and the change-over is expected to be made early in November.

Radio Notes.

Birmingham.—New Plant.—It has been pointed out to us that it was hardly correct to describe the new transmitting plant at the Birmingham station, which was referred to in our September 18th issue, as having been built on similar lines to the plant at the Daventry high-power station. The apparatus in use at Birmingham is of a different manufacture from that at Daventry, and the actual circuit used is quite different, the water-cooled valve at Birmingham being a high-frequency magnifier, whereas the Daventry circuit is a modified choke-control circuit. The actual power in the aerial at Birmingham is 1 kilowatt, and at Daventry it is approximately 15 kilowatts. The new Birmingham transmitter is extremely compact and very easy to work, and from the reports that the B.B. Co. has received, it is a considerable advance on the set which it has replaced.

Ship's Wireless.—Wavelength Agreement.—By agreement between the British, Canadian, and United States Governments, merchant ships after October will cease operating their wireless apparatus on a wavelength of 300 to 450 metres when within 250 miles of the coasts of the three countries. The object is to prevent wireless broadcast programmes from being interfered with by Morse.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Ashford (Kent).—Urban District Council. Electricity meters. (See this issue.)

Australia.—Melbourne.—Postmaster-General's Department. Motor-generator sets for charging secondary batteries. (See this issue.)

Belgium.—October 7th. Belgian Ministry of National Defence, 10, Rue du Meridien, Brussels. Wireless telegraphy and telephony transmission and reception sets. Particulars for 4 fr. from the Cahier des Charges Special No. 583.

October 19th. Municipal authorities of Antwerp. Electric travelling crane at one of the dry docks. Particulars for 5 fr. from Hotel de Ville, Antwerp.

October 14th. Municipal authorities of St. Gilles, Brussels. Supply of a 2,500-kW turbo-generating set.

October 23rd. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Supply and laying of telegraph and telephone cables between Brussels and La Panne, Brussels and the German frontier at Hergenrath, Brussels and Lille, and between Brussels and Roosendael. Particulars for 9.50 fr. on application to Cahier des Charges Special No. 3-144.

October 7th. Supply and laying armoured telephone cables between Buggenhout and Baesrode. Particulars (Cahier des Charges Special No. 3-131) for 2.60 fr.

Birmingham.—October 8th. Board of Guardians. Electrical installation in the new extension of the nurses' home at Selly Oak Hospital. (See this issue.)

Edinburgh.—October 16th. Corporation. 12 electric tramcar trucks, electrical equipment of cars, and air-brake equipment. Specifications from the manager.

The Gas Department invites offers for the supply of steam-, motor- or gas-driven boosting plant at the Granton works. Particulars from Engineer, 15, Calton Hill, Edinburgh.

Edmonton.—October 13th. Board of Guardians. Electric lighting and power installation at Enfield House. (September 25th.)

Erith.—October 9th. Urban District Council. Cable, e.h.p., h.p., and l.p., dividing boxes, cable racks, &c. (See this issue.)

India.—India Store Department. October 14th. L.p. turbine-driven d.c. generating set, condensing plant, and accessories. (September 18th.)

Leeds.—October 20th. Tramways Department. 150 double-deck top covered tramcars complete, or, alternatively, 150 tramcar bodies, 190 tramcar trucks, including wheels and axles, 190 tramcar electrical equipments. (See this issue.)

Lichfield. — October 19th. Electricity Department. Transformers, switchgear, and cable connections; e.h.p. and l.p. cables, boxes, and roadwork; e.h.p. overhead transmission line. (September 25th.)

London.—London County Council.—Highways Committee. October 12th. H.p. and l.p. switchgear for Shoreditch L.C.C. tramway sub-station. (September 18th.)

Islington.—November 11th. Electricity Department. 3-phase, 6,000/6,600-V and two-phase or single-phase 2,500/2,000-V switchgear and accessories. (September 25th.)

H.M. Office of Works.—October 14th. Dismantling wiring and rewiring in conduit at Charity Commissioners' office, Ryder Street, W. (September 25th.)

Manchester. — October 7th. Electricity Department. One 10-ton hand-operated overhead travelling crane and gantry. Specifications from Mr. H. C. Lamb, manager, Electricity Department.

October 5th. Board of Guardians. Electric lamps required during year commencing October 1st, 1925. Forms of tender from Mr. J. Macdonald, clerk to Guardians, Union Offices, All Saints.

Newport (Mon.).—October 28th. Electricity Department. Electrically-driven pumps, pipework, valves, &c.; switchgear; water-screening plant. (See this issue.)

New Zealand.—Wellington.—Post and Telegraph Department. October 27th. Rubber-insulated wire.*

Public Works Department. November 24th. Neutral earthing reactors.*

December 8th. Steel transmission line supports for the Waikato power scheme.*

Rawdon.—October 5th. Board of Governors. Electric light installation at Mitchell Memorial Home. Specification, &c., from Mr. W. H. Brown, County Hall, Wakefield.

South Africa.—Johannesburg.—S.A. Railways. October 29th. Electric cables and wires.*

Cape Town.—October 14th. Electricity Department. Electric motors.*

Southend-on-Sea.—Light Railways and Electricity Department. House-service meters and demand indicators. (See this issue.)

Stoke-on-Trent.—October 12th. Electricity Supply Department. Two sets of steam air ejectors, and one centrifugal oil purifier. (September 25th.)

Switzerland.—Berne.—October 17th. Swiss Federal Railways. Supply and installation of three single-phase, 3,000-kVA transformers, switchgear, &c.; a similar equipment for the Freiburg transformer station; two 3,000-kVA transformers for the Kerzers transformer station; and three 3,000-kVA transformers and switchgear for the Burgdorf transformer station. Particulars from the Electrification Section of the S.B.B., Zimmer 166, 43, Mittelstrasse, Berne.

Uruguay. — Montevideo.—December 22nd. State Electricity Supply Works. December 28th. 200,000 metres r.i. wires and cables. 1,060,000 metres of special cable for outside use.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Adwick-le-Street.—Urban Council. Accepted:—
Wiring 380 houses for electric light (£2,772).—Building & Colliery Supply Co., Ltd. The highest tender was £6,174.

Barnsley.—Town Council. Accepted:—
Ash elevator and bunker for the electricity works (£880).—W. J. Jenkins and Co., Ltd.

Brighton.—Lighting Committee. Accepted:—
Two switchboard panels (£159).—Metropolitan-Vickers Electrical Co., Ltd.

Works Committee. Accepted:—
Installation of electric lighting at Corporation depôt in Hollingdean Road:—

Bostel Bros., Ltd. (Accepted.)	**£184**
Page & Miles, Ltd.	222
R. Garrett	236
J. Taylor	250
C. B. Pennifold	257

Devizes.—Town Council. Accepted:—
Installing electric light in the Town Hall (£103).—James Bros. Twelve tenders were received, the highest being £197.

Dunfermline.—Dunfermline Combination Home and Hospital Committee.
Electric lighting installation (£1,200).—Jas. Scott & Co.

Epsom.—Urban Council. Accepted:—
Overhauling and repairing the Diesel engine at the electricity works (£677).—Carels Diesel & Steam Engines (London), Ltd.

Glasgow.—Tramways Committee. Accepted:—
Graphite brushes.—Kay & Co. and Messrs. Birkbys.
Commutators.—P. R. Jackson & Co., Ltd.
Time recorder.—International Time Recording Co., Ltd.
Alterations to goods hoist.—Waygood-Otis, Ltd.

Greece.—Athens.—The Technical Commission appointed to examine the tenders for the supply of electric light and power to Athens and the Piræus has rejected the offers of the existing Greek Electric Light Company and accepted, with certain reservations, those of the group consisting of the Power and Traction Finance Co., of London, in conjunction with the Greek National Bank and other banks. The proposals of this group involve a loan of £2,000,000 under the Trade Facilities scheme.—*Reuter.*

Hornsey.—Electricity Committee. Recommended:—
Switchgear for 300-kW motor-converter at Muswell Hill sub-station.—Park Royal Engineering Co., Ltd.
Erection of crane and rails at Muswell Hill.—Herbert Morris, Ltd.

Ilford.—Electricity Committee. Recommended:—
Crane, gantry, and runway at Goodmayes sub-station (£218); crane at Gant's Hill sub-station (£105).—H. Morris, Ltd.
Kiosk and transformer at New North Road sub-station (£156 for kiosk and £118 for transformer).—Foster Engineering Co., Ltd.
1½ miles single cable, ½ mile 2-core cable, ½ mile 3-core cable.—Macintosh Cable Co., Ltd.
4 miles single cable.—Hackbridge Cable Co., Ltd.
6 miles single cable, 6 miles 3-core cable, 2 miles 4-core cable.—Deutsche Kabelwerke A.G.

Tramways Committee. Accepted:—
Trolley wire (10 1/16d. per lb.).—Frederick Smith & Co., Ltd.

Ipswich.—Electricity Supply and Tramways Committee. Accepted:—
15 single-decked trolley vehicles (£20,890).—Ransomes, Sims & Jefferies, Ltd.
15 do. do. (£20,940).—R. Garrett & Sons, Ltd

London.—Poplar.—Electricity Committee. Recommended:
4-panel switchboard (£309), and 200-kVA transformer (£215).—Johnson and Phillips, Ltd.

St. Marylebone.—Highways Committee. Recommended:—
Refuse destructor plant. One 200-kW steam generator set (£1,995).—Browett, Lindley & Co., Ltd.

Electricity Supply Committee. Recommended:—
D.c. and a.c. ordinary and prepayment meters for 12 months.—Chamberlain & Hookham, Ltd.; Ferranti, Ltd.

Manchester.—Electricity Committee. Accepted:—
6,600-V sub-station switchgear, Burnage, Bowker Vale, and Guide Bridge sub-stations.—Metropolitan-Vickers Electrical Co., Ltd.
Steam-heating plant, Oldham Road "B" and High Street sub-stations.—H. Tattersall, Ltd.
Constructional steelwork, Burnage sub-station.—Lambourne & Co., Ltd.
150 weldless steel lamp columns and fittings and 12,000 yd. 3 in. weldless-steel tubes.—British Mannesman Tube Co., Ltd.
15-ton and 2½-ton cranes.—H. Morris, Ltd.
1½-ton runway.—Vaughan Crane Co., Ltd.
6,600-V switchgear, Dickinson Street sub-station.—Ferguson, Pailin, Ltd.
12 months' supply of electric cooking ranges.—Jackson Electric Stove Co., Ltd.; Cable Accessories Co., Ltd.; Metropolitan-Vickers Electrical Co., Ltd.
12 months' supply of ironclad switches and cut-outs.—Edison Swan Electric Co., Ltd.; J. H. Tucker & Co., Ltd.; General Electric Co., Ltd.; Baxendale & Co., Ltd.
Spare armature with motor rotor.—Metropolitan-Vickers Electrical Co., Ltd.

Annual Stores Contracts. Accepted:—
Insulating cloth.—L. Andrew & Co.
Insulators.—J. Macintyre & Co., Ltd.; Taylor, Tunnicliffe & Co., Ltd.; Gaskell & Grocott; Doulton & Co., Ltd.; Bullers, Ltd.
Tapes.—Callender's Cable & Construction Co., Ltd.; Siemens Bros. and Co., Ltd.; J. Bonas & Son; Johnson & Phillips, Ltd.; L. Andrew and Co.
Cotton and silk covered wire.—Pirelli-General Cable Works, Ltd.
Tinned copper and tin fuse wire.—Concordia Electric Wire Co., Ltd.; L. Andrew & Co., Ltd.
Tinned steel binding wire.—Brunton, Ltd.

Central Purchasing Committee. Accepted:—
Lamps.—Drake & Gorham (Wholesale), Ltd.; W. E. Beardsall & Co., Ltd.; R. O. Brien & Co.; F. G. Ride & Co.; Hirst, Ibbetson and Taylor, Ltd.; Sloan Electric Co., Ltd.; Underwood (Manchester), Ltd.; Stella Lamp Co., Ltd.; B. I. & H. Cables, Ltd.

South Africa.—Ladybrand, O.F.S.—Town Council. Accepted:—
Electric lighting scheme (£16,250).—Siemens (South Africa), Ltd. The estimate includes power station buildings and 100 house connections with meters complete.

Southend-on-Sea.—Corporation. Accepted:—
Wiring 89 houses, for the Corporation housing scheme (approx. £500).—F. M. Burley & Co.

St. Albans.—Board of Guardians. Accepted:—
Installation of electric drive at the laundry (£102).—Messrs. Giffen.

Forthcoming Events.

Institution of Electrical Engineers (Western Centre).—Monday, October 5th. At the Swansea Chamber of Commerce. At 6 p.m. Inaugural address by the chairman, Mr. J. W. Burr.

(South Midland Students' Section).—Tuesday, October 6th. At the Queen's Hotel, Birmingham. At 7.30 p.m. Address by the Chairman, Mr. R. H. Rawll.

Junior Institution of Engineers (North-Western Section).—Monday, October 5th. At the Geographical Society's Room, 16, St. Mary's Parsonage, Manchester. Annual general meeting and address by the chairman, Mr. J. D. Porteous.

Institute of Transport.—Monday, October 5th. At the Institution of Electrical Engineers, Victoria Embankment, W.C.1. Presidential address by Col. Sir Joseph Nall, D.S.O., M.P.

National Association of Supervising Electricians.—Tuesday, October 6th. At the Junior Institution of Engineers, 39, Victoria Street, S.W. At 7.15 p.m. Presidential address by Mr. F. Gill.

International Motor Exhibition.—October 8th-17th. At Olympia, W.

Electrical Trades Commercial Travellers' Association.—Saturday, October 10th. At the Manchester Hotel, Aldersgate Street, E.C. At 7.30 p.m. Bohemian concert.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

Martin's fuses.
Barkay reflectors (photographic).
Zehnder magnetic chucks.

Notes.

Water Dispute at Chester.—A peculiar situation has arisen at Chester affecting the Corporation's hydro-electric works, due to the alleged wastage of water by a local firm's leaving its sluice gates open. The Electricity Committee points out that this wastage prejudices the efficient working of the electricity works; consequently the Town Clerk wrote to the firm concerned asking it not to use its sluices in such a way as to prejudice the rights of the Corporation. The firm replied objecting to being dictated to in a peremptory manner as to the way in which it should exercise its rights, and, whilst making a temporary concession, said that it would not be repeated. The Corporation is taking opinion of counsel on the subject.

The Electrical Trades Benevolent Institution.—The Annual Festival. — The President for this year, Mr. Edgar S. Barralet, has issued a letter stating that the Festival Dinner of this Institution will be held at the Trocadero Restaurant, on Wednesday, November 4th.

"The main object of this Festival," he says, "is to supplement and emphasise the appeal that I now have the pleasure of making to you for contributions to the funds of this Institution for carrying out the good objects as set out above.

"The ever-widening development in the field of electrical industry, with the greater number of people engaged in it, makes it certain that increased calls will be made on the funds of the Institution, and its ability to meet them depends on the generous support of those engaged in the electrical industry, and trades dependent on it for their prosperity.

"Should you not be able to attend the Festival, I would ask you to send your contributions to the Fund to me or to F. B. O. Hawes, Esq., at the above address.

"It would be a great kindness if you could have a copy of this appeal posted on a notice board in your offices, in order to give it as wide a publicity as possible."

The address of the honorary secretary, Mr. F. B. O. Hawes, is 98, Grosvenor Road, S.W.1. We believe that to take a ticket for the festival, though unable to attend it, is much less advantageous than to send a contribution to Mr. Hawes.

American Generator Explosion.—A generator explosion in the plant of the Lake Shore Electric Railway Co. at Avon, Ohio, on August 23rd resulted in a fire which destroyed the plant, causing a loss of $250,000. A dozen or more villages extending along the shores of Lake Erie for about 40 miles depended on the plant for their lighting service and were thrown into darkness. Interurban cars were held up. Energetic steps to restore power were at once taken, and by the following night the Ohio Public Service Co.'s Edgewater station at Lorain was tied in and service to all the communities affected was resumed.—*Electrical World.*

The Cycle Show.—The annual Motor Cycle and Cycle Exhibition was held as usual at Olympia, but at an earlier date this year, namely, from September 21st to 26th, the opening ceremony being performed by Sir Burton Chadwick, Parliamentary Secretary to the Board of Trade.

Electrical interest was confined to the accessories section, excepting one electric tricycle that was shown by the Argson Engineering Co., Ltd. It is intended for the use of invalids and the aged; it will proceed at graduated speeds of from one to seven miles per hour, will climb a gradient of one in five, and has a radius of from 35 to 40 miles on a single charge. A D.P. "Kathanode" battery of 56 ampere-hours capacity at 24 volts is carried on the main tubular steel frame of the chair beneath the seat. A small electric motor is mounted on the back axle and drives the two rear wheels through reduction and differential gear, totally enclosed and running in an oil bath. Steering, speed, and brake control are combined in one tiller with a stirrup handle; by swinging the tiller to the right or left the chair is steered as desired, by a twist of the stirrup handle the rider can cause the chair to proceed either forward or backward at graduated speeds, or bring into operation a gradual or powerful electric brake, the respective speeds and brakes being indicated by a clearly visible pointer. A band brake actuated by a long lever is conveniently disposed on the near side of the chair, and the equipment includes electric lamps and an ampere-hour meter.

Messrs. Allen-Liversidge, Ltd., became, as from September 1st, the sole concessionnaires for marketing in Britain and export purposes the well-known E.C.L. cast-aluminium electric and acetylene lamps for commercial and other vehicles. The dual-purpose lamp is the most recent product of the company's motor-cycle lighting department, and possesses several features. It is designed so that by one or two slight adjustments it can be used either with electricity or acetylene as the lighting medium. The reflector with which it is fitted is detachable with slight pressure and a twist with the fingers, and its removal reveals a Mangin lens permanently fitted at the back of the lamp's interior, through which the bayonet fastening (electrically wired) for the bulb projects. When the electric lamp is removed, a special burner-carrier fitted with an ordinary open (Roni) burner can be set in the same bayonet joint which previously held the electric lamp. The whole operation of changing over from electricity to acetylene, or *vice-versa*, is a matter of a couple of minutes, and at the back of the lamp, readily accessible to the rider's hand while travelling, is a small metal plunger which controls the focus of the headlamp, so that the width of beam may be altered from the normal long narrow beam to a broad beam of diffused light which clearly illuminates both sides of the road, is claimed to be non-dazzle in character, and is of assistance in fog and when taking sharp corners.

In the garage equipment section special attention is drawn to the company's oxy-acetylene equipment for repairs to accumulators, &c.

Magnetos, lighting and ignition sets, impulse starters, "Fabroil" silent timing gears, &c., were exhibited by the British Thomson-Houston Co., Ltd. The magnetos are

rotating-armature light-weight machines, a feature being that the main housing is die-cast in one piece around the laminated poles. The combined lighting and ignition sets manufactured by this company are of two types; in one a magneto and generator are mounted as a combined unit, while in the "Sparklight" set the current for lighting is derived from the magneto. In the first-mentioned sets a voltage is generated in the windings of the drum-type armature of sufficient value to start charging the 6-volt accumulator when a speed of from 10 to 12 miles per hour is attained; by fitting an automatic cut-out under the brush gear, wiring is reduced. Lamps of pleasing design and durable finish are supplied with each set, whilst the battery is of sufficient capacity, without the aid of the generator, to supply 8 or 9 hours' light continuously.

Messrs. Rotherham & Sons, Ltd., exhibited amongst other things the "Barnet" universal sparking plug terminal, which is instantly detachable from either the plug or the h.p. wire lead. It eliminates all nuts, washers, and ferrules, and is fitted in a few minutes without tools, forming a variable spark gap by the rotation of a fibre ring. The terminal forms a simple means of testing the ignition on any number of cylinders at the same time when the engine is working and turned by hand, and it will fit any sparking plug except Lodge "all-weather" and similar special types.

Electro-plating plant was exhibited by Messrs. W. Canning and Co., Ltd., and Graner & Wells, Ltd., and the following firms were also represented: Batteries, Ltd. ("NI-FE"); Robinson Engineering Works, Ltd. (K.L.G. plugs); Astra Dynamo Co., Ltd. (lighting sets); Lodge Plugs, Ltd. (sparking plugs); A.C. Sphinx Sparking Plug Co., Ltd.; Powell and Hanmer, Ltd. (lighting sets and lamps); North & Sons, Ltd. ("Halford" magnetos and speedometers); Lucas Electrical Co., Ltd. (magnetos and lighting equipment); C. A. Vandervell & Co., Ltd. (lighting and ignition plant); Rotax (Motor Accessories), Ltd.; and the M.L. Magneto Syndicate, Ltd.

A Volta Centenary.—Arrangements are already in progress by the Italian Associazione Nazionale Industrie Elettriche to celebrate in a suitable manner the centenary of the death of Alessandro Volta, which took place near Como on March 5th, 1827.

Lectures.—The first of a series of University extension lectures on "Electricity in Every-day Life" was given at Plymouth Technical School on September 25th by Prof. F. H. Newman. In the course of his lecture Prof. Newman said that if the scheme for building a series of eight central power stations was proceeded with, it was probable that Plymouth would be the site of one of them. Speaking of the generation of electricity by water power, he referred to Dartmoor as a possible source of much power of this description, and mentioned that under a scheme now abandoned it had been proposed to build a power station there for taking the energy from a high-level reservoir at Totnes.

Women and Electricity.—A plea for electricity in the homes of the people was made by several speakers at the recent Birmingham conference of the National Council of Women of Great Britain. A resolution was brought forward urging on the Government the importance of developing a comprehensive electrical scheme for the whole country. Moving the resolution, Mrs. Bridgwater (Birmingham Branch) said that all new houses erected by public bodies should be wired for electricity. Miss Griff (chairman of the Women's Engineering Society) seconded, and the resolution was agreed to.

Birmingham Electric Club: 21st Anniversary.—On Friday, October 23rd, this Club will celebrate its 21st anniversary with a ladies' evening, ball, and whist drive at the Grand Hotel, Colmore Row, Birmingham. The Grosvenor Suite and Windsor Room have been engaged for the occasion. There will be a reception from 7 to 7.30 p.m.; whist from 7.45 to 9.45 p.m.; and dancing from 7.45 p.m. to 2 a.m.; with a supper interval from 10 o'clock to 11 o'clock. Tickets (10s. 6d. each, inclusive of supper) can be obtained before Saturday, October 17th, from the hon. sec., Mr. N. Deykin, 193, Station Road, Wylde Green, Birmingham.

Fatality.—An inquest was held at Manchester on September 24th on Alfred Dudley Drayson (22), an apprentice, who was killed on September 16th at the works of Messrs. Mather & Platt, Newton Heath, Manchester. Deceased, whose home was at Surbiton, Surrey, was a B.A. (Mechanical Science) of Cambridge. Mr. Arthur Merrill, chief electrical tester of the department in which Drayson worked, said that the deceased had been in his department 17 days and was very competent. Witness left him near the electrical switchboard, and on hearing a shout looked round and saw him on the floor. Witness rushed towards him and found that he was clear of all wires. Answering Mr. P. M. Oliver (who represented the family), witness said that Drayson might have slipped on the boards, which were darkened with oil, though in his opinion that did not happen. Had he slipped on the floor and clutched the switches, he would not have been able to release his grip. If his hand touched the "live" metal work he would have received a shock at 440 V. Acknowledging that the cause of death was a matter of conjecture, the Coroner said that it appeared that Drayson tried to keep his eyes on the switchboard meter while putting in the switches, and touched the "live" metal. "So far as I can gather," added the Coroner, "I do not think he slipped. The switchboard is the usual switchboard, and as far as I can judge, there was nothing wrong." A verdict of "Accidental death" was returned.

Appointments Vacant.—Distribution engineer (Rs. 1,000 per month) for supply undertaking in India. Plumber-jointer for the Hove Corporation Electricity Department. Showroom attendant (£250) for the Borough of Mansfield Electricity Department. Clerk, for the Colne Corporation Electricity Department. Assistant mains engineer for the City of Norwich Electricity Department. Scientific assistant for research in connection with electrical ignition appliances (£250 +), draughtsmen (£252 and £205), for the Royal Aircraft Establishment, Farnborough, Hants. Boiler-house assistant engineer and draughtsman, for the Hull Corporation Electricity Department. Junior mains assistant, for the Great Yarmouth Corporation Electricity Supply and Tramways Departments. Lady cook demonstrator, for the Beckenham U.D.C. Electricity Department. Two plumber-jointers, for the Mexborough U.D.C. Electricity Works. (See our advertisement pages to-day.)

New Spanish Electrochemical Works.—Large new works for the production of synthetic ammonia are approaching completion at La Felguera, in the province of Asturias, Spain, for the Sociedad Iberica del Nitrogeno, of Bilbao. The Claude process is being adopted, and the necessary electrical energy for the new works will be supplied from the 12,000-h.p. steam station at La Felguera of the Sociedad Co-operativa Electrica de Langreo and from the hydro-electric station of the Sociedad Hidro-Electrica del Cantabrico.

Automatic Train Control on Pennsylvania Railroad.—A contract has been entered into between the Pennsylvania Railroad and the Westinghouse Air Brake Co., on behalf of the Union Switch and Signal Co., for the installation of an automatic train control system on 700 locomotives and 1,000 miles of double track belonging to the railroad. The installation will cost between 6,000,000 and 7,000,000 dollars. The announcement of the contract was made by Mr. J. L. Humphrey, president of the Westinghouse Co.—*Reuter's Trade Service* (Pittsburgh).

Association of Special Libraries and Information Bureaux.—The idea of providing an opportunity for intercourse between those engaged in collecting and distributing information in the fields of science, industry, and public affairs, has met with gratifying success, under the auspices of this Association. Sir Arthur Steel-Maitland, Minister of Labour, opened a conference at Balliol College, Oxford, which lasted from September 25th to 28th, and was attended by over 200 delegates of organisations ranging from the scientific societies and large libraries, to research institutes and smaller associations of experts, in the aggregate probably representing more than half a million intellectual workers.

The attendance included M. Otlet, of the Institut International de Bibliographie, Brussels, and other visitors from Germany, Holland, and the United States, and the international aspect of the subject was further emphasised by a valuable address from Prof. Gilbert Murray, on the work of the Committee of Intellectual Co-operation of the League of Nations.

Dr. Chalmers Mitchell, F.R.S., spoke of the "World List of Scientific Periodicals," which has just been published with the help of the British Museum authorities; it discloses the existence of some 25,000 separate journals. The problems of translation and collective abstracting were dealt with in papers by several of the leading authorities in the engineering and chemical sciences. An attempt was made to give the conference some insight into the library methods of the daily and technical Press.

The information sections of such Government departments as the Board of Education, Ministry of Health, and Imperial Institute were described. Methods of filing and classifying library matter and correspondence were dealt with by Mr. R. Borlase Matthews, Mr. S. Jast (chief librarian of the Manchester Public Libraries), and others.

The Shannon Power Scheme.—At the annual meeting of the Electricity Supply Association of Ireland, referred to in our last issue, Mr. P. L. Spalding (Dundalk) mentioned the wages and hours dispute at Limerick on the launching of the Shannon scheme, and pointed out that the difference between 8d. per hour, estimated by the contractors, and 1s. 3d. per hour demanded by labour meant an enormous additional cost on the contract. Based on the estimate that 3,000 men would be employed, it meant £125,000 per annum, and, multiplied by the three years the work would be in hand, it would come to £375,000 for labour charges alone. In his opinion the estimate of receipts had been as much overstated as that of expenditure had been understated.

Mr. Wm. Ireland said Mr. Spalding's point was a serious one. It was only the beginning of the trouble, and he thought a protest should be sent to the Government against the scheme.

Mr. Wm. Hewat, president, said that, the scheme having passed Parliament, it was their duty and the duty of other bodies to render any assistance possible towards making it a success, whether they agreed with the methods taken or not. A question just as important as the other was the Bill that would regulate the distribution of electricity. He hoped the Government in promoting that measure would not ignore the interests of the country as they had done in the previous case.

At the Association's dinner Mr. Blythe, Minister of Finance, who was the chief guest, said he thought it had come to be realised that the development of electricity supply in Ireland was one of the matters that would determine to a very large

extent the degree of prosperity that they were to have in the future. The farmers would have to use their brains in a way in which they had not used them in the past, and they would find that electricity would be a powerful agent for their service. He felt certain that when legislation to control production and supply under the Shannon scheme came to be considered bodies like the Electricity Supply Association would be very useful in helping to work out that part of the scheme which had to do with the consumer.

Dr. T. McLoughlin, Free State representative of the contractors, states that there is no intention on the part of the firm of importing German labour; applications for employment have been received from all over the State, and an employment bureau will be opened in Dublin for registration, &c. The trouble in Limerick will not materially affect their plans, as the number of men employed in Limerick will be relatively small. It is now thought that the real work on the scheme will be undertaken in the first instance at Killaloe.

For the first time the Shannon scheme is mentioned in the Free State Revenue Returns, a temporary advance of £100,000 being announced under the terms of the Shannon Electricity Act of the last session of Parliament.

End of Summer Time.—Our readers are reminded that Greenwich mean time will be reverted to at 2 a.m. on Sunday next (October 4th).

Educational.—University of London, University College.—A course of six lectures on "Mercury Vapour Lamps" and "Mercury-Arc Rectifiers" will be delivered by Prof. J. A. Fleming, F.R.S., on Wednesdays at 5 p.m., beginning on October 28th, 1925. The course is open both to members and non-members of the University. Fee, £1 11s. 6d. Application for tickets of admission should be made to Dr. Walter W. Seton at University College, London.

Education in London.—A "Guide to Continued Education in London" has been received from the University of London Press, Ltd., price 6d. net; it gives particulars of the facilities for continued education provided by the London County Council, of which many residents are still unaware. The Council's scheme is of very wide scope, as is proved by the contents of this brochure; lists of institutions providing evening classes in commercial and technical subjects are given, with the days and hours of meeting, and references are included to pamphlets on specific subjects, which are supplied gratis on application. Information regarding scholarships and exhibitions is given in a special handbook published by Messrs. P. S. King & Son, price 3d. plus postage.

An Electrical Fire Claim.—It is reported that the California Wharf and Warehouse Co. and the Balfour-Guthrie Co. are claiming damages to the extent of $902,592 from the Great Western Power Co., of California, for alleged negligence which caused the destruction of their warehouses and properties by fire last year. The claimants state that the source of the fire was the transformer room in one of the warehouses. The power company denies responsibility for the loss.

Institution Notes.

Institution of Electrical Engineers (Western Centre).—The opening meeting of this Centre will take place on Monday next, October 5th, at the Chamber of Commerce, Swansea, when Mr. J. W. Burr, the chairman, will deliver his address. Other events for the session will be:—

November 2nd (Bristol).—"Domestic Electrification," by Mr. J. W. Beauchamp.

November 30th (Cardiff).—"Switchgear Developments during the Past Twenty Years," by Mr. J. H. Thomas.

January 11th, 1926 (Swansea).—Annual dinner and President's visit.

National Association of Supervising Electricians.—On Tuesday, October 6th, Mr. Frank Gill, M.Inst.C.E., M.I.E.E., will deliver his presidential address at the Junior Institution of Engineers, 39, Victoria Street, S.W. Mr. J. S. Highfield will take the chair at 7.15 p.m.

Diesel Engine Users' Association.—Visit to Lewes.—At the invitation of the Lewes and District Electric Supply Co., Ltd., the committee of the Association recently visited that company's generating station, which is of particular interest, inasmuch as it was the first electricity generating station in the country originally equipped with steam engines to have been completely converted to heavy-oil engine plant. At present the installation consists of three "English Electric" Diesel engines and one Mirrlees-Watson Diesel set. The last-mentioned engine has been in regular commission since it was first installed in 1908. The committee was afterwards entertained at luncheon by the directors of the company. Mr. C. G. Tegetmeier, chairman, referred to the very satisfactory progress that had been made by the Lewes Company during the last few years, which, he thought, was to be attributed largely to the economical working of the Diesel engines. Mr. A. W. A. Chivers, president of the Association, was pleased to see that the operating costs of the Lewes Company during the past year both with regard to lubricating and fuel oils, compared remarkably well with those of other undertakings, and he felt sure that it would be impossible to obtain such good results with any other form of plant or with bulk supply, having regard to local conditions and the characteristics of the load to be dealt with. The Electricity Commissioners' bulk supply policy could easily be carried too far and might result in the public having in certain cases to pay a higher price for their supply.

Incorporated Municipal Electrical Association.—Yorkshire Centre.—The Lord Mayor of York (Sir Robert Kay) extended, at a luncheon at the Mansion House on September 24th, a welcome to the members of the Yorkshire Centre of the Incorporated Municipal Electrical Association, who were holding their annual meeting in the city, twenty-four municipal undertakings in the Centre being represented. Mr. W. Rogerson (Halifax) president, acknowledged the welcome. The principal item on the programme was a visit to the hydro-electric station at Linton-on-Ouse, some twelve miles up the river from York. The visitors were shown over the station by Mr. E. J. Nichols, city electrical engineer, who was accompanied by the chairman of the Committee, Alderman C. Shipley. The annual meeting of the Centre at York later was held in private. Mr. W. Rogerson (Halifax) was re-elected president, Major Barker (Barnsley) vice-president, and Mr. H. G. Fraser (Wakefield) hon. secretary. The representation on the Yorkshire Centre Council was fixed as follows:—Large towns, Sheffield, Bradford, Hull; medium towns, Barnsley, Wakefield, Halifax; small towns, Batley, Bridlington, and Shipley. An invitation from the Grimsby Town Council to hold next year's meeting at Grimsby was accepted.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

The new Agecroft station of the Salford Corporation, the description of which is concluded in this issue, was designed by Mr. J. A. Robertson, of Manchester. Mr. Robertson, whose portrait appears herewith, was born in 1869. He entered the engineering industry by becoming an apprentice with James White (later Kelvin & White), of Glasgow. He became chief electrical engineer to Wm. Denny Bros., Dumbarton, and, later, was appointed assistant electrical engineer to the Stirling Corporation. In 1902 Mr. Robertson took over the position of chief electrical engineer at the Greenock municipal undertaking, and after a stay of 12 years transferred to the



Photo by] [*Lafayette, Manchester.*

Mr. J. A. Robertson, M.I.E.E., M.I.Mech.E.,
who was responsible for the construction of the Agecroft (Salford) station.

equivalent position at Salford, where he remained until 1922, when he resigned in order to devote the whole of his time to consulting practice. While at Greenock he erected the Dellingburn power station, and the Frederick Road station at Salford was modernised by him. Mr. Robertson includes a number of local authorities and private companies in his *clientèle*. One of his most recent undertakings is the Ribble power station at Preston. Mr. Robertson has been chairman of the Scottish and North-Western Centres of the Institution

of Electrical Engineers, and he is a member of the Institution of Mechanical Engineers.

Mr. S. J. Watson, the borough electrical engineer of Salford, to whose responsibilities that of the new Agecroft station has been added, is a native of Dover and was educated there. Upon leaving school he became a pupil with G. E. Belliss and Co., Birmingham (the predecessors of Belliss & Morcom, Ltd.), and later secured the position of assistant engineer with the Brush Electrical Engineering Co., Ltd. His connection with the electricity supply industry commenced with his appointment as station superintendent by the National Electric Supply Co., Preston. In 1896 Mr. Watson became engineer and manager of the Bury electricity undertaking, and in 1923 he was appointed to his present position. He was president of the I.M.E.A. for the 1917-18 session, and he has also been vice-president of the Institution of Civil Engineers, Manchester and District Association (1925), and chairman of the Manchester local section of the Institution of Electrical Engineers (1909).



Mr. S. J. Watson, M.Inst.C.E., M.I.E.E.
Borough Electrical Engineer of Salford.

Mr. S. Hann, the Stoke Newington Borough Electrical Engineer, who has been indisposed since the opening of the borough electricity showrooms and extensions and was granted leave of absence in July, is in Switzerland recuperating.

Mr. James D. Dow, for many years sales manager of the old Armorduct Manufacturing Co., Ltd., has now been appointed the managing director of the Anglo Electric Co., Ltd., which controls the sales of "Armorduct" cables.

On September 23rd, the St. Helens Town Council considered the resignation of Captain Vane-Moreland from the position of tramway manager. The chairman of the Tramways Committee said that Mr. Vane-Moreland had only been in office since November last, being appointed at a salary of £550. That was not sufficient to induce a suitable man, who besides being an engineer, must have knowledge and experience as a commercial man, to stay with them. The Corporation had had three managers in five and a half years. It was decided that applications for the vacancy be invited at a commencing salary of £650.

Mr. H. J. Barton Chapple, Wh.Sch., B.Sc., &c., is resigning his lectureship in Electrical Engineering (Radio Specialisation) at the Bradford Technical College, to join the senior technical staff of Radio Press, Ltd., Brush House, London.

Mr. George Hughes, C.B.E., chief mechanical engineer of the London, Midland & Scottish Railway, is shortly to retire. He will be succeeded by Sir Henry Fowler, K.B.E.

Mr. Guy Burney, late managing director of the Sterling Telephone & Electric Co., Ltd., has now returned from the Continent, and has opened offices at Morning Post Building, 346, Strand, London, W.C.2 (Telephone: City 2373). Mr. Burney proposes to interest himself in the development of patented articles—mechanical, electrical, and other kinds—and he will be pleased to hear from his old friends in the industrial world, and others desirous of placing any new invention before him.

Dr. G. C. Clayton, C.B.E., M.P., and Professor H. C. H. Carpenter, F.R.S., have been appointed to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research.

The Croydon Corporation Electricity Committee recommends the appointment of Mr. Lees, constructional assistant, as constructional engineer.

Mr. W. H. Peak, O.B.E., has been appointed managing director of the Sterling Telephone & Electric Co., Ltd., in succession to Mr. Guy Burney, who recently resigned, and Mr. Charles E. Hunter has succeeded the late Mr. Max R. Lawrence as works manager. We understand that Mr. Peak retains his position as managing director of the Relay Automatic Telephone Co., Ltd.

Mr. H. H. Spencer, who recently resigned his position as chief assistant engineer in the Glasgow office of Messrs. Crompton & Co., Ltd., has taken up a similar position with Messrs. F. & A. Parkinson, Ltd., in their London office, 47, Victoria Street, W.1. At a meeting of the Chelmsford Engineering Society, held on September 24th, Mr. Spencer was presented with a travelling clock on the occasion of his marriage. The presentation was made by the president (Mr. T. W. Cooper, M.I.Mech.E.) as a mark of appreciation of the work done by Mr. Spencer as secretary in the early days of the Society.

Obituary.—Prof. E. H. Barton, F.R.S.—We regret to record the death, which occurred suddenly on September 23rd, at Nottingham, at the age of 67 years, of Professor Edwin Henry Barton, Dean of the Faculty of Pure Science in the University College of Nottingham. He was the author of a number of text-books and a contributor to the scientific Press, as well as to the *Proceedings* of the Royal Society, the Physical Society, &c. *The Times* states that Prof. Barton had recently been busying himself with the plans for his department in the new University building which is being erected in University Park, Nottingham, by Sir Jesse Boot. Arrangements had been made for him to give a series of talks to be broadcast throughout the British Isles.

We are sure that many of our readers in the electrical profession and industry will desire to associate themselves with the Electrical Review in an expression of deep sympathy with Mr. A. H. Walton, M.Inst.C.E., of the British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C., in the loss of his wife. Mrs. Walton passed away on September 24th, after a few days' illness.

New Companies Registered.

Reflex Radio Co., Ltd. (208,575).—Private company. Registered September 23rd. Capital, £1,000 in £1 shares. Objects: To acquire the business now carried on by the Reflex Radio Co. at 45, Stamford Hill, N.16, and to carry on the business of manufacturers of and wholesale dealers in all electrical and mechanical appliances and scientific instruments (excluding sparking plugs), and all parts, fittings and accessories for these, but more particularly with regard to wireless telegraphy or telephony, &c. The life governing directors are:—A. T. Izzard, 118, Evering Road, Stoke Newington, N.16, radio engineer; R. E. Izzard, 198, Lower Clapton Road, Clapton, E., radio engineer. No share qualification required. Secretary: J. R. Homer, 45, Stamford Hill, N.16.

McGoff & Vickers, Ltd. (208,672).—Private company. Registered September 28th. Capital, £2,000 in £1 shares. Objects:—To carry on the business of electricians, electrical contractors, electrical, mechanical, and general engineers, manufacturers of electric or other motors, electric or other lighting sets, toys of all kinds, copper and brass founders, &c. The permanent directors are:—E. H. McGoff, 23, Fitzclarence Street, Liverpool; G. D. Vickers, "Rookwood," St. Helens Road, Ormskirk; A. Piggott, "Arranmore," Latham, Burscough; W. S. Roberts, "Newby," Ruff Lane, Ormskirk; and H. Chappell, Ruff Lane, Ormskirk. The first two named are managing directors. Qualification, 200 shares. Solicitor: James Roberts, 5, Harrington Street, Liverpool. Registered office: 12, Johnson Street, Liverpool.

Official Returns of Electrical Companies.

Whitfield Electrical Co., Ltd.—Debenture dated August 29th, 1925, to secure £2,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. C. Page, 15, Buckingham Mansions, Hampstead, N.W.

Quead, Ltd.—E. A. Hurpham, of the Commercial Trades Protection Association, 133, Finsbury Pavement, ceased to act as receiver or manager on September 17th, 1925.

British Illuminated Signs, Ltd.—Satisfaction in full on September 11th, 1925, of mortgage by debenture dated December 6th, 1923, and mortgage collateral thereto dated December 20th, 1923, securing £500.

Nordisk Electrical Power Co., Ltd. (140,530).—Return dated December 31st, 1924 (filed August 5th, 1925). Capital, £10,000 in £10 shares. All shares taken up. £20 paid. £9,980 considered as paid. Mortgages and charges, nil.

Nathan & Allen, Ltd. (174,343).—Return dated June 8th, 1925. Capital, £10,000 in £1 shares. 3,450 shares taken up. £1,100 paid. £2,350 considered as paid. Mortgages and charges, nil.

E. & C. Gates, Ltd. (172,187).—Return dated December 31st, 1924 (filed May 8th, 1925). Capital, £3,000 in 2,700 preference and 300 ordinary shares of £1 each. 1,011 preference and 300 ordinary shares taken up. £723 paid on 723 preference shares. £588 considered as paid on 288 preference and 300 ordinary shares. Mortgages and charges at date of return, nil. Since registered: Series of debentures for £4,000, authorised and all issued April 7th, 1925.

F. B. Hellon & Co., Ltd. (173,480).—Return dated June 17th, 1925. Capital, £4,000 in £1 shares. 3,000 shares taken up. £3,000 paid. Mortgages and charges, nil.

Caffin & Co., Ltd. (173,927).—Return dated June 5th, 1925. Capital, £25,000 in £1 shares. 16,002 shares taken up. £8,502 paid. £7,500 considered as paid. Morgages and charges, nil. Return of allotments made up to June 9th, 1928, shows a further 500 shares allotted for cash.

C. T. Briscoe & Son, Ltd. (173,926).—Return dated March 11th, 1925. Capital, £5,000 in £1 shares. 2,000 shares taken up. £110 paid. £1,890 considered as paid. Mortgages and charges, £1,000.

Premier Private Telephone Co., Ltd. (174,408).—Return dated August 4th, 1925. Capital, £2,000 in £1 shares. 1,200 shares taken up. 15s. per share called up on 800 shares. £575 paid, leaving £25 in arrears. £400 considered as paid on 400 shares. Mortgages and charges, £308 6s. 8d.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Halifax and Bermudas Cable Co., Ltd. The report for the year ended June 30th last states that there was a balance on working of £18,999, as compared with £21,654 in 1923-24. The addition of £43,626 from the previous year makes available £62,625. The deduction of expenditure on repairs and the interim dividend leaves £47,291. It is proposed to pay a further dividend of 5 per cent., free of tax, making 10 per cent., tax-free, for the year, and to carry forward a balance of £44,791. The company's cable was interrupted on two occasions during the year, and faults developed in the shore ends at Halifax and Bermuda. The cable is now in first-class condition, and should be free from interruption for a long period.

Indian Companies. *Tata Hydro-Electric Power Supply Co., Ltd.*—Mail dispatches from Bombay state that the net profit for the year ended June 30th last was Rs. 25 lacs, subject to adjustment on final audit, after making the usual allowance for depreciation and income tax. The issued capital of the company is Rs. 2,80,00,000.

The net profit of the *Andhra Valley Power Supply Co., Ltd.*, for the year ended June 30th last was Rs. 17 lacs, subject to adjustment on final audit and to provision for depreciation. The issued capital of the company is Rs. 2,10,00,000.

German Companies. The *Rheydt Cablé Works Company* contemplates the distribution for 1924 of a dividend at the rate of 15 per cent. on the old shares and 7½ per cent. on the new capital.

The directors of the *Dr. Paul Meyer Company*, of Berlin, report a loss of 508,000 marks for 1924, which is partly covered by the reserve fund. The demand during the year was small, and it was impossible to get remunerative orders; it was found necessary to accept orders at unfavourable prices so as in some measure to keep the works in operation and maintain connections.

The report of *Garbe, Lahmeyer and Company*, of Aix-la-Chapelle, states that ruthless competition prevailed in 1924-25 so that the sale prices did not cover the costs of production. Efforts, however, were made to simplify manufacturing in order to cheapen the prime costs. After having made provision for depreciation the accounts show a loss of 521,000 marks, which has been carried forward.

The *Transradio Company for Transmarine Communication*, of Berlin, reports that the course of business in the current year is favourable, particularly with Argentina. Communication with the East Indies (Java) has recently been opened, while next year the large station in Rio de Janeiro will be inaugurated for traffic with Brazil. In these circumstances it is assumed that a satisfactory dividend may be reckoned upon.

Direct West India Cable Co., Ltd.—The net result of the past year's working was a credit balance of £12,233, as against £11,249 in 1923-24. To this is added £28,026 brought forward, making £40,259, and the deduction of the interim dividend and repair expenses leaves £24,537. It is proposed to pay a final dividend of 5 per cent., free of tax, making 10 per cent. (tax-free) for the year, and to carry forward £21,537. There were four interruptions in the company's cables during the year, but they should now be free from further interruption for a considerable time.

American Water Works and Electric Co.—It is proposed to form a new company under the title of the West Penn Electric Co. to consolidate the electrical subsidiaries of this company. The new company will acquire the preferred and common stock of the West Penn Co. and the common stocks of the Potomac Edison Co. and the Keystone Power and Light Co. The capital will consist of 500,000 first preferred $100 shares, 59,258 "Class A" shares, 165,742 "Class B" shares, and 1,000,000 common shares of no par value.

Chadburn's (Ship) Telegraph Co., Ltd.—The report for the past year shows a loss of £1,375, as compared with profits of £1,202 in 1923-24 and £7,454 in 1922-23. The directors state that they are unable to recommend an ordinary dividend. The preference dividend is paid from the balance brought forward, and £1,445 is carried to the next account.

Sir W. G. Armstrong, Whitworth & Co., Ltd.—In a circular to the shareholders, the directors state that as the cash requirements of the company have been heavy, it is necessary to conserve the cash resources. Accordingly, it has been decided to pay no interim dividends in respect of the current year, except on the first cumulative preference shares.

Stock Exchange Notice.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Shropshire, Worcestershire and Staffordshire Electric Power.—7,830 six per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,127,376 to 1,135,205.

Adelaide Electric Supply Co., Ltd.—In August 250,000 eight per cent. preferred ordinary shares of £1 each were issued to existing ordinary and preferred shareholders in the proportion of one new share for each three held.

Consolidated Gas, Electric Light & Power of Baltimore.—The dividend on the common stock has been raised to 62½ cents per share.

Shanghai Electric Construction Co., Ltd.—The directors have declared a first interim dividend of 3 per cent. (as against 6 per cent.).

Cuba Submarine Telegraph Co., Ltd.—A dividend at the rate of 5 per cent., free of tax, has been declared in respect of the first half of the current year.

Stocks and Shares.

Monday Evening.

Anyone who has had practical experience of the working of a rubber boom will understand the physical and mental strain imposed upon those Stock Exchange members who happen to be thrown into the midst of the vortex which courtesy still dignifies by the name of "market." Other matters have to be hastily pushed on one side. The human machine goes on working as long as it can. The market in the Stock Exchange resembles, in a *coup d'œil* from the roof of the House, a closely-wedged mass of animated corks, hundreds of heads bobbing up and down excitedly upon the unceasing maelstrom of the whirl of the boom. Other markets are relegated to the background of public interest. Changes in our this week's price-list testify, by their unimportance, to the neglect with which clients are regarding aught but the popular shares of the moment.

Districts fell 2½ points last Friday, to 40 middle, a price which brought in the speculative buyer, whose purchases served to rally the quotation to 41½. At the latter figure, the stock returns 8½ per cent. on the money, on the basis of the 1924 dividend of 3½ per cent. Metropolitans weakened to 64½, and Underground £10 shares to 2⅛. The less familiar London Electric Railway ordinary stock changed hands at 41 a few days ago, and this is a cheap-looking stock, whose main disadvantage lies in its unmarketability.

In electricity supply shares, Kensingtons have again put on 5s., which makes the price 12⅝. Except for this, no alteration has occurred amongst the London group of shares. Electric Supply Corporation ordinary have recovered their dividend. So have Whitehall preference. Clyde Valley shares eased off to 28s. 6d.

The Power & Traction Finance Company has received an important contract for electrical power works projected in Greece. It is thought that the financing may be undertaken under the provisions of the Trade Facilities Act.

Wireless shares exhibit a fair degree of liveliness, Canadian Marconis being the chief centre of attention. Curiosity is agog as to what may be the true inwardness of a demand which originated in Canada. A well-known Stock Exchange jobber, closely identified with wireless interests, sailed last week for Montreal upon a mission said to be connected with reasons other than those of health and pleasure. The price of the shares is 6s. 4½d. middle, and the parent Marconis hold their advance at 28s. 9d.

Cable stocks incline to dulness. Anglo-American preferred and deferred are both a little lower. The Eastern division is steady. Halifax and Bermuda has declared a tax-free dividend of 5 per cent., making 10 per cent. for the year. Direct West India ordinary shares are to receive the same, which also makes 10 per cent. for the full twelve months. Similar dividends were paid, in both cases, for the previous year. Chadburn's (Ship) Telegraph reports a loss of £1,375, and, in making the announcement, the directors express their regret that for the first time in the history of the company, they cannot recommend a dividend on the ordinary shares. Last year the latter received 3 per cent., and in the previous half-decade, their dividend was 6 per cent. per annum. The preference dividend has been duly met. The ordinary shares stand nominally at 10s.; shares last changed hands at 7s. 6d., on September 24th. No dealings are officially recorded in the 6 per cent. preference since July 1st, when a bargain was marked at 13s. 9d.

Southern Brazil Electric 6 per cent. bonds have put on several points at 54, but Brazilian Tractions reacted to 74. In Mexicans, the movements are somewhat mixed, as usual, Mexico Tramways Fives being better at 73½, Mexican Light and Power issues going back. Rumours suggest that the revolutionary spirit still smoulders amongst some of the banditti in that distressful country. British Electric Traction stocks retain their substantial rises.

Edisons are a few pence lower at 8s. 9d. Cable construction descriptions are unaltered on the week, the rubber activity having no further effect. Automatic Telephones remain at 47s. 6d. International Automatics are quiet at 28s. 6d. Iron and steel shares gave way upon the decision of the Armstrong-Whitworth board to postpone payment of the interim dividends on the company's junior preference shares. Babcocks remain at 2½, but the market as a whole is disturbed and uneasy at this latest manifestation of the unsatisfactory condition of trade in the "heavy" industries.

Share List of Electrical Companies

	Nom. £	Dividend. 1923	1924	Price Sept. 28. 1925	Rise or fall.	Yield p.c.
Home Electricity Companies						
Bournemouth and Poole	1	13	14	3	—	4 13 4
Brompton Ordinary	1	10	10	1⅜	—	*5 14 3
Charing Cross Ordinary	1	14½	15	10/-	—	6 2 5
do. do. 4½ Pref	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	12	1⅞	—	6 8 0
City of London	1	15	15	48/3	—	6 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	28/6	—6d.	5 12 4
County of London	1	15	15	57/-	—	5 5 3
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3xd	+ 3/8	6 8 0
Kensington Ordinary	5	14	15	12⅝	+ ¼	5 16 8
Lancs. Light and Power	1	7½	7½	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5¼	—	5 7 10
Metropolitan	1	10	11	39/6	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	1⅜xd	—	6 4 5
do. 5% Pref.	1	5	5	18/3xd	6d.	5 6 8
do. 7% Pref.	1	7	7	24/6xd	—	5 14 3
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	14¼	—	6 1 9
South London	1	15	15	2½	—	6 0
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/-	—	6 16 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1xd	+ 1/32	7 10 0
Yorkshire Elec.	1	8	8	19/6	—	5 8 6
Home Rails.						
Central London Ord. Assented Stock	4	4		66	—	6 1 3
Metropolitan	4	5		64½	—1½	7 15 0
do. District	3½	3½		41⅜	—1	8 10 9
Underground Electric Ordinary	10	Nil	Nil	2¼	— ⅛	Nil
do. do. "A"	1/-	Nil	Nil	6/6	—	Nil
do. do. Income Bonds	6	6		95	—	*6 6 4
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	102½	- 1	5 17 1
do. Def.		1½	1½	23¾	- ¼	6 6 4
Automatic Telephone	1	3	6	47/6	—	2 10 7
Chili Telephone	5	6	5	5⅛	— ⅛	*4 11 0
Cuba Sub. Ord.	10	5	5	6¼xd	— ¼	8 0 0
Eastern Extension	10	10	10	17½	—	*5 15 11
Eastern Tel. Ord.	Stock	10	10	171½	—	*5 16 7
Globe Tel. and T. Ord.	10	10	10	17⅝xd	+ ⅛	*5 13 4
do. do. Pref.	10	6	6	10⅞	—	5 10 4
Great Northern Tel.	10	22	22	32¾	—	6 15 4
Indo-European	25	7	8½	42½	—	*5 2 5
Marconi	1	10	10	1 7/16	—	6 19 2
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord.	1	12	12	2 1/16	—	*5 16 4
United R. Plate Tel.	5	8	8	7½	— ⅛	5 6 8
Western Telegraph	10	10	10	16⅝xd	— ⅛	*6 4 0
Home and Foreign Trams. &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3⅜	—	8 3 0
do. do. 2nd Pref.	5	6	6	3⅜	—	8 17 10
do. do. 5% Deb.	Stock	5	5	7½	—	6 10 9
British Electric Traction Ord.	"	6	6	120	—	5 0 0
do. do. 6% Pref.	"	6	6	107	—	5 12 2
Brazil Traction	100	4	4	74	—1	5 8 1
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	87½	- 1	5 14 3
do. do. Preferred	"	96/-	96/-	89½	—	*5 6 5
do. do. Deferred	"	129/5	129/5	109½	—	*5 18 3
do. do. Deb.	"	4½	4½	76½	—	5 11 1
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	63½	+1	7 17 6
Mexican Light Common	100	Nil	Nil	33	+1	Nil
do. Pref.	100	Nil	Nil	14	- 1	Nil
do. 1st Bonds	—	5	5	73½	- 1½	6 16 1
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8
Manufacturing Companies						
Babcock & Wilcox	1	12	12	2½	—	*4 16 0
British Aluminium Ord.	1	5	10	34/6xd	+6d.	5 16 0
British Elec. Transformer Pref.	1	Nil	7	1	—	...
British Insulated Ord.	1	15	15	3 3/16 xd	—	4 12 4
Brush Ord.	1	10	10	1⅜	—	8 17 10
Callenders	1	15	15	3½	—	4 12 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅝	—	... ...
Edison-Swan	4/-	10	10	8/9	—3d.	4 11 4
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	33/-	—	6 5 0
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	18/3	—	5 9 8
do. do. Pref.	1	6	6	20/-xd	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	27/-	—	5 11 1
Henley	1	15	16	3¾	—	4 18 6
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1 1/16	—	*4 14 1
Johnson & Phillips	1	10	10	48/9	—	4 2 0
Met-Vickers, Ord.	1	8	8	24/6	—	6 10 8
do. Pref.	2	8	8	28	—	6 14 9
Siemens Ord.	1	—	7½	28/9	—9d.	5 4 4
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price September 29th.	Fortnight's Inc. or dec
a Acid, Oxalic	5¾d	
a Ammoniac, Sal	£60	
a Ammonia, Muriate (large crystal)	£52	
a Bisulphide of Carbon		
a Borax	£25	
a Copper Sulphate	£25 10s	
a Potash, Chlorate	4d. to 4½d	
a " Perchlorate	5½d.	
a Shellac	£15 15s.	
a Sulphur, Commercial	£7 15s	
a " Roll	£7 15s	
a Soda, Chlorate	3½d. to 3¾d.	
a " Crystals	£5 to £5 5s	
a Sodium Bichromate, casks	4d	
METALS, &c.		
b Aluminium, Ingots	£120 to £125	
b " Wire	1/9 to 2/6*	
b " Sheet	1/6 to 2/-	
p Babbitt's Metal and Anti-friction Metal—		
Grade I	£229	
Grade II	£164	
Grade III	£95	
c Brass (rolled metal 2" to 12" basis)	9⅝d.	
c " Tubes (solid drawn)	1/- to 1/0½	
c " Wire, basis	10½d	
c Copper Tubes (solid drawn)	1/1½	
c " Bars (best selected)	£92	£1 dec.
c " Sheet	£92	£1 dec.
c " Rod	£92	£1 dec.
d " (Electrolytic) Bars	£67 10s.	25/- dec.
d " " Sheets	£148 10s	25s. dec.
d " " Wire Rods	£77 10s.	1/8d. dec.
d " " H.C. Wire	9 11/16d.	
f Ebonite Rod	2/8 to 2/3	
f Sheet	2 3/0 to 2/6	
a German Silver Wire	2/8	
h Gutta-percha, fine	3/9	
h India-rubber, Para fine	3/0½	½d. inc.
i Iron Pig (Cleveland Warrants)	nom.	
l " Wire, galv. No. 8, P.O. qual.	£21	
g Lead, English Pig	£40 10s.	15s. inc.
g Mercury	£13 to £13 5s.	7.6 to 10/- dec
e Mica (in original cases) small	3d. to 3/-	
e " " medium	4/- to 8/-	
e " " large	10/- to 20/- & up.	
p Phosphor Bronze, plain castings	1/3½	
p " " drawn bars & rods	1/3	
p " " rolled strip & sheet	1/2⅝	
p " " wire	1/3⅜	
o Platinum	£2c	
d Silicium Bronze Wire	1/0½	
r Steel, Magnet, in bars	7½d.	
a Tin, Block (English)	£265 to £265 5s.	£13 5s. inc.
p " Wire, Nos. 1 to 16	3/11	

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.
g James & Shakespeare
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd,
p P. Ormiston & Sons.
o Johnson, Matthey & Co. Ltd,
r C. Clifford & Son, Ltd.
* W. F. Denn's & Co.

Proposed Manchester Tube.—A new proposal to deal with the traffic problems of Manchester by means of an underground railway was put forward by Ald. Bowie at a meeting of the North-Western Section of the Institute of Transport on September 25th. The suggestion was that an inner ring should be constructed with a central station in Piccadilly, and that from this the outside areas should be served by a number of branches. The population was large enough to justify the scheme, for it was about the same as that of central London when the first tubes were constructed there—some three millions within a radius of 12 miles from the centre of the city. The speaker said that the cost was estimated at between £250,000 and £300,000 per mile, the geological formation being favourable to construction.

High-voltage Submarine Cable.—Since 1914 the North Sealand (Denmark) Electricity Co. has received a supply of energy from the Swedish hydro-electric works at Lagan, in Halland, through a submarine cable at 25,000 volts, which is laid under the Sound. It was decided some time ago that the pressure should be raised to 50,000 volts, but it was only this year that definite work in the direction of the execution of the scheme was decided on by the electricity company by the establishment of a 50,000-volt line between Sweden and Copenhagen. This has now been carried out in connection with the Southern Swedish Power Co., of Malmo, the town of Fredriksberg, and the city of Copenhagen, which in combination have participated in the total expenditure, which amounts to over 2,000,000 kr. The cable, which is of the three-phase type, has been supplied by a German firm, is 2.89 miles long, and was made in six lengths. The laying of the cable took place between June 28th and July 22nd, and the land-line extension to Copenhagen was then proceeded with.

The Institution of Public Lighting Engineers.

Annual Conference at Leeds.

(*Continued from page* 516.)

On Tuesday, September 15th, the visitors were the guests of the Leeds Gas Committee at luncheon at Leeds Town Hall, where Alderman George Ratcliffe, J.P., chairman of the Gas Committee, presided over a very large gathering.

The toast of "The City of Leeds" was proposed by Sir Albert Ball, of Nottingham. The Lord Mayor of Leeds (Councillor C. G. Gibson) responding, claimed that the Electricity Department was second to none in Yorkshire. In it there was no unit of plant which was older than 1913, and in all they had nearly 100,000 lamps there. They had also a tramway with about 120 miles of single line and contributed nearly £90,000 to the relief of the rates. Alderman Charles Lupton, responding as chairman of the Leeds Housing, Sites, and Improvements Committee, spoke of the great importance of the relative values of gas and electricity in the new housing schemes and in the lighting of the roads serving those houses. When he needed absolutely impartial guidance he sought help from the Fuel Research Department of the Leeds University, which was doing valuable work. Councillor John Arnott (Lord Mayor-elect of Leeds) also responded.

Alderman George Ratcliffe, J.P., chairman of the Leeds Gas Committee, in giving the toast of "The Institution of Public Lighting Engineers," congratulated Mr. Shapley on his new honour, and said that in Leeds the electrical and gas departments worked in complete harmony in the public lighting interest. Mr. Shapley, responding, thanked the members of the Lighting and Gas Committees for the facilities granted to the Conference, and the Corporation generally, for its approval and support. Mr. S. B. Langlands, ex-president of the Institution, also responding, said there could be no quality in street lighting, and they must go on from brightness to brightness.

Councillor E. J. Clarke, chairman of the Leeds Lighting Committee, briefly proposed "The Guests," and Alderman J. H. Waddington, Mayor of Halifax, for many years chairman of the Halifax Gas Committee and vice-chairman during his mayoralty, responding, said that, although he was primarily a gas man, he never regretted that so much had been said of gas at its function and so little of electricity. In all fairness they had to recognise that the future of lighting in our cities, towns, and villages, both in the streets and in the buildings, must to a great extent be left to the electrical side of lighting service. To his mind, as a strong enthusiast for gas, there was no competition to-day with electricity for lighting. On the other hand, when it came to heating, and some aspects of power, he contended that gas held a wonderful first place.

Alderman W. Wilkie, J.P., chairman of the Newcastle-upon-Tyne Lighting Committee, said he had come with Councillor Oates, the Lord Mayor-elect of Newcastle, to invite the Institution to hold its next Conference at Newcastle.

On the resumption of the conference on the morning of September 16th, the delegation from Newcastle formally extended its invitation to that city, which was accepted with thanks.

Mr. Edward C. Lennox, of the Durham County Electrical Supply Co., then threw on the lantern screen a number of views illustrating points in his paper on "Electric Street Lighting in Rural Areas," and the paper was discussed.

Mr. J. S. Thomas, D.Sc., submitted a paper contributed by the Distribution Department of the South Metropolitan Gas Co., and illustrated by a considerable number of lantern views. A discussion followed.

As a result of the election of officers and Council, the following was announced by the secretary as the list of new officers of the Institution:—President, Mr. C. S. Shapley, Leeds; vice-president and president-elect, Mr. R. Davison, Newcastle-on-Tyne; hon. treasurer, Mr. E. M. Severn, London; hon. secretary, Mr. W. J. Liberty, City of London; editor, Mr. E. J. Stewart, Glasgow.

Thanks were accorded to the Lord Mayor and the Lighting and Gas Committees of Leeds for their hospitality; to the president; to the retiring officers and Council; and to the authors and readers of the papers

Presidential Address.

By C. S. Shapley.

(*Abstract.*)

The lay-out of Leeds is difficult from a street-lighting standpoint. The industrial portion is very congested, while the population about two miles from the centre becomes sparse. There are fifteen main arterial roads radiating from the centre; and there are many important roads connecting these arterial roads, which are also very sparsely populated.

We employ in the centre of the city an electric controller which combines three operations in one clock—namely, lighting, checking, and extinguishing. Six of these are in use, controlling 53 lamps, varying in wattage from 300 to 1,000. There are also 58 controllers of the on-and-off type, operating 258 lamps, varying from 200 to 300 watts—making the total number of lamps controlled by time switch 303. The remaining 413 lamps are hand-operated from 53 switch boxes.

A tower motor derrick is kept for general use, and this is at call at any hour for breakdowns. For general maintenance, four hand derricks, each serving 174 lanterns, are employed, and two men per derrick are responsible for the work.

All steel suspension wires and overhead work are examined annually. Steel cables are put to severe test, and coated with a mixture of graphite and vaseline, care being taken that the whole of the wire is coated.

The city is divided into five districts, each controlled by an inspector, who is required to be on his district at lighting and extinguishing time. He patrols one run a week with a lighter, is responsible for the efficient lighting of his district, the supervision of repairs, and the pruning of trees, and has to report on alternate days to the head of the Department. One male and one female clerk, and part-time assistants from the Gas Department, do all the clerical work.

In the choice of lighting, level or uniform density of ground illumination is generally accepted as the ideal. On the other hand, what I should term bright-spot illumination has its supporters; and a strong argument advanced in favour of the latter method of illumination, as compared with level illumination is the pleasing and decorative effect obtained. Added to this is the definite and stimulating influence a bright source of light has on the user of the road. With level illumination, these important factors are very much less pronounced. The lighting may appear monotonous, lacking in contrasts, and rather gloomy. This comparison is probably more noticeable where the light sources for each system are of equal candle power, and the method of obtaining level illumination is by directional light beams obtained by the use of refractors.

I had some experiments carried out in order to compare the lighting of one of our main thoroughfares, when using bright-spot illumination and level-ground illumination obtained by directional beam lighting; and, frankly, I was disappointed with the results of the latter. In this particular case the greater portion of the re-directed light beams was wasted. There was a brilliant band of illumination half-way up the buildings on both sides of the road. The system of illumination by directional light beams was tested on the photometer bar; the curves of the test are shown in fig. 1. The curves 2, 3, 4 and 5, are of lamps fitted with refractors, and curve 1 of a lamp without that device. The ground illumination curve of the lamp with and without the refractor shows graphically that the increase of illumination half-way between the lamps does not compensate for the loss below the lamps. The loss is explained by the concentrated light beams near the horizontal (which are only useful in two directions for street illumination) being made to radiate in all directions. For lighting thoroughfares where the distances between the lamps are necessarily great, one can foresee definite advantages associated with directional beam illumination.

I find it is sometimes an advantage in street lighting to sacrifice illumination for effect; and in Lower Briggate, some gas-filled clear lamps were replaced by opal lamps of the same candle power, with pleasing results. "Even" or "level" ground illumination was a big claim for the particular type of

lamps used; but in the street tests made this claim was not substantiated. The good results obtained from the opal lamps are, in my opinion, due to the bigger area of the source of light, which creates an impression of higher candle power, although it is actually less, as some of the light is absorbed by the opal globe. The lights are brilliant, but not glaring; and the intrinsic brilliancy per sq. in. of globe area is approximately 20 candles. Intensities below this would probably not be so effective. The loss in ground illumination compared with that obtained from a gasfilled clear lamp is comparatively small. The general lighting effect, judged by observation, and not by photometric methods, would appear to be superior to that obtained from gasfilled clear lamps of equal candle power.

With respect to the dazzle effect of bright sources of light, this is not a simple question of brilliance, but of contrasts, and depends chiefly on the observer. Personally, I have not experienced dazzle in the ordinary passing observation one gives to a street lamp, even with the highest candle power units. The loss of vision caused by dazzle (say) from the headlights of a motor-car, is due to the fact that the contrast between the brilliancy of the headlights and the surrounding illumination is too great. The same blinding effect is experienced on going from daylight into a darkened room, though the room may appear quite light when the eyes have become accustomed to the gloom. In this case it is the eyes which are unable to adapt themselves to the sudden contrast. In our street lighting the increase and decrease of illumination to and from lamps is not sufficiently contrasting to interfere seriously with vision, except in isolated places where buildings and obstructions cause deep shadows; and, speaking generally, I think that dazzle in street lighting is more imaginary than real.

The most suitable height at which to fix certain types of lamps in order to obtain the best results was a problem which arose in respect of some special street lighting which we were contemplating. We experimented with a 3-light and a 4-light lamp. The lamps were fixed on 12-ft. columns, and horizontal illumination tests were made at 3 ft. above ground level.

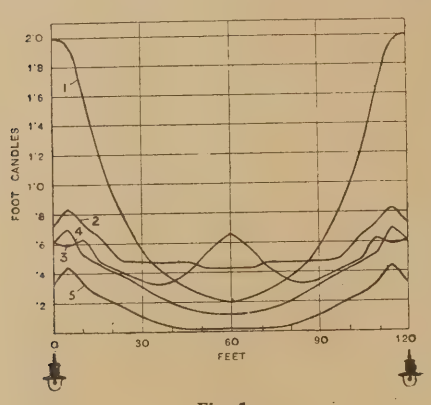


Fig. 1.

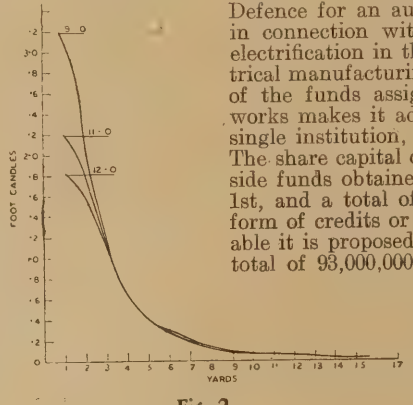


Fig. 2.

An interesting feature to be noted from the curve, fig. 2, is that the horizontal illumination with the 4-light lamp, except within very narrow limits from the base of the lamp, is practically the same for different heights of columns. From the point of view of horizontal illumination with lamps of the above type, the height, within limits, is apparently immaterial. Therefore, any decision in this respect would be influenced chiefly by a knowledge of the locality for which they were intended and considerations of visibility and interference with the line of vision.

In the testing of street lighting the usual standard of comparison is the horizontal illumination; but in my opinion this leaves much to be desired. Horizontal illumination is least influenced by reflected light from buildings and other objects in the vicinity of the lamp, which are factors of sufficient importance to have had some influence in the choosing of the lamp for that particular locality. Pedestrians and any objects in the road are seen chiefly by silhouette and by reflected light from a vertical plane, the reflected light from the horizontal plane playing a part, but not the most important part, in securing visibility. It will be recognised that gradients and the colour of the road surface influence illumination to a considerable extent, and consequently can be considered important factors in the scheme of lighting. In the method of taking horizontal illumination tests, these factors are ignored, the illumination being measured on a white card held in a horizontal position, which is not a true measure of the available illumination.

In taking illumination determinations, we use a lumeter, but its value is very limited, as readings below 0.01 foot-candle are not reliable, though at this illumination definite shadows are produced. In the Jackson Avenue tests observations could only be taken up to a distance of 14 yards from the base of the lamp. This left approximately 45 yards between the lamps where it was impossible to take a reading, though there was distinct illumination in that area; it would be interesting to know if there is an instrument reliable for readings below 0.01 foot-candle.

I think I have demonstrated that my leaning to a bright, cheerful source of light is justified. I would, however, emphasise that street lighting calls for common sense and initiative, in order to give service to the public, and to provide adequate lighting for personal safety—always having regard to economy.

The Exhibition.

An exhibition of lighting appliances was held in the great hall of the Leeds Town Hall throughout the period of the Conference, and was supplemented by sections of street lighting in the city which were allocated to various lamp and control manufacturers for the temporary use of their fittings as a practical demonstration of their worth in normal street lighting. The electrical exhibitors were: Siemens & English Electric Lamp Co., Ltd., showing weatherproof street lanterns, reflectors, anti-vibration disks, &c.; Venner Time Switches, Ltd., two principal types of electric time switches with fifteen-day or six-week clocks, according to size, and various types of housing to suit different local conditions; Foster Engineering Co., Ltd., electric lamps, &c.; General Electric Co., Ltd., electric lighting appliances; Photector Co., Ltd., the "Dia" long-burning flame arc lamp and the "Photector" street-lighting lanterns; Cable Accessories Co., Ltd., electric light fittings; Cryselco, Ltd., opal-type gasfilled electric lamps for street use; British Thomson-Houston Co., Ltd., lanterns as in use in Leeds streets, and "Mazda" lamps; Edison Swan Electric Co., Ltd., anti-vibration fitted electric street lanterns of various classes; Holophane, Ltd., street refractors, two- and four-way, ornamental and otherwise.

In addition to many makers of gas appliances, the following firms showed lighting accessories:—Charles Steel, glassware, paints, and varnishes; Wardle Engineering Co., lamps, globes, &c.; and Donald MacPherson & Co., Ltd., paints, varnishes, and enamels for lamp standards.

(To be continued.)

Russian Electrical Notes.

The Electrical Bank.—The directors of the Electrical Bank have made application to the Council of Labour and Defence for an augmentation of the capital of the Institution in connection with the growing importance of the work of electrification in the country, and the development of the electrical manufacturing industry. It is held that the insufficiency of the funds assigned through the budget for electrification works makes it advisable for these funds to be entrusted to a single institution, and not divided among the different banks. The share capital of the bank is 8,000,000 roubles, and the outside funds obtained amounted to 35,000,000 roubles on August 1st, and a total of 34,000,000 roubles has been granted in the form of credits or loans. If the necessary funds become available it is proposed, in 1925-26, to grant credits and loans for a total of 93,000,000 roubles, of which 12,000,000 roubles would be for the re-equipment of the manufacturing industry, 10,000,000 roubles for rural electrification, 12,000,000 roubles for local electrical construction works, and 15,000,000 roubles for initial works in connection with the erection of new regional stations. Moreover, the bank is faced with the question of financing the importation of electrical manufactures from abroad as the Soviet manufacturing industry does not develop as rapidly as the growth in the demand for electrical goods.

The Weak-Current Trust.—This Trust, whose chief manufactures are telephone and radio apparatus, has brought forward its productive programme for the year beginning on October 1st. The gross output will amount to 16,300,000 (pre-war) roubles, showing an increase of 94 per cent. over 1924-25. Telephone and telegraph apparatus will be turned out to the same extent as in the expiring year, while the output of measuring apparatus is to be increased by 50 per cent., and that of meters by 180 per cent. As the production outlined will be 40 per cent. in excess of the capacity of the works, it is intended to overcome the deficiency by carrying out extensions and the provision of new equipment, which will necessitate the expenditure of 4,300,000 roubles. The working capital will also be insufficient, and a grant of 4,422,000 roubles is asked for by the trust. It is intended to increase the number of persons employed by 71 per cent. to 8,270, and the average wages will be raised by 10 per cent., while the costs of production are expected to be reduced by 8 per cent.

The Electrical Market.—The condition of the electrical market at the beginning of September is stated to have been very animated. A large demand prevailed for stock manufactures and those for delivery in the near future until the close of the building trades season. Cables were in good request, particularly for State industries, as also were copper wire, conductors, flexible cords and other installation materials, while the calls for the supply of lamps were being filled generally by home production. Motors were in great demand, especially sizes up to 40 h.p., and second-hand motors repaired in the shops were being sold at slightly above pre-war prices. The products are being offered principally by the trusts, the part played by other trading organisations in the matter last year having now been greatly reduced, and private firms now only occupy an inconsiderable position in the market.

Electricity Supply in Leningrad.—The programme of the Elektrotok (the Electricity Supply Undertaking at Leningrad) provides for an output of 260,000,000 kWh in 1925-26, or an increase of 35 per cent. over the current year's production. It is proposed to receive 20,000,000 kWh from the Volkhoff station, and a beginning is to be made with the construction of the new peat fuel station, and the erection of a new 10,000-

kW turbo-generator at the Krasnaya Oktyabr station. Altogether it is proposed to expend 7,689,000 roubles on constructional works next year, and in order to complete the programme a loan of 4,000,000 roubles will have to be granted to the Elektrotok.

The Ukraine.—The committee dealing with the electrification of the Ukraine has approved a report deciding that the local electrical committee in the Ukraine should be wound up and be replaced by a district Electric Planning Commission, and that the General Electric Commission should provide the funds for the maintenance of such a commission for that republic.

The Schatur Station.—The inauguration of this station, which is to employ peat as fuel is expected to take place shortly, when the second generating set will be put into operation. Besides making an addition to the supply of Moscow and region, the new works will furnish energy to a number of industrial works. The existing temporary plant will then be shut down, and transferred to the Lyapinsk station now under construction near Yaroslav. The stocks of peat accumulated at the Schatur station amount to 321,000 tons, and will ensure an adequate fuel supply for one year.

Funds for Communal Power Stations.—The National Commissariat of Finance has confirmed an application made by the Central Bank for Housing and Communal Construction for the handing over to the bank of the funds assigned in the State budget for the construction of communal power stations. In 1925-26 it is proposed to finance local stations by the grant of loans for a fixed period of not more than five years at the rate of 6 per cent., of which 5 per cent. would be allotted to the State, and the remaining one per cent. to the bank.

Accumulator Production.—The North-Western Industrial Bureau has confirmed the productive programme of the Accumulator Trust for the year beginning with October 1st. It is proposed to increase the output by 52 per cent. over the current year's production, while batteries for railway purposes only will be augmented by 185 per cent.

Electrical Exports of the United States.

Below are shown the values of electrical machinery and apparatus exported from the United States during the twelve months ended June last. Comparative figures for the twelve months ended June, 1924, are added and notes of increases or decreases also given.

	Twelve months ended June, 1924. Value. $	June, 1925. Value. $	Inc. or dec. $
Electrical machinery and apparatus (total)	68,800,000	66,871,000	−1,929,000
Generators—			
Direct current—			
Under 500 kW	939,000	876,000	− 63,000
500 kW and over	704,000	551,000	− 153,000
Alternating current—			
Under 2,000 kVA	146,000	219,000	+ 73,000
2,000 kVA and over	1,195,000	1,115,000	− 80,000
Steam turbine generator sets	10,000	429,000	+ 419,000
Accessories and parts for generators	1,321,000	1,079,000	− 242,000
Self-contained lighting outfits	652,000	879,000	+ 227,000
Batteries—			
Flashlight batteries	476,000	1,065,000	+ 589,000
Other primary batteries	989,000	941,000	− 48,000
Storage batteries	2,686,000	2,661,000	− 25,000
Transforming or converting apparatus—			
Power transformers	3,937,000	2,086,000	−1,851,000
Other transformers	1,981,000	1,525,000	− 456,000
Rectifiers, double-current and motor generators, dynamotors, synchronous, and other converters	1,076,000	1,110,000	+ 34,000
Transmission and distribution apparatus—			
Switchboard panels, except telephone	2,069,000	2,018,000	− 51,000
Switches and circuit breakers over 10 amps.	2,138,000	1,835,000	− 303,000
Fuses and fuse blocks	333,000	284,000	− 49,000
Watt-hours and other measuring meters	659,000	486,000	− 173,000
Volt, watt and amperemeters, and other recording, indicating and testing apparatus	1,204,000	1,565,000	+ 361,000
Lightning arresters, choke coils, reactors, and other protective devices	918,000	646,000	− 272,000
Motors, starters, and controllers—			
Motors under 1 h.p.	1,683,000	1,703,000	+ 20,000
Stationary motors—			
1 to 200 h.p.	3,155,000	1,957,000	−1,198,000
Over 200 h.p.	936,000	443,000	− 493,000
Railway motors	1,483,000	825,000	− 658,000
Electric locomotives—			
Railway	1,956,000	1,210,000	− 746,000
Mining and industrial	345,000	240,000	− 105,000
Other motors	†120,000	—	—
Starting and controlling equipment	†991,000	—	—
For industrial motors	*877,000	1,101,000	—
For electric railway and vehicle motors	*83,000	141,000	—
Accessories and parts for motors	2,086,000	1,776,000	− 310,000
Electrical appliances—			
Electric fans	1,109,000	812,000	− 297,000
Electric lamps—			
Metal filament	1,101,000	1,135,000‡	+ 34,000
Other electric lamps	331,000	335,000	+ 4,000
Flashlights	629,000	1,056,000	+ 427,000
Searchlights and projectors	404,000	431,000	+ 27,000
Motor-driven household devices	889,000	1,040,000	+ 151,000
Domestic heating and cooking devices	1,055,000	1,231,000	+ 176,000
Industrial electric furnaces and ovens	269,000	225,000	− 44,000
Therapeutic apparatus, X-ray apparatus, galvanic and faradic batteries, &c.	989,000	1,192,000	+ 203,000
Signal and communication devices—			
Radio apparatus	4,062,000	8,273,000	+4,211,000
Telegraph apparatus	446,000	553,000	+ 107,000
Telephone apparatus—			
Magneto telephones	191,000	173,000	− 18,000
Other telephones	657,000	400,000	− 257,000
Telephone switchboards	936,000	987,000	+ 51,000
Other telephone equipment	1,059,000	2,440,000	+1,381,000
Railway signals, switches, and attachments	1,028,000	920,000	− 108,000
Bells, buzzers, annunciators and alarms	126,000	171,000	+ 45,000
Other electrical apparatus—			
Spark plugs, magnetos, and other ignition apparatus	2,127,000	2,247,000	+ 120,000
Insulating material	1,591,000	1,440,000	− 151,000
Metal conduit, outlet, and switch boxes	547,000	655,000	+ 108,000
Sockets, receptacles and lighting switches	1,184,000	1,353,000	+ 169,000
Electric lighting fixtures, interior and street	321,000	990,000	+ 669,000
Other wiring supplies and line material	1,629,000	1,011,000	− 618,000
Electrical apparatus n.e.i.	8,973,000	7,036,000	−1,937,000

* January 1st—June 30th. † July 1st—December 31st.

‡ Electric lamp exports were distributed as follows:—Europe, $38,000; Canada, $37,000; Central America, $83,000; Mexico, $223,000; British West Indies, $22,000; Cuba, $203,000; Argentina, $93,000; Brazil, $26,000; Chile, $52,000; other South American Countries, $75,000; Australia, $129,000; New Zealand, $20,000; British South Africa, $33,000; other countries, $99,000.

Electric Heating "Mystery."—According to the *Electrical World*, the greatest stumbling block in the way of more rapid progress in the application of electric heating is the reluctance of manufacturers and users of the apparatus to publish details. "There is a tendency on the part of many heating engineers to throw a cloak of mystery about the methods used and the results obtained with industrial electric heating. When selling appliances to the user the impression is created that a special secret process has been evolved for his sole purpose. True, most electric heating jobs require special treatment and apparatus, but after the installation has been made the user is more inclined to tell about the improvements he has effected than is the engineer or manufacturer who designed and built the equipment. . . . Specialists who withhold data or harbour the belief that they possess certain trade secrets hamper the growth of the business by creating doubt of the merits of a process about which there appears such a dearth of accurate information."

The Municipal Tramways Association.—III.

Annual Conference at Brighton.

Tramway Finance: Capital Outlay: Application of Surplus Revenue.

By Alderman R. A. Smithson, J.P. F.C.A.

(*Abstract.*)

Since 1918-19 great changes have occurred. The capital expended by local authorities on tramways has increased by £14,824,535, or 26.23 per cent.; the revenue by £5,823,555, or 32.35 per cent.; and the working expenses by £5,384,857, or 40.89 per cent. The revenue per route mile has advanced from £10,870 to £12,954, or by 19 per cent. The effects of the war on the growth of revenue, due to increased fares, and in the working expenses, owing in a large measure to increased wages, are thrown into prominence. The revenue is now more than double what it was in 1912-13, whilst the route miles have increased by less than 18 per cent. On the other hand, the working expenses have increased by 172 per cent. The change in the financial policy and circumstances of local authorities is shown by the fact that while in 1912-13 tramways were assisted by the rates to the extent of £64,988, and contributed in rate-aid £519,715, in 1923-24 they received from local taxation £256,777, and contributed in reduction of it £280,537. In the year 1924-25 34 local authorities raised in rates for tramways the sum of £425,217 (of which seven authorities provided £339,704), and 22 local authorities derived £269,952 in reduction of rates. The amount paid for rates between 1912-13 and 1923-24 increased from £458,317 to £879,980, of which 75 to 80 per cent. was paid in respect of the permanent way. One striking feature is the amount placed to reserve and depreciation funds. It increased from £733,749 to £1,688,405. The total amount set aside in these funds during the last six years was no less than £8,063,132, while the whole sum applied in debt redemption or transferred into sinking funds for that purpose was £9,883,122.

In relation to capital, local authorities differ fundamentally in their financial arrangements from companies. The former must redeem their loan indebtedness, and at the same time maintain their undertakings in an efficient condition. They have thus a burden cast upon them which companies (that as a rule cannot redeem much of their capital) do not have to bear. A municipality may both restore and acquire its capital by the simultaneous operation of renewals and redemption funds. Only in exceptional cases, such as the construction of waterworks or large electricity stations, are they allowed to postpone the commencement of redemption funds. I find that of the total outlay on tramways, £28,653,200 has been spent on the permanent way; £11,029,308 on cars; £6,040,284 on electrical equipment of line; and £3,564,011 on street improvements.

Parliament commonly granted in previous years 30 years for the repayment of permanent way debt, 15 years for cars, and 20 years for the overhead equipment, giving an average (having regard to the amount of expenditure shown above) of 25 years, the shorter period in respect of cars compensating somewhat for the excessively long period applicable to permanent way. Speaking generally, it cannot be said that the loan period is unduly extended in the case of electrical equipment of line. Experience goes to prove that the effective life thereof is in excess of this period. As to tramcars, I am reminded that in Leeds tramcars were purchased by us in 1897, and again in 1900. These cars are now undoubtedly due for replacement. It may be that the effective life-period of this asset has been over-reached, and I may say that replacements would certainly have been effected before this date but for the war and the very high prices ruling thereafter. Respecting permanent way, it is painfully common knowledge that 30 years in respect of all routes over some of which heavy services are run is excessive; 12 or 15 years in these days of much heavier vehicular traffic would be nearer the mark. But it is true that there must be quite a substantial portion of tramway tracks where a 25-years loan period would be quite suitable. 30 years, which is the period according to the usual practice, is therefore too long, if regard is to be paid only to the question of the life of the asset.

Tramway undertakings may, I think, quite legitimately contemplate the replacement of worn-out assets by charging such replacements to capital account, but I accompany this remark with a strong proviso that before fresh borrowings are indulged in for replacements, the old debt in respect of such assets should be entirely repaid. In my view no serious objection can be raised to this procedure, and I may say that in Leeds we are replacing 200 tramcars on this basis. If this method should be applied to sections of permanent way, I think that, as a measure of prudence, it would be advisable to fix the loan period at somewhat less than the present practice of 30 years, in some cases, say, 20 years or even 15 years.

With regard to depreciation funds in addition to sinking funds, I understand that they are statutory in some, if not all, Scottish undertakings. Edinburgh applies to that purpose a sum representing 1½d. per car mile run during the year, while Glasgow adopts a percentage basis varying according to the assets. Last year the total sum represented 3.8d. per car mile, or £490,000, whilst only slightly over £150,000 was actually spent on renewals. Had the undertaking based the provision on, say, 2½d. per car mile (Manchester and Bolton) then the result would have been a surplus instead of a deficit.

I have pointed out that 22 authorities contributed from tramways last year, in reduction of local rates, nearly £270,000. Both the policy and principle involved in that course can be reasonably defended; it cannot be controverted that the rider should pay the cost of the means of transport, whilst the ratepayers in general, who in case of a loss are called upon to meet the deficit, are entitled to some compensation in respect of the risk of that happening. How exceedingly narrow is the financial margin on which tramways carry on the essential services which they render to the community, will be realised when it is remembered that the loss of one passenger per car mile run represents over £1,903,000, or considerably more than the amount set aside in the reserve and renewals fund last year. In these circumstances no one will deny that the risk of loss is a constant and a real one, or question the equity of the contributions when a genuine surplus is realised. I have also pointed out that 34 tramway authorities received assistance from the rates by a direct transfer last year to the extent of over £425,000.

What are the counter-considerations? The amount paid in rates on the permanent way alone last year exceeded £600,000. Without this sum the local rates of the authorities concerned would have been increased by an average of 2d. in the £. The cost of the upkeep of the permanent way—much of which is now ordinary road maintenance—was last year £1,905,000, to which must be added the interest on and the redemption of the cost of constructing it, amounting to about £1,123,000. Electricity for traction purposes cost last year over £2,691,000. The price per unit varied considerably, but from a return which was issued by the Association in October last, it is obvious that the great bulk of it was purchased at a price substantially in excess of the actual cost. It is, in fact, a complaint that in this respect some tramway undertakings subsidise electricity undertakings. The free-riding facilities provided for some deserving members of the community represent a considerable loss of income in many cases. Taken in the aggregate, the tramway industry will compare favourably from the financial point of view with many other industries in the country.

I now pass to another matter, namely, the keeping and publication of the accounts. In this connection it has ever been the aim of the tramway department, over which it is my pleasure to preside, to endeavour to produce and publish the annual accounts at the earliest possible moment, and my committee has had the advantage of being able to consider the annual statements of income and expenditure at the first monthly committee meeting succeeding the expiry of the financial year. This promptitude is highly desirable, in view of the fact that the value of any financial statement dealing with large expenditures is proportionate to the punctuality with which it is available in relation to the financial period treated. It has come within my observation that at a recent conference of a kindred body to ourselves, a member of that body felt himself able to go so far as to make these remarks:—

"It was essential to proper financial control that a local authority should have unity of financial administration. It was therefore necessary that there should be set up by each local authority a finance committee to take charge of and control the whole of the finances and accounts of the local authority. To be consistent with the principle of unity of control, it was also necessary that the chief financial officer should be responsible for, and have charge of, the whole of the finances, and that the accounts should be kept in his office." "There was a tendency for some departments, especially trading departments, to become self-contained and independent of the treasurer's department, which made it difficult for the treasurer to carry out his legitimate duties." "This was wrong in principle, because, as everyone knew, there was a strong temptation to committees and officials interested in any particular undertaking to show satisfactory financial results by methods which an experienced and impartial financial officer would not approve."

It cannot be, surely, that the speaker had in mind, when making these sweeping statements, the large tramway undertakings of the country, and yet these are just the municipal departments where an approximation to self-containment is reached. As the servant of the finance committee the city treasurer must, quite properly, carry out the duties of his office. Nevertheless, the arrangement which has obtained since the inception of the Leeds tramway undertaking has, in practice, been quite satisfactory, whereby the city treasurer and controller deals with all matters of loans, reserves, income tax and departmental audit, &c., whilst the books are kept, and other financial and statistical work carried out, in the accountant's section of the tramway department.

It is evident that the views referred to are not unanimously held by Local Government Officers—as the expressions show which recently fell from Dr. I. G. Gibbon, Assistant Secretary to the Ministry of Health, at the conference referred to. He said:—

"One school tends to regard all matters relating to accounts as a holy of holies within which it is almost impious for

any but the treasurer and his staff to tread. I am inclined to view this as a dangerous doctrine. The best results will never be obtained by a system of checks, however efficient. The mind, not the machine, in the long run is important. The best road to economy does not lie simply in a system of financial control. It is to be found by placing a full measure of responsibility, for economy no less than efficiency, on the head of each particular service."

In my view, the presence of an efficient and experienced accounting officer and staff in the tramway department, at all times assisting the head of that department in regard to financial matters—standing, as it were, at his right hand, following his various operations day by day, and preparing the necessary statistical and financial statements—is essential to the successful working of any large tramway in these days when keen competition (which may alter in incidence almost from day to day) has to be met; and the responsible officer should possess the means of learning, with the least possible delay, what are the results of such alteration in arrangements for handling traffic as he may think it necessary to make. Any change that might be made that would have the effect of transferring from his department the duties of recording and preparing such returns would necessarily make it more difficult for the responsible officer to secure such information as is essential to him in the daily conduct of the undertaking. Such changes might prove uneconomical, and would undoubtedly in the long run result in the duplication of work and staffs.

Discussion.

Alderman W. C. Fenton (deputy chairman, Sheffield Tramways Committee) said it was not generally known by the ordinary man in the street that municipal tramway undertakings had to bear so large a share of the cost of street improvements and street maintenance, as was the case. The reduction of fares because there was a small surplus was the wrong policy if the undertaking was to be kept in a sound financial position. Where the position warranted it, he felt that the ratepayers were entitled to some consideration, for it was upon their credit that the capital for the municipal undertakings was raised. At the same time, the undertaking should not be starved in order to make profits for the relief of rates.

Councillor G. Burke (vice-chairman, Blackburn Tramways Committee) suggested that there should be more strict regulations compelling local authorities to keep their accounts in a commercial way, *i.e.*, providing a trading account as well as a balance sheet. Further, greater attention should be paid to the upkeep and maintenance of the permanent way and rolling stock. In Blackburn this policy had been pursued and the manager there claimed that the undertaking in that respect was as good as, or better than, when it was first installed.

Councillor A. Digby Willoughby (chairman of the Hull Tramways Committee) said it was possible to obtain assistance from the St. David's Committee for the purpose of track renewals on tramways, on those undertakings which were in a poor financial condition. Further, he believed that if the Minister of Transport was approached with regard to some of the difficulties confronting tramway undertakings financially he might allow from the Road Board Fund a fair amount of money towards helping in this direction. Hull had been helped very materially during the past few months from the Road Board Fund.

Councillor V. L. McEntee (chairman, Walthamstow Tramways Committee) complained that municipalities were not able to borrow money at the same cheap rates as private enterprise could. When a tramway authority desired to borrow money it was exploited by the financial people. Recently, Walthamstow had had to pay 5¾ per cent. in borrowing £300,000, and he suggested that the executive council should go into that matter very carefully.

Mr. H. P. Stokes (manager, Plymouth Corporation Tramways) claimed that municipal tramway accounts were kept in the most simple form that could be imagined, and that there was certainly no public company operating transport which would dream of giving the same detail as was to be found in municipal tramway accounts. The paper did not deal very fully with capital expenditure. Many undertakings to-day were suffering from a heavy capital expenditure due to having bought out companies. Profits should be put into the undertaking in the same way that a company puts surplus profits into its undertaking. In that way they could avoid further borrowing. One saw at the present time corporations raising money to renew track at a high rate of interest and at the same time allocating sums from tramway profits to the relief of rates.

Alderman Sir Peter Peacock (chairman, Warrington Tramways Committee) said that Warrington to-day had no difficulty in borrowing at 4½ per cent. On a certain road running through Warrington to Liverpool and Manchester the cost of renewal of the tramway track was very great owing to the heavy through traffic, and although representations had been made to the Ministry of Transport, the Corporation could get no help, and it was told that the tramways were trading undertakings.

Councillor Major Fitzgerald Jones (deputy chairman, Salford Tramways Committee), referring to the question of overlapping loans, said that in Salford there were over-lapping loans and he failed to see how they could be avoided as it was impossible to isolate one portion of the undertaking from another for the purpose of loans. As regarded the relief of rates by means of tramway profits, many people, and he was one of them, were of the opinion that there was no reason why the present generation should subsidise posterity by being charged high fares in order to allow the next generation to have tramway undertakings free of debt. There might be circumstances in which contributions could be made to relieve the rates out of the tramway profits without injuring the riding public.

Bailie P. Burt (sub-convener, Glasgow Corporation Tramways) contended that it was wrong for one municipal department to subsidise another in any way, and added that unless municipalities could carry on an undertaking better than it could be done by private people, then private interests ought to be allowed to do it. The position in Glasgow was that the Corporation could not call upon the ratepayers to make up any loss on the tramways, but there was a fund called the Common Good, which belonged to the citizens and not to the ratepayers, and it was from that fund that the money was obtained for establishing the tramway system. One useful manner in which a surplus could be spent was to lay down tram lines in outlying districts which, although at present they might not provide sufficient revenue to show a profit, would eventually develop into a paying concern.

Alderman Smithson, replying to the discussion, said that although in Leeds a profit on the tramways was usually budgeted for in advance to be applied to the relief of rates at the end of the year, this did not prevent the tramway committee developing the undertaking to the full. This year, for instance, although a profit of £50,000 was estimated for at the beginning the tramway committee had reduced fares to an extent which would reduce the revenue by £40,000, and it might be that the Leeds "chancellor of the exchequer" would not get his £50,000 at the end of the year.

Electricity Supply at Salford.

Agecroft Station Inauguration.

The Salford Corporation's new Agecroft power station, a description of which is concluded on pages 527-28 of this issue, was opened with great ceremony and pride, by the Mayor of Salford, on September 23rd, in the presence of about 400 guests, including the electrical engineers and Mayors of nearly all the neighbouring Lancashire towns. An Electricity Week was also held, the chief feature of which was an exhibition in the Pendleton Town Hall. The Electricity Committee feels that as it now has the resources for meeting a large demand, every effort should be made to create the desire for electricity in the home. Twelve manufacturers participated in the exhibition, which was comprehensive in its appeal, so far as domestic devices were concerned. The Salford Electricity Committee has acquired premises for the opening of permanent electricity showrooms.

On the morning of the opening of the new power station, the guests were given the opportunity of making a tour of inspection. The Mayor, Alderman G. Billington, J.P., who is also chairman of the Electricity Committee, switched on a new 12,500-kW set, two others being already in commission. Subsequently luncheon was served at the Midland Hotel, Manchester.

Sir P. A. Nash, in proposing the toast of "The Electricity Undertaking," congratulated the Corporation on the manner in which it had set out to meet the great demand for electricity, indicating directions in which electric power would most usefully serve the needs of the community, and emphasised the scope for industrial electrification. On behalf of the contractors, Sir Philip asked the Mayor of Salford to accept a handsome piece of plate.

The Mayor of Salford, in acknowledging the toast and the presentation, said that the site of the new Agecroft station was bought originally for a refuse tip. When the present scheme was first put before the Council, it was turned down; eventually costs became more moderate, and the Council decided upon a progressive course. The Corporation was now in a position to assist all large manufacturers to bring down prices by offering them a cheap supply of power, and the Electricity Committee was not out for profits; it was not out to relieve the rates so much as to give the best service possible to the community.

Toasting the trade and commerce of Salford, Lord Colwyn, P.C., D.L., remarked that at one time Lancashire could produce goods cheaper than any other country in the world, but he was afraid that it would not be in that position again until there was a fuller manifestation of co-operative spirit amongst all sections of the community. He urged the young men of to-day to leave sport and recreation and to concentrate their minds on helping their country.

Lord Colwyn provoked a scene when he attacked Communist Sunday schools. A Councillor, apparently of Socialistic sympathies, took exception to some of Lord Colwyn's remarks and the dissension became marked; the Mayor of Salford appealed to the two or three recalcitrants to maintain order and Lord Colwyn desisted from speaking on the matter further, though apparently against the wishes of almost the entire company. When he sat down, he was given a remarkable ovation.

Mr. W. C. Bacon, J.P., chairman of the Manchester Ship Canal Co., said that his company was one of the largest consumers of electricity in the borough, and when developments now taking place had been completed, its load would easily be the heaviest. He was satisfied that electricity would eventually supersede the present wasteful use of coal.

Lieut.-Commander F. W. Astbury, in proposing "The Contractors," said he was delighted to observe that all the machinery in the station was British made and congratulated the Electricity Committee on this fact.

Sir J. Kemnal replied and Alderman J. P. McDougall, J.P., Deputy Mayor of Salford, toasted "The Engineer." Electricity was introduced in Salford 30 years ago, and he had been on the committee 23 years. Agecroft was their third station; in his time there had been five engineers and he was happy to observe that three out of the five were with them that day; the electricity undertaking had given £154,000 towards the relief of rates.

Mr. J. A. Robertson said that the Agecroft station was the result of much co-ordinating work in which many people were concerned, to all of whom he wished to pay tribute. In 191[illegible] the borough was short of power, and the expedient was adopted of forging a copper link with their near neighbour. He hoped that this broadening of the views of the respective councils would be developed to a greater extent. In proceeding with the scheme the Salford Corporation had taken the long view. To-day the station had a load which would be remunerative even if it did not increase.

Mr. S. J. Watson, electrical engineer to the Salford Corporation, emphasised the policy of *service*, and said he hoped that in the near future there would be a great development in the domestic demand.

The final toast to the Mayor and Mayoress of Salford was enthusiastically honoured.

The Magnetic and Electrical Properties of Cast Iron.

By J. H. PARTRIDGE, B.Sc. (Hons.).

Abstract of a Paper read before the Iron and Steel Institute.

The paper is a record of the observations made from a series of experiments on specimens of cast iron, with elements of known and varying degree introduced to find the magnetic and electrical effects produced by them. Cast iron has the advantage of cheap production, convenient casting and machining properties, higher specific electrical resistance, and consequently lower eddy current losses. Hence the use of cast iron could be greatly extended if its magnetic properties could be improved. In 1902 Reusch, from a preliminary investigation, concluded that the carbon content plays an important part in the magnetic value of a material, whilst silicon plays a part chiefly inasmuch as it precipitates graphite, which latter hinders the magnetic induction; manganese did not seem to influence the magnetic induction unfavourably.

In 1921 Goltze concluded that silicon, carbon, manganese, phosphorus, and sulphur decrease the permeability of cast iron and should be kept as low as possible.

In the experiments made with the various constituents the iron was melted in a 30-lb. salamander crucible, and the elements were added either in the metallic form or as ferro-alloys, and bars 12 in. by 1 in. were cast in sand-moulds. The bars were machined down to 1.125 cm. diameter. The primary magnetisation curves were determined by using an Iliovici permeameter, and the hysteresis loops by the bar-and-yoke method. In order to determine the effect of silicon on the magnetic properties of cast iron, bars containing various per-

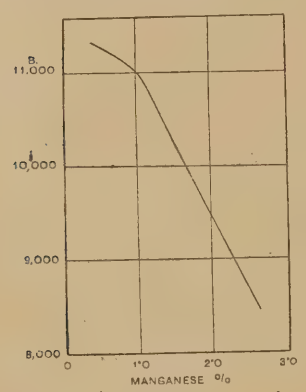


Fig. 1.

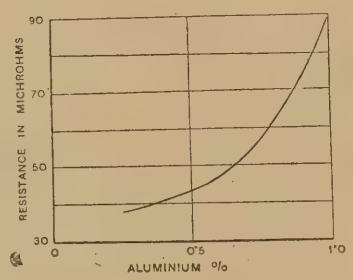


Fig. 2.

centages of this element were cast. Annealed and unannealed specimens were used and the most prominent feature was the magnetic superiority of the annealed bars. The magnetic properties of the cast specimens appear to deteriorate the higher the content of silicon. However, silicon does have a beneficial effect in the cast condition. Thus the magnetic induction of the annealed specimens increases with increasing silicon content. The magnetic properties of the samples were determined by taking hysteresis loops. In investigating the effect of manganese on the magnetic properties of cast iron, the manganese was varied whilst the silicon was kept constant.

Manganese is prejudiced to good magnetic properties and should be as low as possible when cast iron having high induction and high permeability is required. Fig. 1 shows the deterioration of magnetic induction with increase of manganese content. Annealing raises the magnetic induction. In the annealed condition, as in the cast condition, manganese increases the hysteresis loss and the coercive force, but decreases the magnetic induction and remanent magnetism. Since manganese tends to decrease the remanent magnetism, it may be concluded that the addition of this element to cast iron will not produce a material suitable for permanent magnets.

Aluminium was added to American washed iron. The magnetisation and permeability curves are given in fig. 3; specimens A1, A2 and A3 were annealed at 900 deg. C. for 15 minutes. There is a steady decrease in the maximum induction as the aluminium content is increased. The remanent magnetism also decreases as the percentage of aluminium increases. The effect of annealing is very pronounced. The curves of magnetisation and permeability for specimens A5 and A6 in the annealed condition are shown in fig. 3. The extreme high induction of these specimens is largely due to the small amount of combined carbon, and to the distribution of the graphite. Thus aluminium, up to 1 per cent., apparently increases both the coercive force and the hysteresis loss, but further addition causes a huge decrease. The coercive force and hysteresis loss of specimens A5 and A6 are very little greater than those of wrought iron. In order to investigate in detail the effect of aluminium on the magnetic properties of cast iron, it was decided to prepare alloys containing from 1 to 7 per cent., and from 18 to 24 per cent. of this element *i.e.*, to prepare only those alloys which can be machined. Aluminium decreases the maximum induction, the maximum permeability, and the remanent magnetism.

Chromium in the form of 62 per cent. ferro-chrome was added to American washed iron, to which sufficient 45 per cent

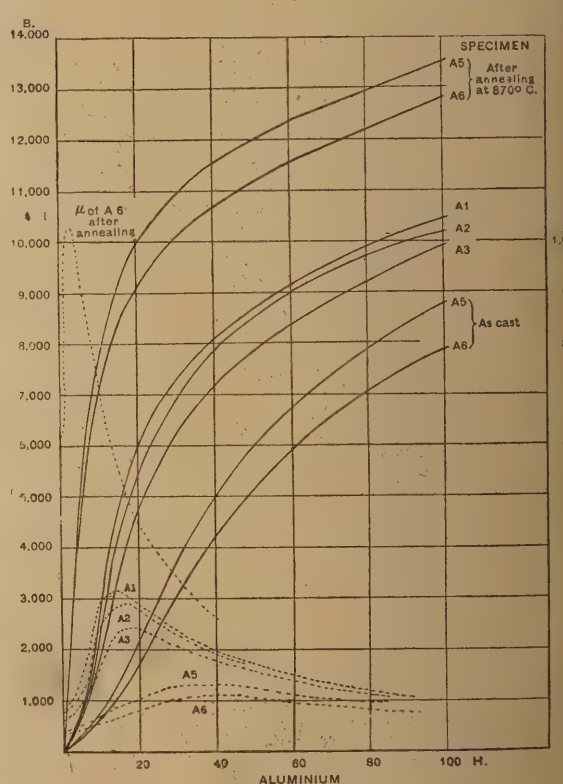


Fig. 3.

ferro-silicon had been added to raise the silicon content to 1 per cent. The specimens had to be prepared in two heat The three bars containing the larger amounts of chromium we satisfactory, but the specimens containing the smaller amoun of this element were high in silicon. Thus chromium is pr judicial to good magnetic properties. Its addition decreas the maximum permeability and the remanent magnetism, a increases the force at which this maximum permeability occur Thus chromium appears to decrease the remanent magnetis and to increase the coercive force and hysteresis loss. A parently chromium is capable of giving a sufficiently hi coercive force, but only at the expense of the remanent ma netism, which would be reduced to a very small amount.

In order to determine the effect of phosphorus, silicon a phosphorus were added to American washed iron. The effe of phosphorus is not very great, and it probably tends to i crease the induction.

In another case cobalt, in the form of metallic cubes, w added to American washed iron in order to determine the effe of this element on the magnetic properties of cast iron. Fro the results of a preliminary experiment, it appeared that coba

would make the iron sound and precipitate sufficient graphite to render the iron machinable. However, this was not the case, and so the bars were remelted and silicon was added. Cobalt increases the magnetic induction, remanent magnetism, and the maximum permeability.

Microscopical examination of the specimens was carried out, and from this it would appear that the magnetic properties depend to a great extent on the microstructure. It was found that for the highest magnetic induction and permeability, the graphite should exist as temper carbon, and as much ferrite as possible must be present. Graphite in the form of flakes is not favourable to high induction. The presence of free carbide denotes low magnetic induction, and should be avoided at all costs when high permeability is required. The presence of carbide also indicates high coercive force, high hysteresis loss, and low remanent magnetism.

The specific resistance of the specimens was measured by passing a small current and measuring the potential drop between two points on the specimen. In order to get accurate results the current was reversed and the specific resistance determined for at least two different current strengths. It was found that silicon increases the specific resistance, and annealing reduces it. In the annealed specimens, the graphite exists in the form of temper carbon, and the continuity of the current is not affected to the same extent.

The effect of aluminium is to raise the specific resistance of cast iron. Annealing raises the resistance, due to the deposition of graphite, as is evident from the fact that the resistance of specimen A5 is less than that of specimen A3, whilst A6 has only slightly higher resistance than A3, although the specimens A5 and A6 contain more aluminium than A3. The increase in resistance due to aluminium is shown graphically in fig. 2. Phosphorus apparently increases the specific resistance.

From his observations made during the series of experiments described, the author has drawn the following conclusions, briefly stated :—

The highest magnetic induction and permeability are obtained with cast iron which has been annealed. When high permeability is required, the graphite should be in the form of temper carbon; as little combined carbon as possible should be present, and free cementite must be absent. In the cast state, silicon decreases the magnetic induction, but its presence may be advantageous in alloys which have to work at low flux densities (*e.g.*, transformer cores). Both in the cast and annealed conditions silicon reduces the coercive force and the hysteresis loss.

In both conditions manganese, nickel and chromium are prejudicial to high magnetic induction. In the annealed condition manganese and chromium increase the coercive force and hysteresis loss and decrease the remanent magnetism. In the cast state aluminium decreases the magnetic induction, permeability and remanent magnetism, and increases the coercive force and the hysteresis loss. In the annealed condition aluminium, in amounts up to 1 per cent., decreases the magnetic induction and the maximum permeability, but increases the coercive force and hysteresis loss.

Phosphorus has little effect on the magnetic properties of cast iron, probably tending to increase the magnetic induction in alloys containing silicon.

The presence of sufficient nickel, or nickel and manganese, makes cast iron non-magnetic.

In the cast state cobalt increases the magnetic induction and remanent magnetism, and increases the maximum permeability.

Both manganese and chromium are capable of giving a sufficiently high coercive force for a good permanent magnet, but in doing so they reduce the remanent magnetism to a very small amount.

Silicon, manganese, and aluminium raise the specific resistance of cast iron.

Cast iron has a very high specific resistance, and is suitable for resistance grids which have to pass heavy currents.

The Wireless Exhibition, 1925.

An All-British Display of Radio-Telephone Apparatus and Accessories.

(*Concluded from page* 514.)

General Electric Co., Ltd.

This company had a very comprehensive display of its radio-telephone products. Prominent among these were examples of super-heterodyne sets—one with six and another with eight valves—designed for a wavelength range of from 200 to 3,000 metres. The six-valve model was arranged with a glass panel to show the construction and movements of the set. Four-valve "Gecophone" cabinet and table sets were exhibited, as well as the new "Gecophone Junior" crystal set. Most of these sets were fitted with the company's new low-loss slow-motion variable condenser (fig. 21). This has an all-metal frame to which the rotary plates are connected. The vanes are of brass and of the "square-law" pattern. The fixed plates are insulated from the frame outside the electrostatic field. The spindle, which is operated by the knob, has a large disk at its end which engages by friction with the small diameter of a "two-speed" idler. The larger diameter

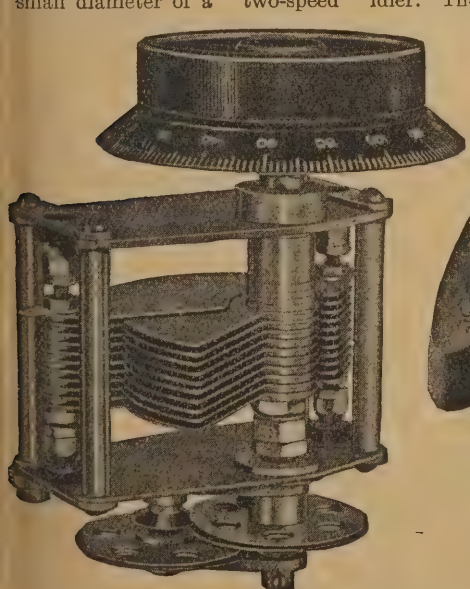


Fig. 21.—The New G.E.C. Low-loss Slow-motion Condenser.



Fig. 22.—Sterling "Mellovox" Loud-speaker.

of the latter engages again with the spindle of the moving vanes, and by this means a considerable speed reduction is obtained. It is claimed that the minimum capacity of this type of condenser is 1/50th of the maximum capacity. The coil holders shown include one for mounting behind the panel, the relative positions of the coils being indicated upon a dial at the front of the panel. Other components shown were a buzzer-type wavemeter; aerial-earth switches; anode reactance units, &c. A section of the exhibit was devoted to "Osram" valves.

Sterling Telephone & Electric Co., Ltd.

A range of standard receivers and amplifiers was on view with headphones and components. The loud-speakers included the "Mellovox," fig. 22, a new hornless model obtainable in three-colour combinations; the "Audivox II" is fitted with an adjusting device, and is claimed to be especially suitable for use out of doors. The Sterling "Super Invicta" battery is as simple as the Leclanché cell as regards ease in handling. Its dimensions are $9\frac{1}{2}\times7\frac{7}{8}\times6\frac{1}{2}$ in., and no chemical depolariser is used, air being relied upon for this purpose. The initial voltage is 1.4 and the e.m.f., after the initial drop, remains practically constant during the discharge on a given external resistance, provided the size of cell is adapted to the ohmic value of this resistance. A large zinc surface is used for the positive and a special carbon for the negative elements; the special construction of the carbon blocks enables them to remain dry in spite of their immersion in the salammoniac electrolyte, so that the gases generated can mix freely, inside the blocks, with the oxygen in the air. The largest cell of this type has an approximate capacity of 500 ampere-hours when discharged at the rate of one ampere for eight hours daily.

S. Smith & Sons (M.A.), Ltd.

This firm's exhibit consisted of transformers, "Mouldensite" insulating material, small h.p. generators for driving motors, &c., and a new unit in the form of a resistance-capacity auto-transformer. The M.L. anode converter is a machine driven by an ordinary accumulator which is intended to take the place of high-pressure batteries for receiving and low-power transmitting sets. The various types of machine include those delivering two separate voltages for the detecting and amplifying parts of the set, and a special model for three or more resistance-capacity coupled amplifiers.

Autoveyors, Ltd.

In addition to condensers and such specialities as "Clix" and radio conduit, the company showed for the first time the high-frequency relay recently referred to in our pages. The adapted model exhibited, whilst retaining most of the principal features of the original design (as employed in the compound focus apparatus) has, in order to avoid too revolutionary a departure from existing subsidiary components and accessories, been confined in principle and design to conform to "valve" convenience, employment, and fitment. It is claimed to provide a means of adaptation of the h.f. relay as a form of "valve" to existing apparatus, and is said to employ electromagnetic phenomena.

S. G. Brown, Ltd.

The various loud-speakers shown by this company included a new cabinet of mahogany without a horn. The tuned-reed principle has not been departed from and a feature is the placing of a quartered moulded board in a central position immediately in the mouth of the flair, which enhances the instrument's appearance. A modified cheaper type of the original tuned-reed "A" headphone was noticed, besides gramophone adaptors, transformers, crystal sets, instruments for the deaf, and electro-megaphones.

Marconiphone Co., Ltd.

Besides valves, including transmitters, amongst the receiving instruments shown were reflex circuits and a new series of two-, three-, and four-valve sets of simplified tuning and construction for loud-speaker work. A large "straight eight" set, as shown in fig. 23, was noticed which employed five stages of h.f. amplification, followed by a detector and two l.f. stages. Reaction has been avoided entirely, which necessitated increasing the number of valves; nevertheless, the filament consumption is only 0.68 A at 6 V, or approximately the same as that of one "R" valve, while the h.p. consumption is said to be no larger than that of four-valve instruments. The dimensions of the cabinet are approximately 26 by 16 by 13½ in. As regards components, the "Junior Ideal" transformer is new, and so is the "die cast" condenser of the square-law type. "Public address" equipment was demonstrated in the main hall, including the Round-Sykes magnetophone, and the valves shown included the D.E.6 (fig. 24), which is particularly suitable for the last stage of a l.f. amplifier using D.E.R. or D.E.2 valves in the initial stages. Its anode voltage is from 60 to 120 V, with from 5- to 10-V negative grid bias; the filament voltage may be from 1.8 to 2 V, and the filament current 0.5 A. The impedance is 10,000 ohms and the amplification factor 5.5.

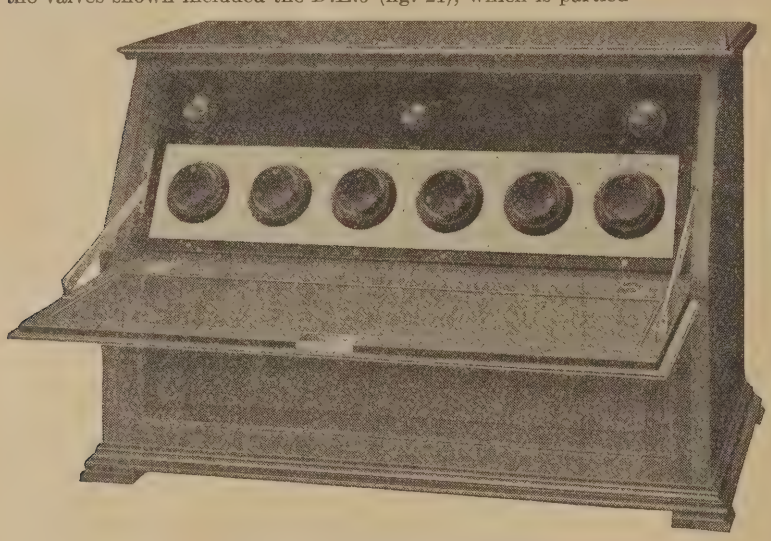


Fig. 23.—A Marconiphone 8-Valve Set.



Fig. 24.—The Marconi D.E.6 Valve.



Fig. 25.—A McMichael Supersonic Transformer.

Chloride Electrical Storage Co., Ltd.

Amongst the various batteries and component parts shown by this company, PW cells for ships' wireless were noted, and the new high-pressure accumulator illustrated in fig. 26. The special features of the latter are: It needs to be recharged only once every six months when used for radio or similar purposes; it is supplied in a dry-charged condition and can be put into operation immediately after being filled with acid, but a freshening charge is desirable during the first month of use. The container is of moulded glass and no separators are required, while no brass or other corrodible material is employed. Every plate is visible, the acid level is plainly marked, and suitable connecting clips are provided with each battery for tapping in 12-volt steps. The battery is made up in 12-cell units, giving 24 volts per battery, the actual capacity of which is 5,000 milliampere-hours when used for very small discharge currents, such as are required for radio apparatus. The normal charging current is ¼ ampere and the weight of the battery is 15½ lb., its width being 4⅜ in., height over the lead terminals 5¼ in., and length 8⅝ in.

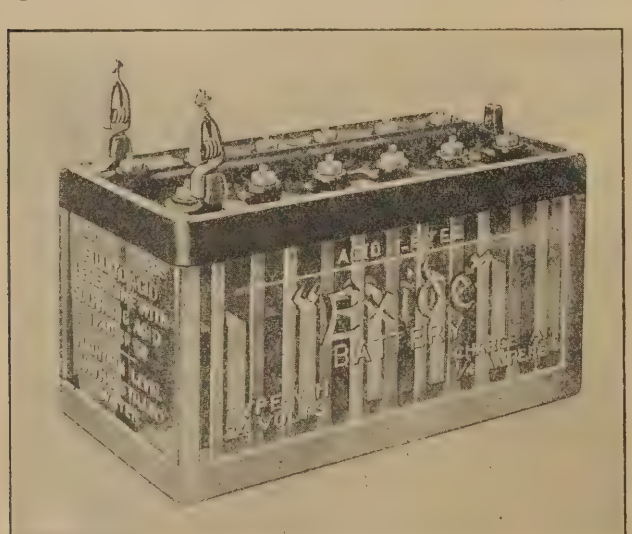


Fig. 26.—The Chloride h.p. Radio Battery.

L. McMichael, Ltd.

Complete receiving sets and many well-known accessories were shown. The firm's super-heterodyne tuned intermediate transformers, although by no means the first to appear, are original in design; the component is provided with a specially-constructed iron core, and a variable condenser to tune the primary is embodied in the top portion of the component, while a milled ebonite knob with a pointer rotating over an engraved scale enables accurate tuning within close limits. The transformer is illustrated in fig. 25. The company's reactor may be used to best advantage as the oscillator unit of a supersonic circuit when plugged in to either its special autodyne neutral point transformer when an autodyne circuit is being used, or into the No. 0 ordinary h.f. transformer when the heterodyne method is being employed.

The M.H. condenser test panel consists of an ebonite base with two terminals, to which are connected four pairs of condenser clips. It will be readily appreciated that by a combination of four clip-in condensers a wide variation of capacities can be instantly obtained by the simple expedient of clipping-in or unclipping the condensers. For obtaining the correct capacity across loud-speaker terminals, for instance, this component is obviously of value. The "Reversine" coil holder will have many uses, for it enables the moving coil to be reversed both in its physical and electrical relationships to the fixed coil. The triple rheostat provides for the control of up to four valves and allows extra valves to be added without disturbing the original lay-out of the panel.

M.O. Valve Co., Ltd.

This company had on view a selection of Marconi and Osram broadcast receiving valves, including 4-electrode bright and dull emitters, high-power commercial valves, and cooled anode 20-kW models. The D.E.T.1 type dull-emitter low-power transmitter is capable of dissipating up to 40 watts at the anode, with an anode voltage of 1,000 V, the filament current being 1.9 A at from 5 to 6 volts.

Radio Communication Co., Ltd.

The "Twin" is an extremely compact receiver, while the "Polar Four" incorporates two distinct tuning circuits, each of which can be tuned to a separate station and the set can be switched to either, thus affording a constant choice of two programmes; it is also suitable for use in a wired house system, enabling control of volume and choice of station from different points in the house. The "block" method of set assembly was represented, and amongst the accessories a hornless sound-reproducing instrument was seen; the dual and triple condensers shown should be very useful for simultaneous tuning, the two or three similar air condensers, as the case may be, being mounted on one spindle, and in order to prevent any risk of the vanes short-circuiting, mica vanes are introduced to separate the metal plates; screening sections separate the individual condensers so as to prevent unwanted coupling between the various sections. The limits of capacity available with the triple condenser are from 0.000014 to 0.00078 microfarad, and the component permits the simultaneous tuning of two or three circuits in one operation, *i.e.*, tuned anodes.

This company staged a representative group of transmitting and receiving apparatus as used on ships of the British mercantile marine. The display included a reproduction of a passenger liner's wireless cabin, in which was fitted a "Polar"

1½-kW transmitting and receiving set, a 1½-kW continuous-wave valve transmitter, and emergency transmitting and receiving apparatus with the necessary manipulating equipment; in addition there was shown a complete ½-kW spark transmitting and receiving set as generally used on an intermediate-type ship, and a ¼-kW spark transmitting and receiving set as usually fitted on board a cargo vessel. A lifeboat transmitting and receiving set was on view and a model of an automatic call device, designed to keep watch on board ship during the absence of the operator and to give an alarm in the event of a distress signal being received.

Burndept Wireless, Ltd.

A full range of this company's well-known apparatus was exhibited, including the new "Ethodyne" seven-valve super-heterodyne receiver, the chief features claimed for it being selectivity and extent of range. Two frame aerials, for plugging into the top of the cabinet, are supplied with the set: one for 250 to 500 metres and the other for 1,000 to 2,000 metres, with a change-over switch. All the tuning is done by the two centre knobs (fig. 27) and the seven valves are of four different types, to ensure that each is correct for the work it has to do. A switch enables one or both power valves to be used; volume control allows the set to be used two or three miles from a station. Besides a series of components the firm supplies valves which are "guaranteed" and a "super-vernier" dial for the fine adjustment of condensers, reaction couplers, variometers, &c., which may be fitted to any set without dismantling it in any way. Concealed within the dial (fig. 28) is a novel friction-driven epicyclic gear and when the knob is rotated it causes the dial and condenser to turn in the ratio of 7 to 1; if rapid searching is required, the dial is rotated instead of the knob. An exhibit was staged in the gallery to illustrate the auto-broadcast system as installed in the Waterloo Hospital under the *Daily News* Wireless for Hospitals Fund. Lead-covered wiring is run throughout the building in a similar manner to lighting circuits and listening points are provided in all the wards. With the aid of the fund seven hospitals have already been equipped in this way and nineteen are in process of being equipped.

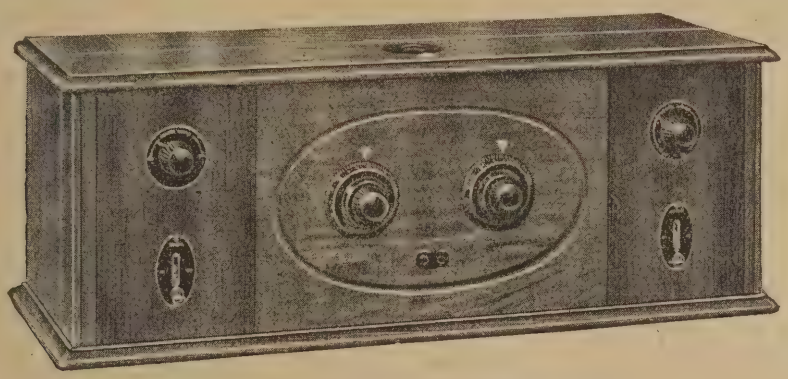


Fig. 27.—"Ethodyne" 7-valve Super-heterodyne Receiver.

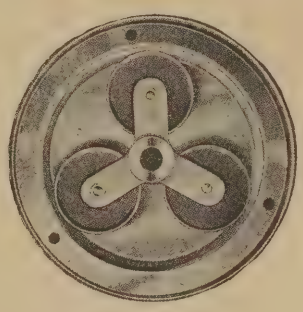


Fig. 28.—Base of Burndept Condenser Dial.

Gent & Co., Ltd.

Besides a variety of "Tangent" radio fitments, there were on view complete receivers, headphones, loud speakers, and a.c. rectifiers for high-pressure supply. The company also caters for constructors' requirements.

Sylvex, Ltd.

This company showed "Sylverex" natural galena crystals and "Kathoxyd" crystals, which are composed of a small brass cup that holds a metal plate covered with a chemical compound. Two special contacts are supplied, one being made of zinc-iron and the other of graphite.

Dubilier Condenser Co. (1925), Ltd.

Amongst typical types of condensers for broadcast receivers, transmitting stations, and laboratory use, the "Univane" pattern was of interest. It is a new type that provides the electrical equivalent of mechanical vernier gearing throughout the full range of the condenser, and this desirable result is accomplished by a simple arrangement by means of which the rotation of the knob of the condenser moves only one vane of the condenser at a time. As soon as one movable vane has been rotated into position where it interleaves with the fixed vanes, a second vane is picked up and is rotated into position as the knob is turned. Thus the full movement from minimum to maximum capacity requires several complete revolutions of the knob of the condenser which enables very fine tuning to be obtained. The number of times that the knob has been turned is shown on a small auxiliary indicator attached to the front of the instrument alongside the dial. The instrument is suitable for use in all types of radio receiving sets.

Other Exhibitors.

The following firms also exhibited sets and accessories:—Auto Sundries, Ltd.; F. E. Wootten, Ltd.; Bowyer-Lowe Co., Ltd.; British Ebonite Co., Ltd.; Neutron, Ltd. (synthetic crystals); J. J. Eastick & Sons; Eagle Engineering Co., Ltd.; Beard & Fitch, Ltd. ("Success" supersonic-heterodyne receivers and components); A. C. Cossor, Ltd.; Pell, Cahill and Co., Ltd.; Falk, Stadelmann & Co., Ltd.; Climax Radio Electric, Ltd.; British Radio Corporation, Ltd.; Hirst Bros. & Co., Ltd.; National Wireless & Electric Co.; Hart Accumulator Co., Ltd.; London & Provincial Radio Co., Ltd.; "Kenmac" Radio, Ltd.; H. Quartermaine (earthing device).

Marconi's Wireless Telegraph Co., Ltd., staged an interesting exhibit of historical apparatus, while the undermentioned firms exhibited sets and accessories manufactured by members of the N.A.R.M.A.T.:—Messrs. Cables & Electrical Supplies; A. W. Gamage, Ltd.; Brown Brothers, Ltd.; Selfridge & Co., Ltd.; H. J. Galleries; Hobday Bros., Ltd.; East London Rubber Co.; and A. J. Dew & Co.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

An Electrical Propeller for Water-Velocity Measurement.

A recent production of the Stonebridge Electrical Co., Ltd., Victoria Road, North Acton, W.3, takes the form of an apparatus for measuring the velocity of a water system, and is built on the principle of the electrical tachometer. It permits, it is claimed, the direct measurement of the momentary value of this velocity, without intermediate calculations. The device consists of a propeller, direct coupled to a very small generator mounted on a common spindle and enclosed in a metal case which is divided into three compartments. The front portion contains a pipe filled with oil, in which the bearings of the driving spindle are located. The rear compartment houses the generator, a small magneto machine of about 0.3 W max. load. In the middle compartment the spindle is decreased to 1 mm. diameter, with double bearing, in order to reduce the friction and render the compartment watertight. A suitable lubricant fills the space between the two middle bearings. In the case of water entering this, it can be easily removed by loosening a screw, the head of which acts as a support. The indicator comprises a small precision instrument which measures the voltage produced by the generator, transmitted by means of a watertight contact piece and a twin flexible cable. The voltage is proportional to the water velocity.

An Electrical Refrigerator.

The Delco-light Co., 717-723, Fulham Road, S.W.6, manufacturers of the Frigidaire electrical refrigerator, exhibited a film bearing the above title to a gathering of their dealers and others interested in refrigeration at Frascati's on September 9th. The film is very instructional. Commencing with specimens of primitive cooling systems, such as the "Water Caves" of our forefathers, the principles of which are fully demonstrated, it proceeds to the "ice-chest" period, in which stress is laid on the rising temperature and diminishing ice factors, together with the processes by which food is affected in the moist atmosphere of the ice-box. Finally we reach the "Frigidaire" electrical refrigerator, and in this section the full working processes of the plant are shown. The plant is automatic; it is fitted with a thermostatic device which starts and stops the compressing unit whenever the temperature of the cabinet necessitates it, so that there is no waste of current nor can the temperature ever rise above a certain point, which is several degrees colder than ice at its lowest temperature. It is claimed for the "Frigidaire" that it provides an absolutely dry germ-free atmosphere in which food is preserved for a much longer period and in more hygienic conditions than is possible in an ice-chest. It can be operated from any electricity supply at, it is claimed, trifling cost, and is

made in sizes to suit the small household or the requirements of those who want up to 400 cu. ft. of refrigerated space.

The accompanying illustration (fig. 1) is of a "Frigidaire" plant. The heat-absorbing element is sulphur dioxide in liquid form. This vaporises at temperatures above 8 deg. F. The compression brought about by the vaporisation operates the switch controlling a small electric motor driving the com-

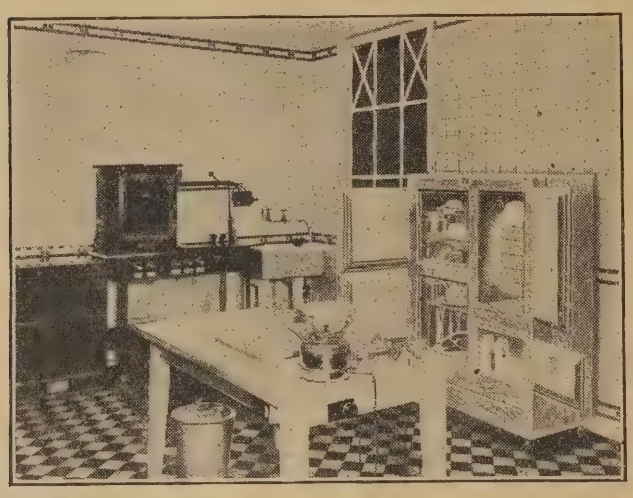


Fig. 1.—A "Frigidaire" Refrigerator.

pressor, at a temperature of 28 deg. F. The sulphur dioxide is compressed into a cooling coil, where it is cooled down till it is converted back into liquid form, when it is again circulated into the absorbing element container. In the latest design of the plant the cooling is effected by air circulated by a fan driven from the compressor motor. In the older designs the cooling was brought about by water circulation.

A Transformer Truck.

The increase in size of the plant in use by the larger electricity supply undertakings and the advantages arising from the rapid installation or changing-over of plant have made the provision of adequate handling facilities of importance. The Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough, has designed special trucks to suit the requirements, one of which is shown in fig. 2; this truck is designed for loads up to 25 tons, and is intended to facilitate the handling and movement generally of transformers and other plant of a similar nature. Arranged to run on main-line railways, it can be used in conjunction with standard railway locomotives and wagons, the usual spring buffers and centre draw hooks and chains being provided. The wheels are of cast steel, mounted on large-diameter axles, provided with ball bearings at the extreme ends. Side lever brakes are fitted,

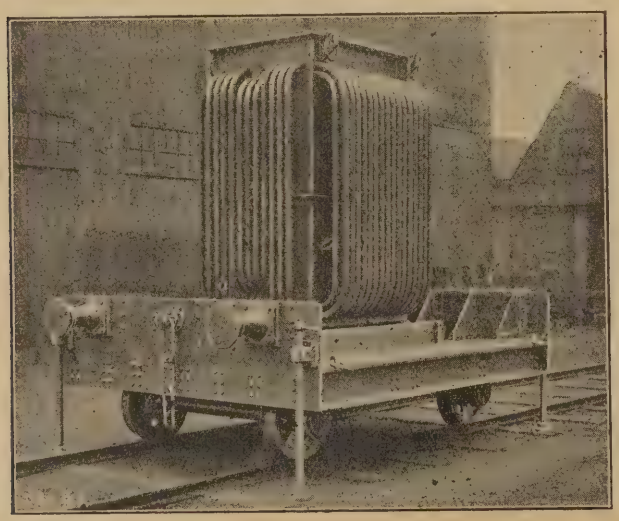


Fig. 2.—A Brush Transformer Truck.

and at each corner there is an adjustable screw column so that the truck may be secured in a level position when being loaded and unloaded, and the possibility of tilting during such an operation is avoided. The floor of the truck is provided with lines of holes to take adjustable stretcher bars of wood, so that the transformer can be firmly held in position during shunting operations. The truck should be of considerable advantage where transformers have to be moved into or out of sub-stations or other buildings, as it can be run into a siding or pit adjacent to the building, and by means of the rollers usually provided the transformer can be quickly run off the truck when the stretcher bar has been removed. The requirements of this class of rolling stock will, of course, vary with the individual requirements of different undertakings, and the makers have different types under construction to suit the particular conditions for which they are needed.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Charges for Electricity Supply.

I was much amused at "Stung's" letter in last week's Review (Sept. 18th), and I cannot let it pass without replying.

To begin with, gas can be stored very conveniently, electricity cannot. Gas should be sold at about 1s. 6d. per thousand and still show a profit—a lot of it is carburetted water, is a deadly poison, blackens ceilings, ruins leather upholstery, burns up the air, &c., *ad infinitum*.

Gas is sold at about three times its value to enable the gas department to change the street lamps every few years, trying to compete with electricity; to lend gas stoves and lead piping to anyone who will use it; to fit powerful lights outside shops at a very cheap rent; in fact, anything that will use gas can be had for next to nothing.

Gas shows such a good profit that they can afford to do it. I would suggest that "Stung," if he is still dissatisfied after reading this, goes back to it and gets value (according to his idea) for his money—the electricity department would not miss him!

Why, even the chairman of the gas department, who thinks (or at least, says) his gas is wonderful, uses electricity!

In rural districts, the people pay anything from 6d. to 10d. per unit for the privilege of having electricity, and I cannot believe the Eccles electricity department will put a service in, supply a meter and a man to read it if they cannot see a return of 30s. per annum paying for what is used at a flat rate.

According to "Stung's" idea, if a house is closed up for a year or two, no charge should be made for service. He wants vision and should think of it like this: A host of men are employed, countless thousands of pounds sterling have been paid out, to give him a supply of electricity, and if when he pressed his switch, no light came, he would have a just cause for complaint. It is up to him to use electricity freely for everything possible, so that his rateable value will be only a small proportion of his total bill. In my own case, frequently I used 2,000 units per quarter and my fixed charge was 30s. per quarter, so that my total inclusive cost per unit was less than ¾d.; at that price there is no room for argument about coal or gas and we cannot forget convenience, cleanliness, and all the other stock arguments.

About 150 small houses had electricity installed about sixteen years ago, the builder buying electricity in bulk and charging 1s. per week in the rent; no meters were installed, no heating or other devices were allowed, and it was found that at 3d. per unit, each house averaged 2s. 9d. per week the year round for lighting only.

As the builder was losing money on this, meters were put in and the average came down to 1s. 3d. per week. I therefore cannot see how "Stung" can have any grievance against the department's insisting on a minimum of £2 per annum, and if he will get busy and buy a few second-hand radiators and *use them*, giving up, "in view of his poverty" his preference for a coal fire, he will find that he gets most wonderful value. There will be less work in the house, he can put ferns in his grate, his wife (if he is married) will be all smiles, having less work to do, and everybody will be happy. He may leave the hall light on every evening, making the house look cheerful.

September 21st, 1925. **E. O. W.**

The Manufacture of Induction Motors.

With reference to Mr. Shaw's letter in your issue of last week, Mr. Shaw will appreciate that the information on which the estimate is based is of a confidential nature and therefore cannot be published.

In anticipation of any scepticism we submitted to you in confidence the basis of the estimate. If Mr. Shaw is seriously in doubt as to the accuracy of the statements contained in the advertisement to which he refers, we suggest that he make an appointment to meet the writer, when we have no doubt we shall be able to give him sufficient information to remove such

F. & A. Parkinson, Ltd.

Guiseley, *September 22nd*, 1925.

[Since the advertisement appeared we have received from Messrs. Parkinson certain figures in support of their claim, the accuracy of which we, of course, are not in a position to vouch for; doubtless they would be pleased to disclose them in confidence to Mr. Shaw. They are also publishing their own output figures for last July in our advertisement pages to-day. Is there any reason why they should not publish replies to Mr. Shaw's questions Nos. 2, 3, and 4?—Eds. Elec. Rev.]

Rural Electricity Supply.

Some very interesting information, in my opinion, is given in the "Correspondence" columns of your issue dated September 25th by Mr. W. Fennell, of the Mid-Cheshire E.S. Co., in particular his remarks on the use of single-phase current, which is only now beginning to be considered on the Continent, as hitherto they have adhered to a 3-phase supply for all power purposes (only utilising single-phase for small lighting loads). His figures of cost of tappings are a remarkable example of what energy and skilled enterprise can bring about, and should do much to take "the wind out of the sails" of those

who make their excuse for not supplying a rural area, that it would cost them over five times the amount of the expenditure to which the Mid-Cheshire E.S. Co. has to go to attain the same end.

As regards the difficulties of possible interference of power lines with telephone lines, there is a great deal in the old saw that "possession is nine points of the law." The telephone engineers were in the field first, and they have built up a fund of accumulated experience upon which it is easy for them to draw when they come in contact with an overhead electrical transmission engineer who, though he may be an expert on his own subject, is not so well versed in the subtleties of the law and custom. The telephone engineer, after all, is only human and he has enough troubles of his own, without adding to them the possible interference of high-pressure transmission lines; so it is obvious that he is not going to make things too easy for the transmission engineer. Again, a powerful government department is very different from a small electricity supply undertaking, and can therefore carry many points by its own weight. Personally, I have always got on very well with telephone engineers, but I have always found it most expedient to confer with them, at as early a stage as possible, in connection with any proposed new development. Still, as your correspondent indicates, it would be just as well if all the electricity supply undertakings could agree on a common basis.

Apart from telephone matters, a much freer hand will be necessary in the design of rural electrification networks. To attain this end there must be some method whereby existing regulations—intended really for entirely different conditions—need not be complied with; hence a solution to this very important question, as to how this can best be accomplished, is badly needed. Mr. Fennell has given some most useful indications as to what is required: now it is for others to add to his contribution.

R. Borlase Matthews.

East Grinstead, *September 25th*, 1925.

The Roman Baths at Bath.

The advertisement on page xxxiii of your issue of September 18th, referred to by Messrs. Johnson & Phillips in their letter in your current issue, was not inserted to flatter them or anyone else. It was inserted to remove a misleading impression—undoubtedly unintentional—that would be sure to be produced by their advertisement in your issue of August 7th (Supplement, p. 11) and to emphasise the principle of "Truth in Advertising."

W. T. Henley's Telegraph Works Co., Ltd.
(W. A. Moore, *Advertising Manager.*)

London, *September 25th*, 1925.

Current Literature.

As of necessity I have to (and like to) keep myself well informed, I have always used such digests as are available. Hence I appreciate your correspondent's suggestion. However, I also know the difficulties. I find it to be a very good plan, if one wants something of this sort and at the same time feels that it has a wide benefit, to start it. If you have compiled a really useful table and would like to have it neatly in print, get it published, and then you benefit others as well as yourself.

Some time ago the Electrical Review used to publish, fortnightly, a classified list of its own contents, which I, personally, and a number of my acquaintances, found very useful. Its only drawback was that it appeared a little late and lacked an international classification.

I started a weekly digest of all the more important current electrical articles in the columns of *Electrical Industries*, a number of years ago. This feature is still running, though the international classification has been dropped. I am at present attempting to deal with all published matter concerning the applications of electricity to agriculture in a monthly journal that I am editing, entitled *Electro-Farming*.

Science Abstracts covered the field very well, but its timing was too great for me. It also suffered from the lack of international classification.

A number of digests of current literature are prepared by various associations and companies in this country; in fact, there is a good deal of overlapping of work. The Association of Special Libraries and Information Bureaux (38, Bloomsbury Square, W.C.1) is doing a great deal to bring about co-operation between those who are digesting various classes of current literature. Your correspondent should get in touch with the secretary. The second annual conference of this Association has just been held.

My general view is that what is chiefly required is (*a*) the classification preferably on the International basis, (*b*) the author's name, (*c*) the mechanical particulars, *i.e.*, length of article and number of illustrations, (*d*) a brief note to give a clear indication of the contents, and (*e*) most important, prompt publication while the journals digested are still current. Rarely can an abstract be sufficient in itself, it should be rather a guide to the article as to whether or not it is worth looking up, since, for serious work, one must always read the original article.

There are over 24,000 scientific and technical periodicals, all of which at some time or other refer to electrical matters, so their abstracting is not an easy affair.

R. Borlase Matthews.

East Grinstead, *September 25th*, 1925.

A Disclaimer.

It has come to my knowledge that a rumour is in circulation that I have accepted the agency of a well-known firm of Austrian manufacturers. Although we all know that rumour was ever a "lying jade," to be severely ignored—in view of the fact that I continue to hold the office of chairman of the N.A.R.M.A.T. Special Committee for the Safeguarding of the Radio Industry, I feel it incumbent upon me in this instance to give rumour the lie direct by stating that I personally have had no business negotiations with any person or firm in Germany or Austria since the outbreak of war; further, I have not accepted the agency for, or taken a commercial interest in, any foreign firm.

I shall feel greatly obliged if you will be kind enough to publish this letter in your next issue.

Guy Burney.

London, *September 28th*, 1925.

Legal.

Telephone Contract Dispute.

In the Mayor's and City of London Court, before Judge Shewell Cooper, on September 22nd, the New System Private Telephone Co., Ltd., Arundel Street, W.C.2, sued Messrs. B. Maisel & Co., Moorgate, for £11 7s. 8d., rent of a telephone installation from January 1st, 1924, to June 30th, 1925. Defendants counter-claimed for damages for breach of contract and a declaration that they were not bound by the agreement of May 29th, 1919, whereby they undertook to rent an installation for 21 years. Alternatively they claimed rectification of the agreement so as to entitle them to give three months' notice to determine it. For the plaintiffs it was stated that the defendants signed the contract in May, 1919, hiring an installation with four instruments for 21 years. The rent had been paid until that now sued for and the defendants sought to say that the contract was void owing to the fact that the instruments had to be attended to from time to time. Documents were produced on behalf of the plaintiffs, which showed that the installation had been periodically examined, and signatures given on behalf of the defendants that all was in order. For the defence, evidence was given by Mr. T. G. Dobb, general manager of the defendant firm, that throughout the period in which the installation had been in use it had been a constant source of trouble. Lately it had been out of use altogether as it was so unreliable. Cross-examined, witness admitted that he signed a contract for 21 years, but said that when he did so he was under the impression that it was not for such a long period, but was subject to six months' notice on either side, and his firm had given such a notice, which, however, the plaintiffs had refused to accept. Witness admitted that from 1921 to 1923 no complaint was made with regard to the telephone in writing, and he also admitted that periods of many months occurred when, according to the records kept by the plaintiffs, everything appeared to be in order. Judge Shewell Cooper said there was only one construction to put upon the contract and that was that it was for a period of 21 years. With regard to the present claim he was satisfied that at times the apparatus had gone wrong and adjustment, and attention was necessary, which was only to be expected in an installation of that kind. It was admitted, with the exception of one occasion when a delay of six weeks was experienced, that the plaintiffs had always attended and overhauled the apparatus when requested to by the defendants. For that six weeks' delay plaintiffs had made a generous allowance. In his view the plaintiffs' claim succeeded, and he gave judgment for them on the claim and counter-claim, with costs.

Radio Goods Conspiracy.

After a trial lasting five days, the hearing was concluded at the Central Criminal Court, on September 23rd, of the case against Naum Abram Ludwin, 34, merchant, and James Smith-Hickie, 26, merchant, who were charged with conspiracy to defraud and with obtaining goods by false pretences.

Mr. Gerald Dodson, opening the case for the prosecution, said that the accused were charged with conspiring together with a man named Anatole Iban Zaitzeff, 54, merchant, who, although he had appeared before the committing magistrates, and been bound over to attend the hearing, had absconded from his bail, and at the present moment the prosecution was unable to arrest him. The two men before the Court, in addition to the conspiracy charges were also charged with defrauding various traders, the method of the frauds being to get goods by representing that they were carrying on a *bonâ-fide* business in the ordinary way, when in reality they got the goods in order to sell them for any price that they might be able to fetch, and put the money in their own pockets. Between July, 1924, and April of this year, they obtained goods to the value of approximately £1,500. Those goods had never been paid for. The defendant Ludwin was a naturalised British subject of Russian origin and was a half-brother to Zaitzeff. The other defendant, Smith-Hickie, got into touch with those two men comparatively recently and occupied a position with them of considerable importance. It was alleged that he was general manager of Ludwin & Co., and managing director of Importex, Ltd. Those two businesses were those which the defendants purported to carry on as genuine businesses. The defendant Ludwin appeared to have begun a business in 1921, or possibly earlier, at 26, Gray's Inn Road, and

he carried on under the style of N. A. Ludwin & Co. In 1923 he removed to an address at 122, Bunhill Row, taking the first floor of those premises. There then came into existence upon the door of those premises the names of a number of businesses and companies. There were the General Distributing Trading Co., Ltd.; British & Overseas Dental Supplies, Ltd.; N. A. Ludwin & Co.; A. I. Zaitzeff & Co., Ltd.; Importex, Ltd.; and the Lancashire Trading Co., Ltd. It was alleged by the prosecution that those businesses and companies had been used for the purpose of giving references to each other. In addition, Counsel said that there was another company called Darag (London), Ltd., but the name of that company did not appear on the door. About December, 1924, Messrs. Hogan and Wardrop, electricians, supplied goods to the value of about £150. They were given three bills of £50 each by way of payment, and those bills were accepted by Ludwin on behalf of Importex, Ltd. The first of the bills was met, but the other two were dishonoured. Ludwin asked Messrs. Hogan and Wardrop to accept payment of £20 weekly until the debt was liquidated. Two cheques for £10 each were given and met. Afterwards, however, Messrs. Hogan & Wardrop were forced to take proceedings and they recovered £29. The balance due to them was £53. Counsel, quoting another case, said that Ludwin had approached the Igranic Electric Co., Ltd., and obtained a large quantity of goods.

At the conclusion of the case for the prosecution Ludwin gave evidence denying the charges. He said that he had been robbed of a large quantity of goods. In his absence from the business goods had been sent by Smith-Hickie, to a firm known as Hoile & English. Witness said, "Hoile & English is a firm carried on by Smith-Hickie's wife and a wife of one of my travellers. Goods I paid 15s. for have been disposed of by them for half that amount." Witness added that Hoile and English owed him £800. If that money had been paid it would have gone to his creditors. Smith-Hickie in the witness-box denied the charges, but admitted that his wife was a partner in Hoile & English. Goods had been supplied to that firm by him.

After a short absence the jury found both the defendants guilty.

The Judge said it was not an ordinary case of long firm fraud. It was not a bogus concern started with the dishonest purpose of entrapping traders, but they sought to bolster up the business by dishonest means. Sentence of six months' imprisonment in the second division was passed on both the defendants.

Theft of Electricity.

At Falmouth Police Court, on September 24th, Frederick Ernest Deeble, principal of the firm of J. H. Deeble & Sons, electrical engineers and yacht furnishers, was charged with fraudulently abstracting electricity belonging to the Electric Supply Corporation, Ltd. It was stated that on July 3rd, 1924, the meters at defendant's premises were inspected by the Corporation's resident engineer and manager, Mr. A. R. Howden, and found in order. On July 9th a meter inspector examined the cut-outs and meter cards, and, two days later, in consequence of information, Mr. Howden examined all the meters, which were in order with the exception of the power meter. That one was unsealed, and a match had been jammed between the revolving disk and the magnet and a piece of bell wire also connected with the terminals inside the meter. Either of these was sufficient to prevent the meter working.

Pleading guilty on behalf of defendant, Mr. H. S. Prideaux said the facts were admitted. The distressing position in which Mr. Deeble found himself was due to a very foolish and ill-considered action on his part. He was ready to assist the Corporation in every way to arrive at the amount of current consumed and to make full reparation. Mr. Prideaux appealed to the Bench to treat defendant as a first offender.

The Mayor said that the magistrates felt that this was a case where the trust and confidence of commercial life was at stake, and they could not do less than fine defendant half the maximum penalty, namely, £25.

Stoller v. Davidson & Co.

In the Whitechapel County Court, on September 21st, before Judge Cluer, a reserved judgment was delivered in a case in which Abraham Joseph Stoller, Stepney, E., sued Messrs. E. Davidson & Company, Stepney, E., electrical engineers, to recover £3 15s. 6d. for an accumulator entrusted to the defendants on May 8th for charging and destroyed by fire the same night on the defendants' premises. The case was heard in July. A member of the defendant firm said that the fire was caused through accumulator acid leaking. If the acid touched anything, it would complete a circuit, cause a spark, and so give rise to a fire. A faulty or leaky accumulator was not usually taken to an electrical engineer for charging. Judge Cluer said that the plaintiff had to prove that the defendants had been negligent. So far as the evidence went, the fire was not caused by any negligence of the defendant firm. Judgment was accordingly entered for the defendants, with costs.

The Mersey Tunnel.—Work upon the construction of the new Mersey tunnel is to commence at an early date under the supervision of Mr. Basil Mott and Mr. J. Brodie, the City Engineer of Liverpool.

Published Specifications.

Compiled expressly for this journal by Patent Agents.

The name of the applicant's patent agent, if any, will be found on the printed specification.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

2,199. "Electrically-driven tools and the like." T. H. Hurst and Hurst Electrical Plant, Ltd. October 27th, 1924. (238,926.)

6,134. "Electric furnaces and the like." W. A. Loke. March 10th, 1924. (239,249.)

10,682. "Telegraph repeater." H. Angel and Western Union Telegraph Co. April 30th, 1924. (239,253.)

11,409. "Warming device for use with electrically-controlled machinery." A. E. Billingsley. May 8th, 1924. (239,259.)

13,121. "Radio direction finders." F. Woods. May 28th, 1924. (239,263.)

13,263. "Tuning or inductance-coil units for high-frequency circuits for use in wireless receiving apparatus." A. W. Sharman and Radio Acoustics, Ltd. May 29th, 1924. (239,267.)

13,531. "Electric connectors." M. D. Davis. June 2nd, 1924. (239,275.)

13,573. "Electrical switches and the like." E. S. Rogers. June 4th, 1924. (239,277.)

13,689. "Compound electric machines." Siemens-Schuckertwerke Ges. June 5th, 1923. (217,226.)

13,744. "Means for ventilating railway carriages, tramcars, ships, and other electrically or mechanically operated vehicles, or subways, buildings, or the like." J. H. Gath. June 5th, 1924. (239,283.)

14,005. "Safety braking appliances for motor vehicles, tramcars, and other power-propelled vehicles." G. O. Evans. June 10th, 1924. (239,294.)

14,161. "Vacuum electric tube devices." E. Y. Robinson and Metropolitan-Vickers Electrical Co., Ltd. June 11th, 1924. (239,299.)

14,770. "Radio-telephonic and other radio-frequency signalling systems." G. W. Hale and Radio Engineering Co., Ltd. June 18th, 1924. (239,309.)

14,771. "Apparatus for wireless reception." G. W. Hale and Radio Engineering Co., Ltd. June 18th, 1924. (Cognate application 7,310/25.) (239,310.)

15,364. "Automatic and semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). June 25th, 1924. (239,314.)

15,442. "Electric plug-in connectors." British Thomson-Houston Co., Ltd., and W. F. Boyd. June 26th, 1924. (239,315.)

17,617. "Drums and a method of carrying the drums for electric cables for mines and like works." J. R. Bond and S. Robinson. July 23rd, 1924. (239,325.)

17,623. "Condensers used in connection with wireless telegraphy and telephony." A. A. Price and Price's Battery & Radio Co., Ltd. May 22nd, 1925. (239,326.)

17,908. "Loud speakers and other sound-reproducing or sound-transmitting apparatus." A. H. Midgley. July 26th, 1924. (Cognate application 20,706/24.) (239,331.)

18,107. "Electrical condensers." C. E. Raeburn and W. E. Taylor. April 24th, 1925. (239,333.)

18,938. "Crystal detectors for wireless receiving sets." A. Gooch. August 9th, 1924. (239,338.)

19,265. "Rotary detector for use with crystal wireless receiving sets." W. Stuart. August 14th, 1924. (239,341.)

19,421. "Socket tubes for electrical connectors, wall sockets, and the like." C. L. Arnold and "M.K." Electric, Ltd. August 16th, 1924. (239,345.)

19,569. "Electrogalvanic method of, and electrolytic bath for applying protective covers on electric conductors, especially metals." J. H. Mellquist. August 18th, 1924. (Convention date not granted.) (220,944.)

19,647. "Starters for automobile engines." A. G. K. Hansen. August 19th, 1924. (239,347.)

20,030. "Holder or suspension fitting for electric lamps." J. Lawton and Sons, Ltd., and F. G. Martin. August 25th, 1924. (239,352.)

20,887. "Synchronous transmission of several messages over one wire by means of alternating currents of different frequencies." C. Lorenz Akt. Ges. September 24th, 1923. (222,462.)

21,310. "Thermostatically-controlled electric switches." E. C. R. Marks (Hart Manufacturing Co.). September 9th, 1924. (239,361.)

22,473. "Electric signalling bells." W. B. Dale, R. A. Hopkinson, and J. Hopkinson & Co., Ltd. September 23rd, 1924. (239,373.)

22,554. "Telephone systems." Coventry Automatic Telephones, Ltd., and V. Amberg. September 24th, 1924. (239,374.)

24,230. "Microphones." L. Darimont. October 22nd, 1923. (223,900.)

24,946. "Impregnating medium for electrodes." L. Kahl and Rütgerswerke Akt. Ges. October 20th, 1924. (239,387.)

27,171. "Electric motor-driven change-speed device." E. C. R. Marks (Hendey Machine Co.). November 13th, 1924. (239,295.)

28,003. "Deoxidation of gases in tanks for electrical apparatus." Metropolitan-Vickers Electrical Co., Ltd. December 29th, 1923. (226,790.)

29,257. "Connecting device for the wire of telephone or telegraph cables." A. Kvaal. December 5th, 1924. (239,409.)

30,612. "Electric heating plates." British Thomson-Houston Co., Ltd. December 20th, 1923. (226,561.)

1925.

9. "Sparking plugs." E. A. Jackson. January 1st, 1925. (239,420.)

1,730. "Electric condensers." British Thomson-Houston Co., Ltd. April 22nd, 1924. (232,920.)

2,514. "Systems of electric distribution." British Thomson-Houston Co., Ltd. January 28th, 1924. (228,551.)

4,979. "Frequency-reducing means for use with static frequency transformers." Telefunken Ges. fur Drahtlose Telegraphie. February 23rd, 1924. (229,705.)

5,288. "Rotary electric ignition commutators or distributors for internal-combustion engines." A. G. Briant. February 26th, 1925. (239,441.)

5,506. "Telephone systems." Siemens & Halske Akt. Ges. March 31st, 1924. (231,443.)

9,117. "Crystal holders of wireless receiving apparatus." J. W. Barber and Brownie Wireless Co. of Great Britain, Ltd. April 6th, 1925. (239,450.)

9,237. "Electric furnaces." Akt. Ges. Brown, Boveri et Cie. April 14th. 1924. (232,224.)

9,435. "Tiltable electric conducting liquid switch." Lurgi Apparatebau Ges. July 7th, 1924. (Addition to 230,406.) (236,518.)

The

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New Electricity Supply Areas.

THE report recently issued by the Minister of Transport respecting proceedings under the Electricity Supply Acts includes a list of the Special Orders made by the Electricity Commissioners during the year under review (to March 31st, 1925). A rough analysis of these Orders may be of interest as indicating the new territory which will thus be catered for in the way of electricity supply, who are the enterprising authorities, and generally the direction which developments are taking.

There are 73 Special Orders altogether, of which 72 authorise supply to new areas and one authorises a transfer of part of an undertaking. Of the 72 Orders for new areas, local authorities have promoted 33 and companies (or persons) 39.

From the nature of the case, all these Orders refer to country areas or small towns. Two of the Orders refer to "cities," but these are the city of Lichfield and part of the city of Wakefield. For the rest, the Orders relate to county boroughs, urban and rural districts, and parishes.

From the point of view of the much-discussed rural development, it is interesting to note that out of the 72 Special Orders, 47 Orders are for supply to rural districts, covering indeed the big number of 93 rural districts in whole or part. The urban districts covered (68) are, of course, also almost exclusively country areas. To the foregoing have to be added 26 parishes and 20 boroughs (of which the most important is, perhaps, Newark-upon-Trent).

One interesting aspect of these Orders is the indication they give of an increasingly popular policy with local authority undertakers, namely, that of extending their areas of supply to the surrounding rural districts. One of the most ambitious of these is Luton, which is extending outwards in a very wide sweep, including Dunstable and rural districts in Bedfordshire, Buckinghamshire, and Hertfordshire. The Bedford undertaking is likewise extending its boundaries, so that these two local authorities will together cover a fairly extensive area.

Worcester is similarly proposing to supply the rural districts to a three- or four-mile radius round the city. This is an element in the South-West Midlands District scheme. Sheffield, Middlesbrough, and Leicester have also secured Orders for extensions into the surrounding country. Of the provincial companies which are similarly expanding their boundaries, the Northampton Supply Co. has a fairly ambitious programme under its Order covering extensive rural and urban dis-

tricts and Daventry. The Oxford Company is extending to Woodstock and elsewhere, and the Abingdon Company is also expanding. The two undertakings, we understand, either have been or will be interlinked. Another company which is interested in rural supply, in fact, mainly engaged in it, is the Western Electric Distributing Corporation, whose West Wilts. Order covers Chippenham, Devizes, Westbury, and a comprehensive slice of that rural country. The power companies are also getting new customers for their bulk supplies by taking out Orders. The Lancashire Power Co. has obtained an Order for the urban district of Golborne, and Electrical Distribution of Yorkshire, Ltd. (the feeder to the Yorkshire Power Co.) has taken out three Orders covering a formidable number of rural and other districts, some 28 altogether. The Lothians Electric Power Co. is fulfilling its obligations (in partnership with the Edinburgh Corporation under the Edinburgh and Lothians Electricity District scheme) to provide "a cheap and abundant supply of electricity", within the portion of the district for which it is responsible, by an Order with a voluminous list of burghs and parishes.

Finally, there is the London and Home Counties Electricity District, which offers very little scope for new Orders. Nevertheless, the few remaining unappropriated spots are being decreased in this list by the following: The County of London Co. has taken Orders for some of the unappropriated areas of Essex, the Leatherhead Co. has staked out a claim in the Epsom rural and Guildford rural areas, the Egham and Staines Co. and the Woking Co. have secured such parts of the rural district of Staines as are innocent as yet of electricity supply, and the Urban Co. has taken up uncatered-for areas in the rural districts of Reigate and Godstone.

In view of the interest attaching to the changing panorama of electrically supplied areas, we have thought it worth while to commence to publish a series of maps illustrating the position up to the time of printing. In some parts of the country, practically the whole area is already parcelled out to statutory undertakers, and, of course, almost all of the "unoccupied areas" are of the rural type, wherever they are met with. We shall deal first with the counties which are still far from completely covered, and afterwards with those offering less scope for new enterprise, omitting counties the whole of which has been allotted to the care of authorised undertakers of one sort or another. The first of these maps, dealing with Bedfordshire, Bucks and Northants, appears in this issue.

Rural Overhead Lines.

Recent correspondence, following on comments in these pages, has recalled attention to the regulations which control the construction of overhead lines for pressures above 125 volts, and to the restrictions thereby imposed upon the development of electricity supply in rural areas. It may not be generally realised that the residents in such areas, which have hitherto been regarded by many as an unpromising field for electricity, are eager to avail themselves of its benefits directly the mains come within hailing distance, and the only obstacle to the satisfaction of their longing for release from the tyranny of the paraffin lamp and oil-cooking stove is the cost of the transmission lines.

That the existing regulations seriously impede rural development is certain, and that there is no necessity for their excessive stringency has been witnessed by Mr. W. Fennell and Mr. R. Borlase Matthews in our columns, whilst we have repeatedly received similar testimony from other engineers in private conversation. Further corroboration was given by Mr. R. B. Mitchell, president of the Incorporated Municipal Electrical Association, at the recent meeting of the Institution of Public Lighting Engineers at Leeds; as reported elsewhere in this issue, Mr. Mitchell, who is chief electrical engineer to the Glasgow Corporation, referred to the rapid extension of electricity supply that is taking place in rural areas, and declared that the "very rigid Board of Trade regulations" were a great handicap to the development of rural electric lighting. Mr. E. C. Lennox, the author of the paper under discussion, who is familiar with rural distribution, agreed, and said they could hardly move for the regulations "rigidly round their necks."

We feel sure of two things: that we are making ourselves ridiculous in the eyes of the rest of the world by maintaining these restrictions, to the detriment of everyone concerned; and that if the electrical fraternity unanimously expresses a wish for the drastic revision of the regulations, the Electricity Commissioners will be found very willing to accord a sympathetic hearing to its representations. So far as the Post Office requirements are concerned, we have in the letter of Mr. S. C. Bartholomew, published in our "Correspondence" columns to-day, evidence that the Engineering Department is by no means unfriendly to the development of rural electricity supply networks, and, with other information which has reached us, we are encouraged to believe that in no long time from now the situation will be materially improved.

The Electrical Outlook in China.

He would indeed be a bold man who would seek to prophesy what prospects China offers in the immediate future for the British electrical exporter. Those enterprising spirits who, decades ago, foresaw that they could benefit China as well as themselves by introducing modern methods into Chinese industrial life and who devoted their capital and energy to building up a market for electrical apparatus and supplies have passed through a period of serious anxiety in recent years. Civil war and brigandage have combined to hamper transport and trade. With the gradual undermining of the authority of the central Government the finances of the country have gone from bad to worse. Throughout the land the treaty rights under which the whole system of Chinese trade has been built up have been increasingly disregarded. Yet amidst this growing unrest and dissension there have been wonderful examples of vitality and recuperation. Customs receipts, which have remained under foreign control, have shown increases where none was expected, and in the foreign trade returns there have also been advances. It is true that the statistical records go no further yet than 1924. The progressive decline between 1921 and 1923 in the tael value of imports of electrical material and fittings was arrested in 1924. In that year their total value was Hkwn. tls. 8,420,098 against Hkwn. tls. 8,266,181 in 1923. What the 1925 figures will be it is hard to say, but we have always urged the British exporter to cultivate the Chinese market, and we still believe that in time he will reap his reward. British material and workmanship still bear a high reputation. The Chinese have not forgotten some bad accidents that took place not many years ago owing to the use of inferior foreign electrical apparatus. Whilst the principal users of electricity are cotton mills, flour mills and oil mills, the most promising line of development at present is in lighting, from town schemes down to small units of 2½ to 10 kW for provincial residences. Hydro-electric plant is practically non-existent, although water power is available in many districts.

It has always been said of the Chinese market that, despite political troubles and internal disorder, business at the Treaty ports would thrive; but Bolshevism, boycott, and strike have so damaged business in recent months that it will take a long while to remedy the disaster. Yet there are a few rays of hope in an otherwise gloomy outlook. In contrast with the turbulent spirits who have been fomenting the anti-foreign movement, many Chinese industrialists thoroughly recognise that the future of the country, like its past, lies in the co-operation of the foreigner. The old-established Chinese merchants are men of great business acumen, and it is their influence as much as any that has led to the fixing of the date for the long-deferred Tariff Conference and to the settlement of the Shanghai strike. An attempt has even been made to produce some semblance of order and authority in Peking by the time the conference assembles there on October 26th. The British delegates have been told by Mr. A. Chamberlain

that, when dealing with the question of raising Customs duties, they must require security for China's performance of her promise to abolish the internal duties known as "likin." On the other hand, the great difficulty is to find amidst the welter of party faction any authority whose promise is likely to be performed. A change for the better may, however, emerge from the fact that, apart from the Bolshevist agitation, there is a truly national movement for freeing the country from foreign control and influence. This national movement is the more moderate of the two, and it is hard to believe that with the example of Russia before them the saner elements will not be able to check Bolshevism. They must be persuaded to use their efforts to place in power responsible men who by their actions can convince the foreign Governments of their ability to restore order and protect life and property. When that is accomplished it will be time to talk of abolishing ex-territorial rights and doing without the foreigner. And unless that is accomplished China must expect henceforth to do without foreign capital or foreign co-operation and to see her agriculture and industries wither and decay.

Hungarian Railways.

It is reported that a Franco-Spanish group has dispatched representatives to Budapest to investigate the possibility of the electrification of the Hungarian railways, this group being said to be the same as has been interested in the conversion of Italian railways to electric traction. An English group is stated to have prepared a scheme some months ago for the construction of a power station based on the utilisation of the lignite mines of Varpalota for the supply of power for the working of the Trans-Danubian railways, but the project proved to be too costly. It is assumed not to be out of the question that the Loucheur group is at the back of the Franco-Spanish group, the former having acquired the majority of the shares in the Phoebus electricity works a few months ago, which supplies the vicinity of Budapest, and also having obtained an interest in the electrical and transport undertakings, which own many electricity works in the provinces and in ceded territory. If the scheme for the conversion of the railways should be realised the Franco-Spanish group would appear to be approaching the position of being able to control the electricity supply system of Hungary.

The German Wireless Apparatus Industry.

Dealing with the second large radio exhibition in Berlin, which has recently been closed, and which is dealt with elsewhere in this issue, Herr Hamm, of Charlottenburg, states that it was a great success, there having been 250 exhibitors and over 400,000 visitors. The economic results were not so brilliant as might appear from the outward circumstances, but most of the firms were satisfied. This is regarded as a very favourable situation having regard to the serious state of distress that the German radio industry experienced during the first two years of its existence. The impression is gained that the state of chaos has been ended and has been succeeded by quiet development. In itself the radio industry has been strengthened; it is controlled by the syndicate of the wireless industry, which also possesses a kind of monopoly for the Telefunken licence, which is provisionally indispensable. Moreover, a smaller syndicate exists, but this only comprises producers of component parts, and so far it has not become of any importance. The policy of the former shows unmistakably the endeavour to prevent, or as far as possible render difficult, the establishment of new concerns. Practically no new firms were noticed at the recent exhibition, but some names have disappeared since the initial period. The tendency of the technical economic development lies in the direction of bulk production, in conjunction with standardisation. The large reduction in prices which has taken place since the spring of 1924 can only be borne if the organisation of manufacturing yields the highest possible results. Whereas a four-valve set at that time was priced at 500 marks and then dropped to 350 marks, one firm has now produced a three-valve set at 135 marks, which can be converted to a four-valve set at an additional cost of 50 marks. If good component parts are used it is impossible at this price to get more than an insignificant profit, so that compensation must be sought for in bulk production. As for the quantities concerned, Herr Hamm states that one of the most important firms in the "low-pressure" branch produces 3,000 double receivers daily, which number is sold and could be increased to 10,000 daily if the works could turn out this number, while a smaller firm constructs 50,000 per month.

Concerning the export possibilities of the German radio industry, Herr Hamm states that these are still favourable. For instance, a head-'phone costs from 8 to 14 marks in Germany according to quality, whereas the price in England and America is 20s. It is argued that with such a price difference Customs barriers cannot entirely stop the export trade, and, in fact, large quantities are being exported to America which are not yet specifically enumerated in the German official statistics.

Suggestion Schemes.

The basic idea of the suggestion scheme is unquestionably a sound one; there is nothing Utopian about it, and it can be abundantly justified on purely utilitarian and economic grounds. Where a scheme has really succeeded, it has given satisfaction to all parties directly concerned. At the same time, however, the history of actual experiments in this direction, it is to be feared, makes but mixed reading. There have been, and there are, quite notable successes; but there have been also failures. Unfortunately, it is the derelicts and cripples which are most noticed and commented upon, and all too often the efficient schemes are passed by in silence. There is certainly no inherent reason why a wisely conceived, soundly executed programme should not fully satisfy all reasonable expectations. A sound scheme working smoothly not only aids efficiency, it is itself a token of efficiency. It also suggests confidence, and may express even cordiality, in the relations as between management and executive. These are prime essentials.

Probably the foremost reason why so many of these experiments are still-born, or fail to reach maturity, is just the fact that those responsible for their inception, and entrusted with their execution, overlook the human element that is involved. The psychological factor here looms large: nowhere, indeed, is it more in evidence. It has to be remembered that success is the logical outcome, not of a purely negative thing, as mere acquiescence, but of something positive, as a species of enthusiasm. More than that, the enthusiasm has to be shared; in other words, there must be keenness alike to solicit suggestions, on the one hand, and to offer them on the other. Employers and employés must be at one in this that they welcome the facilities the scheme provides. In addition, it is most necessary to obviate, if possible, all covert opposition from intermediary officials. To this end everything must be above board, and all concerned must be assured of a square deal. Suspicion, more than anything else, kills all such enterprises. Put in skeleton outline: The employers solicit proposals which shall ensure increased efficiency, &c. They promise that careful consideration shall be given to all suggestions submitted, and state in general terms the kind of thing they want. The offers which are accepted they will pay for at a fair price. In any case, they will give a reasoned reply when a suggestion has been turned down. The rest is matter of detail.

For those interested in the subject who wish to study details of actual schemes, and to realise more fully what is involved, a brochure entitled "Suggestion Schemes," prepared by the Industrial Welfare Society, of 51, Palace Street, Westminster, S.W.1, can be recommended.

Guiding principles, exposition of schemes, details of working, including suggestion box and other methods, questions affecting adjudication and assessment of values, and of dealing with appeals, are all treated with judgment, and clarity. The nine appendixes in particular give just the kind of data that those thinking of inaugurating an actual scheme will find of most use.

Mining Electric Locomotives.—II.

Battery-Propelled Machines submitted for the Markham Competition.

It is of interest to record the fact that of the five locomotives which competed in the final tests for the £1,000 prize offered by Sir Charles Markham for a machine suitable for use in place of the pit pony for the haulage of tubs in coal mines, three (including the prize winner, which was described last week) were fitted with standard Kathanode batteries manufactured by the D.P. Battery Co., Ltd.

The locomotives had to be designed to meet the arduous conditions met with underground. The machine built by the Metropolitan-Vickers Electrical Co., Ltd., was designed in accordance with the specification drawn up by the promoters of the competition; it was found impossible, however, to adhere to the weight specified and at the same time construct a locomotive which the designer considered to be sufficiently robust for all underground duties. The electrical gear was kept as simple as possible, and the M.V. machine is actually capable of turning through an angle of 90 deg. on a 13-ft. radius with an overhang not exceeding 10¼ inches, *i.e.*, 1¼ in. less than that specified.

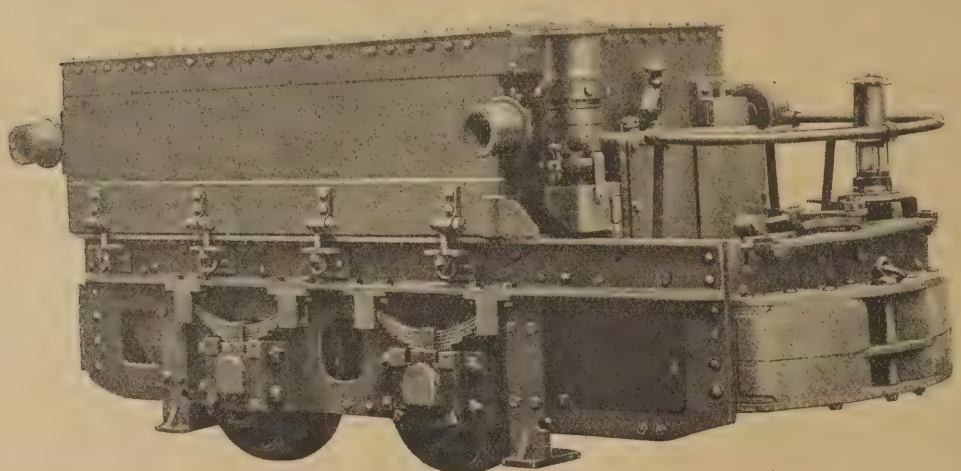


Fig. 1.—Metropolitan-Vickers Mining Locomotive.

The Metropolitan-Vickers Locomotive.

This machine is illustrated in figs. 1, 2, and 3; its battery was manufactured by the Chloride Electrical Storage Co., Ltd., and is of the "Exide-ironclad" locomotive type, consisting of 35 LMV-10 cells, which type of cell can give heavy current discharges without undue drop in the voltage, thus maintaining speed when negotiating steep inclines. The battery has a capacity of 323 ampere-hours at the 5-hour discharge rate; sufficient mud space is allowed, so that cleaning out is unnecessary during the life of the plates, whilst the head room over the plates is such that topping-up is minimised and acid sloppage practically impossible, qualities that make for trouble-free service.

The battery compartment is flame-proof and strong to withstand an internal explosion or a fall of roof; it is fitted with wide flanges separated by distance pieces to provide sufficient ventilation, the arrangement being such that it is impossible for the hot flame of an explosion to communicate with the outside atmosphere. All the terminals inside the batteries are suitably protected from short circuit. The case is made additionally strong by dividing it into three separate compartments which have specially wide flanges between them.

The two motors, one on each axle, figs. 2 and 3, are spring-suspended in the usual locomotive manner. The drive is through a double reduction chain, the high-speed chain being totally enclosed. The motors are enclosed in flame-tight covers, the terminal boxes being cast to the motor frame and forming separate flame-tight compartments through which the leads are taken by means of flame-tight bushes. Suitable inspection doors are provided for the motors in accessible positions.

The controller, enclosed in a flame-proof box, is of the cam-operated contactor type with a blow-out coil on each contactor; in addition, two interlock line switches with an overload relay are provided. The motors are reversed by means of a separately interlocked drum, the arrangement being similar to that provided on the standard Metropolitan-Vickers locomotive controller. This reverse drum is operated by a removable key which can only be taken off in the "off" position and also in this position the controller handle is locked so that it cannot be moved. In addition, the interlock is such that it is impossible to operate the reverse drum unless the controller handle is in the "off" position. The controller handle is of the "dead man's" type, and is so arranged that in the event of the handle being released the current is immediately cut off from the motors, and before it is possible to start up again it is necessary to return the controller handle to the "off" position. A flame-tight receptacle is provided on the battery box, into which a suitable plug engages. When the locomotive is in commission this plug is locked in place; similar locks are provided on the controller case so that it is impossible for any unauthorised person to open the controller case or remove the battery plug. In order to remove the battery box from the chassis, four special rollers are provided, which are detachable. These wheels would be kept in the charging station and would only be fitted at the station when it is required to replace a battery. The wheels engage with a side track, and the track on which the locomotive runs is slightly inclined to the horizontal, so that the weight of the battery is taken on the wheels provided, and by slacking off the retaining bolts it is possible for the battery box to be lifted out clear of the chassis. The locomotive chassis can then be run out to the re-charge battery station, where a reverse process takes place.

The locomotive has brakes on each wheel. The brake gear is of the compensated type and can be operated by either foot or hand. In order to lessen the possibility of generating sparks of sufficient heat to ignite gas when braking, the shoes have been lined with Ferodo. Sand boxes have been provided for each direction of running and are operated by suitable foot levers.

The Patterson Locomotive.

The rectangular steel-plate body of the machine (fig. 4) submitted by Messrs. R. H. Patterson & Co., Ltd., of Newcastle-on-Tyne, is 18 in. square and open underneath, the cab being attached to an extension of the frame and of equal strength to the main body. The overall dimensions are: length, 8 ft. 3 in.; height, 3 ft. 5½ in.; and width, 3 ft. 1½ in.; the wheel base is 22 in., and the maximum overhang on a 13-ft. curve is 7⅞ in. outside the outer rail. The weight of the complete vehicle is 2 tons 15 cwt.

The 10½-b.h.p. intermittent-rated, series-wound, totally-enclosed motor (by Messrs. Clarke, Chapman and Co., Ltd., of Gateshead) operates at 64 volts and a speed of 1,200 r.p.m. for full-load speed. The steel yoke has facings to fit exactly between the vertical members of the chassis and is rigidly bolted and dowled

to it. The transmission end of the motor shaft is enlarged, bored, and splined to take the driving shaft of a (Messrs. D. Brown & Sons) worm reduction differential mechanism, which is contained in a steel casing built into the main chassis. The reduction gear has a ratio of 10.5 to 1. The driven shafts of the differential

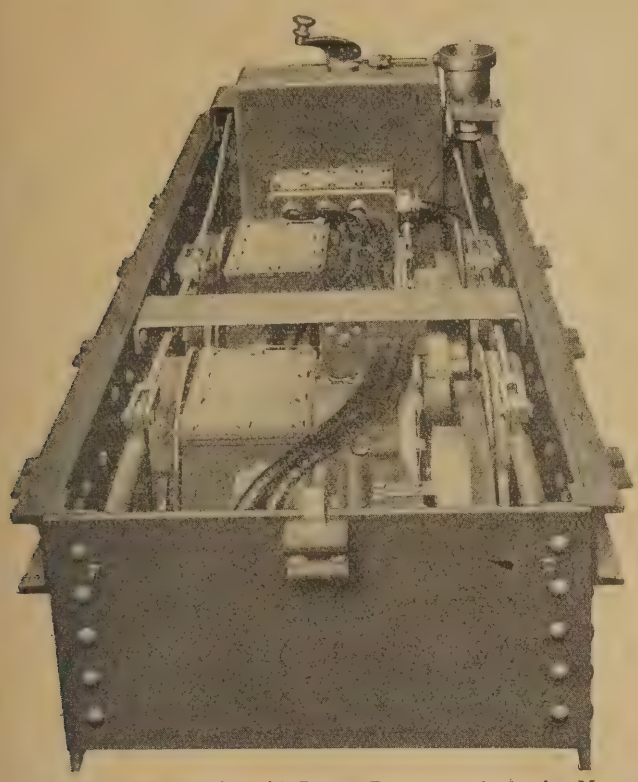


Fig. 2.—M.V. Locomotive with Battery Box removed, showing Motors.

extend through the sides of the chassis, and have two steel driving disks rigidly secured to them, each driving disk being provided with a nickel-chrome steel crank pin at 4½ in. radius

The track wheels have steel centres and main-line quality tires, and are mounted on the ends of the fixed axles with Hyatt roller bearings enclosed in the bossing of the wheel centres. Crank pins of nickel-chrome steel are secured to the track wheels at 4½ in. radius, and a compensated driving yoke of triangular form connects each set of wheels and the driving disks, one set on each side. In this manner differential action is transmitted to the track wheels through the driving yoke. The bearing taking the crank pin of the driving disk is a phosphor-bronze solid block sliding in the jaws of the driving yoke, and supported by a steel spring. The wheels are mounted in cast-steel horn blocks, sliding in machined pockets on the main chassis, and supported by steel springs of the same strength as the springs on the driving yoke. The bearings connecting to the track wheel cranks are of the "SKF" radial double-track ball type.

A totally-enclosed flame-proof controller (made by the Electro-Mechanical Brake Co., West Bromwich) is situated in the cab, combined with the same firm's flame-proof "unbreakable" resistance and a circuit breaker of the tramway type (by the English Electric Co.) enclosed in a flame-proof casing with automatic blow-out and handle control. A notched gate device on the controller lever ensures the steady cutting out of resistance step by step, it being impossible to short circuit across any step of the controller, and a mechanical spring return gives a "dead-man's" effect in case of accident to the operator, the controller handle returning to zero the moment it is released.

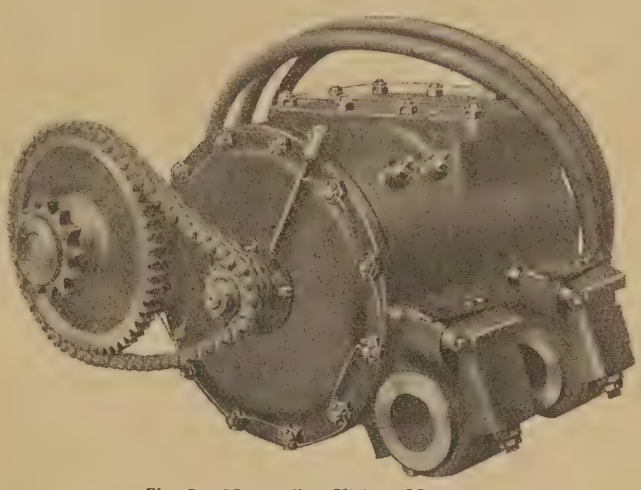


Fig. 3.—Metropolitan-Vickers Motor.

Brake drums 12 in. in diameter by 2½ in. face are formed on the back of, and concentric with, the driving disks on each side. The two brake posts are curvilinear, and are pivoted on adjustable fulcrums mounted on the chassis. At the other end, a tension bolt passes through the extended ends of the brake posts, and is fitted with check nuts on the lower side, and cams mounted on the ends of the lay shaft engage with the upper leaves of the brakes, the tension head bolt being pivoted within the cam heads, so that upon the lay shaft being rotated by link and lever, the cam depresses the top leaf, and by imparting an axial motion to the tension bolt pulls the lower leaf equally and oppositely. The brake leaves are held open by a coil spring on the tension bolt, and the two brakes are synchronised to work simultaneously. Control is exercised by a lever with clutch and quadrant in the cab.

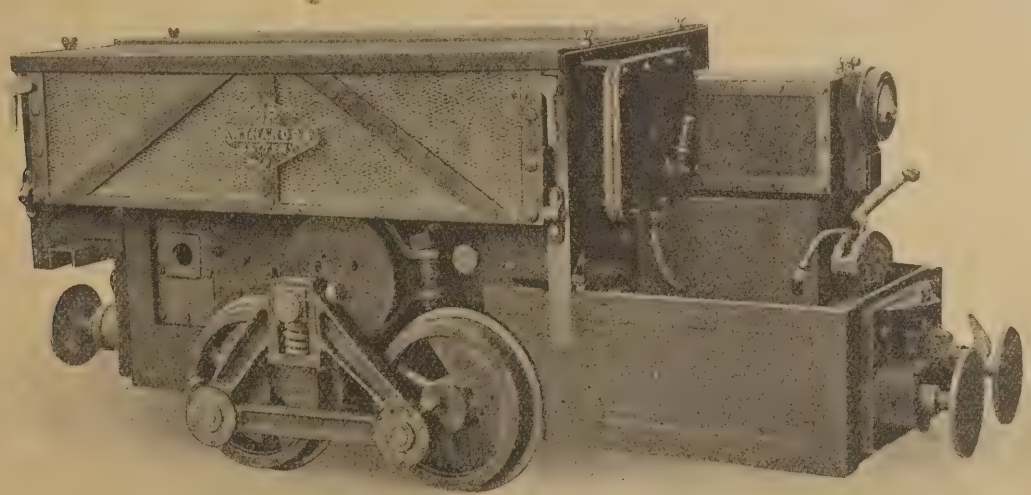


Fig. 4.—The Patterson Mine Locomotive.

The TR-29-type 32-cell lead-acid battery of the "Kathanode" series (manufactured by the D.P. Battery Co.) is contained in four teak crates, each portable by itself. The four crates straddle on the top of the chassis in a cage formed with two rigid end plates and two portable hinged doors, with portable cover. The terminals and inter-cell connections are heavily covered with rubber to ensure freedom from open sparking, and a voltmeter is fitted to show the open-circuit voltage as an indication of the battery's condition.

Steel headstocks with spring buffers and draw hooks are fitted at the forward and after ends. Sanding boxes are provided with dead-lift valves operated by pedals from the cab, one pedal controlling the forward pair and a second the after pair. The full-load haulage speed on a gradient of 1 in 24 is five m.p.h., the light speed being approximately seven m.p.h. The draw-bar pull has been tested to be between 1,100/1,200 lb.

The principal feature of the Patterson machine is the method of transmission between the prime mover and the track wheels. The differential gear imparts a differential action in curving to the driving frames, which, in turn, dispose the power in exactly equal parts to both track wheels. The spring-compensated sliding block gives a cushioning effect to the driving pin when starting under load, and also gives the wheels freedom to move vertically without straining the driving yokes in any way.

Control Gear for Beet Sugar Manufacture.

By J. O. KNOWLES, M.A.

In the manufacture of beet sugar large quantities of low-pressure steam are required for process work from the diffusing of the beet liquor to the refining of the crude sugar. This fact in itself suggests that electric power can be generated at a very low cost in the sugar factory, because the enormous condenser losses of the usual power station (comparable as they are to the actual electrical energy produced) can be at once diminished by using a turbo-generator exhausting into the process service instead of into a condenser.

The power required for the handling of the large quantities of materials is in the aggregate considerable and this power is required at widely scattered points in the process routes. Electrical drive is therefore a foregone conclusion, both because of the low cost of generation under the conditions stated above and because of the convenience and economy of electrical and individual drive as against a possible alternative of steam or Diesel-engine drive. Apart from these questions of cost and economy, the one essential for the auxiliaries is reliability. This is true of all process work, and of sugar manufacture in particular, because of the quantities handled in a continuous succession of processes, and because of the comparative instability of the syrups in the process stages and the demand for quality in the finished product.

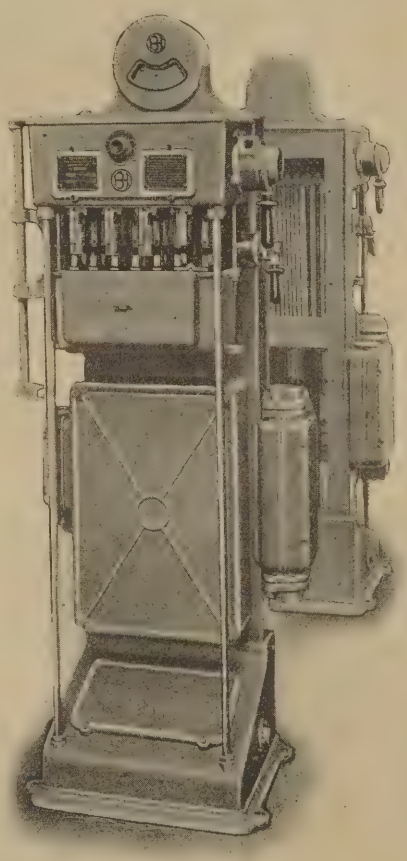


Fig. 1.

Variation in the speed of the driving motors is not a very important matter in most of the processes, as the quality of the product is governed by temperature, and the length and repetition of processes. Thus the only serious objection to the use of a.c. supply is removed, and the electric drive becomes a fairly simple problem in the selection and control of the right motors for the various working conditions.

Most of the motors will be required for handling the materials from one stage to another, the chief exception being the drive of the slicing machines for cutting the beets into small pieces preparatory to the extraction of their juice by diffusion. A slicing machine approximately 7 ft. in diameter, of the annular type (in which the beets are fed into a hopper so as to fall into an annular space where knives moving in a horizontal circle slice them across) will cut some 300 tons of beet in 24 hours, sufficient, that is, for about 35 tons of sugar. The starting duty of the slicing machine motors will, of course, be fairly heavy, so that wound-rotor motors are required and the starters should be of the step-by-step type with liberally rated starting resistances. Fig. 1 shows a suitable starter with a ratchet (step-by-step) handle suitable for operation by men having no electrical knowledge, the starting switches being of the multiple drop-switch type so as to give a quick certain movement on each step, without danger of breakdown by severe burning, such as might occur if a slowly moving contact arm were used. The drop-switch type stator circuit breaker is mounted in the same pillar, so that the whole forms a compact unit (with its own resistances) that can be set down in a convenient position without the necessity of making interconnections and interlocks on site.

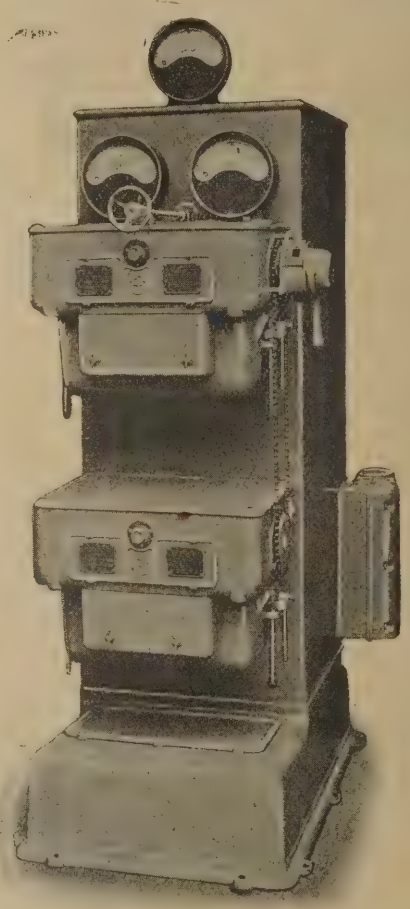


Fig. 2.

Alternatively, a synchronous motor may be used on the heaviest drive so as to keep up the power factor and improve the efficiency of the whole system. The motor will be started as a wound-rotor motor with a re-

sistance in the rotor circuit. When all the resistance has been cut out of circuit, the motor will be running at nearly synchronous speed (*i.e.*, with a small slip of, say, 5 per cent.). The rotor circuit is then opened again to superimpose on the rotor current an additional current from the exciter. The switchgear required will comprise a stator circuit breaker, a rotor starter, a change-over switch in the rotor exciter circuit and an exciter field regulator. The stator circuit breaker, which will be of the oil-immersed drop-switch type (with no-volt and overload releases), may be mounted with the change-over switch and the rotor starter in one pillar as shown in fig. 2, or for large motors, the rotor starter may be separated from the circuit breaker in another pillar. The liquid type of starter has also certain advantages for large isolated motors which it has not for the control of smaller motors. For large motors the liquid starter is comparatively small in size, easy to maintain (in large individual units), and gives a smooth start.

Having considered the power plant for the heaviest drives, and general questions of speed variation and load factor, the most suitable type of supply is practically settled.

Apart from the slicing-machine drives, the other motors are largely required for handling the product from process to process. The conveyors practically describe the sequence of processes, for the bulk of the material dealt with is such that mechanical handling is essential. Thus conveyors are required for bringing the raw beets to the washers (through which they are conveyed by spiral arms on a horizontal shaft.). Elevating conveyors are then needed for loading the slicing machines, which may be placed over the diffusers so that the slices can fall by gravity. In the next few processes the main product is in the form of a liquor, but the waste products—the fibrous residue of the beets from the diffusers (where the liquor is pressed from the beets), the carbonate of lime from the saturator (where the liquor is reduced to sugar in solution), and after evaporation and concentration the "char" or charcoal from the refiners require mechanical handling. Finally, the crystallised sugar from the vacuum pans must be removed, sorted, and packed, and the finished product dispatched.

For the various conveyors, auto-transformer starting will usually be the most satisfactory. The initial torque required to start heavy laden conveyors against considerable bearing friction is too great for satisfactory star-delta starting, and yet a squirrel-cage motor (protected by a well-designed starter in which the change-over cannot be made too soon), is sufficient without the added expense of a wound-rotor motor. A further safeguard is an overload restrainer which automatically lowers the overload cores, not right out of circuit, but sufficient to prevent the trips operating on the normal current peaks in switching to the "start" and "run" positions. In the case of long runs, where several conveyors must be used in series, an auxiliary contact can be fitted on each starter to energise the no-volt coil of the starter before it in sequence, so that no conveyor can be started unless the next conveyor is already in motion to remove the conveyed material.

Apart from solid materials, circulating pumps are required for passing the liquor from the beets through the saturators and filters, though the plant will no doubt be arranged to use gravity where possible. For some of these pumps wound-rotor motors may be required, especially where the lift is exceptional or the volume of stationary liquid to be set in motion is considerable. A suitable controller for the larger pump motors is shown in fig. 1, already described, but for smaller pumps up to, say, 10 h.p., a simpler type might be used to reduce the high cost of using a wound-rotor motor (where necessary), without diminishing the factor of safety. While some of the features that are advisable for protecting larger motors may be omitted or modified, the construction should be strong even in the case of those parts which are too often made of light material because they only carry small currents. For such small starters mechanical strength is of greater moment than electrical capacity. Especially in process work is it important that the small auxiliaries should be as sound a job as the larger plant.

Besides conveyors and pumps, a number of fans will be required for circulating air and gases. In the first place, CO_2 must be produced (by calcining limestone) and pumped into the saturators for treating the different liquors, to remove the lime as carbonate of lime. Then sulphurous acid gas is needed to decolourise the resulting juice from the lime filters, and after evaporation and concentration in vacuo, air fans are still required for drying the sugar. Star-delta starting can be used for the fans, but in some cases it is essential to have some means of altering the draught or air pressure. A good combination (to save the expense of wound-rotor motors with wasteful rotor resistances) is to use a two-speed motor in conjunction with a baffle in the air-pipes. These two-speed motors have two separate stator windings and a squirrel-cage rotor. When starting, the low-speed winding is switched on first (by straight-on, star-delta, or auto-transformer starting) and an extra switch is provided in the starter by which the high-speed winding is switched in (the low-speed winding being cut out by the same movement). By using the two speeds in connection with regulation of the baffle almost any required draught can be obtained economically.

A few other special drives are required, such as stirrers for the washing conveyors and melting pans, and of course the power plant auxiliaries are necessary if power is to be produced at the sugar works as suggested in the first paragraph.

Beet sugar manufacture does not differ very much from cane sugar manufacture. The yield per acre and the yield of sugar is now about the same (about 25 tons of beet or 3 tons of sugar per acre), and a large plant would deal with 1,000 tons of beet in 24 hours. The cane sugar factories have, of course, the advantage of cheap labour, but the beet sugar industry, with Government help, is now developing quickly in this country, and provides a new opening for business in electrical manufactures.

The writer is indebted for the photographs and some of the information in this article to Messrs. Brookhirst Switchgear, Ltd., of Chester, who are at present engaged on the manufacture of control gear for several of the new beet sugar factories being erected in this country.

High-pressure Transmission Masts.—Our German contemporary *Elektrotechnik und Maschinenbau* published in a recent issue an interesting article on the respective merits and costs of wood, steel, and ferro-concrete masts for the support of high-pressure transmission lines. The author considers that wooden masts are not suitable for lines working at a higher pressure than 35,000 volts, and even then are liable to cause interruptions. It is possible to get wooden masts that will carry lines working at higher pressures, but they are almost as costly as, and less durable than, steel or ferro-concrete masts. The author strongly favours the latter, and on the question of their durability, draws attention to the fact that they have been used for twenty years in France and for fifteen years in Austria. The only advantage, he considers, that can be put forward in favour of steel masts is that they can be taken down and rebuilt in new positions. This is, however, a convenience rarely required in connection with high-pressure lines.

Automatic Oil Purification.—Now that the principle of the employment of centrifugal separators on motor ships for the purification of fuel oil is becoming more generally recognised, interest is being centred in the details of the installation of such plant in order that the maximum efficiency and convenience of operation may be obtained. In this connection the arrangement which is being utilised on one of the new Holt Line motor ships now under construction at the Caledon yard illustrates the automatic operation of separators. The daily consumption of fuel oil will probably be in the neighbourhood of 13 tons, and this can be handled by one of the two De Laval machines working only a certain number of hours per day. According to the *Motor Ship*, the system is entirely enclosed, and is provided with an automatic controller, which not only regulates the maximum throughput, independent of the variable temperature of the oil, but also controls the head of pressure of the oil. The fuel is first passed through a coarse strainer, thence to the electrical heater, and finally to the purifier. The clean oil tank has an automatic float operating the regulating valve from the electric heater, and when closing it the electric current to the heater is switched off, thus preventing the oil from being overheated.

Electricity Supply in Great Britain.—I.

The Present Position with Regard to Statutory Powers.

Since the Electricity Commission was established in 1920 considerable progress has been made towards the accomplishment of its primary purpose—the reorganisation of electricity supply throughout the country; most of the Electricity Districts have been definitely delimited, and in some of them Joint Electricity Authorities or Advisory Boards have been set up, whose function it will be to ensure that further development shall be accelerated, with the ideal in view that every part of the country shall eventually be provided with a supply of electricity, generated and distributed on the most economical lines. The Commissioners have also granted a large number of Special Orders, supplementing the Provisional Orders and Acts of Parliament under which electricity is distributed and thus greatly extending the area covered by statutory powers.

There still remain, however, considerable areas over which no authorised undertakers have the right to supply electricity; many of these are more or less adequately catered for by companies or persons as yet unprovided with statutory powers, but for our present purpose, following the practice of the Electricity Commissioners, we shall regard these as "unoccupied areas," without prejudice to the possibility—in many cases the probability—that the unauthorised undertakers will eventually take steps to secure Special Orders and join the ranks of the elect. We propose to publish a series of maps showing the areas which are not yet covered by statutory powers, using for this purpose (by permission of the Controller of H.M. Stationery Office) the Ordnance Maps prepared for the Boundary Commission of 1917, which give the boundaries of county boroughs, rural and urban districts, and parishes. These maps, on a scale of 4 miles to one inch, can be got from Messrs. Edward Stanford, Ltd., price 6d. each.

The information on which the maps are based is to be found in the most convenient form in the Electricity Commissioners' volume of Returns of administrative particulars relating to authorised undertakers, published in January, 1925; but as these data are correct only up to the end of 1923, they have been supplemented with particulars contained in the Commissioners' Annual Reports, the *London Gazette*, and other publications obtainable from H.M. Stationery Office, bringing the information up to date. The map reproduced on the opposite page shows the various municipal boroughs, urban districts, rural districts and parishes contained in the Administrative Counties (divided by thick lines) of Bedford, Bucks, Northants, and Soke of Peterborough, together with the County Borough of Northampton. This area comprises 1,420,914 acres, and contained a population of 791,996 persons in 1921. The assessable value of the total area is approximately 4½ million pounds. As far as can be ascertained from the various available records, no statutory powers for the supply of electricity are held, nor has any application been made for them, in respect of the portions of the area shown on this map which have not been hatched.

The following is a list of authorised undertakers whose areas are wholly or partly included in the map:—

Local Authorities.

Aylesbury Corporation.
Bedford Corporation.
Luton Corporation.
Maidenhead Corporation.
Peterborough Corporation.
Kettering Urban District Council.

Companies.

Chesham Electric L. & P. Co., Ltd.
Cookham and District Electricity Corporation, Ltd.
First Garden City, Ltd.
Northampton Electric L. & P. Co., Ltd.
Rushden and District Electric Supply Co., Ltd.
Slough and Datchet Electric Supply Co., Ltd.
Uxbridge and District Electric Supply Co., Ltd.
Wellingborough Electric Supply Co., Ltd.
Windsor Electrical Installation Co., Ltd.

The Metropolitan Electric Supply Co., Ltd., possesses certain bulk supply powers under its Acts for parts of South Bucks—both shaded and unshaded.

Since this map was prepared by the Ordnance Survey Department in 1917, two new Urban Districts have been created, *viz.*, Wolverton and Burton Latimer.

It should also be noted that Hedsor Parish is now in Wycombe Rural District, and Wendover Parish has been transferred to Aylesbury Rural District; and a small part of the parish of Eton Wick has been transferred to Eton Urban District. Except for the above alterations, the map is topographically up to date in all respects. With the aid of such a map, the area entrusted to any particular undertaker can be readily traced out from a description of the area in words, except where the boundary line does not follow the various local government boundaries shown on the map, which is not very often the case. When all such areas have been shaded over, the areas that remain unoccupied can be readily described from the map, and any particulars regarding them that may be required can be ascertained from the census or other official publications.

It has been estimated that the possible number of consumers in the whole of the area shown on the map is well over 200,000, whereas the present number of consumers probably does not much exceed 20,000.

The above estimate of 200,000 is based on the figures given in the 1921 census, which shows the number of resident families to be over 190,000. In addition, in Table 10 of the Census the number of buildings not containing dwellings is given as over 10,000. These buildings include such places as offices, factories, warehouses, workshops, places of worship, and places of amusement.

In dealing with the areas of the various authorised undertakers, it is very important to be able to ascertain the relation in position and extent of undertaker A's area to undertaker B's area, &c. For this purpose it would be necessary to use a map of the whole country in order to make a complete survey of the situation. As such a map reproduced in our pages would be on too small a scale to be of practical use, it is proposed to deal with the respective counties on the largest practicable scale. The unoccupied areas are shown unshaded; those which are hatched are covered by statutory powers either granted or applied for (in the latter case, of course, the powers may be withheld).

The following details with regard to the existing undertakers have been extracted from the Electricity Commissioners' Returns:—

Luton.—Arrangements for mutual assistance have been entered into by Luton Corporation and the North Metropolitan Electric Power Supply Company, under Section 19 of the Electricity (Supply) Act, 1919; approved August 25th, 1922.

Uxbridge and District Electric Supply Co., Ltd.—Arrangements for mutual assistance have been entered into by the Uxbridge Company and the Metropolitan Electric Supply Co., Ltd., under Section 19; approved November 22nd, 1923.

Northampton Electric Light and Power Co., Ltd.—Arrangements for mutual assistance have been entered into by the Northampton, Wellingborough, and Rushden and District Companies, under Section 19. Also the Northampton Company has been authorised by the Northampton, Wellingborough and Rushden Electricity (Bulk Supply) Special Order, 1922, to break up certain streets outside the respective areas of supply of the three companies.

Engineering and financial data relating to the authorised undertakers mentioned above can be obtained from the Electricity Commissioners' Return—"Electricity Supply"—published in June, 1925.



Electricity Supply in the Counties of Bedfordshire, Buckinghamshire, and Northamptonshire.

Practical Nomography.

How to Make and Use Nomograms.

By REGINALD O. KAPP, B.Sc., A.M.I.E.E.

The graphical representation of a law, known as a nomogram or alignment chart, is fascinating. The connection between the lines and scales on the chart and the often complicated mathematical concepts represented is so far from obvious that such charts must appear astonishing to the uninitiated and not far short of black magic to the non-mathematician. One might think that great ingenuity was required to devise a graph which would correctly interpret a mathematical formula involving a diversity of functions of several variables. And yet the geometry on which this branch of graphical representation is based is quite elementary.

It is possibly the apparent difficulties of the subject that have prevented this aid to practical engineering from being more universally employed, although it was invented by M. d'Ocaigne many years ago.

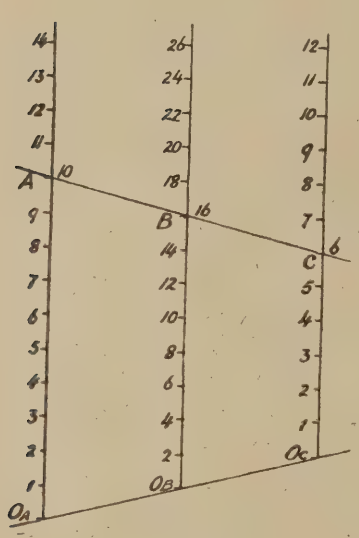


Fig. 1.

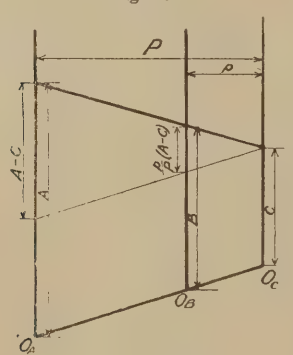


Fig. 2.

Parallel Straight Lines.

The three parallel lines in fig. 1 are equally spaced and therefore: $O_A A + O_C C = 2 O_B B$, wherever the straight line A B C is placed.

If scales are drawn on the three lines the zero point of each being at O_A, O_B, O_C respectively, and if the scale divisions on the B line are placed at half the distance from each other to those on the other two lines, and if O_A, O_B, O_C all lie on one straight line, then any straight line must cut the three lines at such scale divisions A B and C that we can read off the diagram scale divisions to solve the equation:

$$A + C = B, \text{ or put in another form,}$$
$$A - B + C = 0 \qquad (1)$$

Thus fig. 1 is a nomogram for the above simple formula.

The three quantities A, B and C may each be a function of one of three independent variables. In this case the scales on the A, B and C lines must be so-called functional scales. A functional scale is one on which the distance of each scale division from the zero point is proportional to the function of the variable. We *measure* a distance corresponding to the *function* of the variable and *write* against the point thus obtained the value of the variable itself. Functional scales familiar to engineers are those contained on the slide rule in which the function is the logarithm of the numbers marked on the scale. As an example, consider the expression for the moment of resistance of a rectangular beam:

$$R = bh^2/6$$

This can be written: $\log R - 2 \log h - \log b/6 = 0$.

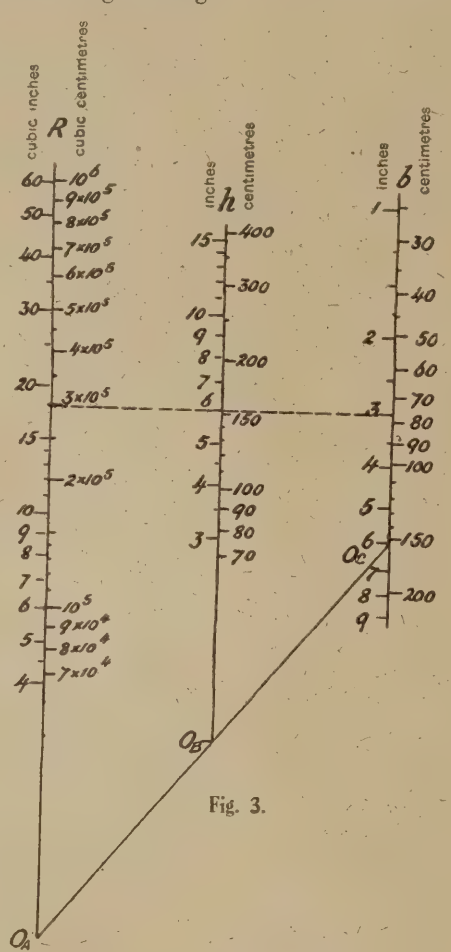


Fig. 3.

In this form the resemblance to expression (1) above becomes apparent if we write $\log R = A$, $2 \log h = B$, $-\log b/6 = C$. If we *measure* on the left hand or A line values of ($\log R$) and *write* the corresponding values of R against the measured points, making the point where $\log R = 0$ coincide with O_A, we have a functional scale of $\log R$. Similarly we can mark off a functional scale of $(-\log b/6)$ on the right hand or C line. The point for which $(-\log b/6) = 0$ must coincide with O_C. At this point $b = 6$. This is the same thing as operating a slide rule so that the 6 on the slider is opposite the 1 on the fixed portion. The 6 causes the scale to be shifted, but has no influence on the distances between scale divisions, which must be the same as on the scale of R. The function being negative, increasing values of b involve decreasing values of the function so the scale runs in the opposite direction from the scale of R. On the middle or B line we mark a functional scale of ($2 \log h$). The distance to be measured between corresponding scale divisions would be half as great on this scale as on the two outer scales if the function were $\log h$. As the function is $2 \log h$, the distance between scale markings is the same on the middle scale of h as it is on the two outer scales. The point at which $2 \log h = 0$ or $h = 1$ must coincide with point O_B.

It suffices now to choose the slope of the line O_A, O_B, O_C so that the useful values of R, h and b lie conveniently on our paper. Suppose we wish to construct a chart for cases where h varies between 3 in. and 15 in. and b varies between 1 in. and 9 in. Our tie line O_A, O_B, O_C must slope rather steeply as shown in fig. 3. To avoid this difficulty we can choose some other example as a tie line corresponding to more useful values of our variables. Such an alternative tie line is shown dotted in fig. 3, and if this is used, there is no need to extend the scales to their zero points.

It is useful that each line has two sides to it so that one side can be used for one kind of unit and the other side for another kind of unit. Thus fig. 3 has been constructed in inches, but corresponding values in cm. have been added on one side of each line. When this is done a nomogram may save a great deal of arithmetic in the conversion of units.

Figs. 1 and 3 show the correct type for any expression containing three independent variables which can be got into the form of equation 1. One variable must occur only in A, another variable only in B, and the third variable only in C. In each case the function of the variable may be simple or complicated; the chart will always have the same simple form.

A large number of expressions involve only multiplication and division of the variables or simple powers of them, and all these are easily got into the form of equation 1 by taking logs, and the graphs will contain simple logarithmic scales. Every engineer carries at least two logarithmic scales about with him, unit length being exactly half as much on one as on the other. These

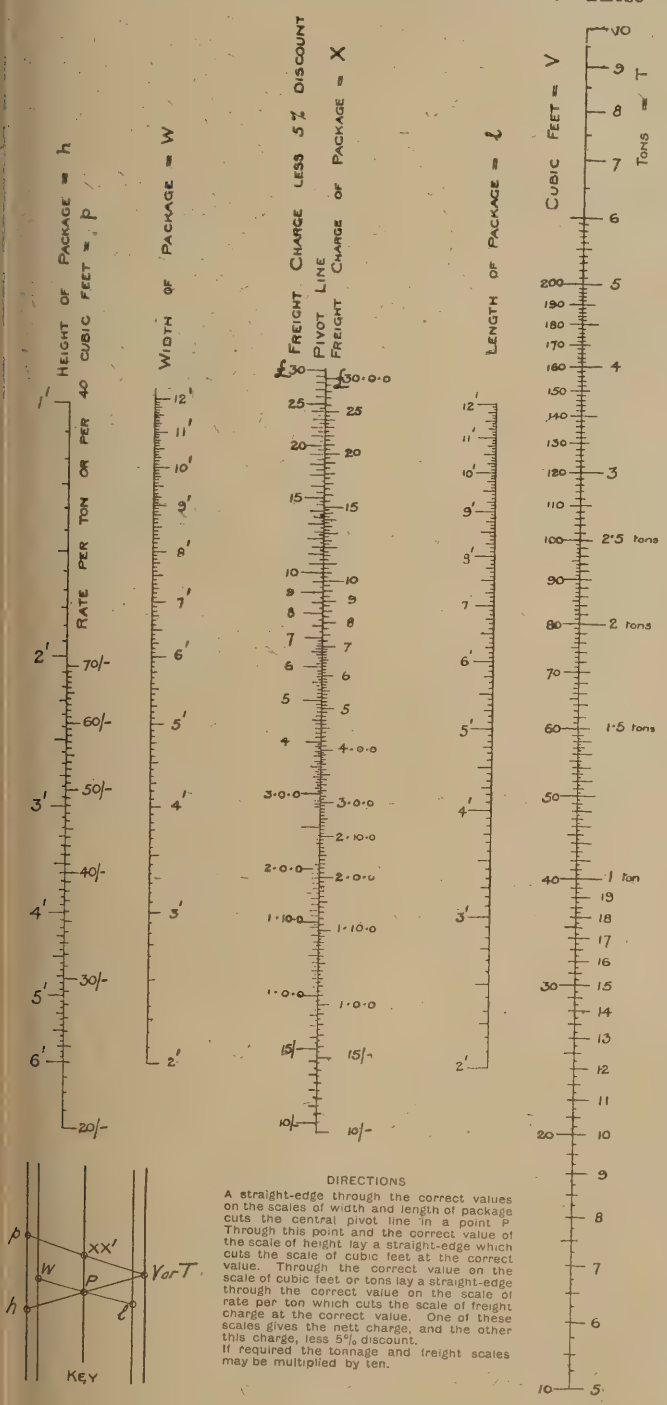


Fig. 4.—Nomogram for Freight Charges.

are the long and the short scales on his slide rule, and these suffice for a great number of graphs. In fig. 3 only one of these scales is needed.

A rule is useful to decide whether increasing values of the function are to be plotted upwards or downwards. A glance at equation 1 gives the rule. For this equation increasing values of all the three functions are measured in the same direction, and the sign of each term is opposite to the sign of the terms next to it. So we may say that *if two successive terms are of opposite signs, the scales are measured in the same direction; if two successive terms are of the same sign, the scales are measured in opposite directions.*

Unequal Spacing of Lines.

We have so far only considered cases where the three parallel lines are equally spaced. If they are not equally spaced and the distance of the B line from the C line is p and the distance between the A and C lines is P, fig. 2 shows that—

$$B = C + p/P \times (A - C).$$

It will be easily found that—

$$A - B \times P/p + (P/p - 1)\ C = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

This means that the scale divisions must be so spaced that if unit length represents one unit of the function A, p/P unit lengths will represent one unit of function B, and $p/(P-p)$ unit lengths will represent one unit of function C.

Unequal spacing is useful in exceptional cases; for instance, if the expression to be represented contains various higher powers of the variables, particularly if these differ by one. It may then be possible to use the same logarithmic scale for all three lines. Unless there are good reasons for it, unequal spacing should be avoided. A nomogram in which the spacing of the lines and the choice of unit length on the scales are arbitrary is needlessly tedious to construct, and looks amateurish when finished. It suggests that the designer set about his task with no clear idea of what he was doing. *When the scales are logarithmic, the advantage of being able to use the available scales on the slide rule should never be lost sight of.*

More than Three Variables.

So far we have only considered expressions containing three independent variables. For the case involving more variables, we will choose as an example the calculation of freight charges from the weight and dimensions of a packing case.

The cubic contents of the three dimensions denoting length, height and width are:—

$$\text{cubic feet} = V = h \times l \times w$$

$$\text{or } \log V - \log h - \log l - \log w = 0,$$

which can be arranged in some convenient way so that any two terms are on one side of the equation sign and are equated to a value which we will call K. For instance—

$$\log V - \log h = \log l + \log w = K$$

so that we get two separate equations—

$$-\log h - K + \log V = 0$$

$$\log w - K + \log l = 0.$$

Each of these expressions can form a separate chart for three variables. If we elect to make the scale run upwards for increasing values of a positive function, the scale of h must run downwards. Applying our rule, the scale of K must run upwards, as the sign is the same as that of the function of h. As the sign of the last term is opposite to the sign of the K term, the scales of these two run the same way so that the V scale must run upwards. The long scale of the slide rule can be used for both h and V. As we are not interested in the values of K, it is not necessary to write any figures on this scale. A blank line suffices. For the second chart, the scale of w runs upwards, that of K also runs upwards as before, and that of l must run upwards. If the choice of unit length on all scales is consistent, which holds in this case if the same slide rule scale is used for each, we can superimpose the two K lines. The single K line thus formed is called a pivot line.

The charge for a given package

$$X = p \times V/40$$

if p is the charge for 40 cb. ft. or one shipping ton.

This can be written—

$$\log (p/40) - \log X + \log (V) = 0$$

Applying our convention, all the scales increase upwards, and as the scale of V previously found also increased upwards, the new nomogram can be superimposed on the one giving V so that the values for V coincide. The same slide rule scale can be used again. To reduce the number of lines, the distances should be so chosen that the X line coincides with the K line already constructed, and we get a complete chart as in fig. 4. A second scale on the V line gives shipping tons corresponding to volume and a second scale on X gives costs where 5 per cent. discount is allowed. A glance at a

slide rule will make it clear that this second scale of x is the first scale moved so that the .95 mark on one comes opposite the unity mark on the other.

Charts with Slanting Lines.

We now come to consider another type of alignment chart based on equally simple but somewhat different geometry.

On fig. 5 we have the relationship $A/B=p/q$. The apex of the two similar triangles can have any position on the line O_A, O_B, giving different values of p/q. Put $p/q=C$ and we can write values of C along line O_A, O_B. We have then a chart solving the expression

$$A/B=C \quad \ldots\ldots(3)$$

and as before A, B and C may be any function of three independent variables, and the scales A and B functional scales. C is also a functional scale, but of a more complicated nature. The correct points can be calculated,

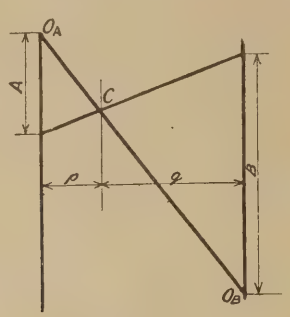


Fig. 5.

but it is generally simpler to construct all values of C point for point. Assume a convenient value of B such as 1 or 5 or 10. Then $A=C$ or $5C$ or $10C$, as the case may be. A series of lines through the selected value of B and successive points on A cuts the C line in points corresponding to easily calculated values. It will be readily seen that the same relationship holds if the values of C are placed on the C line produced beyond O_A. This gives a more extended scale of C, and is therefore sometimes of advantage.

In the simplest form of equation (3), it is better to turn the expression into the form of equation (1) by taking logs. But sometimes one of the functions is not

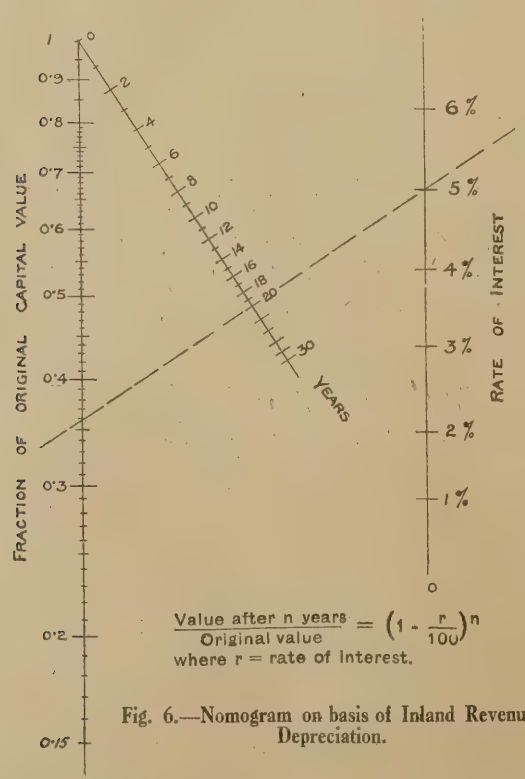


Fig. 6.—Nomogram on basis of Inland Revenue Depreciation.

suitable for simple logarithmic representation. For instance, A may be of the form $(f(a)+m)$ where m is a constant, and then the form indicated by fig. 5 is the easiest and quickest to construct. An example of this type of chart is shown on fig. 6. If p is the fraction of original capital value after n years, r the rate of interest—

$$p=(1-r/100)^n.$$

Taking logs,

$$\log p/\log(1-r/100)=n,$$

which is of the form shown in equation (3).

By taking logs a second time, a chart as given by equation (1) could be constructed instead.

(To be concluded.)

Reviews.

Alternating Currents and Transients. By F. M. Colebrook, B.Sc., &c. Pp. 195; 97 figs. London: McGraw Hill Publishing Co., Ltd. Price 15s. net.

In this volume, the author treats the theory of alternating currents by the well-known rotating-vector or symbolic method, and the book is apparently the outcome of a desire to co-ordinate the nomenclatures of pure vector analysis and the rotating-vector method of treating a.c. theory, and to simplify the interpretation of the symbolic operator j. As a matter of fact we have never found any particular difficulty in comprehending the meaning and function of j, and we do not think that the author has succeeded in making clearer what already offers little difficulty. In this treatment, the author endeavours to counteract the interpretation of the symbolic operator j as an "imaginary" quantity, and instead he pleads for the simple understanding that "the symbol j . . . rotates a vector through 90 deg. in a certain defined direction. . . ." We do not know of any other interpretation to be placed upon it!

Chapter I opens with vector definitions and proceeds immediately to introduce the operator j. The principles of vector addition and subtraction are then indicated and the study of j proceeds on more advanced lines. The author indicates the distinction to be drawn between vectors and operators, and the chapter concludes with graphical calculations employing both of these. The triangle of fig. 11 should be lettered A.B.C. in order to accord with the text, and in the line immediately below this figure, v should be av.

Chapter II treats of the scalar product of vectors, and the point of chief interest lies in the indication that transferring the operator j from one member of a scalar product to the other does not alter the magnitude of the product, but it reverses the sign. This is a useful rule to remember.

Variable vectors are dealt with in Chapter III, and the calculus is here employed for the first time in the volume.

Chapter IV enlarges upon the vector analysis of alternating currents, and very clear diagrammatic representations are given illustrating Kirchhoff's laws. The author then proceeds to a vectorial study of simple circuits containing resistance, inductance, or capacitance, and thence to compound series and parallel circuits containing more than one of these characteristics. We think it is regrettable that the author has not indicated by arrows, the assumed directions of rotation of the vector systems, and we deplore the settings of figs. 30, 31, 32, 33 and 34, the pairings of which are incongruous. We should much prefer to see the use of the word capacitance to capacity; it is more euphonious in our opinion, and in better harmony with inductance. We see that on p. 43 the author uses the conception of a "charge on the plates" of a capacitance, but we prefer Steinmetz's dictum that there is obviously no more sense in thinking of current as charging the capacitance with a quantity of electricity than of voltage as charging an inductance with a quantity of magnetism. The latter idea has been discarded long ago, so why not let the former also die a natural death? The subsequent treatment deals with inductively coupled circuits, which include transformer and a.c. bridge circuits.

Chapter V bears particularly upon the problems arising in the theory of the action of telegraph or telephone cables. The application of hyperbolic functions to the determination of current and potential distribution in telephone and telegraph cables is given, and the chapter concludes with a short treatment of stationary waves on wires.

Chapter VI includes a vectorial treatment of damped electric oscillations, and the theory of the generation of continuous oscillations by means of the thermionic valve is given. Free oscillations in magnetically coupled circuits are dealt with at greater length.

Chapter VII is concerned with the application of vector analysis to the theory of irregular a.c. waves and it very pertinently brings to the fore the fact, which is not always appreciated in practice, that if a non-sinusoidal e.m.f. wave is applied to an inductance, the current harmonics are smaller in amplitude than the corresponding pressure harmonics; the ratio of the nth current harmonic to the fundamental, for instance, is only $1/n$th of the ratio of the corresponding e.m.f. terms. In the case of capacitance, however, the opposite is the case and the current harmonics are greater in amplitude than the corresponding pressure harmonics; the ratio of the nth current harmonic to the fundamental is n times the ratio of the corresponding e.m.f. terms. These features are of very considerable importance in the testing of high-pressure cables.

Chapter VIII studies the current and pressure relationships in unloaded and loaded three-phase star and delta connected systems. The power supplied by three-phase systems and the three-wattmeter and two-wattmeter methods of power measurement are discussed. The two-wattmeter method of determining the power factor of a balanced three-wire star connected load is given, and a brief reference to the general theory of symmetrical polyphase systems of e.m.f.'s of any wave form concludes the chapter.

The usual series of examples and answers is given after each chapter for the benefit of students.

The author generously gives a bibliography of twenty-four publications dealing with the subject matter of his book, which those interested will recognise as containing most of the best and really useful works upon the subjects.

The illustrations are excellently clear and well reproduced, and the general make-up of the volume is a credit to the lishers. A useful summary of contents is given at the front of the volume and a subject-matter index at the end.

We think the title of the work might have been chosen more carefully, as far too little attention has been given to the study of transients to warrant the inclusion of that term in the descriptive sense adopted.

The Induction Motor. By H. Vickers. Pp. ix+332; figs. 151. London: Sir I. Pitman & Sons, Ltd. Price 21s. net.

At the present day it cannot be expected that any new book on the induction motor can bring with it a large amount of new matter; and in the preface the author admits that "he is deeply conscious of his great debt to various writers." Indeed, it would not be too much to say that the free use that has been made of the writings of such authorities as Steinmetz, Walker, Kloss, Smith, and others, gives to the book much of its utility. In addition, Dr. Vickers has the advantage of personal experience in the design of induction motors. The book thus represents a useful compendium of present knowledge and practice on the theory and calculation of induction motors. The subject matter is somewhat wider than the mere title implies, but the treatment is often scanty.

With all deference to American writers, we do not like the expression of torque in synchronous watts. In our opinion the author has not in the first chapter carried out his claim in the preface to have rendered due acknowledgment to sources upon which he has drawn, while some diagrams have not been copied correctly. The cross-field method has been chosen in preference to the rotary-field method in the treatment of the single-phase induction motor. Chapter III is headed "Starting devices for single-phase motors"; but after two pages the author makes a startling digression into the action of the induction generator, while the tail-end of the latter subject appears to have monopolised the succeeding chapter. Credit can be given to the author for his work in the chapter on electric braking.

The induction motor as phase converter deserves more than the two pages it receives. Speed control is treated at great length—in particular the rheostatic and pole-changing methods. The author's close connection with Mr. Hunt may serve to explain the long account of the motor bearing this name, but we are surprised to find that so little has been made by him of the ingenious device due to Mr. Creedy, wherein the speed change is effected by altering the number of phases.

As is to be expected, phase advancing and the induction-type synchronous motor find a place in a modern treatise on the induction motor, but we could have wished that they had received less cursory treatment. Windings are dealt with satisfactorily in a modern manner, though the three coloured plates referred to appear for some unexplained reason in the middle of the chapter on starting devices. The remaining chapters devoted to design should prove of value to the student.

Greater care should have been spent on the revision of the proofs, while some of the German references would defy even experts at solving puzzles.

Telephone Communication. By Charles Allen Wright and Albert Frederick Puckstein. Pp. xviii+515; figs. 294. London: McGraw-Hill Publishing Co., Ltd. Price 25s. net.

This volume is mainly devoted to telephone communication at what the authors call medium-frequency, in order to distinguish it from wire telegraphy and radio telephony, the frequencies of which lie outside. This medium band of frequencies lies within the limits of 50 and 6,000 cycles per second. Principally, however, the work deals with the causes that produce attenuation and distortion of speech, and the means of minimising them.

The work is sub-divided into four parts, dealing respectively with (*a*) The general discussion of the telephone problem; (*b*) Telephone apparatus and lines; (*c*) Recent developments in telephone communication, and (*d*) The maintenance of telephone plant. These are followed by an appendix on the electrical fundamentals which apply directly to medium-frequency apparatus and lines.

Much of the ground covered by this work has already been fully treated in several English manuals, but the reader who is particularly interested in the mathematical treatment of telephone problems will find here all the essential material required to enable him to calculate those quantities which enter into the phenomena of telephone transmission. The practical side of telephony receives a fair amount of attention, *e.g.*, the construction of loading coils, relays, cables, valves, &c., &c.

The chapters on multiplex or carrier-current telephony and radio-telephony are up to date, but the Austin-Cohen formula for the received radio current must be accepted with reserve in view of recent experiments in this direction.

Under "Maintenance of Apparatus and Circuits," simple tests for resistance and the localisation of faults are given and these are followed by descriptions of methods for the measurement of alternating currents, potentials, frequencies, phase shifts, and attenuation.

It is a pity that the authors dismiss so important a machine as the Franke alternator in the brief space of eleven lines in view of its importance in alternating current measurements. A diagram showing its principle, and a somewhat more extended treatment of its operation, would be distinctly useful.

The chapter on "Electrical Fundamentals" is a convenient summary of the various formulæ met with in electro-technics, followed by a brief explanation of vectors and hyperbolic functions.

Each chapter is followed by sets of questions and problems, as also by a bibliography of books which it is recommended should be read in connection therewith. A series of laboratory exercises forms a final appendix.

Although an American manual, having its distinctive transatlantic expressions, the British reader will find much useful information within its pages.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities New Publicity Literature, Liquidations and Failures.

A Shopping Week.—In connection with Dewsbury shopping week, which opened on October 3rd, the Electricity Committee of the Corporation supplied illuminated signs for the Town Hall; tramway standards and electric street lamps were decorated; and the Yorkshire (Woollen District) Tramways Company and the Ossett & Soothill Nether Tramways Company each supplied a decorated and brilliantly illuminated tramcar for touring the surrounding districts to advertise the "week."

E.D.A. Activities.—On Saturday last about 60 newspapers in all parts of the country contained an apposite advertisement drawn up by the British Electrical Development Association drawing attention to the end of "Summer time" and the approach of the lighting and heating season. The keynote of the advertisement was "Light, warmth, and comfort in one word—Electricity."

An "Exide" Window-dressing Competition.—A window-dressing competition in connection with "Exide" batteries was recently organised by the Chloride Electrical Storage Co., Ltd., and over 1,400 entries were received. The judges, who were editors of the automobile and radio Press, awarded the first prize (20 guineas) to the Negus Electrical Co., Cambridge. The second (10 guineas) and third (5 guineas) prizes were awarded to Mann, Egerton & Co., Ltd., Norwich, and J. Tee and Co., East Finchley, respectively.

Window-lighting Competition.—Messrs. W. P. Holt and Co., electrical contractors, Bradford, are to be congratulated on the fact that the electrical installations at the shops of Madame Eda (modiste), Bridge Street, and Mr. J. Walton (confectioner), Victoria Square, which won the first prizes in two sections of the window-lighting competition in the recent Bradford Shopping Week, were put in by them twelve months ago, and were not altered in any way for the competition.

Works Visit.—Last month a party of members of the East Kent branch of the Electrical Contractors' Association paid a visit to the Cosmos Lamp Works (Metro-Vick Supplies, Ltd.), Brimsdown. The journey was made by charabanc and upon the return a break was made to allow the party to inspect the company's London showrooms.

Catalogues Wanted for Australia.—The Australian Commonwealth Engineering Standards Association is establishing a valuable collection of trade catalogues and similar commercial material in connection with its library, which, with the very extensive library of the Institution of Engineers, Australia, is available for the use of members of both organisations. The engineer-secretary, Mr. W. R. Hebblewhite, of Macleay House, 16, College Street, Sydney, asks us to bring the matter to the notice of British manufacturers, in order that the Association may be placed on their mailing lists for the receipt of their publications.

Lead.—Messrs. James Forster & Co., in their lead market report of October 3rd, say: "Closing prices yesterday were £39 15s. for October and £37 5s. for January, a rise on the week of 30s. and 25s. respectively. Since September 21st, when the price touched £40 10s., consumers have not been much in evidence, but it was certain that, with the present acute shortage, prices would advance again when buying was renewed. The shipping strike is dislocating supplies and its effect will be felt for many months to come. On the other hand, consumption shows signs of decreasing both here and on the Continent owing to the high price, and lead is arriving in London from France, Germany and Belgium. Under present conditions the price is likely to go higher yet."

Electrical Commercial Travellers.—The following events are included in the programme of the Electrical Trades Commercial Travellers' Association, to which we briefly referred in our last issue:—

October 10th.—Bohemian Concert, Manchester Hotel, 7.30 p.m.

October 30th.—Lecture by Mr. V. Dale on "Salesmanship," at E.L.M.A. Rooms, at 7 p.m.

November 13th.—Annual General Meeting, St. Bride's Institute.

November 21st.—Whist Drive and Social, Manchester Hotel, 7.30 p.m.

January 15th, 1926.—Lecture Demonstration on "Lighting," by Mr. W. E. Bush, at E.L.M.A. Bureau, at 7 p.m.

February 13th.—First Annual Dinner, Manchester Hotel, 6.30 p.m.

March 20th.—Grand Carnival Dance, Manchester Hotel, 7.30 p.m.

For Sale.—Lincoln Corporation Electricity Committee invites offers for one 750-kW Willans-Westinghouse turbo-alternator and exciter, also a quantity of steam valves. Mr. H. J. Shaw will sell by auction on October 27th, at 85, Newington Causeway, a stock of electrical and wireless goods, &c. (See our advertisement pages to-day.)

Trade Announcements.—The Macintosh Cable Co., Ltd., have moved to larger premises at 241a, West George Street, Glasgow. Telephone No.: "Central 7278"; Telegrams: "Cablamac."

The telephone numbers of Messrs. Everett, Edgcumbe and Co., Ltd., Colindale Works, Hendon, have been altered to "Colindale 6045 and 6046." The firm's London office telephone numbers will remain unaltered, *viz.*: "Victoria 3020 and 3021."

Iron & Nickel Battery Co., Ltd., have removed to 17-19, Cockspur Street, Pall Mall, S.W. Telephone: Regent 7187.

Runbaken Magneto & Accessory Co. state that all communications, parcels, &c., intended for the Runbaken Magneto Co., Ltd., should be addressed to 270, Deansgate, Manchester, and not elsewhere, as their former branch depôts have been closed down.

On September 30th Mr. M. W. Woods removed his London offices and showrooms to larger premises at 3, Denman Street, London Bridge, S.E.1. Telephone number: Hop 6966/7.

Mr. J. Carman, electrician and wireless engineer, of 65, King Street, Ramsgate, is opening a branch business at Broadstairs.

Mr. J. E. Dawson, radio engineer, has opened new showroom premises in High Street, Boston.

Messrs. S. Evans & Sons, electrical and wireless specialists, have opened premises at 16a and 18, King Street, Maidenhead.

Catalogues and Lists.—Mr. F. Turner, 61-63, Summer Hill, Birmingham.—An illustrated leaflet containing details and prices of art metal fire surrounds, curbs, &c.

Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, W.C.2.—Leaflet No. 1052, containing an illustrated description of the company's 100-W "Type Q" broadcast transmitting equipment.

Messrs. Crompton & Co., Ltd., Chelmsford.—Descriptive List No. 607, dealing with auto-synchronous motors and their applications, particularly in the improvement of power factor.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—Calendar cards for October, November and December, bearing views of Chester.

The British Thomson-Houston Co., Ltd., Mazda House, Newman Street, Oxford Street, W.1.—An illustrated pamphlet dealing with the "Trojanette" kitchen-lighting unit, and a blotter advertising "Mazda" lamps.

Mr. O. N. Beck, 11, Queen Victoria Street, E.C.4.—An illustrated pamphlet describing the "Opifex" water-level communicator for boilers.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—Leaflets Nos. 18/1-1, describing the company's d.c. mill motors; and 17/1-1A and 17/1-1D, dealing with the "X" type d.c. commutating-pole motor. Fully illustrated.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester.—A series of illustrated pamphlets dealing with the "Cosmos" three- and five-valve sets, crystal set, and valves.

The Mulford Wireless Service Co., Ltd., Nightingale Lane, Balham, S.W.12.—A showcard indicating which of the radio valves on the market possess similar characteristics. Also an identification "tally" for the use of those who charge accumulators in quantity.

Rotocrete, Ltd., 11 and 12, Windsor House, Victoria Street, S.W.1.—Three pamphlets describing the "Rotocrete" beam system of building construction.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A pamphlet entitled "The Secret of Better Home Lighting," describing the company's domestic lighting fittings and lamps. The "Osram Bulletin" for October, advertising "Osram" lamps and valves.

The Cambridge Instrument Co., Ltd., 45, Grosvenor Place, S.W.1.—An illustrated postcard depicting CO_2 and CO content measuring instruments.

Attaix, Ltd., 36, Bernard Street, Southampton.—Two leaflets illustrating and describing the "Chargeless" high-low tension supplier and the "Adaptolite" four-valve wireless set.

Mr. W. S. Johnson, 42, George Street (first floor), Edinburgh.—A leaflet illustrating and describing a cordless electric iron.

Messrs. Alan Wright, Sentinel House, Southampton Row, W.C.1.—An illustrated and priced folder advertising "Inventum" electric fires.

Tungstalite, Ltd., 47, Farringdon Road, E.C.1.—An illustrated folder dealing with "Tungstalite" lamps, and a price list of cables, conduit, lampholders, switches, &c.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—An illustrated pamphlet describing the "Igranic" supersonic heterodyne receiver outfit, and a priced leaflet of component parts for radio purposes.

Messrs. Simpson, Baker & Co., 2-5, Nelson Street, Bristol.—A booklet showing radio receiving sets, loud speakers, valves, and other component parts. Illustrated and priced.

Messrs. Etablissements Merlin et Gerin, Grenoble, France.—An illustrated catalogue, describing various types of transformer pillars for tapping overhead high-pressure transmission lines.

Messrs. Hunter & Jack, 38, Elliot Street, Cranstonhill, Glasgow.—A price list of "B.I." lamps.

Swedish General Electric, Ltd., 5, Chancery Lane, W.C.2.—Stock list No. 116, containing particulars and prices of a.c. motors and d.c. motors and generators available for immediate delivery. Also pamphlet No. 102, dealing with motors and machinery for the printing trade.

The Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—October blotter bearing an illustration of the "No. 586" fire.

Siemens & English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, E.C.4.—A leaflet bearing illustrations of the showcards, signs, posters, &c., produced in connection with the company's lighting "campaign." Also monthly price list for October.

Messrs. Cole, Marchent & Morley, Ltd., Bradford.—An illustrated pamphlet describing the company's heat-extraction steam engines.

Messrs. Birkbys, Liversedge, Yorks.—A mailing card showing a transformer tapping switch for 200 A at 50,000 V (max.), moulded in "Elo" insulating material.

Messrs. J. Hopkinson & Co., Ltd., Britannia Works, Huddersfield.—Illustrated list (No. 1850) particularising their "Mac" valves.

Messrs. Higgs Motors, Witton, Birmingham.—October stock list of motors, announcing a.c. price reductions.

Messrs. Herbert Morris, Ltd., Loughborough.—32-page illustrated pamphlet relating to their hand overhead cranes.

Messrs. Tok Switches, Ltd., Granville House, Arundel Street, London, W.C.2.—Blotter for October.

Bankruptcy Proceedings.—F. A. Fraser, electrical engineer, 33, Tothill Street, Westminster, S.W.1.—This debtor attended on September 29th before Mr. Registrar Francke, at the London Bankruptcy Court, for public examination upon accounts showing unsecured debts of £806; a partly secured debt £2,500 (security valued at £800), assets "nil," and a deficiency estimated at £2,506. Replying to Mr. Vyvyan, Assistant Official Receiver, the debtor stated that in addition to being an electrical engineer he had acted as director to several limited companies. Among the number was the Electrical Contract and Maintenance Co., Ltd.; that concern went into liquidation in 1924, but was succeeded by the Electrical Contract and Maintenance Company (1925), Ltd., which was still in existence. Whilst a director of the old company he guaranteed an advertising account owing to Messrs. Sells, Ltd., who had obtained judgment against the company for £326; they agreed to refrain from proceeding under the judgment in consideration of witness guaranteeing the payment; a sum of £150 was paid before the company went into liquidation, but Sells, Ltd., thereupon proceeded against witness for the balance, obtained judgment for £186, and instituted bankruptcy proceedings. At the time of giving this guarantee witness held 2,000 shares in the company. In October, 1919, he assisted in the formation of R.J. Corporation, to which Messrs. Cox, the bankers, advanced £13,000 on the security of debentures and the joint and several guarantees of the four directors. That company went into liquidation in 1921; Messrs. Cox realised £3,000 in respect of the debt, and the four directors became responsible for £2,000 each in respect of the balance. Witness had returned his guarantee as the partly secured debt of £2,500, the security being a reversion which he had valued at £800. The debtor attributed his insolvency to the failure of companies in which he had been interested and to his liability under the before-mentioned guarantees. The examination was concluded.

W. J. Lattimer (Lattimer & Co.), electrical engineer, 52, High Street, Croydon.—Receiving order made September 24th, on creditor's petition. First meeting October 14th, at 29, Russell Square, W.C. Public examination November 23rd, at the County Court, Croydon.

J. S. McLeod (McLeod Bros.), radio and electrical engineer, 189, Blackburn Road, Bolton, and also with a partner as

McLeod Bros., at 55, Chorley New Road, Horwich.—First and final dividend of 3s. 10½d. in the £, payable at the offices of Messrs. H. L. Price & Co., 47, Mosley Street, Manchester.

C. Wright and H. T. Wright, electrical engineers, 251, Fulham Road, S.W.—Trustee, Mr. W. Strachan, 50, Gresham Street, E.C., released August 25th.

S. H. Bardwell (Bennett, Bardwell & Co.), electrical engineer, 22, Church Street, Basingstoke.—Receiving order made September 24th, on debtor's own petition.

T. Roberts and J. Taylor (Roberts & Co.), electrical engineers, 61, Old Town Street, Plymouth, and Fore Street, East Looe.—Trustee, Mr. F. West, appointed September 26th.

J. Isherwood, wireless and photographic dealer, 91, Lee Lane, Horwich.—First and final dividend of 2¾d. in the £, payable at the Official Receiver's offices, Byrom Street, Manchester.

J. B. Shields, plumber and electrician, 221 & 198a, Linthorpe Road, Middlesbrough.—First and final dividend of 1s. 5d. in the £, payable October 13th, at 55-57, Albert Road, Middlesbrough.

F. Mitchell and J. Mitchell (separate estates), electrical engineers, lately carrying on business under the style of F. Mitchell & Co., 97, Stockport Road, Ardwick, and 58, Ashton Old Road, Openshaw, Manchester.—Last day for proofs for dividend, October 14th. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

F. J. North, electrical engineer, 13a, Midland Road, Wellingborough.—First and final dividend of 2d. in the £, payable at the Official Receiver's office, The Parade, Northampton.

A. Thompson (Arnold Electrical Co.), electrical and mechanical engineer, 38, Lucy Street, Hulme, Manchester.—Last day for proofs for dividend October 17th. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

Dissolutions of Partnership.—Electro-Factors, electrical factors, 4, Oxford Mews, W.2.—Mr. E. A. Pye and Mr. F. J. Whaten have dissolved partnership. Debts will be attended to by Mr. Pye, who will continue the business under the same style.

Hone & Stammers, electrical engineers and wireless contractors, 46, Malden Road, New Malden.—Mr. B. F. Stammers and Mr. H. P. G. Hone have dissolved partnership. Mr. Stammers will attend to debts.

Company Liquidations.—Will Smith, Ltd., electrical engineers, 281, West Derby Road, Liverpool.—An adjourned meeting of creditors was held recently. At the statutory meeting held previously a statement of affairs was submitted which disclosed liabilities of £2,028, and net assets of £43, leaving a deficiency as regarded the creditors of £1,985. The meeting was adjourned to enable the debenture holder to be asked to withdraw her claim in favour of the unsecured creditors. This, however, she was not prepared to do, and the adjourned meeting eventually broke up without any resolutions being passed; the matter will therefore remain with the present liquidator.

C. F. Hendrick & Co., Ltd., loud speaker manufacturers, 10, Berwick Street, Victoria, S.W.1.—A meeting of creditors was held on September 28th, when the chair was occupied by Mr. H. R. Gothard, C.A., 8, Laurence Pountney Hill, E.C., who stated that he had been appointed to act as the liquidator in the voluntary liquidation of the company. The statement of affairs presented disclosed liabilities of £507, and net assets of £16, leaving a deficiency of £491, subject to the costs of liquidation. Mr. Gothard reported that in addition to the liabilities shown on the statement of affairs there was a certain amount due to directors. The company was formed on September 4th, 1924, with a nominal capital of 3,000 shares of £1 each. It was stated that 750 shares were allotted to Mr. Hendrick as consideration for the purchase of an invention. In addition 1,502 shares were taken up for cash. No sales had taken place at all. The stock was mostly partly finished and if sold by auction would not fetch more than £50. Mr. Gothard added that there was every possibility of a reconstruction and in that case the creditors would be paid in full. It was decided to confirm the voluntary liquidation of the company with Mr. Gothard as liquidator. The following are creditors :—

	£		£
New Synergy Co.	22	Wandsworth Die Casting Co.,	
Solidite Mfg. Co., Ltd.	24	Ltd.	40

Deeds of Assignment.—W. Wilson (J. Rattray & Son), plumber and electrical engineer, 293, Great Western Road, and 1, Westbourne Terrace, Glasgow.—Particulars of claims to be forwarded immediately to the trustee, Mr. J. McNicol, 59, Bath Street, Glasgow.

J. A. H. Halifax, electrical engineer, 24, Duckworth Grove, and 5, City Road, Bradford.—Particulars of claims by October 28th to the Trustee, Mr. J. E. Turner, 2, Piccadilly, Bradford.

Private Arrangements.—Charles Gates, Ltd., electrical engineers and wireless dealers, Norwich.—A conference of the creditors of the above was held on October 2nd, at the Royal Hotel, Norwich, when the representative of the bank, who were creditors for £585, was elected to the chair. The statement presented disclosed liabilities of £3,468, whilst the assets were estimated to realise £1,707. From the latter amount had to be deducted £131 for preferential claims, leaving net assets of £1,575, or a deficiency of £1,892. It was stated that the claims of the trade creditors totalled £2,882. The company was registered in March, 1924, with a nominal capital of £2,000, of which approximately £1,100 had been issued. There were two directors, and the accountants reported that during the twelve months to March last the turnover was in the neighbourhood of £9,000. The gross profit earned had been insufficient, having regard to the working and overhead expenses. It was further stated that the accountants had been investigating the matter on behalf of a client, who was contemplating finding capital for the business. It was possible that something like £1,000 would be found for the company. After discussing the position, it was decided to appoint a committee to consider the matter, and to deal with any offer which might be received. The committee consisted of the representatives of the Cable & Electric Accessories Co., Burndept., Ltd., Chloride Electrical Storage Co., the Hart Accumulator Co., and one local creditor.

The Institution of Rubber Industry.—At the annual general meeting of the London and District Section, on September 28th, Mr. D. A. S. Porteous (Messrs. Johnson and Phillips, Ltd.), was elected chairman, and Mr. S. C. Mote (India Rubber, Gutta Percha and Telegraph Works Co., Ltd.), as vice-chairman. Dr. T. J. Drakeley (Head of Department of Chemistry and Rubber Technology, Northern Polytechnic Institute), was re-elected hon. secretary. Dr. Drakeley stated that 180 new individual members had joined the Institution during the previous week. Members of the Section are paying a visit to the laboratories of the Netherland Government Rubber Institute, at Delft, Holland, at the invitation of Dr. A. van Rossem (Director of the Institute). They were to leave London last night (Thursday), October 8th, and return by Sunday morning next. On Monday last at a meeting held at the Engineers' Club, Sir Chas. Higham read a paper on "Collective Advertising."

Book Notices.—"Arctic and Western Hudson Bay Drainage (and Mississippi Drainage in Canada) in Alberta, Saskatchewan, Manitoba, and Western Ontario, Climatic Year 1922-23." (Pp. 234 and map.) Ottawa: F. A. Acland (Government printer).—This publication is a mass of detailed information regarding stream measurement and similar matters, compiled by the Dominion Water Power Branch, Department of the Interior.

"Faraday House Journal." Vol. XI, No. 4. London: Faraday House.—The Michaelmas term issue, besides the usual notes and notices, contains an article entitled "A Three-phase Balanced Load Wattmeter," and another on "The Pressure Testing of Cable Lines with D.C." It is satisfactory to note the long list of appointments secured by Faradians, and the official "blazer" badge of the College is illustrated.

"On the Road," by W. H. Beable. 115 pp. London: Simpkin, Marshall, Hamilton, Kent & Co. Price 5s. net.

"The Confessions of a Capitalist," by Sir E. J. P. Benn, Bart. Pp. vii+287. London: Hutchinson & Co. Price 18s. net.

"Modern Picture Theatre Electrical Equipment and Projection," by R. V. Johnson. Pp. xii+170; figs. 79. London: Crosby, Lockwood & Son. 15s. net.

"Modern Advertising," an authoritative guide to the use of every form of present-day publicity (to be completed in 20 fortnightly parts). Part I. London: Sir Isaac Pitman and Sons, Ltd. Price 2s. each part.

"Circular of the United States Bureau of Standards."—No. 276, Motor-Vehicle Headlighting. Price, 20 cents.

Local Exhibitions.—Scunthorpe and Frodingham.—An electrical exhibition was opened on September 28th by the chairman of the municipal Electricity Committee (Mr. Donald Munro) at the Central Auction Rooms. The show remained open for the rest of the week.

Nottingham.—The electrical exhibition organised by the Nottingham branch of the Electrical Contractors' Association was to be opened yesterday (Thursday). The exhibition has the support of the Corporation Electricity Department, and sixteen members of the Association have erected stands. The result is a very comprehensive demonstration of electricity in service, the arrangements having been made under the supervision of Mr. W. A. Gillott. The Corporation's exhibit takes the form of a bungalow, each room of which is equipped with the appropriate electrical appliances.

New German Company.—With the title of the Gesellschaft fur Hochvolt Isolation a new company has lately been formed in Dresden to manufacture insulating material for very high voltages.

Large Foreign Orders.—An optimistic note is struck in *British Industries*, dated September 30th, in the publishing of a list of important orders from oversea countries secured by members of the Federation of British Industries. It is stated that one of the surest signs of a return to stability in the world's commerce and industry is the increased magnitude and number of orders for export of their products received and accepted by British engineers. Among the orders quoted are the following :—Six additional patent stokers for the Buenos Aires Central Electric Station; three Marconi radio-telegraph and telephone installations of the "YB1" type; a 3,000-line automatic telephone exchange for Fontainebleau (Paris); and the erection and equipment of an electrolytic plant in Paris.

Japanese Machinery Import Restriction.—Advices from the F.B.I. correspondent in Tokyo show that a committee of investigation consisting of Governmental and business people has been set up to study the question of reducing the importation of machinery as much as possible. The committee has been named the National Product Investigation Association, and its terms of reference include the following :—(1) To investigate the present Customs tariff in connection with the development of the Japanese electrical industry; (2) to consider the advisability of establishing a system of inspection

of Japanese-made machinery in order to improve the quality; (3) to consider the granting of subsidies; (4) the adoption of a standard rating for electrical machinery; (5) the reduction of reckless competition between makers; (6) an investigation of the possibilities for reducing imports.—*The Times Trade and Engineering Supplement.*

"Use Electricity."—The autumn number of this little quarterly booklet, which has been regularly issued by the North Metropolitan Electric Power Supply Co. to its consumers and others in its area since 1919, bears on the front cover an amusing sketch of "Mr. Switch of the North Met," whose helpfulness from morn to eve is exemplified inside. The company, which has added 2,375 premises to its connections during the first half of 1925, offers a fixed charge and low unit rate for all domestic purposes, and nearly 1,000 consumers have adopted this attractive tariff, known as the "Annual Service Rate." Two new showrooms have recently been opened, making a total of 16.

New Indian Company.—A new company has lately been formed at 2, Fairlie Place, Calcutta, with a capital of 500,000 rupees and the title of the Electric Welding and Manufacturing (India) Co.

Hackney Strike Failure.—The strike of employés at Hackney electricity works, which was to have taken place last Friday afternoon, failed to materialise. Only eight men ceased work, the others refusing to obey the strike notices, and there was no interruption in the electricity supply. Seven of the men who struck returned to work later. The dispute arose from the employment of a jointer who was not a member of the Electrical Trades Union. The 20 wiremen employed in the wiring of the Council's new showrooms, who ceased work, have been deemed by the Council to have resigned.

Trade Openings in Bulgaria.—A Sofia correspondent of the *Financial Times* says that there is, without doubt, an opening for British trade in Bulgaria, more especially in the matter of textiles and machinery. Machinery of all kinds is needed for agriculture, irrigation, electricity, and automobiles. For the first five months of the year imports from Great Britain amounted to £700,000, an increase of 50 per cent. as compared with the similar period of 1924. This shows that the trade is to be found in spite of competition from Italy, France, and Czecho-Slovakia. It is stated that British goods are recognised as the best, and the price is not so much of a difficulty as the method of paying for them.

Wage Reductions Unprofitable.—Speaking at a luncheon of the American Chamber of Commerce in London last week, Mr. E. A. Filene, a prominent American business man, said that mass production and mass distribution were the order of the day if a country was to find success. Reduced wages and longer hours would not necessarily mean cheaper or greater production. He concluded by saying:—"For the first time in history it pays to pay good wages."

Machinery for New Zealand.—The New Zealand Railway Department intends to make extensive additions to its workshops in the Dominion which will involve the purchase of very considerable quantities of up-to-date machinery. It is intended, as far as possible, to place the orders for this machinery in Great Britain. Particulars of requirements are now with the New Zealand High Commissioner in London, who is receiving many inquiries from British firms.—*The Times.*

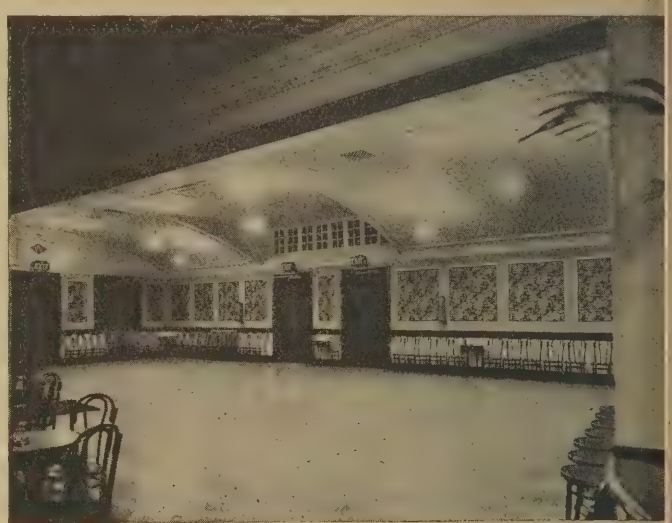
Egyptian Government Contracts.—The *Board of Trade Journal*, dated October 1st, contained a further reminder to British manufacturers that the lists of tenderers for supplies for the Egyptian State Railways, Telegraphs and Telephones are being revised, and a new application must be made by any firm desirous of being placed on the lists. Among the materials specifically mentioned are electrical materials, lifting machinery, lighting materials, signalling material, and telegraph and telephone materials. Applications should be addressed, by October 15th, to the General Manager of the Egyptian State Railways, Telegraphs and Telephones, Cairo, and the reference 129.45/7 should be quoted.

The 1925-26 E.D.A. Conferences.—As we mentioned in our last issue, the 1925-26 series of Conferences organised by the British Electrical Development Association commences on October 15th with a demonstrated address by Mr. W. E. Bush on "Selling Better Lighting to the Shopkeeper," at the E.L.M.A. Lighting Service Bureau; the programme will be repeated on the following evening. On November 20th the *venue* will be Caxton Hall, Westminster, and a paper on "Assisted Wiring Schemes" will be read by Mr. James Edgar (South Shields); the chair will be taken by Mr. R. P. Sloan, C.B.E. A display of electrical films will be given at Australia House on December 18th. Mr. Ll. B. Atkinson, M.I.E.E., will be the principal speaker on January 15th, his subject being "Suggestions and Auto-Suggestion in Salesmanship"; the chairman will be Sir Philip Nash, K.C.M.G. Mr. Walter Riggs, A.M.I.E.E., will occupy the chair on February 19th, when Mr. G. Blair Imrie (Messrs. Imrie & Angel) will speak on "The Electrical Industry and the Architect." The final meeting will be held on March 19th; Mr. D. N. Dunlop will be in the chair and Mr. J. J. McKenna will deliver an address on "The Progress and Prospects of Commercial Electric Cookery." The last three meetings are to be held at Caxton Hall. Definite limits have been fixed for the conferences, the programme stating that they will commence at 7.30 p.m., and terminate at 9.30 p.m. The programme also says: "There are no fees. Everyone electrical cordially invited."

Radio Apparatus in South America.—In a review of the radio apparatus market in South America, *The Times Trade and Engineering Supplement* states that in Chile the United States and Germany hold the lead as suppliers, chiefly owing to price considerations, as the main demand is for the cheapest sets which will operate satisfactorily. While the buying public realises the good quality of British apparatus, prices are too high. It is estimated that the United States' share of the trade has increased from 60 per cent. in 1924 to 75 per cent. this year. At the same time, the German share has fallen from 20 to 12 per cent., and that of Great Britain from 15 to 9 per cent. In Brazil the position is better; recent figures show that Great Britain is pushing ahead, and in 1923 British exports of radio apparatus to Brazil were slightly higher than those of the United States. In dealing with Brazilian firms, it should be remembered that rather extended credit facilities are required; agents' catalogues should be in Portuguese; and advertising is very necessary. The Germans have a good hold of the electrical industry, and their commercial acuteness is shown by the German manufacturers' system of combining non-competitive agencies for marketing composite lines of electrical merchandise. The Uruguayan market is good; the United States supplies the bulk of the goods, followed by Great Britain and Germany. The ten-year concession secured by the Peruvian Broadcasting Co. opens up an assured and progressive market for radio goods in that country. Ecuador and Colombia are moderate markets, but the importation of receiving sets into Venezuela is at present prohibited.

Fire.—Early on the morning of September 29th a fire occurred in the Test Department of the British Thomson-Houston Co., Ltd., at Rugby.

The Lighting of an Assembly Hall.—The accompanying illustration is a view of the Muswell Hill Assembly Hall, a new building which has recently been illuminated throughout by Messrs. Wight & Co., Finchley. From the ceiling of the main hall are suspended three rows of "Unalux" units equipped with "White Osram" lamps. This equipment provides an even, glareless illumination. The steps of the entrance hall are illuminated by two units fitted beneath the portico, comprising special fittings with G.E.C. "Superlux" globes, and two "Unalux" units light the entrance hall. Over the serving counter of the bar two cord pendants are fitted with "Equiluxo" glassware of the distributing type. In the wine and spirit stores, immediately behind the bar, illumination is provided by special ceiling fittings with "Superlux" globes; and a single "Unalux" unit provides the general illumination of the bar. A special feature of the installation is the number of wall plugs fitted at various points round the hall, for the purpose of enabling spotlights and projectors fitted with rotary colour screens to be used. In the grounds experiments are being carried out with G.E.C. "Fairyland" strip and "Osram" colour-sprayed lamps. Floodlight projectors fitted with colour screens are also being tried, with the aim of producing decorative colour effects in the trees.



Muswell Hill Assembly Hall.

British Machinery for Russia.—M. Bogdanov, the president of the All-Russian Supreme Economic Council, who is at present in London, interviewed by a representative of the *Financial Times* recently, said that his purpose in coming to Great Britain was to become acquainted with the condition of British industries, and the possibility of placing orders for a variety of equipment and machinery in this country. "Already a million pounds' worth of equipment for the textile industry has been placed in Great Britain. Negotiations are proceeding for further quantities of machinery, as well as for ship construction, power installations, &c., but we expect to be offered acceptable terms of credit for our orders."

Electrical Equipment for Buenos Aires.—Plans for the electrical equipment of the new port of Buenos Aires have been prepared and submitted by the Director-General of Navigation and Ports to the Government. A preliminary estimate of the cost of the installation amounts to 840,000 pesos. —*Reuter's Trade Service* (Buenos Aires).

Australian Electrical Imports.—It is stated that the value of the imports of machinery into Australia during the fiscal year 1924-25 was £1,822,543 in excess of the 1923-24 figure, owing principally to the larger imports of electrical apparatus.

Indian Trade Commissioner's Address.—The *Board of Trade Journal* states that as from November 1st the address of Mr. T. M. Ainscough, C.B.E., the Senior Trade Commissioner in India, will be: Fairlie House, Fairlie Place (P.O. Box 683), Calcutta.

An Anglo-South American Association.—An Anglo-South American Association has been formed, with offices at 25, Haymarket, S.W.1, for the promotion of British trade in South America. The Association has only one object—to inform public opinion on the vital urgency of recapturing the great Latin-American markets. It has the support and co-operation of some of the most prominent business men in the country; among those who have already promised to be vice-presidents are:—Sir Godfrey Baring, Bart., Sir Trevor Dawson, Bart., Sir Robert Hadfield, and Sir Arthur Stanley, G.B.E. A circular issued by the Association says that British investments in South America amount to over £1,100,000,000. There is half a billion of money in Argentina alone; there is a quarter of a billion in Brazil. Even in the comparatively small and unexploited Venezuela we have £10,000,000, and it is significant that nearly all the latter's rich oil and mine workings have been subsidised by British money. "South America wants to trade with us more than anybody. The South American Republics have never forgotten what the British people did for them in the cause of Latin-American freedom. They would rather see our ships and traders than those of any other country in the world, and we intend to see that this fact is brought home to everybody in Britain, and particularly to our traders whose commercial interests can be directed to South America. Higher prices, due to higher wages, have not been the only reason why we have lost our South American orders. We have not shown the energy, the enterprise and the personal enthusiasm of our competitors. Informed public opinion can alter this. To-day South American markets are in effect the greatest and perhaps the only markets in the world where we can hope completely to recover our prosperity from the appalling industrial set-backs of the last 11 years. Germany has not been slow to see its possibilities, nor has the United States."

A B.T.-H. Film.—During the next few months a film produced for the British Thomson-Houston Co., Ltd., will be exhibited at many of the leading kinemas. The title is "Listeners-in," and in a skilful and ingenious manner B.T.-H. headphones are introduced at various points of a romantic story. A series of coloured showcards has also been issued in connection with the "Mazda" lighting and radio campaigns. One of these is a chart showing the voltage of lighting sets and the type of lamp cap employed on passenger automobiles, commercial vehicles, and motor-cycles of numerous makes.

Manufacturers' Tariff Campaign.—Speaking at the annual meeting of the National Union of Manufacturers last week, Mr. George Terrell (president) characterised the Safeguarding of Industries Act as a failure. He said: "The Government scheme has been in operation for nearly eight months, and so far only one industry has been able to obtain the benefit of it. Many industries dare not apply, as from the definite experience of the last few months they know that the procedure is so dilatory, so inquisitorial in character, and the results so uncertain, that they would get an abnormal dump of foreign goods in the interim, which would probably put them out of business for months to come." The Union has decided, therefore, to undertake an extensive propaganda campaign to impress upon the people of this country the need for protecting British industries. A part of the scheme is the training of 50 lecturers to present the Union's case in all parts of the country.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 30th. In the case of foreign applications, the name and address of the British representatives are also given:—

Ledbitum. No. 461,108. Class 1. Bitumen paint. Kalvar. No. 451,110, and Kalvarfin. No. 461,000. Class 1. Varnish paint.—Callender's Cable and Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.

Ormond. No. 459,643. Class 8. Condensers, transformers, resistances, crystal detectors, all being component parts of apparatus for use in wireless telephony.—Edward Joseph L. Delfosse, trading as the Ormond Engineering Co., 199-205, Holloway Road, London, N.1.

Radio Sun (lettering and design). No. 458,398. Class 8. Apparatus for use in wireless telegraphy and telephony.—Auto Sundries, Ltd., 10a, Lower Grosvenor Place, London, S.W.1.

Radolion. No. 460,428. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Edward A. Graham, trading as Alfred Graham & Co., St. Andrew's Works, Crofton Park Road, London, S.E.4.

Spark (design only). No. 460,486. Class 13. Sparking plugs and similar electrical devices for igniting the charge in internal-combustion engines, spark intensifiers and component parts of and accessories for ignition devices, lamps, electric lamp bulbs, electric horns, electric safety fuses or cut-outs, electric switches, junction boxes, &c.—Robert Bosch Gesellschaft, 8, Militarstrasse, Stuttgart, Germany (W. P. Thompson & Co., 12, Church Street, Liverpool).

Colco. No. 461,200. Class 13. Clips of ordinary metal for securing wires, tubes and the like to walls.—Colman & Co., 110, Dale End, Birmingnam.

Mulparvo. No. 461,213. Class 18. Electric fires and radiators.—Berry's Electric, Ltd., 85-86, Newman Street, London, W.1.

Midge. No. 461,214. Class 18. Electric fires and radiators.—Berry's Electric, Ltd., 85-86, Newman Street, London, W.1.

New Spanish Company.—La Sociedad Slem is the name of a new company which has lately been formed in Barcelona with a capital of 510,000 pesetas, to manufacture and deal in accumulators.

New French Company.—A new company has lately been formed in Paris (14, Rue Drouot) with a capital of 600,000 francs and the title La Société pour l'Exploitation des Brevets et Procédés Marcel Fichter to manufacture electricity and other meters, automatic time switches, &c.

The "Mulparvo" Heater.—Correction.—We regret that in the advertisement of Messrs. Berry's Electric, Ltd., in our issues of September 11th and 25th, the left-hand block illustrating the "Mulparvo" heater was inserted the wrong way up, and also that the right-hand block showed the heater in a vertical position, whereas it has a slight backward tilt.

For Sale.—By order of the liquidator of Grigg, Ltd., electrical sign manufacturers, of Sanderstead Works, Sanderstead Road, South Croydon, Messrs. Leopold Farmer & Sons will sell by auction on the premises early in November, the stock of electrical signs, plant and machinery, also the freehold manufacturing premises. (See our advertisement pages to-day.)

German Cable Production.—In commenting upon the heavy increase in the consumption of copper which has taken place in Germany in the last year or two, *Commerce Reports* states that this is mainly due to the growth of the cable industry, the capacity of which has been doubled since the war. Germany is exporting cables in large quantities, and the works are said to have orders ahead for some months.

Polish Electrical Engineering Industry.—It is reported from Warsaw that the Protection Union of the Polish Electrical Engineering Industry has recently approached the Polish Ministry of Commerce with a request that, with the object of encouraging the development of the home electrical industry, the import duty on generating machines and motors should be increased by 30 per cent., on cables by 40 per cent., on electrical apparatus, switches, and electro-technical porcelain by 50 per cent., and on electric lamps by 100 per cent.

Unemployment.—For the third week in succession a decrease in the number of unemployed was recorded on September 21st, when the total was 1,312,000, as compared with 1,327,700 on September 14th. The total at the corresponding period of 1924 was 1,180,200.

Copper and Lead Prices.—Messrs. F. Smith & Co. report, October 6th: Copper (electrolytic) bars, £67 5s., 5s. dec. Do., do. sheets, no change; do., do. wire rods, £77 5s., 5s. dec.; do., do. h.c. wire, no change.

Messrs. James & Shakespeare report, October 6th: No change in the prices of copper bars (best selected), sheet and rod, and English pig lead.

Messrs. Edward Till & Co. report, October 6th: No change in the price of india-rubber, Para, fine.

United States Electrical Exports.—During July the United States exported electrical machinery and apparatus to the value of $6,526,668. Although lower than the previous month's figure, this was $286,259 more than the total for July, 1924. The total value of exports for the first seven months of 1925 was $47,787,634, a decrease of $2,197,011. Reverting to the July figures it is seen that there were a number of large decreases as compared with the equivalent figures for 1924. Transformers fell off in value by about one-half to $247,031; generators and parts fell from $380,500 to $370,520; electric railway locomotives from $411,495 to $14,525; stationary and railway motors from $283,742 to $206,126; telephone switchboards from over $150,000 to $50,000; rectifiers, motor-generators, and converters from about $40,000 to $29,642; and there were a number of other decreases. The principal increase occurred in the case of radio apparatus, which rose from $297,586 in July, 1924, to $643,463 in July last. Large increases were also shown by telephone and telegraph apparatus; domestic heating and cooking devices; steam turbo-generator sets; primary batteries; small motors, and many other items.

The Electrical Trade of New Zealand.—The statistics of New Zealand's import trade during the second quarter of the year, published in the *Board of Trade Journal*, show that the value of the imports of electrical machinery was £519,393. The bulk of this (£329,972) came from the United Kingdom, while the United States occupied the second place with goods valued at £141,846. Other exporters were Canada, £21,433; Australia, £7,945; and Japan, £64.

Social Event.—On September 25th, the Dubilier Condenser Co. (1925), Ltd., held its first carnival dance and whist drive at the Chiswick Town Hall, under the auspices of the Dubilier Athletic Sports Association. Two halls were used for dancing. Mr. W. H. Goodman, the managing director of the company and president of the Association, made a short speech, and Mrs. Goodman presented prizes to the successful whist players, and to the wearer of the best fancy dress (Miss Phyllis Leach). It is proposed to hold another similar function shortly.

Orders for Electric Rolling Stock.—Important additions to the rolling stock of the London, Midland and Scottish Railway, for use on the company's Southern electric system, are planned for next spring and early summer. The new rolling stock will serve the Broad Street to Richmond, and Euston to Watford lines, and is intended specially to meet the requirements of the rapidly-developing, residential district between Willesden and Watford. Orders have been placed for a large number of coaches, motors and driving trailers, which will be equipped with the Westinghouse brake apparatus. The new coaches will measure 57 feet by 9 feet and will be of the compartment standard type. New stock of similar type has been ordered for the electric line between Liverpool and Southport.

Lighting and Power Notes.

Bedford.—Extension of Supply.—The Town Council proposes to extend its area of electricity supply to Sandy at an estimated cost of £12,000, and to Potton at a cost of £4,300, and application is being made for sanction to a loan of £16,300 to cover the cost of the scheme.

Bexhill.—Bulk Supply.—The Electricity Commissioners have approved the agreement entered into between the Bexhill Corporation and the Hastings Corporation for a bulk supply of electricity to Bexhill.

Bredbury and Romiley.—Inauguration of Supply.—The Urban District Council's electricity undertaking was formally inaugurated on September 26th. Electricity is obtained in bulk from the Stockport Corporation. The capital cost of the scheme was £20,000.

Canada. — Hydro-Electric Development.—The British Columbia Electric Railway has announced plans for increasing the capacity of its existing hydro-electric generating plant to 700,000 h.p., at a cost of $30,000,000, with an immediate development on the Bridge River to cost $13,000,000 and be capable of generating 62,000 h.p.—*Reuter's Trade Service* (Ottawa).

Continental.—France.—Since the termination of the war, the Compagnie Parisienne de Distribution d'Electricité has effected considerable extensions in connection with the supply of electricity in the Paris district. Five development programmes, involving an outlay of 630 million fr., have been approved by the Paris municipal authorities, and of this sum 470 millions had been expended up to the end of last year. The plant at the St. Ouen and Issy-les-Moulineaux power stations has been increased from 120,000 to 270,000 kW by the addition of five 30-35,000-kW turbo-generators. The third programme involves the substitution for old 10,000-kW turbo-generators of new ones of 12,000 kW, the frequency being at the same time altered from 41⅔ to the standard 50 cycles to enable the company's mains to be linked up with the large hydro-electric systems which are being developed in France. The fourth programme, work in connection with which is well in hand, comprises the installation of three more 30-35,000 kW turbo-generators at the St. Ouen and Issy-les-Moulineaux stations, while the fifth is concerned with the modification and extension of the distribution mains.

Eastbourne.—Electricity Extensions Sanctioned.—The Corporation has received from the Ministry of Transport sanction to a scheme for the erection of overhead lines to provide a supply of electricity to Willingdon. The decision is the result of a recent inquiry.

East Ham.—Loan Sanctioned.—The Electricity Committee has received sanction to borrow £5,000 for the extension of feeder cables from the generating station to Plashet Grove.

Electricity Charges.—The Electricity Committee has recommended the substitution of a flat-rate charge of 1½d. per kWh throughout the year, instead of the winter and summer rates for heating and cooking.

Exeter.—Extension of Supply.—Steps are being taken to extend the h.p. cables to Topsham, and to transfer the Topsham Electricity Co.'s undertaking to the City Council. The following electricity charges are proposed in the Topsham area:—Lighting: 10d. per kWh. Heating and power: 6d. per kWh, with a minimum payment of 10s. per annum. Street lighting: 40s. per annum per lamp of an average of 50 c.p.

Bulk Supply.—The Electricity Committee has recommended that a bulk supply be given to Crediton at 6,000 V, 3-phase, the charge to be at the rate of £5 per kW of maximum demand and 1d. per kWh for energy consumed, subject to a minimum payment of £250 for the first year, £300 for the second, £350 for the third, and £400 for the fourth.

Federated Malay States.—Perak Hydro-Electric Scheme. —*Eastern Engineering* states that it is reported that Sir W. G. Armstrong, Whitworth & Co., Ltd., are prepared to proceed with the Perak river hydro-electric power scheme, subject to the satisfactory results of negotiations which are now proceeding between the company and the Trades Facilities Act Committee. The terms of the draft concession, which will cover the districts of Kuala Kangsar and Kinta, and the Chenderiang Mukim in the district of Batang Padang, are now under discussion, and will in due course be submitted to the Government for approval. The concession now contemplated will not affect the rights of existing concessions.

Guildford.—Street Lighting.—The Electricity Committee proposes to light a number of streets by electricity.

Killamarsh.—Electricity Supply.—The local gas company having intimated that it can make no further reduction in the price of gas, the Council has decided to approach the Staveley Coal and Iron Co. with a view to obtaining a supply of electricity.

London.—Battersea.—The Electricity Committee has received sanction to the borrowing of £30,000 for buildings and £90,000 for plant.

The Committee is making arrangements to supply electrical energy to shopkeepers for lighting their windows after closing hours at the special rate of 1¾d. per kWh and 10s. per quarter for the necessary time-switch.

Hackney.—The Electricity Committee has recommended a scheme for cable extensions, at an estimated cost of £41,850.

Mexico. — Hydro-Electric Development. — According to *Commerce Reports*, the Compania Hidro-Electrica y Irrigadora del Chapala has signed a renewal of the contract with the Federal Government, by which the company is conceded an average of 15 cu. m. of water per second, which can be used between the top of Juanacatlan Falls and a point where the Rio Verde and El Lerma Rivers unite. The company is given the right to construct the necessary dams, and will develop new generating plants of at least 30,000 h.p.

Maidstone.—Extension of Supply Area.—The Electricity Committee has recommended to the Corporation that the scheme for the supply of electricity to the parish of Bearsted be proceeded with at an estimated cost of £6,500.

Newark.—Electricity Charges.—It was reported at a recent meeting of the Town Council that an agreement had been come to with the Derbyshire and Nottinghamshire Electric Power Co., which has powers to supply Newark with electricity in bulk, as to the price to be charged. The Council will pay the company 1.25d. per kWh, a minimum guaranteed consumption equivalent to £2,000 for the first two years and £3,000 for each subsequent year of the agreement. The Council proposes to charge power users a special basic price of £8 per kW on the annual maximum demand, plus .3d. per kWh consumed. Small consumers will be charged a flat rate of 7d. per kWh for lighting, 2½d. per kWh for domestic appliances, and 3d. per kWh for small motors.

Peterborough.—Purchase of Cookers.—The Electricity Committee is applying for sanction to the borrowing of £1,500 for the purchase of 100 electric cookers.

Preston.—Year's Working.—The accounts of the Corporation electricity undertaking (engineer: Mr. J. F. Simpson) for the year ended March 31st last show a total income of £105,542, as compared with £92,167 in the preceding year. Working expenses amounted to £64,176, as against £48,783, leaving a gross profit of £41,366 (£43,384), to which was added interest and a grant from the Unemployment Grants Committee, making a total of £43,344. After deducting capital charges and contributing £792 from revenue to capital account, a net surplus of £7,979 remained. The previous year's working resulted in a surplus of £15,876. The capital expenditure amounted to £166,824, and included £85,290 for plant, machinery, &c., at Ribble power station, and £74,156 for mains and services. The electrical energy sold increased from 7,712,908 to 9,798,324 kWh, and the maximum supply demanded from 3,460 to 4,000 kW.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Stafford.—Heating and cooking: 1d. per kWh.

Burnley.—Lighting: In the borough, from 5½d. to 5d. per kWh; for certain "off-peak" hours the charge will be 2½d. per kWh. Outside the borough, from 6½d. to 6d. per kWh, and for certain "off-peak" hours, 3d. per kWh. Heating and domestic purposes: Flat rate of 1½d. per kWh.

Erith.—Heating: From 3d. to 2d. per kWh.

Hebden Bridge.—Domestic purposes: From 1½d. to 1¼d. per kWh.

Salford.—Charges for Electric Cookers.—The Electricity Committee has adopted the following scale of charges for the hire of electric cookers:—Small standard cooker, a rental of 7s. 6d. per quarter; medium standard cooker, 10s. per quarter. These charges include the provision of a thermometer and an electric kettle, also free wiring up to a maximum of 50 ft. and free maintenance.

South Africa.—Cape Town.—Work has commenced on the new power station near the mouth of Salt River. The erection of the station is part of a scheme which involves an expenditure of about £1,000,000. When completed, the station is intended to supply the energy required for the electrification of the Cape Peninsula railways.

Southampton.—Year's Working.—The report on the working of the Corporation electricity undertaking (engineer: Mr. W. G. Turner) for the year ended March 31st last shows a total income of £173,654, as compared with £149,780 in the preceding year. Working expenses amounted to £111,002, as against £101,123, leaving a gross profit of £62,652 (£48,657). Interest and sinking fund charges absorbed £40,018, special expenditure charged to revenue amounted to £15,355, and £5,000 was contributed to the borough fund, leaving a balance carried forward of £2,279. During the year £110,907 was spent on capital account, the chief items being £41,037 for machinery, &c., £59,510 for mains and services. The electrical energy sold increased from 13,416,882 to 17,909,256 kWh, and the maximum supply demanded from 8,363 to 10,064 kW. A 6,000-kW turbo-alternator was put into commission in December last, and the second 1,000-kW rotary converter put into operation at Back-of-the-Walls sub-station in January.

Spalding.—Electricity Supply.—In granting the Urban District Council a Special Order to supply electricity within the urban and rural areas, the Electricity Commissioners have intimated that they consider the offer made by the Boston and District Supply Co., Ltd., for a supply of electricity in bulk to be satisfactory and one which should be accepted by the Council. The Council desires to have its own generating plant at the gas works, and the estimated cost of this scheme is £30,000.

(*Continued on page 583.*)

An Electric Wire and Small Fittings Factory.

A Visit to the Works of Messrs. Ward & Goldstone, Ltd., Manchester.

The present factory of Messrs. Ward & Goldstone, Ltd., at Manchester, to which we had the opportunity to pay a visit recently, was established in 1918, when the firm of Ward & Goldstone was converted to a public company under the style of Ward & Goldstone, Ltd. The premises, which cover an area of about two acres of ground and six acres of floor space, consist mainly of a two-bay building constructed on modern factory lines with steel-framed glass roofs, and an additional and adjacent three-storey brick building. The main building is devoted principally to the manufacture of rubber and cotton cables, the stranding and rubber covering being carried out in one bay and the vulcanising and braiding in the other.

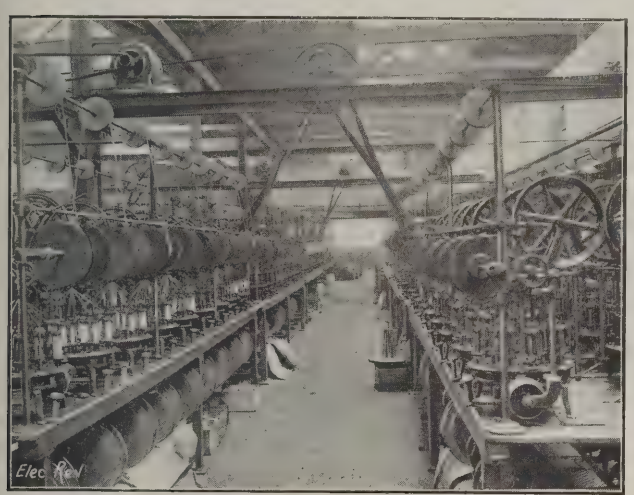


Fig. 1.—Corridor in Braiding Department.

The lay-out of the machinery is such as to facilitate the progress of manufacture, enabling the material in the various stages to be passed from one machine, or group of machines, to another without congestion. All sizes and grades of indoor cables are made at the works, up to 37/12, including the whole process from the wire stranding.

The cable machinery operations are effected in the centre portions of the bays, where the stranding, rubber covering, rubber-winding and rubber-forcing machines are located, and the plant for each operation is set out as a separate department or shop.



Fig. 2.—Fine Silk- and Cotton-Covering Machines.

Fig. 7 is a view of the heavy wire-stranding department. The machines at the front are stranders of the tandem type, used for the heavier gauges of wire, while at the back, high-speed torpedo stranding machines are in service for the stranding of medium- and light-gauge wires. The stranding of flexible wire is a very delicate operation, and is effected by these machines at high speeds.

Three methods of rubber covering are used according to the grades of cable required. Fig. 3, p. 580, is a view of the longitudinal rubber-covering machines, in which the conductor is rolled between two strips of rubber, the machine rollers being grooved to accommodate the cable, where it is covered and the rubber sealed on each side, and some of the heavy-wire rubber insulating machines are shown in fig. 4. Some of these machines give the wire two coverings of rubber in one operation or journey through the machine. The rubber-winding machines are very similar in design to the tandem stranding machines, the rubber strip being rotated about the travelling wire. One machine in this department is of particular interest, in that it effects rubber lapping and cotton covering twice in one operation. These machines are used particularly for the manufacture of bell wire. The rubber-forcing machines are chiefly used for cab-tire sheathed cables, the inner insulation of which is applied first by the rubber-covering equipment. The rubber is forced through a mould surrounding the travelling wire, the mould being heated by steam. The cables, after being dealt with by the rubbering plant, are taken to the vulcanising department. This is situated at one end of one bay and is equipped with two large and one small vulcanising pans, one large one of which is shown in fig. 6.

The next performance in the manufacture of rubber cable, braiding, is carried out in the braiding shop, fig. 1, where there are two parallel rows of vertical braiding machines using hemp, pure silk, or ordinary cotton according to the quality and size of the wire required. The cables pass through the revolving reels of hemp, &c., and are taken off spools under the benches and rewound on others at the tops of the machines. The pattern-braiding process, in which revolving reels carry material of varying colours, is a fascinating operation. Compounding tanks are provided at the far end of the factory for the next operation, where the cables are run through hot bitumen fluid. These tanks are easily convertible for use as enamelling tanks, the process being very similar.

All cables are tested before dispatch in a well-equipped test room. Mirror-galvanometer tests are applied to the insulation, and bridge tests to the conductors. The wires are also subjected to pressure tests, in which a pressure of 5,000 V is put on the cables for 15 to 30 minutes. A small motor generator and a transformer are provided for the purposes of these tests.

Fig. 2 is a view of the fine silk- and cotton-covering machines which deal with all qualities of flexible cords, including telephone leads, for the Post Office and Admiralty, and leads for automobile equipment. Very delicate silks are used in this portion of the works,

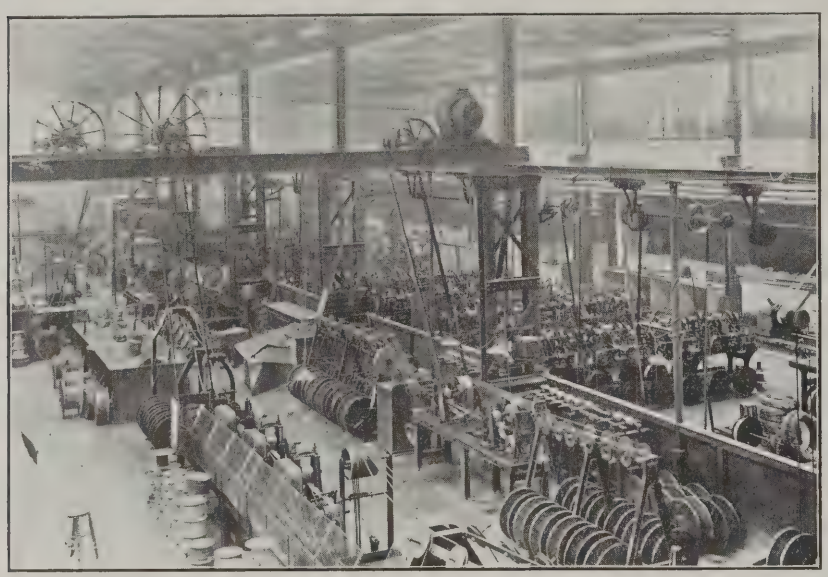


Fig. 3.—Longitudinal Rubber-Covering Machines.

which is rather more suggestive of a silk or a cotton mill than a cable works. The machines shown are of the multiple type, each applying two or more coverings in one operation. The bench at the front is the testing bench for this class of cables, which are examined under a microscope as they are unreeled and rewound from one spool to another. Fig. 8 shows the double cotton-covering machines.

Considerable motor-car cable work is done in this department. This cable is taped with oilproof tape, braided, and then varnished. The varnishing room is in front of the test bench, where a very high grade of varnish, which is claimed to stand the most severe bending test, is used. This process is also used for wire for armature and field coils for small motors, &c. A large quantity of the motor-car cable is armoured, and this performance is done on machines which wind either aluminium, brass, or other metal wires neatly round the cables or leads.

The front end of the main building is arranged in two storeys, the upper floor of which consists of the loom department and the cord room. In the former the telephone and motor-car multiple leads are put through their final operations. The telephone cords are plaited by either of two machines, 4-way or 6-way, which were built to Mr. Ward's own design. The terminals are sweated to the leads in dipping baths in this section of the factory, and the multiple leads are braided by machines which are skilfully operated to reduce the size of the braiding at the ends of the leads, where a lesser number of "singles" is accommodated, and also, in the case of head 'phone leads, &c., to make neat joints where the conductors branch off. The cord room is devoted wholly to telephone cords. The ends of the flexibles are stripped and bound in preparation for the terminals of varying shapes by a looping machine, another little device of Mr. Ward's design. An interesting product of the firm of Ward & Goldstone is what is termed I.E.E.-quality flex. This is treated with two layers of pure rubber, and then cotton covered, braided, and finally twisted. The drums on which the wire is dispatched from the works are made in a well-fitted-out joiners' shop. separate department deals with the winding of instrument wires on small reels and special drums. Fig. 5 shows the fine flexible wire-stranding machines.

The manufacture of the accessories is carried out entirely on the two upper floors of the three-storey adjacent building already referred to, the greater part of the ground floor of which is used as the general stores. Probably the most interesting manufacture undertaken in this building is that of a special insulating compound in the form of bases for wireless coil holders, Home Office pattern lamp holders, &c. The material is produced from a special powder of Ward & Goldstone's own preparation, which is put into moulds and heated under pressure on hand-operated highly-geared moulding presses. Six of these presses are at present installed, three steam and three electrically heated. The product is a black compound of very superior finish, and it is claimed that its insulating qualities are exceptionally high, and that it will withstand a very high temperature without breaking or crumbling. In cases where metal parts are embedded in the compound, these are, of course, placed in position in the mould with the powder before it is put on the pressing machines.

The first floor of this block is devoted to the manufacture of switches and light metal work, including all manner of wireless apparatus, ironclad switches, fans, G.P.O. telegraph sounders and tappers, &c. The bulk of the metal work is turned on standard capstan lathes in the machine shop. Automatic machines are also provided for turning up brass parts, such as adaptors for headlights for cars. A few engraving machines on which the firm's own engraving is done are also installed in this room.

The top floor is equipped with apparatus for metal stamping, stove enamelling and nickel plating, &c. Magneto plates for automobiles, wireless transformer stampings, and similar work are turned out on metal stamping machines. Two Canning nickel-plating machines are installed in a room divided off from the machine room. The assembling of all manner of small accessories is undertaken on this storey, including such articles as "Voltalite" generators and lamps for cycles.



Fig. 4.—Heavy Rubber-Covering Machines.

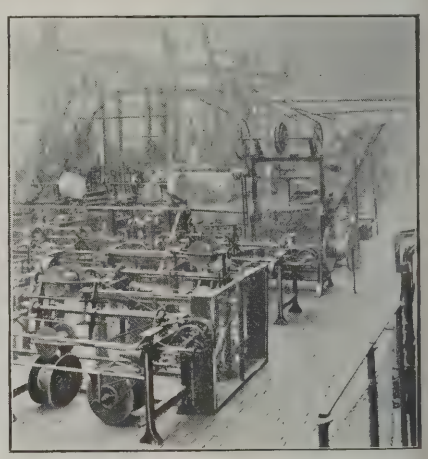


Fig. 5.—Fine Flexible Wire-Stranding Machines.

Electric drive is used throughout the factory, and in several departments, including the braiding room, fig. 1, small workroom, where a steam engine operated the first wire-covering machine. The founders and directors of

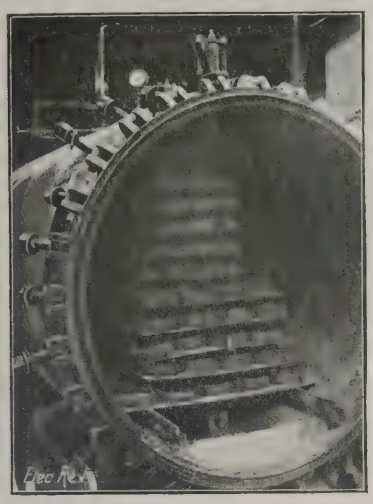


Fig. 6.—Vulcanising Pan.

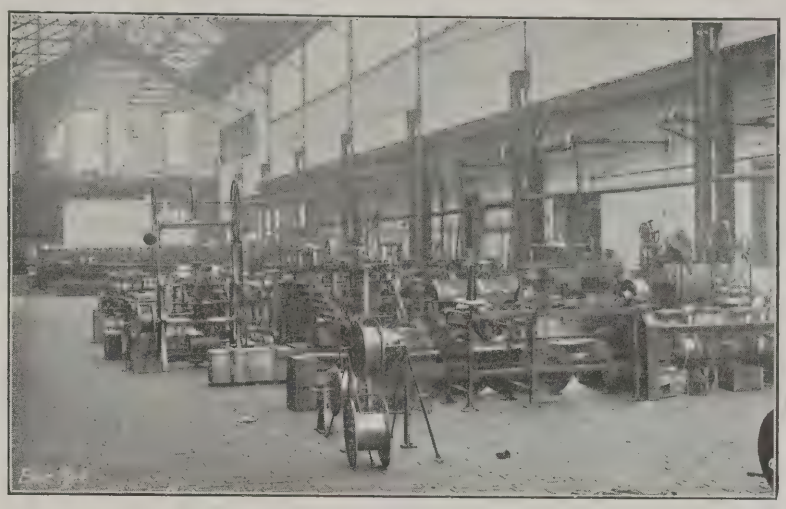


Fig. 7.—Heavy Wire-stranding Department.

this is arranged overhead by motors mounted on steel girders. The supply is at present d.c., and is received direct from the Salford Corporation electricity works, but it is about to be converted to 3-phase a.c., and a sub-station is being provided to receive a high-pressure supply at 6,500 V, which will be reduced to 420 V by a 200-kVA static transformer. A low-pressure 6-panel open-type slate switchboard is being erected by Messrs, Ward and Goldstone for distribution throughout the works.

The works are at present turning out over a million yards of flexible cord per month, and are capable of dealing with 30 to 50 tons of wire per week, but it is anticipated that with extensions to the factory which are now well in hand, this output will be doubled. The extensions will comprise a new bay to the main building, measuring 120 ft. by 35 ft., with an additional extension of 40 ft. by 30 ft.

About 750 hands are employed at the works, and the majority of the charge hands are given a financial interest in the concern. Canteens are provided for the benefit of all employés whose social life is not overlooked, sports, clubs, &c., being organised for their entertainment.

It is interesting to recall that the original works of Ward & Goldstone were established 30 years ago in a

the firm are proud to be able to claim that to some extent the firm has changed the situation which existed in the



Fig. 8.—Double Cotton-Covering Machines.

early days, when the flexible-cable industry was largely in the hands of foreign manufacturers.

Hydro-Electric Progress in Switzerland.

Some Details of the Amsteg (Uri) Power Station.

There are several interesting features in the hydro-electric station recently established by the Swiss Federal Railway authorities at Amsteg (Canton of Uri) in connection with the supply of electricity for the Gothard line. The station utilises the water power of the River Reuss, between Gurtnellen and Amsteg. The barrage is located at Pfaffensprung, and impounds 200,000 cubic metres of water, at an available head of 270 m.; it is constructed on the arched-dam system, as shown in figs. 1 and 2, reproduced from the *Génie Civil*. The height of the dam is 21 m. from the river bed, and the width of the span at the top 25 m.; the masonry is 3.5 m. thick at the base and 1 m. at the top, where the radius curvature is 18.5 m. Theoretically, a thickness of 2.2 m. at the base would have been sufficient. The structure was mathematically investigated as though it were the arch of a bridge, with regard to the effects of compression and changes of temperature, and in order to secure the most favourable conditions, vertical joints at four places in the upper portion were left open during the construction and after the barrage had been exposed to cold weather for a long time they were closed with cement mortar. The work was finished four years ago, and has been under load for three years with completely satisfactory results. From the intake the water is conveyed under pressure to a water tower through a tunnel $4\frac{5}{8}$ miles in length, and of approximately 70 sq. ft. section. The water tower, which is situated above the village of Amsteg, consists of a shaft 16.4 ft. in diameter and $98\frac{1}{2}$ ft. deep, cut in the solid rock; at its lower end it is connected to a gallery 360 ft. in length and 753 sq. ft. in section, and at its upper extremity to a discharge shaft 262 ft. long and 236 sq. ft. in section. From the water tower the water is conducted to the station by means of three steel pressure conduits, each 1,476 ft. in length and of a diameter partly of 5.9 ft. and at the lower end of 5.25 ft. Each of the pipes is intended to feed two 10,000-kW turbine-generators.

So far only five sets have been installed. The turbines are of the Pelton type, constructed by the Société des Ateliers de Constructions Mecaniques, of Vevey, and are coupled direct to Oerlikon alternators. Work is, however, well in hand on the construction of the sixth set.

The turbines are designed to work with water under a head of 902 ft. and a delivery of 1,045 gallons per second, the running speed being 333½ r.p.m. When the station was first projected two schemes were considered, one involving the use of single-rotor turbines operated by two jets, and the other turbines with twin wheels

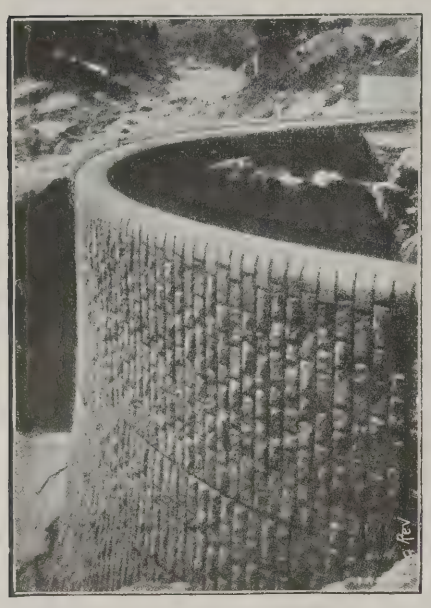


Fig. 1.—The Dam seen from above.

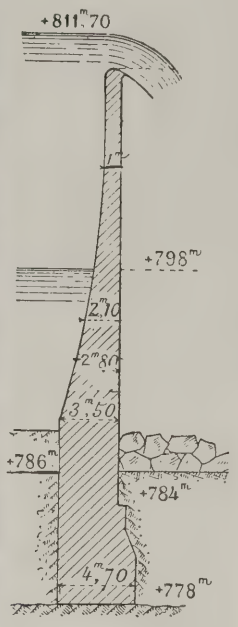


Fig. 2.—Section of Dam at Key.

on the same shaft, each actuated by a single jet. The railway authorities finally decided in favour of the latter type, which possesses the advantage of having more readily accessible injectors and a better water flow. The diameter of the wheels is 6 ft. 1 in., and that of the two jets 215 mm.—about 8.4 in. It is claimed that they are the largest jets so far used in Europe. Each of the wheels is enclosed in a separate casing mounted on

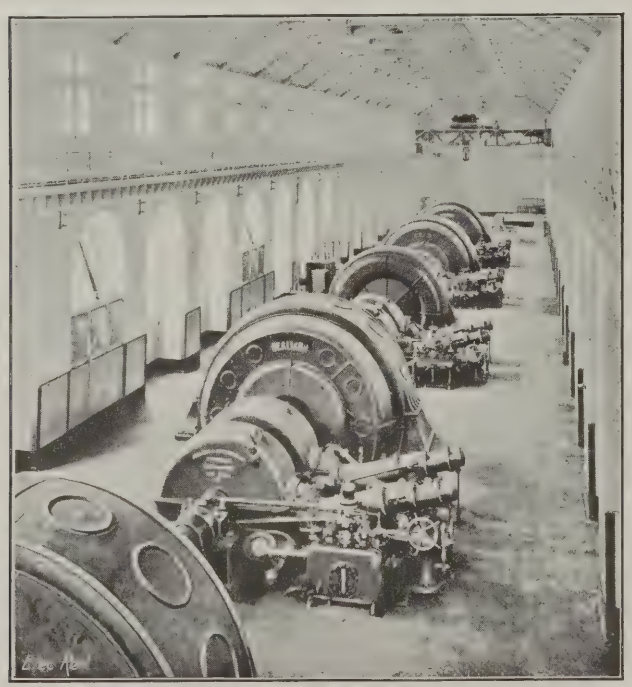


Fig. 3.—The Interior of the Turbine Room.

a common cast-iron base located on steel plates, these being employed in order to protect the masonry of the discharge canal from the action of any water projected from the wheel outlet and from the jets when the latter are suddenly charged.

The Pelton wheels comprise 20 cast-steel blades or vanes, polished on their inner faces; as each vane receives no fewer than 333 17½-ton impulses per minute, special attention was devoted to their secure attachment, this being effected by two special rings bolted to the hub disk, an arrangement which also makes it possible to dismantle the vanes without disturbing the disk.

The two cast-steel injectors each carry a tuyere of similar material with a bronze nozzle, which can be readily renewed. A needle valve in the centre of the circular tuyere enables the water supply to the turbines to be adjusted in accordance with the load. The needle valves are screwed to rods which at their outer ends carry the adjusting pistons of the oil-pressure servo-motors. The thrust of the water on the needle valve is partially balanced by powerful steel springs mounted within the servo-motors to facilitate hand regulation. Although the tendency of the needle valve in all its positions is to close the tuyeres, any sudden closing is rendered impossible by means of a special arrangement of the servo-motors to act as oil brakes should the needle valve close. A second system of control is furnished by a deflector screen surrounding the jet, by means of which the water can be instantly diverted from the turbine in the case of a sudden decrease of load, the screen being actuated by an independent

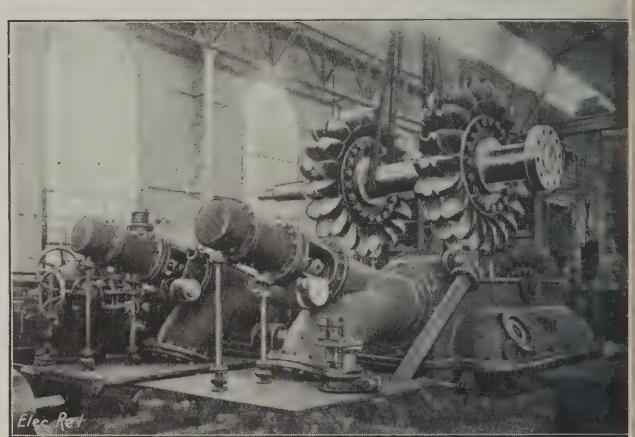


Fig. 4.—A Pelton Turbine During Erection with the Twin Wheels Suspended.

servo-motor. In order also to prevent any interruption of the supply in the event of accident to the double-action regulator, a device has been incorporated by means of which, in such a case, the hand regulation gear is automatically brought into action. An automatic speed controller is also included in the equipment, which automatically diverts the water from the jets whenever the speed of the turbine increases more than 20 per cent. above the normal rate. The turbines are direct coupled

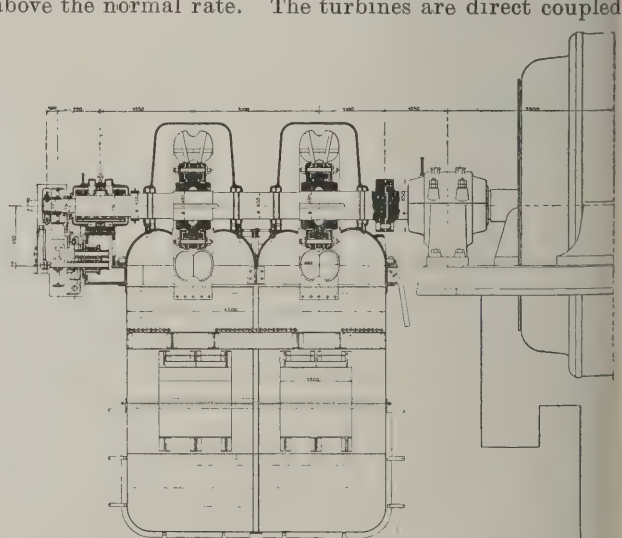


Fig. 5.—Section of 14,300 h.p. Twin-wheel Turbine.

to Oerlikon six-pole totally-enclosed alternators generating single-phase current at 15,000 V, which is stepped up to 60,000 V by 10,000- and 5,000-kVA oil-immersed core-type transformers.

Fig. 3 is a view of the interior of the turbine room, and fig. 4 shows one of the turbines, with the twin wheels suspended, during erection, while fig. 5 is a section of one of the twin Pelton wheels.

Lighting and Power Notes.

(*Continued from page 578.*)

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Western Electric Distributing Corporation, Ltd., to supply electricity within parts of the rural districts of Bath and Frome; and the Lancashire Electric Power Co., for the supply of electricity in the urban district of Leyland.

The Gwynedd Trust, Ltd., has applied to the Commissioners for an amendment of the Flint and Holywell District Electricity Order so as to include the parish of Gwaensygor.

Spenborough. — Proposed Change-over.—Application is being made for sanction to borrow £5,000 for the change-over of the system of supply to a.c. for the whole area.

Straits Settlements.—Singapore.—According to *Eastern Engineering*, in his report for the year 1924, Mr. W. S. Dunn, municipal engineer, states that the scheme for the replacement of street oil lamps by electric lamps was completed during the year. The cost of public street lighting was $105,358, and in addition to this, $2,310 was expended on the purchase of lamp posts.

Stone.—Electricity in Bulk.—The Urban District Council is arranging with the Stoke-on-Trent Corporation for a bulk supply of electricity.

Stoke.—Loans Sanctioned.—The Electricity Committee has received sanction to loans of £6,000 for electricity mains and switchgear in connection with a supply in the Fenton district; and £2,650 for buildings and equipment.

United States.—Electrical Development.—According to *Power*, the new central steam-power station built on the Broad River at Parr Shoals, S. C., by the Broad River Power Co., was recently inaugurated. The first section, the construction of which was started last November, has been completed at a cost of $3,000,000, with an extensive system of h.p. transmission lines. The plant, which has been designed for an ultimate capacity of 85,000 h.p., will furnish a supply in Columbia and Spartanburg and throughout Central South Carolina. Powdered fuel is being employed at this station.

In order to meet the increased demand for power at Baltimore, the Consolidated Gas, Electric Light and Power Co. has started on the erection of a steam generating plant planned some time ago. The new station will be ready for operation in about a year, and will be designed for four 36,000-kW turbo-generators. Only one of these sets, however, is to be included in the first installation.

Wimbledon.—Loan Sanctioned.—The Electricity Committee has received sanction to borrow £10,000 for the purchase of domestic appliances to be let out on hire.

Worthing.—Inquiry.—Col. T. C. Ekin, on behalf of the Electricity Commissioners, held an inquiry at the Town Hall on September 29th into the applications of the Corporation and East Preston Rural District Council for Orders to supply electricity in the rural district of East Preston. For the Corporation it was stated that it was proposed to make a charge of 6½d. per kWh for lighting, which was the same as that charged in the borough, and that the Rural Council could not give a supply at such a low rate. For the Rural District Council it was suggested that it should have control of the development of electricity in its area. It was proposed to obtain a bulk supply from Worthing and to retail it at 8d. per kWh for lighting and 2½d. per kWh for power and heating. The Corporation stated that it was not prepared to give a bulk supply. The Commissioners will intimate their decision in due course.

Tramway and Railway Notes.

Belgian Congo.—Railway Electrification.—According to *The Times Trade and Engineering Supplement*, the Technical Committee appointed a year ago to study the proposal to electrify the railway from Matadi to Kinshasa has reported in favour of immediate electrification. The Mpozo falls would be utilised to generate energy for the coastal section of 100 km. and if the necessary arrangements can be made in time to permit work to be begun at the termination of the next rainy season, it is believed that the electrification of this portion of the line could be completed by the end of 1928. This initial programme would be followed by the conversion of the remainder of the line, the Inkisi falls being harnessed to provide the necessary power. It is estimated that the electrification of the entire line would occupy six years. The Congo railway is 400 km. in length.

Bradford.—Year's Working.—The report on the working of the Corporation tramway undertaking (manager: Mr. R. H. Wilkinson) for the year ended March 31st last shows a total revenue of £628,263, as compared with £619,581 in the preceding year. Working expenses amounted to £486,893, as against £486,449, leaving a gross surplus of £141,371 (£133,132). After deducting capital charges there was a net surplus of £51,846. The income from the railless-car service was £21,371, and the final result was a deficit of £5,315. There was a net surplus of £601 from the Parcels Department. The total net surplus from the three undertakings was £47,132, which was appropriated as follows: Contribution to capital account, £18,000; reserve or renewals fund, £16,132; rate relief, £13,000. The amount spent on track renewals during the year was £134,591, of which £120,796 was charged to capital account and the remainder appropriated from revenue. The number of passengers carried by the tramway and railless-car services increased from 92,683,421 to 100,150,739, and the car-miles run from 6,863,348 to 7,045,762.

Motor Omnibuses.—A special sub-committee of the Corporation Tramways Committee, appointed to consider the possibility of running 'bus services between tramway routes, has recommended the purchase of twenty-four motor 'buses, at an estimated cost of £1,500 each.

Blackpool.—Track Renewals.—The tramway track between the Cabin and Bispham on the Fleetwood section is to be re-laid to enable the present promenade service to be extended to Bispham. The cost is estimated at £7,395.

Continental.—Belgium.—The French Dyle et Bacalam Company recently made application to the Belgian Ministry for Railways for a concession to construct three metropolitan lines in Brussels. This has now been followed by the Société Générale de Chemins de Fer Economiques, which has offered to construct the permanent-way of a network of metropolitan lines at the cost of the conceding authority on condition of being granted a working concession for the three lines proposed, of a total length of 8.7 miles, capable of being ultimately extended to 21 miles. In addition, the same company has offered to construct a tunnel with a double line of normal gauge to connect the Northern and Southern railway stations at the cost of the State.

Switzerland.—Plans have been prepared for the electrification of the Rorsbach-Heiden mountain railway.

Germany.—A preliminary concession has been granted in respect of a projected electric tramway between Falkenstein and Rodewisch, Saxony.

Rumania.—The Bucharest Tramway Co. is reported to have placed a contract with a Belgian concern for the electrification of its tramway system and for the construction of several new lines in the city of Bucharest.

Sweden.—Application is being made by the Swedish State Railways for a grant of 3,050,000 kr. for the electrification of the western main line. The line near Stockholm is also to be reconstructed.

London.—Underground Station Improvements.—Three of the five new "comb" escalators at Tottenham Court Road were put into service on September 29th, and the dismantling of the eight lifts was commenced. The space now occupied by the lifts will be used for the provision of a large booking hall. The scheme of improvements provides for the merging of the Hampstead and Central London stations into one large station. The number of passengers dealt with at the Tottenham Court Road stations in 1924 amounted to 20,000,000, and the improvements will allow for an increase of 50 per cent. in the annual traffic.

Straits Settlements.—Penang Hills Railway.—We have received from Mr. W. J. Williams, engineer and manager of the Penang municipal electricity supply and tramway undertakings, a copy of his report, together with the statement of accounts, on the working of the Penang Hills Railway for the year ended December 31st last. The total revenue amounted to $63,818, and working expenses were $55,446, leaving a gross profit of $8,372, to which was added $7,070 brought forward at December, 1923, and interest of $79, making a total of $15,521. Of this amount $13,741 was appropriated for expenditure on construction during 1924, leaving a balance of $1,780. This railway was opened for traffic on October 21st, 1923, and the capital expenditure to that date was $1,489,130. Additional expenditure on construction amounted to $1,130 during 1923, and $69,449 during 1924, making a total of $1,559,709. The number of passengers carried during the year under review was 81,900, and the car-mileage was 12,927.

Wallasey.—Track Renewals.—The Tramways Committee has had under consideration a report submitted by the borough engineer on the reconstruction of the tramway track in various parts of the district. The estimated total cost of the scheme, to be spread over eight years, is £194,850. The Committee has recommended the Council to proceed with the first section of the work from Liscard Village to Mount Pleasant Road at a cost of £16,500.

Telegraph and Telephone Notes.

Australia.—"Beam" Radio Stations:—A resolution was proposed by Mr. G. A. L. Green (South Africa) at the Imperial Press Conference, which is being held in Australia, urgently impressing on the Imperial Government the necessity of expediting the completion of "beam" stations in England, and was carried. According to the *Financial Times*, Mr. Bruce, Federal Prime Minister, strongly protested against the refusal of the British Government to permit Australia to control a reciprocal "beam" station in Great Britain. Australia, he said, demanded the same privileges as were granted to Canada, foreign countries, and the cable companies.

China.—Telegraph Operators' Strike.—The operators of the Chinese Telegraph Administration struck work last week. They are demanding increased pay and better treatment.—*Reuter* (Shanghai).

New Radio Station.—It is reported that Messrs. C. Lorenz and Co., of Tempelhof, Berlin, have lately secured a contract for the equipment of a wireless station at Canton for ship communication purposes.

Czecho-Slovakia.—Automatic Telephony.—Work is well in hand on the conversion of the telephone exchange in Prague to automatic operation on the Siemens and Halske system. Out of 12,000 subscribers' lines, about 4,000 are now worked automatically, the apparatus having been supplied by the Telegrafia Co., of Pardubitz.

Post Office Revenue.—Treasury Returns.—The Treasury returns for the first half of the financial year indicate that the revenue of the telegraph service amounted to £2,600,000, a decrease of £100,000 as compared with the corresponding period last year; the income of the telephone undertaking was £7,750,000, an increase of £50,000.

The Telephone Service.—Exchange Names.—In anticipation of the coming change to automatic switching, three telephone exchanges were renamed on October 1st: East Ham became Grangewood, Kingsbury is now Colindale, and Woodford has become Buckhurst. The new Sloane exchange also had the bulk of its subscribers allotted to it from four other exchanges.

Radio Notes.

Daventry.—Aerial Fault.—A breakdown of the aerial at the B.B. Co.'s high-power station (5 XX) on September 30th caused the afternoon programme to be interrupted for a time. The fault was soon rectified. The usefulness of the station was increased as from October 1st by an extension of the hours of broadcasting. For a period of one month as an experiment it will transmit additional programmes from 11 a.m. to 2 p.m. daily, except on Saturdays and Sundays.

Geneva Conference.—Too Many Stations.—Changes in the conduct of broadcasting in Europe are foreshadowed as a result of the International Wireless Conference which has just been held in Geneva. According to *The Times*, delegates to the conference are agreed that Europe has more broadcasting stations than can be possibly fitted into any wave band which the Governments of Europe are ever likely to set aside for broadcast purposes. It is felt that instead of having the present large number of comparatively low-power stations, Europe in the future must have fewer and more powerful transmitters. It was realised from the beginning of the Geneva Conference that there were not sufficient separate positions in the broadcast wavebands to give to every station a place to itself. Some stations had to be put on the same wavelengths. This part of the scheme was governed by geographical considerations, the power used by any two stations, and their distance apart. All sorts of adjustments were made during the recent tests, but this part of the plan was a failure. Sooner or later each station must have its own wavelength. Meanwhile something must be done to keep the present cause of interference between the stations of Europe to the least harmful limits. The conference decided on a temporary plan, which differs in many respects from that on which the recent tests were based. The new scheme will come into operation about November 1st. Another meeting of the board will take place in December. Additional details of the scheme will be announced as they are arranged by the permanent staff at Geneva. New stations will be given positions below 200 metres.

Imperial Press Conference.—Broadcasting Committee.—At the Imperial Press Conference, which is being held this year in Australia, Sir Percival Phillips (Great Britain) opened the discussion on broadcasting. He said that there seemed to be a prospect that broadcasting would conflict with the interests of the newspapers. Mr. C. F. Crandall (Canada) moved the appointment of a special committee of the Empire Press Union to keep in touch with the Dominions in order to watch the course of broadcasting. The resolution was carried.

Irish Free State.—Appointment of Broadcasting Officials.—The Ministry for Posts and Telegraphs has, according to the *Wireless Trader*, invited applications for the following positions in connection with the new broadcasting station at Dublin:—Station director, assistant engineer, musical director, and announcer. The salaries are £750, £300, £400, and £250 per annum respectively, and it is believed that the appointments will be made sometime during this month. The posts of musical director and announcer will be part time, and all positions will be non-pensionable. The appointments will be made by a Selection Board, acting under the Civil Service Regulations Act, and will be for a period of one year, and subject to termination at a month's notice.

Selection Committee.—Mr. J. C. W. Reith, managing director of the B.B.C., and Sir Hamilton Harty have been appointed to the Selection Committee which will draw up a scheme and make recommendations to the Free State Government in respect of all aspects of its broadcasting organisation. The Committee consists of officials appointed by the Free State Civil Service Commission. All the members are of Irish birth with the exception of Mr. Reith, and the B.B.C. is co-operating with the Free State Government in order that the broadcasting service in Southern Ireland shall be started on a firm foundation. The first meeting of the Committee will be held in Dublin on October 13th, and it will deal with the appointment of the staff.—*Manchester Guardian.*

Italy.—New Station.—Owing to an error in a Marconi communication, it was stated last month that the company was erecting a broadcasting station in Milan. The facts are that it has received an order for a broadcasting station in Rome of a larger power than the one which was erected by it there some time ago, and which is now working. As soon as the larger station, which will be of 12 kW, is in operation, the smaller, a 6-kW station, will, we understand, be removed to Naples.

New Zealand.—New Station.—Figures made public last June show that there were just over 4,200 holders of listening licences in New Zealand. Until the 500-watt station of the broadcasting company is ready to begin service, the Government has authorised existing stations to carry on, and is subsidising them, says the *Australian Electrical Times*. Auckland's broadcasting station (IYA) has taken the call sign VLAK and wave-length of 420 metres. With a subsidy of £15 per week from the Postal Department and £15 from traders, and under the supervision of a local committee representing, as well as the company, the trade Postal Department, and listeners, an improved service is promised.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Ashford (Kent).—Urban District Council. Electricity meters. (October 2nd.)

Australia. — Melbourne. — December 1st. Postmaster-General's Department. Motor-generator sets for charging secondary batteries. (October 2nd.)

Sydney.—December 16th. New South Wales Government Railways and Tramways. 10 single-phase, 1,800-kVA transformers.*

Belfast. — November 2nd. Electricity Department. Motor-generator and transformer. (See this issue.)

Belgium.—October 31st. Association Liegoise d'Electricité, 33, Rue Darchis, Liege. Supply of electricity distribution mains in the communes of Horion-Hozemont, Awans, Xhendremael, Houtain-Saint-Simeon, Hermée, and Vottem. Particulars from above address.

Bristol.—October 19th. Port of Bristol Authority. Two 2-ton electric capstans. Specification from the General Manager and Secretary, 19, Queen Square, Bristol.

Dartford.—October 17th. Electricity Works. Small steam coal for 6 or 12 months. (See this issue.)

Dublin.—Electricity Department. Transformers for one year. City Electrical Engineer, Fleet Street, Dublin.

Dublin Borough Commissioners. Electric wiring of 416 houses at Croydon Park. City Architect, Exchange Buildings, Lord Edward Street, Dublin.

Edinburgh.—October 16th. Corporation. 12 electric tramcar trucks, electrical equipment of cars, and air-brake equipment. Specifications from the manager.

October 13th. Electricity Department. Cables, conduits, pavement box frames and covers, fuse boxes, meters, meter boards, &c. (See this issue.)

Edmonton.—October 13th. Board of Guardians. Electric lighting and power installations at Enfield House. (September 25th.)

Egypt.—Cairo.—December 1st. Ministry of Public Works. Two pumping units and accessories for the Mex pumping station.*

Glasgow.—October 19th. Parish Council and District Board of Control. Stores, including electrical fittings, for six months. Forms of tender from Mr. M. A. Reynard, inspector and clerk, 266, George Street.

Leeds.—October 20th. Tramway Department. 150 double-deck top-covered tramcars complete, or, alternatively, 150 tramcar bodies, 190 tramcar trucks, including wheels and axles, 190 tramcar electrical equipments. (October 2nd.)

Lichfield. — October 19th. Electricity Department. Transformers, switchgear, and cable connections; e.h.p. and l.p. cables, boxes, and roadwork; e.h.p. overhead transmission line. (September 25th.)

London.—Islington.—November 11th. Electricity Department. 3-phase, 6,000/6,600-V and two-phase or single-phase 2,500/2,000-V switchgear and accessories. (September 25th.)

H.M. Office of Works.—October 14th. Dismantling wiring and rewiring in conduit at Charity Commissioners' office, Ryder Street, W. (September 25th.)

Manchester.—October 13th. Electricity Committee. Twelve months' supply of wooden cable troughing, capping and boards. Form of tender from Mr. H. C. Lamb, manager, Electricity Department.

Newport (Mon.).—October 28th. Electricity Department. Electrically-driven pumps, pipework, valves, &c.; switchgear; water-screening plant. (October 2nd.)

New Zealand.—Wellington.—Public Works Department. December 8th. Steel transmission line supports for the Waikato power scheme.*

Sheffield.—October 20th. Tramways and Motor Department. 50 double-deck vestibule tramcars. (See this issue.)

Sleaford.—October 20th. Electricity Department. Cables, &c. (See this issue.)

South Africa.—Cape Town.—October 14th. Electricity Department. Electric motors.*

Southend-on-Sea.—Light Railways and Electricity Department. House-service meters and demand indicators. (October 2nd.)

Uruguay.—Montevideo.—December 22nd. State Electricity Supply Works. 200,000 metres r.i. wires and cables. December 28th. 1,060,000 metres of special cable for outside use.

November 27th. H. and l.p. cables and accessories.*

Wakefield.—October 12th. West Riding County Council. Equipment of central repair shop at Thornes, including electric motors and engineering workshop equipment. Particulars from West Riding county surveyor, County Hall, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Argentina.—The tender of Tilling-Stevens Motors, Ltd., for the supply of 100 petrol-electric omnibuses for service in and around the city of Buenos Aires was, *Modern Transport* states, accepted last week.

Australia.—Melbourne.—Victorian State Electricity Commission. Accepted:—

Nineteen 3,000-kVA single-phase transformers.—Johnson & Phillips, Ltd.

Barking.—Electricity Committee. Accepted:—

Motor converters (£4,950).—Ateliers de Constructions Electriques de Charleroi.
H.p. switchgear (£2,683).—A. Reyrolle & Co., Ltd.
D.c. switchgear (£3,718).—Bertram Thomas.

Tramway Committee. Accepted:—

Rails (£80).—Cargo Fleet Iron Co., Ltd.

Birkenhead.—Electricity Committee. Accepted:—

4-core l.p. cable (£3,430).—Hackbridge Cable Co., Ltd.
3-core e.h.p. cable (£1,750).—British Insulated & Helsby Cables, Ltd.
L.p. service cable (£1,085).—Liverpool Electric Cable Co., Ltd.

Bournemouth.—Corporation. Accepted:—

20 tramcars and equipment (£52,320).—Metropolitan-Vickers Electrical Co., Ltd., and the Brush Electrical Engineering Co., Ltd.—*The Times.*

Croydon.—Board of Guardians. Accepted:—

Electrical fittings and appliances for six months.—J. & T. Robinson.

Dundee.—Housing Committee. Accepted:—

Electric lighting installation at Corporation houses (£109).—Marshall, Hutton & Co.

Erith.—Housing Committee. Recommended:—

Installing electric light at 100 houses (£662).—Erith Electrical Co., Ltd. The other tenders received were: E. E. Beaven (£10 13s. 4d., or £9 16s. 9d. per house); Dean & Davis (£9 14s. per house); Electrical Supply Stores (£733); W. Dickinson & Co. (£895).

Germany.—We are informed that the Lopulco pulverised fuel system, the rights of which belong to International Combustion, Ltd., of London, is to be installed in a new boiler house of the Berlin Electric Light Works on 12 large boilers. It is understood that this order has been secured in face of exacting investigations by German engineers into all known Continental and American systems of pulverised fuel.

Hull.—Telephones Committee. Accepted:—

Cable (£101).—Union Cable Co., Ltd.
Bronze wire (£321).—T. Bolton & Sons.
Telephone cords (£82).—British L. M. Ericsson Manufacturing Co., Ltd.

Keighley.—Corporation. Accepted:—

Installation of electric lighting in 50 houses on the Broomhill estate.—Ideal Electric Co.

Board of Guardians. Accepted:—

Electrical installation at St. John's Hospital and the Central Children's Homes.—Ideal Electric Co.

Lanarkshire.—

Electric lighting installation, &c., in the operating theatre and X-ray block at the County Sanatorium, Stonehouse (£991).—Telford, Grier and Mackay, Ltd.

London.—General Post Office.—*The Times* says the Postmaster-General has placed with a British firm a large order for battery glass jars for the telephone department. An undertaking has been given that the jars will be made in this country. It is stated that the number of jars ordered runs into six figures.

Portsmouth.—Board of Guardians. Accepted:—

Electrical stores.—H. A. Evans.
Electric lamps.—Stella Lamp Co., Ltd.

Meter Contracts.—Brighouse Urban District Council, Clyde Valley Electric Power Co., and the Borough of Kirkcaldy have placed contracts for electricity meters with Edison Swan Electric Co., Ltd.

Salford.—Tramways Committee. Accepted:—

Special trackwork.—Hadfields, Ltd. (£338); Thermit, Ltd. (£441).

Health Committee. Accepted:—

Wireless reception apparatus for Nab Top Sanatorium (£145).—Marconiphone Co., Ltd.

Shipley.—Health Committee. Recommended:—

Electric light installation at smallpox hospital (£179).—G. Binns.

Stoke-on-Trent.—Corporation. Accepted:—

Wiring central power house extension (£1,068).—Hamley & Ingram.

Electricity Committee. Accepted:—

Erection of eight all-electric houses (£4,500).—Maddock Bros.
E.h.p. testing set (£119).—British Electric Transformer Co., Ltd.

Wimbledon.—Electricity Committee. Recommended:—

3,000-kW turbo-alternator (£16,499).—Metropolitan-Vickers Electrical Co., Ltd.

York.—Education Committee. Accepted:—

Re-wiring at Queen Anne School (£187).—Electricity Committee.

Forthcoming Events.

Electrical Trades Commercial Travellers' Association.—Saturday, October 10th. At the Manchester Hotel, Aldersgate Street, E.C. At 7.30 p.m. Bohemian concert.

Junior Institution of Engineers.—Tuesday, October 13th. At 39, Victoria Street, E.C. At 7.30 p.m. Paper on "Town Planning: its Effect and Influence on Industry," by Mr. R. A. Hudson
Friday, October 16th. Lecturette, "Super-Tension Cable Dielectrics," by Mr. A. J. Tracey.

Institution of Civil Engineers.—Wednesday, October 14th. At the Institution of Civil Engineers, Great George Street, S.W. At 6 p.m. Joint meeting with the bodies which are co-operating in the work of the Special Committee on tabulating the results of heat-engine trials. Discussion on "Standard Codes for Tabulating the Results of Trials on Steam Turbines and Condensing Plant," to be opened by Mr. R. A. Chattock.

Institution of Engineers-in-Charge.—Wednesday, October 14th. At St. Bride's Institute, Bride Lane, E.C. At 7.30 p.m. Presidential address by Engineer Vice-Admiral Sir Geo. G. Goodwin, K.C.B.

British Electrical Development Association.—Conferences.—Thursday and Friday, October 15th and 16th. At E.L.M.A. Lighting Service Bureau. At 7.30 p.m.

Birmingham Electric Club.—Friday, October 16th. At the Grand Hotel, Colmore Row. At 7 p.m. Lecture on "Power Factor Improvement as Affecting the Economical Running of Works Plant," by Mr. F. C. Hall.

Institute of Transport (North-Western Section).—Friday, October 16th. At Lime Street Station Hotel, Liverpool. Paper on "Electrically-propelled Vehicles for Road Transport," by Mr. F. Ayton.

Electrical Power Engineers' Association (Southern Division).—Saturday, October 17th. At the Hotel Cecil, Strand, W.C. At 5.30 for 6 p.m. Annual dinner.

National Association of Supervising Electricians.—Saturday, October 18th. At Ye Mecca Restaurant, Ludgate Hill, E.C. Dinner and whist drive.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

Ideal electric irons.

Notes.

Perlit Cast Iron.—There is now being introduced a process for the manufacture of cast iron which would seem to be of considerable significance. The process is not new, for it has been adopted on the Continent for some time; but, so far as this country is concerned, it has been practically investigated to a limited extent for some months by the North-Eastern Marine Engineering Co., a marine Diesel engine-building concern. The patent rights in this country have been acquired by the British Perlit Iron Co., Ltd. The *Motor Ship* has examined a number of Perlit castings, and can assert that within its experience nothing of a like nature has been produced in ordinary cast-iron practice. Quite apart from the homogeneous nature of the metal, it draws attention to the fact that it has handled twisted bars of Perlit cast-iron, lengthy turnings from the metal, cold-bent strips and other items, all of which prove conclusively that the process can render possible the production of castings of an extremely high quality and possessing unique properties.

Report on a Tramway Accident.—Major G. L. Hall has furnished the Minister of Transport with a report upon a tramway accident which occurred at East Dulwich on July 31st last. The cause of the mishap was the back-running of an L.C.C. tramcar after reaching the highest point of the steepest gradient on Dog-Kennel Hill. The car collided at the foot of the hill with another which was standing there. There were 38 cases of personal injury, and a number of persons complained of shock. None of the cases was serious. It appears that the motorman inadvertently omitted to change over the reversing key before applying the magnetic brake, and so lost control of the car. Major Hall says that it is possible to obviate the necessity for changing over the reversing key before the application of the magnetic brake in the event of a run-back by an alteration in the standard connections between the armatures and fields of motors, but it is considered that the system introduces drawbacks so serious as to outweigh any advantage which may be gained.

A True Fish Story.—The *Electrical World* says that tons of dead and stunned fish recently lodged against the dam of the Interstate Public Service power house near Bedford, Ind., blocking the wheel pits and causing some of the wheels to be closed down. The entire countryside carried and hauled fish away. One fish weighed eighty-four pounds and a number weighed more than fifty pounds. Employés of the company in boats were kept working to prevent the trash racks from becoming clogged.

Industrial Heating in the United States.—According to a writer in the *Westinghouse International*, the industrial heating load in the United States now amounts to about one million kW, representing about one-tenth of the total load. This is distributed as follows:—Steel melting furnaces, 225,000 kW; brass melting furnaces, 95,000 kW; heat treating furnaces, 85,000 kW; industrial ovens, 200,000 kW; bread baking and commercial cooking, 100,000 kW; welding, 55,000 kW; and miscellaneous small units, 325,000 kW. It is stated that 95 per cent. of the japanning ovens in use in the automobile industry are electrically heated.

Electric Wiring in New Zealand: Registration of Linesmen.—A correspondent in New Zealand has sent us the following extract from *The Dominion* of August 15th, suggesting that it will give a hint to intending "wiremen immigrants" and others to the effect that unless they qualify by examination they may have to work as labourers. The same thing applies to plumbers and painters:—

New provisions for the control of electric wiring in New Zealand are contained in the Electrical Wiremen's Registration Bill. The Bill provides for the establishment of a Registration Board, consisting of five members, who will conduct examinations, issue certificates, receive applications for registration and authorise the same in cases where the conditions of registration have been complied with. An applicant may register on payment of the prescribed fee if he has received satisfactory training as an electrical wireman and is the holder of a certificate granted after an examination in both theoretical and practical wiring, or at the commencement of the Act is the holder of a certificate or licence as an electric wireman issued by an electrical supply authority approved by the Board. A further provision enables the Board to register a person who, although he is not the holder of a certificate or licence or has not passed the prescribed examination, is competent to perform the duties of an electrical wireman. A provisional licence may be granted for a period not exceeding six months to any person not qualified to be registered under the Act, and on application being made within a month of the expiry of the licence, the Board may register the person as an electrical wireman, if it is satisfied that the applicant has been employed as such for at least three years previously. Registered electrical engineers may do electrical wiring work or be appointed as inspectors, and are subject to the Board's power to suspend them for defects. The wiring of any premises for electric lighting, heating, and power purposes is to be undertaken by or under the direct supervision of a registered electrical wireman. Electricity supply authorities are empowered to appoint inspectors to inspect all wiring work before it is connected with the source of supply, and report on any defects. Complaints against inspectors' decisions by a recognised body representing electrical traders may be investigated by a competent person appointed by the Board, and if the Board is satisfied that the inspection was unfairly made, it is empowered to suspend the inspector or cancel his registration. Power is given to appeal against any of the Board's decisions, the appeal to be heard by a magistrate and two assessors. A register is to be kept, and the Board has the power to suspend licences for proved complaints of defective workmanship.

Street Traffic Signals. — A system of co-ordinating the control of cross-streams of vehicular traffic in main thoroughfares by means of electrically-operated signals is to be considered by the London Traffic Advisory Committee.

Parliamentary Acoustics.—With a view to improving the acoustics of the debating chamber of the House of Lords, preliminary tests were carried out recently with a variety of sound-producing and magnifying appliances. The apparatus was inspected by officials from the Office of Works. Tests were made with a single microphone placed on the central table of the Chamber and with headphones attached to the Lords' benches, and satisfactory amplification of voices was reported from all parts of the chamber. In some cases the speaker was located 15 ft. from the microphone.—*Daily Telegraph.*

The Ilford Cable Contract.—The recommendation of the Ilford Electricity Committee that a contract for 14 miles of cable be placed with a German company (Elec. Rev., October 2nd, p. 542) was recently adopted by the Council, and some attention has been given to the matter in the daily Press. The Council is credited with the object of breaking a "ring" of British cable-makers, and with the intention of saving money for the ratepayers. The German price is stated to be 13 per cent. lower than the lowest British tender. The *Morning Post* interviewed the electrical engineer at Ilford, and attributes to that gentleman what seems to us to be the remarkable opinion that of the total amount of money involved, £4,000, not more than some 3 per cent. would have gone in wages if the contract had been placed here. It was, he said, incorrect to suggest that the Council was opposed to the firms which constituted the Cable Makers' Association. It was, however, a singular fact that all British quotations were, within a fraction of a penny per yard, identical, and when a foreign firm quoted a much smaller figure it was bound to be accepted by the Council unless there was something radically wrong with the firm; the fact that it was a German concern could not be regarded in itself as sufficient ground for rejecting its favourable tender.

The *Morning Post* states that the action of the Ilford Council was severely criticised by an official of one of the largest firms of cable manufacturers in the country, who are members of the Cable Makers' Association. "We in England," he said "have to pay full Trade Union wages, which are at present something like 40 per cent. higher than those paid in Germany; a year ago they were over 60 per cent. higher. When the Ilford Council called for tenders for the cable in question it inserted the usual clause insisting that Trade Union rates of wages and length of working hours should be adhered to. This obviously goes by the board now that the contract has been placed in Germany. British firms are overburdened with high rates in consequence of the large number of unemployed, involving the payment of unemployment benefit and relief. Germany avoids all this by securing at lower prices contracts which should be kept in the country. It is difficult to overcome such unfair competition."

The following communication on the subject has reached us at the moment of going to Press:—

"The Ilford Council are to be congratulated on their courageous attempt to break the ring of electrical cable manufacturers by placing an order for cable with a German firm. It is interesting to note that there are ratepayers who have the common sense to see that what they might save on "doles" is more than counterbalanced by the extra prices demanded by the rings for their manufactures. There are, of course, other rings apart from cable-makers, which, in the happy position of knowing that municipalities dare not place orders abroad naturally exploit public undertakings to their own advantage. The ratepayer is thereby indirectly *subsidising the home manufacturer*, but, as usual, he has dust thrown into his eyes on the plea of unemployment. Nobody, of course, would suggest placing all orders abroad, but it is high time the community refused to be coerced by the combines in order to subsidise profiteers and shareholders. It is to be hoped that other municipalities will follow the lead of Ilford and thus help to eliminate one of the main causes of our industrial unrest."

October 5th, 1925. "Sales Engineer."

Appointments Vacant.—Electrical engineering draughtsman (£315) for the Metropolitan Asylums Board. Plumber-jointer for Precsall U.D.C. electricity department. Plumber-jointer for Salford Corporation electricity department. (See our advertisement pages to-day.)

Builth Wells Electricity Undertaking.—The electricity undertaking at Builth Wells, which was inaugurated on September 19th by Mrs. Black Jones (Electrical Review, October 2nd), is the outcome of the formation of a company under the chairmanship of Dr. Black Jones which had previously explored the neighbourhood of the town to ascertain whether water power could be utilised for generating electricity. Observations over a long period showed that the power available was liable to very wide fluctuations, and estimates of the cost proved that the expenditure of capital would be excessive. In 1924 it was decided to erect a generating station in the town, and a convenient central site was found. The power house is of steel and concrete construction. The plant includes a Ruston-Hornsby horizontal semi-Diesel oil engine driving a 40-kW d.c., 230-V generator. Provision is made for a second generating set. A switchboard supplied by the Austin Lighting Co. is equipped with pressure-regulating apparatus. A 600-Ah battery of Messrs. Pritchett & Gold & E.P.S. Co.'s manufacture is also installed. The exhaust pipe from the engine passes underneath the oil-storage tank to prevent the oil becoming too viscous in the winter. The cooling water for the cylinder jacket is pumped from a sump to an overhead tank and flows through the jacket by gravity. The distribution of current is effected by means of overhead ring mains.

Where the mains cross the lines of the Post Office, the copper cables are covered with P. B. J. insulation, thus avoiding the use of unsightly wire cradles. The steel transmission poles, which were supplied by the British Mannesmann Tube Co., are of the one-piece stepped pattern, and are made of high-tensile steel. Builth Wells is an instance of a town which is out of reach of any bulk supply, and is obliged to generate its own energy. The design and erection of the undertaking have been carried out by and under the supervision of Messrs. Moffett, Rosher & Mann, consulting engineers, Birmingham.

Nottingham's Electricity Supply.—The temporary dislocation in Nottingham's electricity supply, which took place recently, was referred to at a meeting of the City Council on Monday last. Ald. E. Huntsman, chairman of the Electricity Committee, said that the whole of the plant in the North Wilford power station was tested thoroughly before being put into service. A system of protection was provided to guard against overloading on the main cables, and it was necessary that the relay apparatus at both ends of the line should be of the same make and the same class. Plans were supplied to the men who had to carry out the work, but they failed to understand certain marks on the plans when installing the apparatus, and the omission could not be detected until the plant was put into operation. Investigations showed that that was the cause of the trouble. When the current was cut off, every effort was made to restore it as quickly as possible, and plant was put in which was not properly equipped with balancers; that was the reason for fusing in certain parts and for certain lamps being burnt out. They had got the very best plant, and they had now safely got over the transition.

Electrical Association for Women.—Lecturers have been supplied by the Association to other women's organisations, namely: For the St. John's Fellowship meeting on October 6th, at 54a, Tottenham Court Road, London, at 8 p.m. Subject: "Making the Home Electric." Speaker: Miss E. E. Wilson (member, E.A.W. Council); for the Hastings and St. Leonards Women Citizens' Association on November 20th, at 3 p.m. Public meeting on "Electricity in the Service of Women." Speaker: Miss C. Haslett (director, E.A.W.); and for the Dulwich Women Citizens' Association on December 8th, at 3 p.m. Subject: "Electricity in the Service of Women." Speaker: Alderman Mrs. Hammer (chairman, E.A.W.).

Fatalities.—At Dunfermline recently an inquiry was held into the death of an electrician employed at the power station of the Aitken Pit, Kelty, from a shock received by coming into contact with a "live." cable. An electrical engineer stated that he and the deceased had completed some work and were testing it. They found difficulty in getting the current into phase. In the course of experiments in order to find out what was wrong he heard the sound of an explosion and saw that the place was in flames. He found deceased lying on the floor. There had been some mistake in connecting up which they had not known about. The accident might have been due to deceased temporarily forgetting the possibility that the metal parts were alive, or he might have stumbled.

Questioned by the agent of the Fife Coal Company, witness stated that what was being done was a recognised operation for certain purposes, and was always associated with a certain amount of risk. None but skilled men were employed in connection with such an operation.

The Sheriff said that he did not think that it was possible to ascertain exactly how the accident happened, and without knowing that, it was impossible to make any suggestion for preventing a similar accident in the future. The jury returned a formal verdict.

A woman named Matilda Cayer, aged 68, of Rice Lane, Liverpool, who had booked an excursion ticket to Southport, fell on the electric railway at Walton Junction station on Friday last and was killed, receiving an electric shock and being struck by an incoming train.

Electrical Plant at the Southampton Docks.—In the note in our issue of September 25th (p. 506) upon the plant supplied to the Southampton Docks by Messrs. Mather & Platt, Ltd., we stated that the pumps shown provided the necessary hydraulic power for the pumps used for de-watering Nos. 1, 2, and 3 dry docks. The receiver and manager of Gwynnes Engineering Co., Ltd., which supplied the de-watering pumps, considers that our statement is misleading. He asks us to make it clear that the turbine pumps illustrated in our note actually provide hydraulic power for the operation of the sluice valves on the de-watering pumps.

The Manchester Dance.—The Manchester Electrical Engineers' Dance will be held at the Midland Hotel, Manchester, on December 4th. Information respecting the arrangements may be obtained from Mr. J. Harcourt-Williams, National Buildings, St. Mary's Parsonage, Manchester, the hon. treasurer, or from Mr. George H. Fawcus, 29, Stamford New Road, Altrincham, the hon. secretary.

National Association of Supervising Electricians.—"Economic Premiums."—Two cash prizes—one of £10 and the other of £5—are being offered to members of the Association by the president, Mr. F. Gill, M.Inst.C.E., M.I.E.E., for the best two papers dealing with economic questions. Rules have been drawn up, and papers must be received by the general secretary, N.A.S.E., not later than November 25th, 1925.

On Tuesday last, at the Junior Institution of Engineers, London, Mr. J. S. Highfield opened the new session, and called upon Mr. A. H. Dykes, in the unavoidable absence of the President, Mr. F. Gill, M.Inst.C.E., M.I.E.E., to read Mr. Gill's address. Three economic subjects were dealt with by the author. In the first place he commented on the multiplicity of patterns of accessories and materials that were used in electrical installation work, and suggested that the Board of Control of the Association should appoint a small committee to report on the subject and to make proposals for the elimination of superfluous varieties and the simplification of stocks. Next Mr. Gill referred to the prevention of accidents, and suggested that a "safety code" should be prepared with this end in view; and finally he discussed thrift, laying stress on its personal application and showing in detail the growth of savings at compound interest.

Bauxite in Hungary.—As a result of investigations carried out on behalf of the State by the Hungarian Geological Institute during the past year, special interest is said to have been evoked by the discovery of new deposits of bauxite in the Bakony and Vertes fields. The depth of the deposits is inconsiderable, and the degree of purity of the ore is declared to be greater than that of any other occurrence of bauxite. Working of the deposits is reported to have been begun already with the assistance of foreign capital.

The Norman Lockyer Lecture.—The first annual Norman Lockyer Lecture, established by the British Science Guild as a means of periodically directing the attention of the public to the influence of science upon human progress, will be given by Sir Oliver Lodge, F.R.S., on Monday, November 16th, 1925, at 4 p.m. The subject of the lecture will be: "The Link Between Matter and Matter." Lord Askwith, K.C.B., K.C., President of the Guild, will be in the chair, and the lecture will be given in the Hall of the Goldsmiths' Company. Tickets of admission may be obtained on application to the Secretary, British Science Guild, 6, John Street, Adelphi, London, W.C.2.

Institution Notes.

Institute of Transport.—On Monday last, the first meeting of the Session was held at the Institution of Electrical Engineers. Sir Lynden Macassey, the retiring president, presented the premium awards, which included the Railway Engineering Gold Medal to Major C. H. W. Edmonds, for his paper on "Modern Traffic and Signalling," and the Water Transport Gold Medal to Mr. H. J. Deane for his paper on "Modern Dock Equipment." He then installed Col. Sir Joseph Nall, D.S.O., M.P., in the chair. In the course of his presidential address, Sir Joseph said that the membership of the Institute had increased during the past year from 1,977 to 2,374. Four Local Sections were in operation, a fifth was contemplated, and the establishment of branches in South Africa, Australia, India, and South America was under way. The first Institute examination was to be held in the spring of 1926. The address dealt mainly with the question of competition between rail and road transport, and the president, referring to the maintenance of paving by tramways, expressed the view that those who were concerned in road transport must be prepared to shoulder a due proportion of the cost of providing and maintaining the roads which they used. Road transport enjoyed heavy subsidies by way of road maintenance, and the roads and railways should be placed upon a more equitable basis. If justice was to be done, the law must be amended; he suggested that tramways should receive the same grant in aid from the Road Fund as would be paid to the road authority for that part of the road if the tramway did not exist. The present practice in the matter of omnibus licensing called for early revision.

Junior Institution of Engineers.—Problems of Broadcasting.—At the opening meeting of the session, Mr. E. Bishop, B.Sc., of the B.B.C., lectured on the subject of "Problems of Broadcasting," in the course of which he referred to a microphone which was in use, of the carbon type, which was giving good results and had great possibilities for the future, being entirely free from hisses. In connection with the arrangements for outside and simultaneous broadcasting, Mr. Bishop said that, contrary to ordinary commercial practice, an unloaded land line transmitted sounds better than one which was loaded, the reason being that radio sounds covered the whole range of audible frequencies and not merely the range of ordinary speech. The wireless link had been found impossible to use for any distant relay work. Future developments would probably lead to bigger stations and fewer of them, and more American and Continental transmissions.

Institution of Heating and Ventilating Engineers.—At the autumn meeting held on October 6th, Mr. E. Ower, B.Sc., A.C.G.I., of the National Physical Laboratory, read a paper on the measurement of air flow. The author treated the subject from an engineering standpoint, confining his attention to instruments and methods suitable for industrial use. He dealt at some length with the Pitot tube, both in its usual form and with modifications, explaining the conditions to be observed in designing alternative types for use in special cases. Dealing with manometers, he described three types suitable for factory work. For all-round usefulness combined with accuracy and ease of observation, he advocated the Krell form of inclined tube manometer. Reference was also made to a tilting micromanometer whose calibration could be calculated from a knowledge of its dimensions, and to a two-liquid gauge capable of giving a magnification of about 10 to 1. The orifice plate and Venturi tube were described, attention being drawn to the facts that these instruments gave rise to considerably larger pressure differences than the Pitot tube, and that they were eminently suited to the taking of continuous records of flow. The lecturer dealt also with the construction and use of vane anemometers, the calibration of manometers, and the testing of connections and instruments for leaks. In the latter connection he emphasised the necessity for testing all rubber leads, since even new rubber tubing sometimes showed traces of porosity.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Col. Sir Joseph Nall, D.S.O., T.D., M.P., who was inducted into the chair of the Institute of Transport on Monday last, is a director of the Llandudno and Colwyn Bay Electric Railway, Ltd.

The Railway Engineering gold medal was recently awarded by the Institute of Transport to Major C. H. W. Edmonds, O.B.E., M.I.E.E., of the Westinghouse Brake & Saxby Signal Co., Ltd. Major Edmonds was a member of the Automatic Train Control and Light Signals Committees of the Ministry of Transport.

Major Basil Binyon, O.B.E., who is the new chairman of the Wireless Section of the Institution of Electrical Engineers, and whose portrait accompanies this note, was born at Ipswich in 1885. He was educated at Leighton Park School, and from there went to Trinity College, Cambridge. He took the Natural Science Tripos with distinction and the M.A. degree, and after a year of post-graduate engineering study, served a term in the shops of the Cambridge Scientific Instrument Co. He made his entry into the radio world in 1909 by joining the Lepel Wireless Syndicate, by which he was employed in the construction of a station in Jamaica. When



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Major Basil Binyon, O.B.E., M.A.,

The new Chairman of the Wireless Section of the I.E.E.

the Lepel concern was taken over by the French Cie. Générale Radiotélégraphique, Mr. Binyon was appointed research engineer. In 1911 the French company set up an English agency, and Mr. Binyon was placed in charge of it. In addition to shipping work, he erected a number of land stations, including one at Borneo and another in the Bahamas. When the inquiry into the position of radio-telegraphy in the Empire was held by a Parliamentary committee, Mr. Binyon represented his company. Upon the outbreak of war he secured a commission in the R.N.V.R., and helped in developing aircraft signalling, and, incidentally, obtained a pilot's certificate. He continued with the Royal Air Force until 1919, when the Radio Communication Co. was formed, with Major Binyon as managing director. Under his guidance this company has made rapid progress, and is now a leader in the field of marine radio-telegraphy.

The Walsall Town Council has confirmed the appointment of Captain H. V. Morland, manager of the St. Helens Corporation Tramways, as tramway manager, at a salary of £800 per annum, rising by annual increments of £25 to £900.

According to the *Sydney Morning Herald*, the Sydney, New South Wales, City Council, at a meeting on August 18th, considered a recommendation of the electricity committee that Mr. Forbes Mackay, the chief electrical engineer, be granted an increase of £1,500 per annum, making his salary £3,500, owing to his additional responsibilities in the reconstruction of the new power house. The Council declined to approve of the £1,500 to Mr. Mackay as an increase of salary, and the Lord Mayor explained to the City Council that the £1,500 was only to cover Mr. Mackay's expenses in Britain for 12 months. Alderman Marks said the Lord Mayor's statement to the Council was entirely different from his recommendation to the committee. After considerable discussion it was agreed that the £1,500 be passed as an honorarium for 12 months only. The Lord Mayor promised that the question of permanent increase of salary would be further considered when Mr. Mackay returned from London, and that he (the Lord Mayor) would make a further recommendation in regard to Mr. Mackay's expenses. Mr. Mackay was to leave for London at the end of last month for the purpose of advising British tenderers for the new power house plant, which is expected to cost approximately £1,000,000.

Mr. C. H. McCarthy-Jones, M.I.E.E., M.I.Mech.E., consulting engineer, has accepted the appointment of manager to the Indian Radio Telegraph Co., Ltd., and sails for Bombay early in November to take up his new duties. His consulting practice has been assigned to Messrs. Murray Coombs and Richards, Premier House, 150, Southampton Row, W.C.1.

The staff of the Birmingham Electricity Supply Department have presented an oak clock to Mr. R. H. Rawll, district installation engineer, on the occasion of his marriage to Miss E. Hodges, of Stoke Newington.

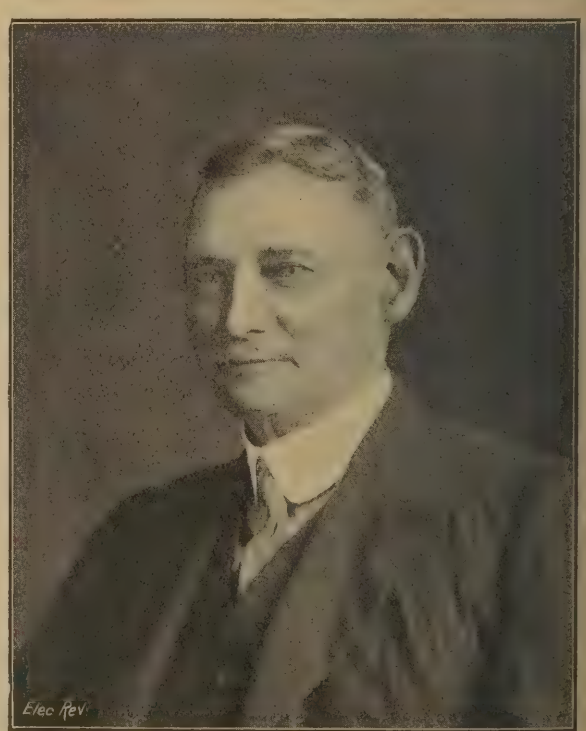
Mr. J. S. Smith, late manager to Sterling Telephone and Electric Co., Ltd., Cardiff, has been appointed district manager to the Marconiphone Co., Ltd., 21, Mosley Street, Newcastle-on-Tyne.

Mr. Alan W. Andrews, Glasgow, has been appointed, from 110 applicants, manager of the Corporation of Alloa electricity undertaking, in succession to Mr. D. McLennan, now at Inverness.

Messrs. W. J. Furse & Co., Ltd., of Nottingham, have taken advantage of the occasion of the opening of the electrical exhibition there to present a gold hunter watch to their superintending engineer, Mr. H. Abdy, who was largely responsible for their exhibit, in recognition of his thirty years' continuous service with the company. Messrs. Furse take some pride in the fact that they are the oldest firm of electrical contractors exhibiting.

The *Industrial Australian and Mining Standard* states that Mr. J. E. Morwood, B.E., who, during the past two years, held an important position with the Brisbane Tramways, left Brisbane on August 16th for London. Mr. Morwood obtained first-class honours at the University of Brisbane in electrical engineering, and recently has been awarded the W. and E. Hall Travelling Fellowship, which provides for two years' travel in England, the Continent and America; on his return he will lecture at the University for 12 months.

Obituary.—Captain M. H. P. Riall Sankey.—We regret to state that Captain Matthew Henry Phineas Riall Sankey, C.B., C.B.E., R.E. (Retired), passed away suddenly at his residence at Ealing, on Saturday last, heart failure being the cause. Captain Sankey was born at Nenagh, Ireland, in November, 1853, and was therefore in his 72nd year. He was a past president of the Institution of Mechanical Engineers, a member of the Institution of Civil Engineers, of the Institution of Electrical Engineers, and of the Institute of Naval Architects. He obtained his commission in the Royal Engineers in 1873 and after sixteen years in fortification and other branches of military engineering, telegraphs, signalling and other service, he retired in 1889 to become a director of Willans & Robinson (in recent years amalgamated in the English Electric Co., Ltd.). When Mr. Willans passed away Captain Sankey undertook the editing of his works on steam engine trials. He devoted a great deal of time to steam turbine and internal combustion engine design. He left Messrs. Willans & Robinson, Ltd., Rugby, in 1904, in order to take up consulting engineering work. He was very closely engaged with Marconi's Wireless Telegraph Co., Ltd., as director and consulting engineer, and he was also a director of Marconi's International Marine Communication Co., Ltd., and other Marconi concerns. He held many other directorships as well, among the companies with which he was thus connected being the Relay Automatic Telephone Co., Ltd., the Never-Stop Transit, Ltd., the Niclausse Water Tube Boiler Co., the Still Engine Co., Ltd., &c. He was a member of various engineering committees, was the



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The Late Captain M. H. P. Riall Sankey.

author of various papers, &c., and a frequent speaker in public discussions. The funeral took place on Wednesday, October 7th, at Brompton Cemetery.

Mr. A. R. Dodge.—The death occurred in August of Mr. Austin R. Dodge, consulting engineer to the American General Electric Company. Mr. Dodge had been connected with the company for nearly 30 years, having dealt principally with turbine matters.

Mr. J. P. Lawlor, county councillor for Wicklow, who died last week at Dundrum, in that county, was a pioneer of electric lighting in the county.

New Companies Registered.

W. R. Thornton, Ltd. (208,677).—Private company. Registered September 28th. Capital, £1,000 in £1 shares. Objects: To acquire the business of an engineers' furnisher, electrical engineer and contractor and dealer in mechanical and electrical apparatus and appliances carried on by the liquidator of W. R. Thornton & Son, Ltd., of Barrow-in-Furness. The first directors are:—W. R. Thornton, Ruskinville, Dalton-in-Furness, electrical engineer (permanent governing and managing director); and A. A. Haynes, Dane Garth, Barrow-in-Furness, railway officer. Qualification of W. R. Thornton, 50 shares; of other directors, £1. Solicitor: P. K. Lee, 4, Lawson Street, Barrow-in-Furness. Registered office: 123, Ramsden Square, Barrow-in-Furness.

Kingsway Radio, Ltd. (208,759).—Private company. Registered October 2nd. Capital, £3,000 in £1 shares. Objects: To acquire the business now carried on at Cannon Street, E.C., as the "Kingsway Radio Co.," and to carry on the business of manufacturers of and dealers in wireless instruments and accessories of all kinds, photographic instruments and accessories and sports requisites of all kinds, &c. The subscribers (each with one share) are:—P. F. Hedges, The Briars, Southend Road, Hockley, Essex, managing clerk; C. W. Church, 1, Bush Lane, E.C.4, clerk. The first directors are:—H. L. Percy, W. J. Mather and C. M. Sutherland, addresses not stated. The said H. L. Percy shall be a director so long as he lives, and the said W. J. Mather shall be entitled to hold office so long as he lives and is holder of 500 shares. Qualification (except permanent directors), 250 ordinary shares. Remuneration, £150 each per annum. Solicitors: Peter Thomas and Clark, 1, Bush Lane, Cannon Street, E.C.4.

Société Genevoise, Ltd. (208,746).—Private company. Registered October 1st. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in scientific instruments, appliances and apparatus of all kinds, electrical, magnetic, steam, hydraulic and other engines, machines, appliances and apparatus, telegraphic and telephonic appliances and apparatus, mechanical, electrical, motor and general engineers, electricians, &c. The subscribers (each with one share) are:—W. L. Custance, 41, Albert Road, W.22, merchant; H. R. White, 39, Wellington Avenue, N.15, chartered secretary. The first directors are:—F. Turrettini (permanent) and W. L. Custance. Solicitors: Bate & Co., 35, Bedford Row, W.C.1. Registered office: 95, Queen Victoria Street, E.C.4.

Winchcomb Electric Light and Power Co., Ltd. (208,731).—Private company. Registered October 1st. Capital, £6,000 in £1 shares. Objects: To carry on the business of an electric light and power supply company. The permanent directors are:—J. Atkins, 59, Church Street, Tewkesbury, electrical engineer; R. W. W. Edwards, Cleve Hill, near Cheltenham, hotel proprietor; W. C. Hands, 195, North End Road, West Kensington, W.14, electrical engineer; W. E. C. Hutchings, North Fanncote, Winchcomb, farmer; and H. W. Stephens, Winchcomb, solicitor. Qualification, £50. Secretary and solicitor: H. W. Stephens, Winchcomb, Glos.

Quickfix Electrical Fittings Co., Ltd. (13,822).—Private company. Registered in Edinburgh September 28th. Capital, £10,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all apparatus, fittings, fixtures and accessories in connection with electric and gas lighting and power, &c. The directors are:—J. Coggans, 154, George Street, Glasgow, manufacturer; H. Patrick, 15, Mair Street, Plantation, Glasgow, wine and spirit merchant; G. U. Scott, 95, Renfield Street, Glasgow, picture house director; and J. McLean, 12, Woodside Terrace, Glasgow, commission agent. Qualification, 200 shares. Registered office: 33, Bath Street, Glasgow.

Neron Lamps, Ltd. (208,763).—Private company. Registered October 2nd. Capital, £5,000 in £1 shares. Objects: To carry on the business of engineers, electrical engineers, electricians, suppliers of electricity, manufacturers and vendors of electric lamps, &c. The subscribers (each with one share) are:—L. F. Szilagyi, 16, Helenslea Avenue, N.W.11; J. A. Milne, 82, Hazelwood Lane, Palmer's Green, N.13, chartered secretary. The directors are:—R. T. Durran, address not stated; C. P. Jenson, address not stated; L. F. Szilagyi, 16, Helenslea Avenue, N.W.11 (director of Siemens-Schuckert (Great Britain), Ltd.). No share qualification required. Solicitors: Nicholson, Graham and Jones, 19-21, Moorgate, E.C.

Impex Electrical, Ltd. (208,707).—Private company. Registered September 30th. Capital, £2,000 in £1 shares. Objects: To carry on, in the U.K. or elsewhere, the business of importers, exporters, manufacturers, salesmen, factors, brokers and suppliers of, agents for and dealers in wireless and electrical instruments, apparatus, accessories, machines and materials of all kinds capable of being used in connection with electricity, radio or wireless telegraphy, telephony or telephotography, &c. The subscribers (each with one share) are:—M. Franses, 5, Granville Mansions, Shepherds Bush, W.12, merchant; S. Franses, 28, Queen's Road, Bayswater, W.2, merchant. The first directors are not named. Solicitor: H. A. Lawrance, 13, Hanover Street, W.1.

Official Returns of Electrical Companies.

Brookhirst Switchgear, Ltd. (175,995).—Return dated December 31st, 1924 (filed April 20th, 1925). Capital, £550,000 in £1 shares. 126,002 shares taken up. £30,502 paid. £95,500 considered as paid. Mortgages and charges, £25,000.

Tisbury Electric Supply Co., Ltd. (176,539).—Return dated May 21st, 1925. Capital, £6,000 in £1 shares. 5,000 shares taken up. £5,000 paid. Mortgages and charges, nil.

Gayton Park Electricity Co., Ltd. (184,208).—Return dated April 6th, 1925. Capital, £3,000 in £1 shares. All shares taken up. £3,000 considered as paid. Mortgages and charges, nil.

J. Hadden & Co., Ltd.—J. E. Percival, of 6, Old Jewry, E.C.2, ceased to act as receiver or manager on September 17th, 1925.

C. J. Thursfield & Co., Ltd.—Second mortgage debenture dated September 16th, 1925, to secure £500 charged on the company's undertaking and property, present and future, including uncalled and unpaid capital. Holder: R. S. C. Jamie, 106, Trafalgar Road, Moseley, Birmingham.

Yeovil Electric Light and Power Co., Ltd. (186,456).—Return dated May 25th, 1925. Capital, £10,000 in £1 shares. All shares taken up. £10,000 paid. Mortgages and charges, nil.

Barrett & Morris, Ltd.—Satisfaction in full on May 24th, 1925, of debenture dated July 25th, 1924, securing £100. (Notice filed September 23rd.)

Newton Brothers (Derby), Ltd. — Particulars filed of £50,000 debentures authorised September 16th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Bordesley Electrical Accessories Co., Ltd. (176,962).—Return dated November 21st, 1924 (filed April 24th, 1925). Capital, £5,000 in £1 shares. 4,662 shares taken up. £2,350 paid. £2,312 considered as paid. Mortgages and charges, £500.

Resisto Electric Wire and Tape Co., Ltd. (176,804).—Return dated January 13th (filed March 21st), 1925. Capital, £500 in £1 shares. All shares taken up. £500 paid. Mortgages and charges, nil.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Agricultural and General Engineers, Ltd. The report for the year ended March 31st last states that the depression in the home and foreign markets continued to have an adverse effect upon the affairs of the constituent companies, but an improvement was shown and this is continuing. The combined accounts show a manufacturing profit of £406,963, as against £362,806, and the profit carried down rose from £78,697 to £111,624. The gross profit of the parent company was £44,100, and after deducting expenses a balance of £379 remains, as compared with £6,884 in the previous year. The addition of the amount brought forward leaves £10,861 to the credit of the revenue account. The meeting is to be held on October 16th.

Western Electric Distributing Corporation, Ltd. The report for the year ended June 30th shows a net profit of £7,938; to this is added £915 brought forward, making £8,853. It is proposed to pay a final dividend of 5 per cent., making 8 per cent. for the year (as compared with 10 per cent. in 1923-24), to transfer £1,750 to reserve, and to carry forward £751. The issue of 20,000 ordinary and 20,000 six per cent. cumulative preference shares of £1 each has been sanctioned. The ordinary shares are being offered at par and the preference shares at a premium of 5s. 6d. to existing shareholders.

Falkirk Iron Co., Ltd. The directors propose to issue a new series of 6 per cent. debentures to replace the existing 8 per cent. first mortgage debentures now outstanding. It has been decided to limit the issue to £130,000. The new debentures will mature in 1945, when they will be repaid at par unless they have previously been redeemed by the operation of the sinking fund. Commencing in 1935, an annual drawing will be made, or they will be purchased in the market, to the total of £6,000 per annum. The holders of the existing 8 per cent. debentures will have the option of converting their holdings into ordinary shares at the price of 25s. per share, or into the new debentures.

Swiss Companies. The accounts of the Bank für Elektrische Unternehmungen, of Zurich, for 1924-25, including the amount of 256,000 fr. brought forward, show an available surplus of 5,033,000 fr., as compared with 4,174,000 fr. in the previous year. It is proposed to pay a dividend at the rate of 8 per cent. on the A and B shares of the corresponding nominal amount of 500 fr. and 50 fr., and to place 500,000 fr. to the special reserve fund.

The directors of the Maschinenfabriken Escher, Wyss and Company, of Zurich, report net profits of 635,000 fr. for 1924-25, as compared with 493,000 fr. in the previous year, and propose to pay the statutory dividend of 8 per cent. on the preference shares, while no distribution is to be made on the ordinary shares, which received 4 per cent. in 1923-24. The passing of the dividend on the latter is due to the desire to strengthen the working funds owing to the existing keen competition. During the past year it was only possible to obtain normal activity at very depressed prices, and the results were also prejudiced by a strike extending over two months.

French Companies. The directors of the Electro-Métallurgie de Dives report net profits of 9,055,000 fr. for 1924-25, as compared with 5,535,000 fr. in the previous year. It is proposed to increase the rate of distribution from 70 fr. per share in 1923-24 to 80 fr. for the past year.

The Société des Accumulateurs Electriques (formerly A. Dinin) reports a large increase in the gross profits for the year 1924-25, the net profits and balance forward amounting to 3,782,000 fr., as compared with 1,891,000 fr. in the previous year. It is proposed to pay a dividend at the rate of 18 fr. gross per share, as against 12 fr. in 1923-24.

La Société des Accumulateurs Dinin, of Paris, reports a profit of 13,421,052 fr. for the financial year 1924-25, as compared with only 12,526,315 fr. for the preceding 12 months.

German Companies. The Electricity Company (late W. Lahmeyer) reports net profits of 1,593,000 marks for 1924-25 and a dividend at the rate of 8 per cent. on the ordinary shares.

The Poege Electricity Company, of Chemnitz, has decided to carry forward the loss of 36,000 marks incurred in 1924-25 owing to unfavourable sale prices and high taxes and social burdens.

Kaministiquia Power Co.—At a meeting on October 1st the shareholders ratified the scheme for the sale of the company's assets to the Fort William Paper Co. mentioned in our issue of September 25th (p. 509).

Polish Companies.—The Société d'Entreprises Electriques en Pologne, of Brussels, is increasing its capital from 10 to 20 million francs.

Company to be Struck off the Register.—The name of the undermentioned company will be struck off the register at the expiration of three months unless cause is shown to the contrary :—

Witchell's Electrical Accessories, Ltd.

Browett, Lindley & Co., Ltd.—It is not proposed to pay any interim dividend on either the preference or ordinary shares.

Stocks and Shares.

Monday Evening.

Four p.c. is a very useful Bank Rate for trade and finance alike. Its establishment last Thursday proved to be another pleasant surprise to the Stock Exchange. Although a reduction had been previously anticipated, its announcement was not expected when it actually came, for money market conditions hardly warranted the alteration, so far as the layman could discern. In explanation, the theory is advanced that the Bank Rate has come down on political reasons; in other words, that the Treasury is anxious to do everything possible in order to stimulate national trade and industry.

The immediate effect was to lead to a strengthening of prices in the gilt-edged section. Investment issues of all kinds went better. A premium of 2s. was bid for the new County of London preferences. Debenture stocks have become harder to find than ever. There happens to be on offer at the moment a modest amount of General Electric 7 p.c. debenture at 104¼. The price would stand higher were it not for the fact that the company has the right to redeem the stock at 100 in 1931, if it cares to exercise this option. Moreover, there is a sinking fund, now in operation, for repayment of a certain amount of stock every year at par.

The only noticeable change in the prices of London electricity supply shares is ⅛ rise in St. James and Pall Mall ordinary, to 14⅞. Charing Cross preference are rather better. In the provincial list of ordinary shares, Bournemouths have receded to 58s. 9d. Bromley (Kent) are 34s. 6d., Folkestone 39s. 6d., Oxford 5⅛, Isle of Thanet 17s., and Llanelly 19s. 9d. Of the Colonials, Victoria Falls ordinary keep good at 48s. 3d., the preference being 32s. Amongst the foreign stocks, Mexicans tend to droop. Reversion to Greenwich mean time had no influence over illumination shares. Gas stock went a little easier.

Home Railway issues have been rising and falling with the capriciousness of a barometer. At the Liverpool Labour Congress, the Communists received such snubs that the Home Railway market plucked up heart, and substantial rises were secured. Then came the week-end hints of N.U.R. trouble, and some of the previous gains became lost. Metropolitans show on balance a rise of 4 points at 68½, and Districts are 3 up at 44½. Underground Electric Railways £10 shares have strengthened to 2¼ and the Income bonds at 97 stand 2 points higher at 97. The market lacks the power to attract the public, however, and prospective purchasers are startled by any shadow of Labour disturbances.

Considerable business is being done in the new shares of the United River Plate Telephone, the price of which is 35s. premium. The old shares, at 7, are ex rights. Chili Telephones have risen to 5⅝. Cable stocks are dormant; there is little interest being taken in them at present. Great Northerns show a 5s. rise. Wireless shares have the public interest in Canadian Marconi as the feature of their market. The price touched 7s. before reacting to 6s. 9d. Radio common and preferred are both very quiescent.

Brazilian Tractions dipped to 72½, and rallied to 74 bid. Anglo-Argentine Tramways 5 per cent. debenture is in request at 76. Rio Tramways firsts rose to 96½, the seconds to 86½. Of dollar stocks, Shawinigan Water Common improved to 167½. British Electric Traction ordinary is better at 121.

Siemens are a hard market at 28s. 9d. The price drooped to 27s. 6d., but was quickly restored to its previous level. Metropolitan-Vickers are a florin down. Electric Constructions shed 1s. 6d. Edisons have gone back to 8s. Cable Construction issues are dull. The reason given in the market is that holders have been selling these in order to meet their obligations in the rubber share market. This is a factor which does duty in every Stock Exchange department that exhibits dullness nowadays. The roar of the rubber boom is heard in the land; the world and his wife are bent—especially the wife—upon making easy fortunes out of rubber shares. To finance the purchases, stocks and shares of other kinds have been sold. The dullness of engineering and similar issues has a more direct cause in the postponement by Armstrongs of the interim dividend payments upon the company's junior preference shares. Babcocks are 50s., and are unchanged on the week.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Oct. 5. 1925.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	18	14	2⅛	— 1/16	4 15 4
Brompton Ordinary	1	10	10	1¾	—	*5 14 3
Charing Cross Ordinary	1	14½	15	£0/-	—	6 2 5
do. do. 4½ Pref....	1	4½	4½	17/6	+6d.	5 2 10
Chelsea	1	12	12	1⅞	—	6 8 0
City of London	1	15	15	48/3	—	6 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	28/6	—	5 12 4
County of London	1	15	15	57/-	—	5 5 8
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation ...	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12⅝	—	5 16 8
Lancs. Light and Power	1	7⅛	7½	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref....	5	6	6	5½	—	5 7 10
Metropolitan	1	10	11	39/3	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary ...	1	6	7	1⅜	—	6 4 5
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	24/6	—	5 14 3
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref. ...	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	14¼	+ ⅛	5 17 8
South London	1	15	15	2½	—	6 0
South Metropolitan Pref. ...	1	7	7	1½	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref. ...	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/-	—	6 16 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6

Home Rails.

Central London Ord. Assented Stock	4	4	66	—	6 1 3
Metropolitan	,,	4	5	68½	+ 4	7 6 0
do. District	,,	3½	3½	44½	+3	8 10 9
Underground Electric Ordinary	10	Nil	Nil	2½	+ ⅛	Nil
do. do. "A" ...	1/-	Nil	Nil	6/6	—	Nil
do. do. Income Bonds	6	6	97	+2	*6	3 9

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
do. Def.	,,	1½	1½	23⅜	—	6 6 4
Automatic Telephone	1	8	6	47/6	—	2 10 7
Chili Telephone	5	6	5	5⅜	— ¼	*4 7 0
Cuba Sub. Ord.	10	5	5	6½	—	8 0 0
Eastern Extension	10	10	10	17½	—	*5 15 11
Eastern Tel. Ord.	Stock	10	10	171½	—	*5 16 7
Globe Tel. and T. Ord.	10	10	10	17⅝xd	—	*5 13 4
do. do. Pref.	10	6	6	10⅞	—	5 10 4
Great Northern Tel.	10	22	22	33	+ ½	6 13 4
Indo-European	25	7	8½	42½	—	*5 2 5
Marconi	1	10	10	1 7/16	—	6 19 2
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord. ...	1	12	12	2 1/16	—	*5 16 4
United R. Plate Tel.	5	8	8	7	— ½	5 14 4
Western Telegraph	10	10	10	16⅜	—	*6 4 0

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3⅜	—	8 3 0
do. do. 2nd Pref. ...	5	6	6	3⅜	—	8 17 10
do. do. 5% Deb. ...	Stock	5	5	7½	—	6 10 9
British Electric Traction Ord. ...	,,	6	6	121	+1	4 19 2
do. do. 6% Pref. ...	,,	6	6	107	—	5 12 2
Brazil Traction	100	4	4	74	—	5 8 1
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	88½	+1	5 13 0
do. do. Preferred	,,	96/-	96/-	91½	+2	*5 4 1
do. do. Deferred	,,	129/5	129/5	111½	+2	*5 16 7
do. do. Deb.	,,	4¼	4¼	77½	+1	5 9 8
Lond. & Sub. Trac. 5% Pref. ...	1	2½	Nil	4/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds ...	—	5	5	63½	—	7 17 6
Mexican Light Common ...	100	Nil	Nil	33	—	Nil
do. Pref.	100	Nil	Nil	63	—1	Nil
do. 1st Bonds ...	—	5	5	72½	—1	6 18 0
Yorkshire (West Riding) ...	1	5	—	18/9	—	5 6 8

Manufacturing Companies.

Babcock & Wilcox	1	12	12	2½	—	*4 16 0
British Aluminium Ord.	1	5	10	33/9	—9d.	5 19 5
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3 3/16xd	—	4 12 4
Brush Ord.	1	10	10	23/-	+6d.	8 13 10
Callenders	1	15	15	3 3/16	— 1/16	4 14 1
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅜	—	... ...
Edison-Swan	4/-	10	10	8/-	—9d.	5 0 0
do. 5% Deb. ...	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	30/6	—1/6	6 11 2
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	17/3	—1/-	5 15 3
do. do. Pref.	1	6	6	20/-xd	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	27/-	—	5 11 1
Henley	1	15	16	3 3/16	— 1/16	5 0 5
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1 1/16	—	*4 14 1
Johnson & Phillips	1	10	10	48/9	—	4 2 0
Met-Vickers, Ord.	1	8	8	22/3	—2/-	7 2 3
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	28/9	—	5 4 4
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

The Berlin Wireless Exhibition.

Some Impressions of a Visitor.

THERE were certain aspects of the large Exhibition held in the Berlin Radio Hall this year which reminded us that the more energetic type of British wireless manufacturer is by no means confined to his home market, but that on occasion he can carry the war into the enemy's country with effect. The English visitor on arriving at the exhibition would particularly notice that one shop window almost next to the Hall was crowded with a comprehensive range of Amplion loud speakers. In the hall itself, he would observe that one

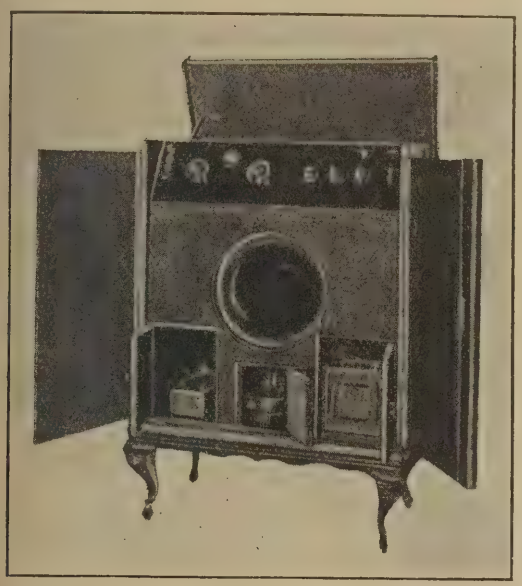


Fig. 1.—A German Set incorporating a Brown Loud Speaker.

German maker exhibiting a range of high-class cabinet receivers of the 8-valve type had adopted the Brown loud speaker as being the best obtainable for the work (fig. 1); this was the Radiotechnische Werke, and the familiar name on the loud speaker was one of the first things which attracted attention to the sets. In the hall, too, was to be noticed a very comprehensive exhibit of Clix (fig. 2), all the three makes in question being widely known in Germany.

The Radio Hall, in which the Exhibition was held, is a huge structure with a floor area of some 80,000 square feet, was hardly large enough for the exhibits and the large attendance. During the course of the exhibition (to 1st December, some 200,000 people visited the hall, and the public interest in wireless shows no sign of abating this year. At any rate, the crowds in the building were the reverse of pleasant after half-past eleven each day, and it involved a struggle to examine the exhibits after that hour. Apart from the crowd, however, the reception arrangements for foreign visitors were unequally thorough. The amusement side of the Exhibition had also received great attention. Loud-speaker installations throughout the hall distributed music during the day, and a small theatre seating some 500 people was arranged in a minor hall of the building, where a typical broadcast farce (complete with chorus) was given several times daily to crowded houses. The exhibition building, too, with its open-air restaurant and its situation near the beautiful Grunewald, could hardly have been better adapted to its purpose.

The Deutsche Reichspost (German Post Office) had an interesting exhibit on the gallery of all the apparatus of a typical transmitting station, including a small radio, as well as a number of typical receiving instruments from a 7-valve down to a 2-valve, these sets being shown unboxed, while large and well-executed drawings of the circuits were mounted on the wall behind each instrument to enable the visitor to follow its construction, as seen in fig. 4. The connection between the German Post Office and the wireless industry is, of course, much closer than in this country, for in addition to supplying the equipment of the transmitting stations, it is also a large shareholder in each of the broadcasting companies, and exercises a very great measure of control quite apart from its power in the way of regulations.

The competition of German-made telephones has always been an extremely marked feature of the English trade ever since the early days in 1923, when makers were startled to find their home market flooded with German headsets, all duly stamped B.B.C., in spite of the so-called prohibition of the use of imported sets. Since then so many thousands of them have been unloaded in this country at cut prices that English makers have of late been considering an application for this essential branch of the wireless trade to be protected by the Safeguarding of Industries Act. It is evident from an inspection of the Berlin Exhibition that this competition is still keen, and it was quite easy to obtain telephones in fairly small lots at prices in the neighbourhood of 5s., which confirms (if any confirmation were needed) the complaint recently made by Mr. Hooker, a director of Messrs. C. A. Vandervell, Ltd., that many German-made telephones are supplied below the English cost of production. Many makers represented at the Berlin Exhibition claim to be exporting their headsets in thousands to England without any trade mark. Though German production costs show an upward movement, the telephone makers are doing everything in their power to retain their hold on the trade by cheapening the construction, but this policy seems now to have been carried to excess, and it is hardly probable that any worse competition in telephones will be experienced than hitherto.

The average amateur, on the other hand, has for many of his requirements to pay a higher price than in England. It is, for instance, seldom that a piece of crystal can be obtained for less than 1s. 6d., while the detector portion arranged to plug in to the set in very



Fig. 2.—A familiar English Accessory.

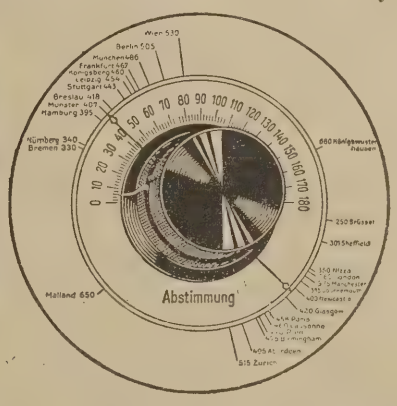


Fig. 3.—A German Dial.

much the same way as a valve costs 6s. or 7s. Further, his various accessories in the way of aerial, batteries, accumulators, &c., are usually higher in price than the amateur is accustomed to pay in this country.

In sets, there is a steadily increasing improvement over previous years, and most of the valve instruments on exhibition were quite up to date in the employment of reaction, which had previously been forbidden by the regulations. One of the most noticeable features of the sets was the way in which the use of ebonite was avoided, and in fact everything possible was done to cut down the cost of construction of most of the instruments shown. Examples of sets in elaborate "period" furniture were rare compared with what is usual at an exhibition in this country. In spite of this, however, the sets on view presented, on the

whole, a very attractive and uniform appearance, with their dead-black and plated finish. One of the small features which mark the average German instrument is the increasing adoption by many makers of very elaborately engraved 5-in. diameter fixed dials, these

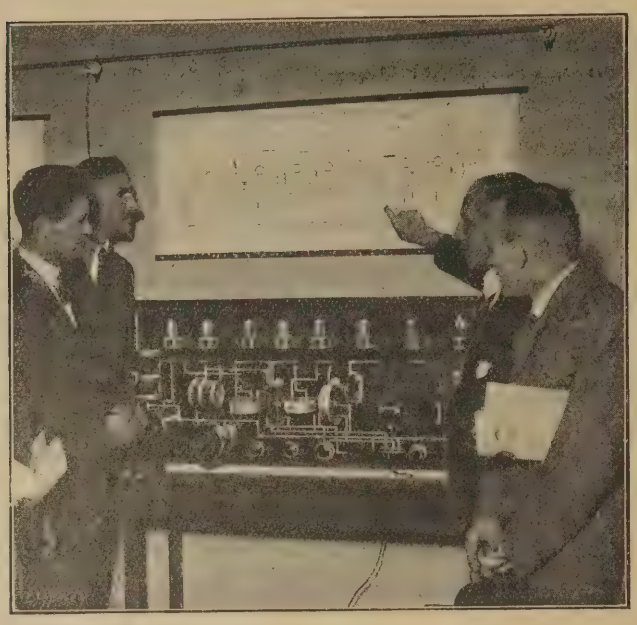


Fig. 4.—Part of the German Post Office exhibit.

being sometimes merely calibrated in degrees on the upper half, leaving space on the lower half for the user to mark his own readings; other makers have the dial engraved with both the wave lengths and the name of every station which the apparatus will receive at t exact spot where the pointer should be set. One tempted to wonder, however, what sort of corre tions will be required when the instrument is eventual installed some two or three hundred miles from t place where these settings were originally obtain and when, in addition, the user has exercised the usu privilege of varying the length and direction of h aerial and making the other little changes which a customary.

The home construction of sets has in the past be practically forbidden by the regulations, or, at a rate, only allowed in the case of members of one other of the recognised amateur clubs, but it will n rapidly come into favour with the abolition of the restrictions from September 1st. On the stand of o of the principal makers of parts they had the hap idea of installing a boy of 14 at a bench in the fro of the stand, who was continuously occupied in buildi up instruments from the various components exhibite and showing how rapidly these could be made up. T removal of the restrictions, too, has brought forwa a big variety of publications for the amateur, and one stand in the gallery a publisher was exhibiti dozens of different cheap handbooks priced at 1s. a 1s. 9d. each, together with a specimen of each instr ment described, which had been built by different me bers of amateur clubs. The clubs, such as that org nised by the "Sendung," and the Deutscher Fu Technische Verein, also had stands, on which were sho models of the sets built by their members, complete wi well-executed drawings.

It is estimated that the total attendance at the exhi tion during the time it was open from September 4 to the 13th was about double last year's figure.

New Electric Fires.

Designs for the Coming Season.

(*Continued from page* 534.)

Belling & Co.

A rather novel form of imitation coal fire (fig. 14) is included among several new designs which this firm has put on the market. A wrought-iron brazier measuring 24 in. high, 16½ in. wide, and 8½ in. deep is packed with imitation coal illuminated by a concealed amber lamp. Fitted in the front of the brazier are two 1-kW fire bars with separate switches. The bars are of the firm's standard "Multi-Parabola" type; this form of bar has 75 small parabolic wells which, it is claimed, throw the maximum amount of heat forward. The bar is curved to



Fig. 14.—The Belling "Pillar" Fire.



Fig. 15.—The "Belling" Dome Fire.

give a wider distribution. The fire is mounted on four legs, the front pair taking the form of square columns. Four finishes are available.

Another new "Belling" fire is that shown in fig. 15. This is a low-priced model made of sheet steel, the ornaments being of solid cast brass finished in bronze. The top is domed and perforated, and is so arranged that kettles, &c., can placed upon it. The fire is fitted with two separately-switch "Multi-Parabola" 1-kW elements, and is given a black a bronze finish.

Bastian & Allen.

The fires manufactured by this firm are distinguished the well-known "Quartzalite" element, in which the w is wound in or upon quartz tubes, raising the latter to a so red glow. Among the season's designs is the "Salisbury type shown in fig. 16. This has an attractive appearan being finished in oxidised copper. Behind the elements is polished copper reflector which can be readily removed cleaning. The dimensions are:—Height 15 in., width 17 i

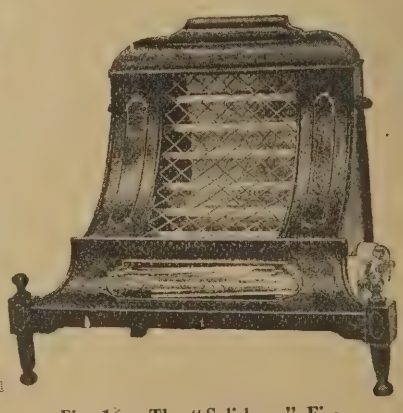


Fig. 16.—The "Salisbury" Fire.



Fig. 17.—The "Quart Adam Fire.

and depth 9 in. The loading can be anything between 1 a 2 kW.

Another "Quartzalite" fire is the "Adam" pattern (f 17). This also can be arranged for from 1 to 2 kW. T finish is oxidised silver, and the fire is 15 in. wide a 18 in. high.

H. W. Sullivan, Ltd.

One of the new fires produced by this company is the "utility" design, illustrated in fig. 18. This, the "Adapta" fire, is equipped with a movable 750-W element which, by means of a small lever, can be turned from a vertically-sloping position into the horizontal position in which it is seen in the illustration. Thus the fire can be used for ordinary heating purposes or for boiling a kettle. The model is finished in black enamel with nickel-plated relief. Its height is 12½ in., width 11¼ in., and depth 6½ in. Another new Sullivan design is the "Adjusta" fire (fig. 19). This, it will be observed, is so mounted that it can be swung and fixed in any position. Two "Uniglow" elements, each of 1,000-W loading, are fitted, and the case is of cast-iron and sheet-steel finished in black enamel with aluminium reflectors and nickel-plated mounts. The dimensions are:—Height 20⅜ in., width 15 in., and depth 9½ in.

Metro-Vick Supplies, Ltd.

Included in the new designs put forward by this company is a new model of "Cosmos" bowl fire (fig. 20). This is similar to the original pattern in general arrangement; the reflector is of hammered copper, 12 in. in diameter. Fig. 21 shows a new cast-iron model of the "Cosmos" radiant fire which has been produced to meet the demand for a light fire for municipal hiring schemes. A new type of element (2-kW) is fitted; the backplate hinges down, and the elements can be replaced in a few minutes. The fire has an oxidised copper finish. A third design is the Jacobean "Cosmos" fire, illustrated in fig. 22. The heating element consists of two 1-kW bars, each composed of a cylinder of special refractory material on which the resistance wire is tightly wound. The whole element bar attains the same degree of red heat as the resistance wire.



Fig. 18.—The Sullivan "Adapta" Fire.

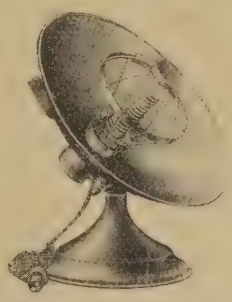


Fig. 20.—New "Cosmos" Bowl Fire.

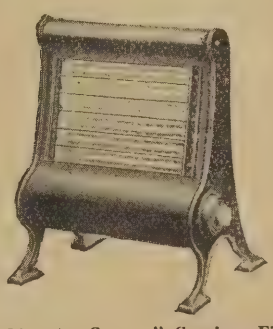


Fig. 21.—A "Cosmos" Cast-iron Fire.



ig. 19.—The Sullivan "Adjusta" Fire.

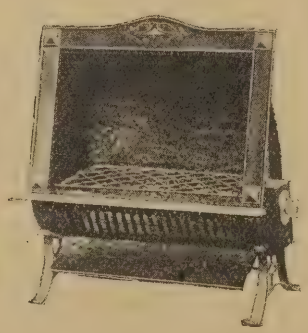


Fig. 22.—A Jacobean "Cosmos" Radiant Fire.

Each bar can be replaced quickly by unscrewing a wing nut at each end.

Siemens and English Electric Lamp Co., Ltd.

This company handles the "Xcel" domestic appliances made by the Automatic Telephone Manufacturing Co., Ltd. In a recently-issued booklet a number of new designs of "Xcel" fires are illustrated; we have selected two of them for mention. One (shown in fig. 24) is a "well"-type fire, in which the elements are mounted horizontally in a recessed base; a curved polished-copper reflector throws the heat forward, while there is also a certain amount of direct heat projected through openings in the base. There are four 600-W elements, and these are plugged into special sockets at the sides and are easily replaced. The fire has an art-black finish and measures 19½ in. by 21 in. by 10½ in.

The other (fig. 23) is a bowl-type heater—the "Fulray." It has a plug-in element similar to those used in the first-mentioned fire with a loading of 600 or 1,000 W. A carrying handle is provided, and the bowl can be tilted and fixed in a horizontal position. The base can be either black or bronzed.

Jackson Electric Stove Co., Ltd.

Among the new season's models made by this company is the "No. 589" design depicted in fig. 25. This is a development of the "Cheery" fire, and, like that model, has a polished back reflector, broken up into horizontal sections, with the element (1.5, 2, or 3 kW) arranged at the base. The depth is sufficient to permit a 2-pint kettle to be placed over the element on a swing-over trivet. A number of finishes are provided.



Fig 23.—The "Fulray" Bowl Heater.



Fig. 24.—An "Xcel" Well Fire.

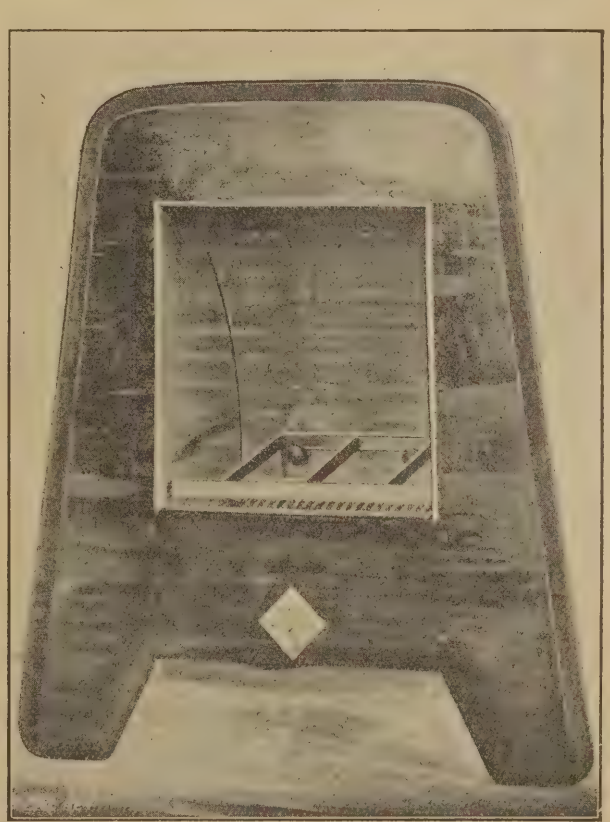


Fig. 25.—The Jackson "No. 589" Fire.

Berry's Electric, Ltd.

This company has put forward two new designs of "Magicoal" fires, of which Mr. Berry was the originator. One of these is a Queen Anne model. This fire has a 3-kW loading with a controlling switch. The dimensions are: Height 26 in., width 34 in., depth 20 in., and the body has a plated steel finish.

The company has also placed on the market the "Mulparvo" utility heater (fig. 26), which can be used either as a fire,

placed on end or horizontally, or as a small cooker. The element is loaded at from 600 to 1,000 W, and it is easily removed

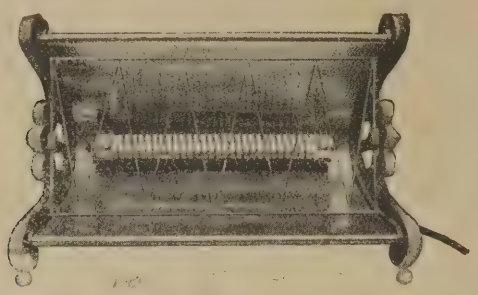


Fig. 26.—The "Mulparvo" Utility Heater.

for replacement. Oxidised copper and silver finishes are available.

(To be continued.)

Church-Bell Ringing by Electricity.

The Autosonneur.

The following is a brief description of an interesting method of ringing church bells by electricity, which has recently been patented by Mr. F. Wust and put on the market by the French firm of Messrs. Wyss & Cie., who are represented in this country by Mr. Paul Diény. The installation comprises a small electric motor, fig. 1, working in conjunction with a special device by means of which the rotary motive power of the motor is only imparted to the bell on its upward stroke. The motor drives the apparatus by means of a belt, provided with a jockey pulley, working on a flywheel loosely mounted so that it normally runs free on a main shaft. On one end of the latter is a sprocket on which works a length of pitch chain, the ends

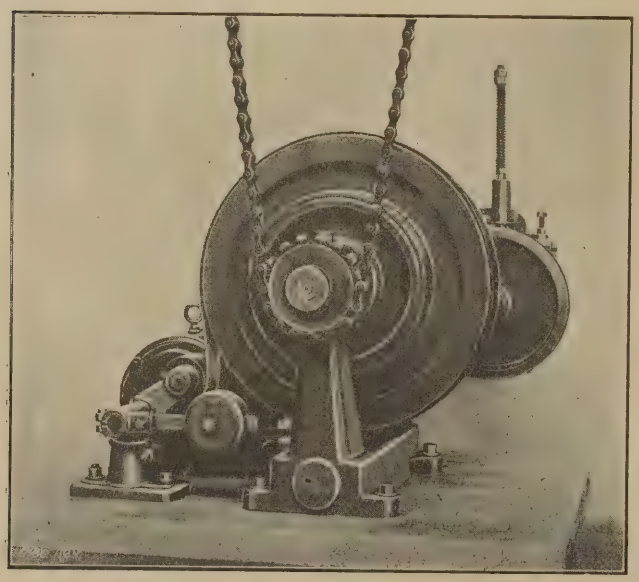


Fig. 1.—Bell Ringing Device.

of which are connected to a light steel band running in a grooved pulley secured to the bell arbour. At the opposite end of the shaft is a pinion and spur wheel, connected with an automatic gear, by means of which a clutch is automatically disengaged on the completion of the upward stroke of the bell. The female portion of the clutch is built up as part of the flywheel, while the male part is secured to the shaft on which the sprocket is mounted. On the completion of the upward stroke, the bell in its descent reverses the motion of the steel band and chain; this by the medium of suitable mechanism brings into action a brake band on a drum, connected with which is a system of levers by means of which the clutch is disengaged. As soon as the bell reaches its lowest position and has again to be lifted, the brake band is released, allowing the clutch to be once more engaged, and the power of the motor to be imparted to the sprocket. Thus while the flywheel runs continuously in the one direction the shaft carrying the sprocket reverses at each oscillation of the bell, disengaging the clutch on the downward stroke, and engaging it on the upward one. Cam adjustments are provided whereby the degree of bell oscillation can be varied as desired.

Another ingenious part of the apparatus is a pulley driven by a belt off the flywheel boss by means of which the clutch is automatically held in the disengaged position when the bell is not in use or when, if necessary, it is desired to ring it by hand. Connected with the pulley is a small drum to which is secured a leather strap and weight. To stop the bell ringing it is only necessary to switch off the current. The machine then continues to be driven by the bell—the clutch being still automatically engaged and disconnected—this giving rise to a braking action which quickly brings the bell to a stop. During its final oscillations there comes a period when the flywheel turns slightly in a reverse direction; this has the effect of raising the jockey pulley which frees the pulley, allowing the weight to fall, so disengaging the clutch and bringing into action a lever which retains it in that position. Conversely, the first action on starting the electric motor for bell ringing is to automatically raise the weight, so permitting the clutch to be engaged and disconnected by the automatic gear.

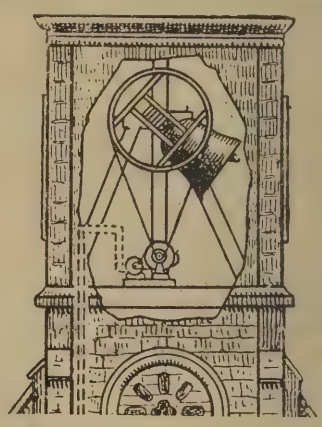


Fig. 2.—Installation in Belfry.

As usually arranged the motor and "Autosonneur"—the name by which the device is known—are located in the belfry (fig. 2), and the bell can be run at any time by the simple movement of a switch in any convenient part of the church, thus rendering bell-ringing independent of expert ringers. A separate motor and gear are necessary for each bell, but it is claimed that owing to the compactness of the gears, these can be readily installed and that the energy consumption is very small, the cost being only a few shillings per year per bell. Furthermore, being entirely automatic, it is claimed to require no more attention than occasional lubrication. Quite a number of churches in France have, we understand, already been fitted with the electric bell-ringing arrangement, among them being the Cathedrals at Troyes and Dole.

The Import Trade of China.

The following table shows the value of China's imports in 1924 of material of interest to the electrical and allied trades, indicating the principal countries of origin. The figures for 1923 are given in comparison, and notes of increases or decreases are added. It is probable that the trade credited to Hong-Kong was to a fair extent transacted with the United Kingdom.

Country whence imported.	1923. Taels.	1924. Taels.	Inc. or dec. Taels.
Brass and yellow metal; bars, sheets, wire, &c.—			
Total	1,351,000	1,699,000	+ 348,000
Hong-Kong	478,000	604,000	+ 126,000
Great Britain	122,000	102,000	− 20,000
Japan	658,000	752,000	+ 94,000
Belgium	6,000	16,000	+ 10,000
United States	3,000	8,000	+ 5,000
Germany	39,000	168,000	+ 129,000
France	19,000	27,000	+ 8,000
Copper bars, rods, sheets, plates, nails, and wire.—			
Total	851,000	963,000	+ 112,000
Hong-Kong	46,000	28,000	− 18,000
Great Britain	36,000	75,000	+ 39,000
Japan	722,000	719,000	− 3,000
Germany	37,000	128,000	+ 91,000
Belgium	8,000	8,000	—
United States	4,000	6,000	+ 2,000
Electrical materials and fittings.—			
Total	8,103,000	8,195,000	+ 92,000
Hong-Kong	610,000	647,000	+ 37,000
Great Britain	1,245,000	1,236,000	− 9,000
Italy	53,000	81,000	+ 28,000
Japan	2,495,000	2,171,000	− 324,000
Canada	50,000	7,000	− 43,000
United States	1,322,000	1,215,000	− 107,000
Sweden	34,000	13,000	− 21,000
Belgium	233,000	315,000	+ 82,000
Holland	219,000	367,000	+ 148,000
France	51,000	52,000	+ 1,000
Germany	2,064,000	2,171,000	+ 107,000

Country whence imported.	1923. Taels.	1924. Taels.	Inc. or dec. Taels.
Machine tools.—			
Total	463,000	638,000	+ 175,000
Great Britain	74,000	71,000	− 3,000
Denmark	2,000	7,000	+ 5,000
Japan	78,000	182,000	+ 104,000
United States	89,000	188,000	+ 99,000
Germany	219,000	158,000	− 61,000
Belgium	7,000	28,000	+ 21,000
Propelling machinery, such as boilers, turbines, &c.—			
Total	1,474,000	1,906,000	+ 432,000
Great Britain	720,000	993,000	+ 273,000
Japan	103,000	90,000	− 13,000
Canada	—	6,000	+ 6,000
United States	348,000	289,000	+ 59,000
Sweden	59,000	282,000	+ 223,000
Germany	229,000	143,000	− 86,000
Belgium	21,000	41,000	+ 20,000
Italy	3,000	49,000	+ 46,000
Machinery, other, not textile, brewing, refining, &c.—			
Total	12,909,000	12,783,000	− 126,000
Hong-Kong	999,000	529,000	− 470,000
Great Britain	3,343,000	3,120,000	− 223,000
Japan	1,560,000	1,898,000	+ 338,000
Canada	75,000	201,000	+ 126,000
United States	2,820,000	3,133,000	+ 313,000
Denmark	849,000	135,000	− 714,000
Germany	2,180,000	2,738,000	+ 558,000
Belgium	377,000	450,000	+ 73,000
France	146,000	104,000	− 42,000
Russia	10,000	16,000	+ 6,000
Sweden	125,000	169,000	+ 44,000
Netherlands	35,000	265,000	+ 230,000
Italy	223,000	206,000	− 17,000
Telegraph and telephone material.—			
Total	1,002,000	1,053,000	+ 51,000
Hong-Kong	89,000	39,000	− 50,000
Great Britain	287,000	323,000	+ 36,000
Japan	226,000	124,000	− 102,000
Canada	133,000	2,000	− 131,000
United States	64,000	77,000	+ 13,000
Sweden	78,000	252,000	+ 174,000
Germany	106,000	222,000	+ 116,000
Belgium	10,000	4,000	− 6,000
Scientific instruments and apparatus.—			
Total	1,024,000	1,210,000	+ 186,000
Hong-Kong	102,000	125,000	+ 23,000
Great Britain	130,000	101,000	− 29,000
Germany	269,000	323,000	+ 54,000
Belgium	4,000	10,000	+ 6,000
France	30,000	25,000	− 5,000
Japan	264,000	357,000	+ 93,000
United States	232,000	281,000	+ 49,000

The Haikwan tael = 3s. 7 15/16d. in 1924 and 3s. 5¾d. in 1923.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

The "Pelican Univernier."

A useful knob and dial substitute for the ordinary dial on the shaft of a condenser, variometer, or rheostat is marketed by Messrs. Pell, Cahill & Co., Ltd. It gives one very close control of such instruments, the mechanism being so designed that the speed of rotation of the knob is 12 times that of the shaft. The "Pelican Univernier" is made of moulded "Eboneum," and can be easily fitted to any existing condenser shaft without having to drill the panel; one hole only is needed for fixing.

A New Crystal Receiver.

The "Lowke Dane Tree" crystal receiving set which has been placed on the market by Messrs. Lowke & Sons, Ltd., is complete for reception on all wave-lengths of the British Broadcasting Co.'s band, including the high-power Daventry station, without the use of any plug-in coils. The set is enclosed in an oak cabinet, fitted with a hinged lid, the panel fittings being nickel plated. The detector is provided with a fine screw and push adjustment and it is set at an angle which is said to assist vision and manipulation.

The "Clearer Tone" Valve Holder.

An anti-microphonic valve holder has been placed on the market by Messrs. Benjamin Electric, Ltd. The component is made of bakelite, and is designed to minimise the transmission of outside noises and vibration to the valve filament, the valve being "floated" on springs which have one turn only, and themselves form the valve-pin sockets; thus each is a solid piece of metal from the tag to the valve leg with no soldered joints or wire connections. As shown in fig. 1, the holder is four-cornered, and terminals are provided at the



Fig. 1.—An Anti-microphonic Valve Holder.

corners, in addition to soldering tags for use in the case of a permanent fixture.

A Battery Switch.

A neat and effective little radio battery switch is marketed by Messrs. Benjamin Electric, Ltd. Fig. 2 will indicate its action; "it's off when it's in," and a sharp straight tug is

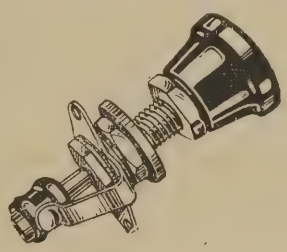


Fig. 2.—A Benjamin Push-pull Switch.

needed to establish contact, hence accidental switching is avoided. The simple single contact makes the device reliable, and it is easy to fix, one hole only being required, and there is but one locknut to adjust.

"Reco" Batteries.

Two interesting types of battery are being placed on the market by the Radio Equipment Co., Ltd., for use with broadcast wireless apparatus; they are also suitable for other purposes, of course. The high-pressure battery is unusual in that it is re-chargeable; as shown in fig. 3, plug sockets clearly

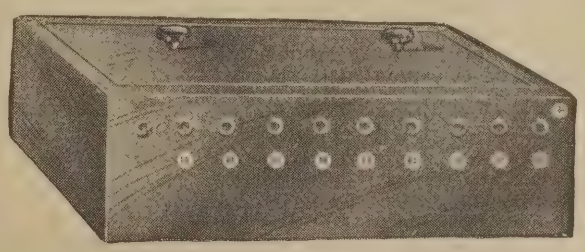


Fig. 3.—"Reco" Re-chargeable High-pressure Battery.

marked in voltage steps are arranged along one side of the box and the dimensions of a 60-volt battery are 5¾ by 9¼ by 3 in. and its weight is 6 lb. It is claimed that they are unusually noiseless and that they do not deteriorate when not in use. Bat-

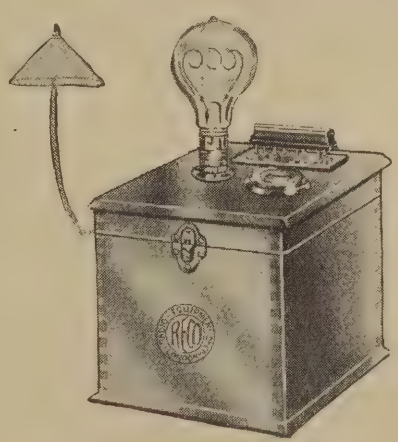


Fig. 4.—"Reco" Low-pressure Battery.

teries to give various voltages up to 115 V are made up of the requisite number of celluloid cells, each of 1.5 volts, of the Leclanché type; they are sent out in a charged state, the cells being filled with a jelly which dissolves when the cells are filled with pure water, forming a non-acid electrolyte. Such a battery may be re-charged by connecting it direct to the d.c.

domestic lighting circuit through a switch and suitable lamp. The low-pressure batteries, from 2½ to 6 volts, are suitable for dull-emitter valves (total consumption not to exceed 1 amp.) being composed of a smaller number of larger cells similar to those described above. They are enclosed in neat wooden boxes and may be connected to a d.c. lighting circuit of from 100 to 250 volts through the lamp as shown in fig. 4; another type is obtainable for connection to a d.c. supply which is not absolutely pure, it being claimed to reduce disturbances of this nature. The voltmeter and plug switch indicated in fig. 4 enable the voltage of each half of the battery to be ascertained, for if one half the number of cells only is used at a time the other half will recuperate, which is a characteristic of cells of the Leclanché pattern. These batteries operate continuously while they are connected to a source of supply, but should the charging supply fail, we understand the battery will continue to function for several hours.

Traders' Demonstration Outfit.

The Marconiphone Co., Ltd., has drawn our attention a new departure in the form of an outfit which is primari intended for the use of wireless dealers who wish to demo strate. The equipment consists of a full-size "super" Rour loud-speaker, a "super" amplifier with eight valves, fi 60-volt h.p. accumulators, and two 6-volt l.p. accumulator The outfit can be operated from any good 2-valve h.f. ar detector set, or a special 2-valve set without feedback ca be supplied for this purpose. The apparatus is similar to th used for the company's "public address" system and has bee designed in response to requests for a set of equipment sui able for general demonstrations, concerts, &c. It is probab not generally known that a suitable Marconiphone installatic to operate Round loud-speakers has hitherto cost somethir like £800; the new outfit will, however, be retailed at £140.

The Institution of Public Lighting Engineers.

Annual Conference at Leeds.

(Concluded from page 550.)

Electric Street Lighting in Rural Areas.

By Edward C. Lennox.

(*Abstract.*)

The lighting of rural areas with long straggling roads presents a rather different proposition from that of lighting city streets. The high standard of illumination aimed at in the busy thoroughfares of towns is not essential. Nevertheless, the lighting must be such as to fill certain conditions. Economic conditions are different. The town, with its high rateable value and comparatively shorter lengths of roadway to be lighted, and the rural area, with its very low rateable value and long lengths of roadway to be lighted, present two entirely different problems.

When comparing illumination values in candle-power of lamps of the vacuum type with similar-sized lamps of the gas-filled type, it should be borne in mind that, where stated in "candle-power in the maximum direction," the figures given refer to mean horizontal candle-power in the case of the former, whereas the measurement in the downward direction is given for the gasfilled lamp. The method of expressing the efficiency of lamps in spherical candle-power has obviated the possibility of error in comparing efficiencies; but the only satisfactory method of comparison is to state efficiency in terms of lumens per watt. This figure is obtained by dividing the total lumens obtained from the lamp, by the watts input.

One of the essential points to be considered in laying-out an electrical street lighting installation is the question of pressure variation. The voltage from the supply station is, of course, liable to some slight variation due to the varying loads; but these variations are usually kept strictly within prescribed limits. It often happens, however, that, with the idea of obtaining more value for money (by extending the working life of the lamp), lamps are fitted to a circuit with a pressure of (say) 10 per cent. below that for which they were made.



Fig. 1. Arrangement of Conductors at 250 Volts, showing Guards.

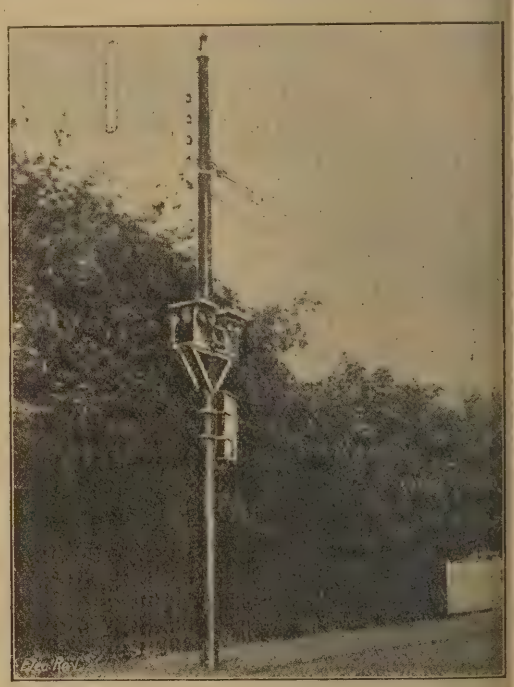


Fig. 2.—Switch Pole with Transformers; 100-Volt System.

When one is buying light, as is undoubtedly the case with street lighting authorities, it should be considered which is the most economical problem:—Running the lamp at a lower pressure than that for which it was designed, and so getting a longer life, but less efficiency, or running the lamp at a higher pressure, and so getting better efficiency, but shortening its life.

Take a 200-V, 100-W lamp costing 5s., supplied with energy at 3d. per kWh, normal life 1,000 hr., and average lumens 1,100. The cost of energy for the lamp giving 1,100 lumens for 1,000 hours is £1 5s., and the cost of the lamp is 5s., totalling £1 10s. With the lamp operated at 10 per cent. below the rated voltage, and its life extended to 1,500 hr., the light output would be reduced by 33 per cent., and the lumens output therefore would be 737 lumens. The consumption would be reduced by 15.5 per cent.; therefore, the watts consumed by the lamp would be 84.5. The cost of energy for the lamp would be 31s. 3d., and the cost of the lamp is 5s. Therefore, the total cost to obtain 737 lumens for 1,500 hr. would be 36s. 3d. At this rate the total cost of the lamp giving 1,100 lumens for 1,000 hours would be 36s. 1d.—an increase of 6s. 1d. over the cost of running at normal pressure. With the lamp operated at 10 per cent. above the rated voltage, and the life reduced to 667 hours, the light output would be increased by 40 per cent. The lumens output would be therefore 1,540 lumens. T consumption increase would be 17.5 per cent. Therefore, t watts consumed by lamp would be 117.5; cost of energy for t lamp giving 1,540 lumens for 667 hours would be therefo 19s. 6d., and the cost of the lamp is 5s. Therefore, the tot cost to obtain 1,540 lumens for 667 hours would be 24s. 6d. this rate, the total cost of the lamp giving 1,100 lumens f 1,000 hours would be 27s. 11d.—a decrease of 2s. 1d. on t cost of running at normal pressure.

These results should show the futility of under-runnir lamps, and it cannot be too strongly emphasised that all lam should be run at their rated pressure; especially is this so the larger and more efficient types of lamps, where the lo becomes ever greater.

The control of street lighting in a town or city has alwa been a vexed problem. The use of lamplighters invariab results in lighting up some time before dusk, in order th the last lamp shall be lighted in time, or in certain lamps n being lighted in time. This drawback in areas where t lamps are more or less congested is emphasised in rur areas where the lighting covers long distances in all direction and where it would generally be necessary for the lamplight to traverse long roads twice before the whole installation w lighted. It is impossible in these days to conceive that i dividual switching can be justified on maintenance costs alon Time switches are therefore universally resorted to, whi switch on and off automatically the whole of the lamps predetermined times.

The choice of fittings suitable for street lighting by electr city is so wide that it is only necessary to lay down certai principles which should be borne in mind. They must be robust design and weatherproof, well ventilated and fitted wit an easily adjusted focusing device; they must also be arranged that the light rays are directed so as to obtain th best distribution of light.

The fittings should be fixed as high as possible to give th

best results. Where large units of 300 W (4,300 lumens) are used, and mounted (say) 25 to 30 ft. high, with spacing of 300 to 400 ft., with directional type reflection, the resulting illumination would be even and leave little to be desired. It is not possible, however, owing to the question of cost, for such large units as these to be installed in the type of district under consideration.

Where expenses allow, an improved fitting can be used comprising a white enamelled reflector and a small prismatic refractor.

These fittings should be equipped with an anti-vibratory device, of which there are several on the market. The most efficient type of those adopted by the author consists of two concentric rings connected to one another by strips of phosphor-bronze gauze, which is very springy and which damps any vibrations that occur on the outer ring before they can reach the other.

Street lighting networks such as are required in rural areas can be carried out by several methods—by underground cable; by using the existing pole line carrying the supply company's overhead distribution networks, supplying at 250 V as the normal pressure for lighting purposes, to carry a switch wire, and using the supply company's neutral wire as a return; by utilising the supply company's existing pole lines to carry a separate street lighting network, consisting of line wires and return, operating at a similar pressure as the network; by running out new overhead networks at the supply company's pressure; by reducing the supply company's pressure to (say) 110 volts, and running out networks at this pressure; and by adopting the "series" system, widely used in America.

In considering the various systems, one must first compare the capital costs entailed. This is difficult to give with any degree of accuracy, as the costs are governed to a great extent by local conditions. The author has, however, for comparative purposes, prepared the costs for a complete lighting installation over a certain mile of roadway, but has been unable to obtain with accuracy figures showing the average cost of the "series" system. On an underground system (made ground) the average cost per yard of the network, including switches, &c., is estimated at 10s. 7d., and the average cost per lamp (40 yd. spacing) at £32; on a pole line with switch wire, using the network neutral as the return, the network (per yd.) and the lamp costs are 2s. 5d. and £8 2s. respectively; on a separate pole system, the network and lamp costs (including the cost of the poles) are 6s. 4d. and £15 10s. respectively; and on the 100-V system (including the cost of the poles) the respective costs are 3s. 4d. and £10.

The use of underground cable for street lighting schemes, while very desirable from many points of view, is almost out of the question for rural districts, owing to its prohibitive cost. Where it is unavoidable, the cable used is paper-insulated and lead covered, wrapped with hemp, and jute served. The cable should be looped into the foot of each lighting pillar, a special dividing box being available for this purpose, having glands for entry for two cables. This greatly facilitates testing for faults.

For reasons of economy, however, it is generally found impossible to put forward to rural district authorities an underground scheme for carrying out street lighting. There are many towns and villages, and thousands of consumers of electricity to-day, who would still be without supply if overhead work had been prevented. Where wood poles are used, these should be of Norwegian, Russian, or Swedish red fir cut in the winter season and retaining the natural butt of the tree. They should be creosoted to the Post Office Specification with 10 lb. of creosote per cu. ft. Steel poles, when necessary to take the greater stresses, should be tubular, and stepped in three pieces, to obtain relative strengths for the stresses imposed on different parts of the pole. Where an overhead network already exists for private distribution, the poles can be used to carry a switch wire, and the existing neutral can be used as a return. This is not always favoured by the supply company, as it interferes with their B.O.T. earth tests on the neutral, and is not desirable from the street lighting point of view, as the pressure drop along the neutral of the company's network, which may vary considerably during the lighting hours, would also affect the pressure at different points on the street lighting circuit.

New street lighting networks, comprising feed and return wires, when run out on existing private distribution networks, are erected on the sides of the poles opposite to the existing wires, and arranged so that like phases or neutrals are opposite to one another.

Where new construction of poles, &c., is necessary allowance should be made to cater for the erection of additional wires for further development of the street lighting network or private distribution network.

The reduction of the normal supply pressure of (say) 250 V to a pressure of (say) 110 V for street lighting purposes deserves every consideration. The advantages gained by reducing the pressure are:—Increased efficiency of the lamps, increased distribution value of light, lower costs of running out networks, and the use of stronger lamps.

In laying out a scheme of this type, which would be in an area already supplied at low pressure, the source of supply to the street lighting network should be fixed as near the centre of the area as possible, or the area, if large, should be split into sections, with a source of supply at the centre of each section. At this point are fixed the main switch and fuses controlling the whole installation, the time switch for automatically switching on and off the supply to the installation, and the transformer or transformers to reduce the pressure to 110 volts. The secondary side of the transformer is connected directly to the street lighting wires, which would radiate in all directions necessary, so as to reduce as far as possible pressure drops in the outlying parts of the sections.

The transformers used in these schemes are oil insulated, and housed in outdoor type cast-iron or sheet-metal tanks—the latter being lighter, and therefore preferable. The accompanying illustration, fig. 2, shows the arrangement of box and transformers on the pole.

Care must be taken to earth efficiently all ironwork, including the core and tank of the transformer.

Discussion.

Opening the discussion, Mr. W. Bell, M.B.E. (Camberwell), raised a question with regard to the table of costs set out in the paper, and said he found in London that gas was a more economical proposition for public lighting than was electricity.

Mr. H. E. Fryer said that if rural roads, such as the Great North Road, or the big arterial roads in the South and Midlands, could be lighted so efficiently that the ordinary considerate motorist need use only headlamps which were not too powerful and a nuisance to other road-users, the lighting profession would be doing a very great public service. In town streets few motorists used their big and powerful headlights, but in the dense darkness of the country they all had to use them. The present method of lighting, though excellent in its way, did not really meet the requirements of illuminating a road to an extent which made dazzling headlights unnecessary. The most comfortable conditions under which he had driven through town streets had been in shopping areas, where most of the light, without undue shadows, had come from the shop windows, entertainment houses, &c. It seemed to him that with that lighting the road got equal illumination, and it came from a direction which was at right angles to the line of travel; by putting a relatively high light on one side of the object on the highway and putting the other side of the object in shadow, it brought that object very clearly to the notice of the driver. If they were to have horizontal illumination rather than vertical on the roads under certain circumstances, objects, whether dark like the policeman's uniform mentioned by the president the previous day, or light like the policeman's white coat, would be more visible alike on dry highways or wet. If more lamps, at less distances, were placed on the great highways, it would be an advantage.

The President said that if they were to have electric lighting by overhead mains on the great roads of the country, it would probably be very much on the lines suggested by Mr. Lennox rather than on the lines which one saw at present. Mr. Lennox seemed to have hit on a very neat means of carrying overhead electric lighting conductors.

Mr. J. Christie, M.I.E.E., electrical engineer and manager, Brighton, said this question of overhead transmission in rural areas was a point which most engineers were having to consider very seriously. Overhead lines seemed to be the only effective method of dealing with the problem. Mr. Lennox's suggestions would be very useful. In his own district they had reconditioned their electric lighting. They were using 50-volt lamps in series, and had 1,500-watt lamps in certain areas, and found that the very robust filament required for carrying the current gave a most magnificent light.

Mr. R. B. Mitchell, president of the Incorporated Municipal Electrical Association, congratulated the author of the paper on his contribution, and on the very neat arrangement of overhead wires which he had shown to the meeting. It was an example worthy of being followed all over the country. It seemed to him that the lighting of rural areas would only become possible by co-operation between the supply undertakings and the rural councils. He thought in the future it would become possible, because of the rapid extension of electricity supply even in rural areas now. The poles could quite well be run along roads and used for carrying supply wires as well as wires and lamps for lighting the roads. With regard to the advisibility of using lamps in series, he thought lamp makers were now becoming very efficient in producing high-voltage lamps of almost equal efficiency and life. He thought there would be very little to choose between them. In the matter of electric lighting in rural areas, there should be some relaxation of the very rigid Board of Trade regulations, which were framed to prevent accidents, but which in effect were probably more rigid than was necessary and were a great handicap to the development of rural electric lighting. He thought there was a happy medium which would reduce the cost of overhead lines very materially.

Mr. A. C. Cramb, M.I.E.E., borough electrical engineer, Croydon, said the paper was a very valuable one and illustrated an excellent system of lighting. A point he would like to raise was whether the lamps on Mr. Lennox's system were at a reasonable height, seeing they had to be some distance apart; whether by altering the height they might get something better in the way of directional lighting. There was room for considerable improvement in this direction, and the Institution might debate the possibilities of some fitting which would direct the rays up and down the road. The condition and organisation of this country's roads had become an appalling scandal, and the Government had had to set up the Ministry of Transport, which had earned a great deal of gratitude for what it had done so far in road improvement. It was highly

important that roads should be properly illuminated. The illumination of the streets and roads of this country, taken as a whole, was appalling. Even in London there was no system or continuity. There were certain bright spots where there was a brilliant display of lighting, but there were others which were very much the opposite. What was required was some co-ordinating effort, just as was being done with regard to road construction. That Institution could do a very fine work if it could put forward to the Ministry of Transport suggestions with regard to the systematic lighting of the roads of the country.

Mr. W. J. Liberty, lighting superintendent, City of London, and hon. secretary of the Institution, said he entirely sympathised with the suggestion that there was great need for co-ordination of lighting systems in the London area. One of the reasons why there was this multiplication of forms of lighting in London was that around the City Corporation itself there were now some thirty metropolitan boroughs, each with its own ideas of lighting. Some had got installations of electricity. Others had deeply-rooted ideas in favour of gas. The result was that the motorist moved from intense brightness to great darkness. This was more common in the metropolis than anywhere else, because other districts had only one responsible local authority. He had known travellers run into something because they were blinded by the relative darkness of lesser lighting after a period of great brilliancy, though to anybody who had not passed out of that brilliancy the darkness was not by any means so serious.

Mr. Leon Gaster, of the Illuminating Engineering Society and the National Safety-First Council, said that good road lighting had become a subject demanding very special study from a national safety point of view. He did not think there would be so serious a difficulty in getting proper light control if a good case could be presented for such control. He saw no reason why some portion of the revenue from motor taxation should not be allocated to road lighting. Last year there were 80,000 road accidents, and statistics of that kind should be utilised to strengthen the case for proper road lighting.

Mr. Fowler (Dundee) said that in Dundee they had a main road three miles long and 160 ft. wide, which they had been called upon to light in sections. It was a road to relieve central city traffic. They had fitted up 300-watt lamps 25 ft. high, with a spacing of only 40 yards. In his opinion that was sufficient to light that very broad highway, for traffic both inward and outward.

Mr. Lennox, in reply to the discussion, said that if this question of road lighting were taken up as a national affair and put into the hands of rural surveyors themselves for control, they would no doubt look at the lighting question much more sympathetically. It was simply because lighting was left in the hands of local parishes that the rural surveyor was at present not very sympathetic and looked upon lighting poles as a curse. The costs which he had given in the paper included the cost of the lamps. The saving he got, of 2s. 1d., was more than would be the actual cost of replacing the lamp. Fittings should be cleaned at least once a month and preferably perhaps once a fortnight, and the man who cleaned saw the lamps which were out, and replaced them where necessary. Headlights on motor-cars would remain a necessity for many years yet, even with lighting of the roads such as he had described. He did not think they could seriously contemplate series lighting for rural areas because of the cost and the question of going to the Government. It was a great handicap to electrical development in rural areas to have to have the Board of Trade regulations so rigidly round their necks. They could hardly move for those regulations. If the Electricity Commissioners were to look on the matter in a broader attitude he thought it would be for the benefit of the whole community. He entirely agreed that all possible statistics should be secured, to be put before any authority concerned in the question of public safety. With regard to the need for co-ordination, which he agreed was very important, he thought it might be well for that Institution to frame a resolution with a view to a petition being sent to the Ministry of Transport, urging that authority to consider this question of road lighting.

Public Lighting by Gas.

A paper on this subject, prepared by the Distribution Department of the South Metropolitan Gas Company, was read by Dr. J. S. Thomas; it pointed out that the present inadequate lighting of the streets was due to the inadequate expenditure on this service, and criticised adversely the adoption of luminous flux as the fundamental quantity in the discussion of lighting problems, preferring the specification of candle-power and its distribution. The chaotic state of the subject in respect of the diversity of lighting appliances and lighting specifications was deplored, and commendation was expressed for the valuable work done by Mr. A. P. Trotter. The lighting of 95 per cent. of the streets was classed as "inferior beacon lighting," and it was claimed that gas was much cheaper than electric lighting.

In the discussion Mr. L. Gaster said that accidents by night were far in excess of those by day, due to insufficient lighting. Mr. A. C. Cramb referred to the importance of giving the best possible illumination at the minimum cost. Mr. S. B. Langlands said that the Institution should tackle the whole problem in conjunction with the Ministry of Transport. Mr. T. Newton urged the need for a standard table of illumination. Mr. J. Stewart agreed with Dr. Thomas regarding the mode of specification, and drew attention to the new specification of the B.E.S.A. for a portable photometer. Other speakers took part in the discussion, and Dr. Thomas, in reply, said the public had not yet been educated to realise the need for better street lighting; it was not a case of gas *versus* electricity, but of getting the necessary money—good light could then be provided.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Broadcasting Power.

The *Daily Express* has seen fit to give prominence to an article by Prof. A. M. Low on a subject of vital commercial importance, namely, the transmission of power, and claims to speak in the name of science in favour of a system of broadcasting power.

Whilst admitting the need for educating the public mind to the urgent necessity and commercial importance of scientific research, it cannot be too strongly stated that the extravagant prophecies of Prof. Low are liable to mislead those who have no special knowledge of the subject and to raise expectations impossible of fulfilment, which are bound to bring science into disrepute.

The bankruptcy of science is now almost a catch phrase, which is indeed deserved if such vapourings in the Press are allowed to go unchallenged. The gentle sarcasm of Senatore Marconi as to the remotenesss of its solution is not sufficient.

I claim as a member of the community to raise my voice against it, although it is difficult to deal with the matter seriously.

It is not as if there were no data on which Prof. Low could form an opinion; we have at the present time high-powered stations broadcasting energy, but not a thousand-millionth part of that energy is usefully employed.

If he proposes to limit himself to beam transmission, experience again tells us that for any useful distance the improvement is very slight.

The experiment which caused this brain wave is a very old one, often done to amuse the young student—the melting of a tenpenny nail without wire attachments, by induced currents. This is a very well-known high-frequency experiment, and is accomplished by the very opposite method to that which Prof. Low proposes, namely, by concentration.

H. P. Amphlett, F.P.S.L.

London, *September 25th*, 1925.

The Æsthetic Aspect of Advertisements.

In view of your Advertisement Competition, the following parable on the æsthetic aspect of advertisements may be of interest to readers of the Review.

There is a street in Progress Town called Advertising Street, and it is through this thoroughfare that all who wish to buy must pass. Some hurry through without stopping—these are wise. Others observe with wise and serious faces and collect and collate and revise and compare and consult statisticians and publicity experts, and do all manner of such things—these are not wise. Some few, who have no intention of buying, loiter along with much amusement.

This street is exceeding noisy, for every advertiser there is shouting at the top of his voice day and night. So loud are their voices that, though everyone protests at the clearness of his neighbour's cries, the buyers cannot distinguish what one of them is saying. Some shout the same thing day after day, year after year, until the antiquity of their dress and accent draws upon them the ridicule of their fellows. Others change their fashions with such bewildering rapidity that the buyers are puzzled afresh every day in making out who they are. Others, again, have a set rotation of fashion to which they adhere, and which earns for them the nickname of "farmer" from their enemies. And there are always at least six who have been standing on tip-toe and all waving the same article and shouting: "Mine is the best," with such diligence that they have entirely forgotten why it is the best, nor could they remember if they tried. And altogether there is such a noise and a bustle and a waving and a confusion that it is not uncommon for the poor buyer to find he has ordered four times what he thought of getting and ten times what he wants of an article he does not know how to use.

But besides these general noises, there are some particular strange antics to which I especially desire to draw attention.

There was once an advertiser here, named Irrelevance, who, having hanged himself by the heels from the doorway of his place of business, said: "Surely the admirers of my gold watch will enter this door." But of all who passed by and pitied him, not one so much as noticed that he had a gold watch. He was much distressed at this, and grew thinner every day until, when I last heard of him, he had shrunk to the thickness of a bankruptcy petition. A little while after another and stronger advertiser thrust him aside and, widening the doorway, took up his abode there.

There is also another advertiser who, having thrown mud over himself with a spade, put on a clean shirt and collar and, disdaining lavender water, pushed his way among the buyers with much assurance.

There are others of a weird, and some of a horrible, sort. One of the former, who is well known there, though not very prosperous, goes about shouting: "Although there are 14 hippopotami in England, not one has trodden on my toes, which are free from corns." The buyers laugh at him, but some few, wanting foot-salve, buy a box of his. One of the latter sort of advertisers, who is yet better known and very prosperous and confident, sets his clerks to dig up the graves of illustrious men, such as Confucius, Drake, and Shakespeare. He then hangs their bones upon his kettles, his pots, and his pans. By this means he is enabled to make a great noise and hopes to charm the skies to drop gold upon him.

Advertising Street was first built by a professor, who said: "Tell people that there is a sky, and they will want to buy your blue saucepans." And although he taught his workmen this song, and although they chanted it while they built Advertising Street, he never could say why the sky should tell you about saucepans. Perhaps it is because the description which a grocer friend of mine read in a book by a man named Conrad, which is a description of the kings of the West and of the East, reminded him that his stock of yellow and red cheese was low. Though why sunsets should remind grocers of cheese is known neither to me, nor to you, nor to any other creature.

R. Twigg.

Great Malvern, *September 26th*, 1925.

Radio Aerials and Lightning Discharges.

A few instances have been reported during the past summer of wireless apparatus being destroyed by lightning, but considering the number of aerials now in use the damage has been unexpectedly small. The extent to which aerials are affected by lightning discharge and the results likely to arise therefrom are questions of practical importance to all users of wireless apparatus, and an attempt is being made to collect information relative to actual cases in which aerials and apparatus have suffered in this way. I shall be glad if I may use the publicity of your columns to ask anyone, and everyone, whose apparatus has been damaged to forward full information to me at the address given below. The data particularly required are:—

(*a*) The date and time of the occurrence.
(*b*) The position and approximate dimensions of the aerial.
(*c*) The nature and position of the earth connection.
(*d*) A brief description of surroundings, *i.e.*, position of adjacent houses, trees, telephone wires, &c.
(*e*) Whether the aerial was directly earthed or whether either receiving or transmitting apparatus was in circuit.
(*f*) The fullest possible description of the incident and the nature of the damage done.

C. L. Fortescue.

City and Guilds (Engineering) College,
Exhibition Road, London, S.W.7.
September 26th, 1925.

The Cost of Living in Bombay.

I wonder if one of your readers who has had recent experience in Bombay would be good enough to publish the usual particulars requested by those contemplating work in that city.

Also, what would be the equivalent in Bombay of a salary of £300 per annum in this country?

Sales Engineer.

September 29th, 1925.

Rural Electricity Supply.

It is unfortunate that Mr. Fennell is so prone to make overstatements. In his letter published in your issue of September 25th he writes:—"The Post Office can, and do, put their lines underground when they wish; for instance, in cities and when leading into exchanges. Their talk of speech efficiency limits is a device to save themselves trouble—regardless of the enormous expense their refusal imposes on other utility undertakers, and therefore upon users of electricity."

The statement made in the latter part of this quotation is inaccurate. When projected high- and extra-high-pressure overhead lines will cross Post Office overhead lines, first consideration is given by the Post Office as to whether its lines can be placed underground without undue degradation of circuit efficiency, and in the great majority of cases it is the Post Office lines which are diverted to underground. Taking the country as a whole, I should say that at appreciably more than 75 per cent. of the crossings this is the method adopted, as the best way of meeting the difficulty. To say, therefore, that "their talk of efficiency limits is a device to save themselves trouble" is not only a reflection on the good faith of the engineers dealing with the matters, but is a very grave misstatement of the actual position. Moreover, Mr. Fennell has no excuse for making such a charge, as in a recent case in which his company notified the erection of an overhead power line with proposed crossings of Post Office routes at 29 points, the Post Office has offered to go underground at 22 of them!

Mr. Fennell may regard such loose accusations as a necessary part of his declared policy of "making ourselves a nuisance to the Post Office officials," but surely it cannot but be a disservice to his legitimate cause of pushing rural electrification?

S. C. Bartholomew.

Office of Engineer-in-Chief, G.P.O., London.
October 2nd, 1925.

The Roman Baths at Bath.

With all due deference to Messrs. Henley's regard for the principle of "Truth in Advertising," which regard we fully share, we cannot admit that any misleading impression could be caused by our advertisement in your issue of August 7th (supplement page 11). Not the slightest reference was made in our advertisement to the electrical installation at the Baths, but only to the Roman plumbing there. It might as well be argued that we should not quote in a wiring advertisement some remarks on electrical matters by, let us say, Mr. Baldwin, without previously assuring ourselves that his house had been wired on our system.

We admit, however, that our idea might have been used with even more point by Messrs. Henley's—if it had occurred to them first.

Johnson & Phillips, Ltd.
Charles Stewart, *Director.*

London, *October 2nd*, 1925.

The Manufacture of Induction Motors.

I am much obliged to Mr. Parkinson for his reply in this week's Electrical Review to my letter of the 14th ultimo, and desire to thank him for his kind invitation to investigate personally the claim put forward, but I regret to say I feel that no particular purpose would be served by doing so, as in all probability any information furnished would be in confidence and my objection to this would be that the advertisement referred to endeavoured to belittle the whole British electric motor trade and received a large amount of publicity, and therefore Mr. Parkinson should produce evidence, if he can, to substantiate his claim, and this evidence should have the same degree of publicity as his original claim.

I quite realise that if Mr. Parkinson has received internal information with regard to the turnover of various British manufacturers without their knowledge and consent, it is of a confidential nature and no doubt the persons who have obtained this information have every desire to remain anonymous. Nevertheless, I quite fail to see why this desire for secrecy on the part of Mr. Parkinson should prevent his replying to my questions Nos. 2 and 4.

With reference to Messrs. Parkinson's advertisement appearing in this week's Electrical Review, I must congratulate them on their turnover for July, and would be very interested to hear the total for June and August, and why, if as they mention "every month our output increases," the August total is not also shown.

Question 3 in my letter: "On what period of time is their estimate based," is replied to in their advertisement this week in the Electrical Review, and by a strange coincidence we also had an excellent order book for that month; our total a.c. industrial power motors amounted to 756, as well as a large number of d.c. dynamos and motors, which machines Messrs. Parkinson do not manufacture. If desired the Editor of the Electrical Review, or any other impartial person, can verify this figure.

By a simple calculation it would therefore appear that if Messrs. Parkinson and Crypto advertised jointly, we could claim instead of 1 in 4, 1 in 2½ or 40 per cent. of the total trade of the country in these motors, and we would not add, as they do at drapery sales, "for four weeks only."

The Crypto Electrical Co., Ltd.
J. G. Shaw, *Managing Director.*

London, *October 3rd*, 1925.

Is the Contracting Business Degenerating?

Judging by the weekly reports in your "Contracts Closed" columns, I should say the answer to the above question is in the "Positive." In this week's issue the following are noted: Installations in 380 houses for £2,772 (a little under £6 per house), the highest tender being £6,174. Corporation Depôt accepted at £184, the highest tender being £257. Town Hall accepted at £103, the highest tender in this case being £197. In the foregoing cases I am not *directly* interested, but as an electrical contractor who turns out high-class work at consistently low rates, it is with feelings of disgust that I read the above figures. It is fairly obvious that there is something wrong, and it is little wonder that your budget of bankrupts gets larger weekly. My principle is that it is better to do nothing than to work for nothing and make a present of £20 to your cheesparing client. Recently I was asked to tender for a school installation in an outlying district. My quotation was £89, but a firm of plumbers cut me out by £19. This meant that they intended to carry out the contract £9 below cost. For comparison purposes I afterwards made up an estimate based on all kinds of Continental and other rubbish, and even then my price worked out at £81. How is it done?

Polyphase.

October 3rd, 1925.

Legal.

The Assessment of an Electric Sign.

In the Glasgow Valuation Appeal Court on September 29th, the Scintillating Advertising Company (Scotland), Ltd., Glasgow, appealed against an assessment of £400 and suggested £49 as the proper figure. For the company it was explained that the subject involved was an electrical device erected on the roof of a building. All that was outside the building was a hoarding, fitted to which was a large number of electric lamps which were illuminated to produce various messages. The mechanism operating the sign consisted of a dynamo, transforming plant, and 4,000 movable types. The firm operating the sign paid a rent of £100 for the use of the room.

Mr. Alexander Walker, City Assessor, said that the sign appeared on the supplementary valuation roll for last year at £75. The rent of the room itself did not enter into the case. It was only the erection, including machinery, which was being valued. It was his contention that the erection was held by the appellants from the London firm on a four years' lease, which might be extended until the expiry of the patent. Replying to a question, the agent for the appellants stated that the patent had ten years to run.

The Court fixed the assessment at £60, and the Assessor intimated that he would lodge an appeal.

Warehouse-Breaking.

T. Watson, J. Grieveson, W. C. Sefton, and J. W. Sulsby, of Framwellgate, Durham, were remanded at Durham on September 30th on a charge of warehouse breaking and of malicious damage to electrical fittings at the Durham main electrical power station, the property of the Newcastle-on-Tyne Electric Supply Co., Ltd. Watson said that he, Sefton, and Sulsby found a quantity of brass and copper on the floor, which they put in a sack; they then knocked off with a hammer the fittings of the engine, which they put into two sacks. Grieveson admitted helping to dismantle the engine. It was stated that two 6,000-V switches had been completely broken, and all the copper and brass had been removed. The total damage was estimated at £300.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

6,666. "Automatic electric motor starters." A. Roberts and Mather and Platt, Ltd. March 15th, 1924. (239,555.)

8,762. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. A. Pollock. April 7th, 1924. (239,560.)

9,124. "Variometer and vario-coupler." J. C. N. Eastick. April 10th, 1924. (239,561.)

9,175. "Synchronous telegraphy." J. V. Foll. April 10th, 1924. (239,562.)

9,254. "Systems of electrical distribution." British Thomson-Houston Co., Ltd. May 11th, 1923. (215,729.)

11,222. "Speed-regulating devices." Siemens-Schuckertwerke Ges. May 9th, 1923. (215,757.)

11,406. "Alternating current electric machinery." F. Creedy. May 8th, 1924. (Cognate application 15,770/25. A divided application on 27,911/24.) (239,571.)

11,834. "Transformer for mercury-vapour lamps." H. Busse. May 24th 1923. (216,508.)

13,283. "Electrical rheostats and similar regulators, applicable also to fuse-holders and the like." Berkeley & Young, Ltd., N. W. Gilbert and H. C. E. Jacoby. May 30th, 1924. (239,575.)

13,767. "Methods of balancing cable circuits." Western Electric Co., Ltd., W. E. Mougey and J. Collard. June 5th, 1924. (239,577.)

13,827. "Intercommunication telephone systems." V. Hutchinson. June 6th, 1924. (239,581.)

13,965. "Inductance coils." J. P. Jayne. June 10th, 1924. (239,586.)

14,101. "Thermionic vacuum tubes or valves." C. Seymour and J. L. Miller. June 10th, 1924. (239,594.)

14,221. "Generation of waves by thermionic valves for wireless telegraphy and telephony." C. Seymour and G. Shearing. June 12th, 1924. (239,599.)

14,298. "Electroscopic apparatus for testing the conductivity of various materials." H. T. Scott-Huntington. June 13th, 1924. (239,606.)

14,371. "Production of electrodes for alkaline storage batteries." J. F. Monnot. June 13th, 1924. (239,609.)

14,405. "Telegraph apparatus." Automatic Telephone Manufacturing Co., Ltd., and H. H. Harrison. June 13th, 1924. (239,610.)

14,421. "Manufacture of welded tubes by electric resistance welding." E. Schroder. June 14th, 1924. (239,614.)

14,449. "Automatic control of dynamo-electric machines." British Thomson-Houston Co., Ltd., and F. P. Whitaker. June 14th, 1924. (239,615.)

14,772. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. June 18th, 1924. (226,154.)

15,134. "Electrical transmitters for use in automatic telegraphy." Creed and Co., Ltd., and F. G. Creed. June 23rd, 1924. (Addition to 191,772.) (239,626.)

15,416. "Timing devices." Western Electric Co., Ltd. (G. Deakin). June 26th, 1924. (239,630.)

15,484. "Terminals for use in wireless instruments and for like purposes." N. Garnett. June 27th, 1924. (239,632.)

15,514. "Electric insulating materials and electric insulators." F. V. Wythes and Siluminite Insulator Co., Ltd. June 27th, 1924. (239,633.)

15,671. "Electric measuring instruments of the moving-coil type." British Thomson-Houston Co., Ltd., A. P. Young and A. G. Salisbury. June 30th, 1924. (239,636.)

16,712. "Automatic control of electric motor converters." British Thomson-Houston Co., Ltd., F. P. Whitaker and C. J. Sarjeant. July 11th, 1924. (239,650.)

16,778. "Electric connection sockets or like electrical fittings." G. A. G. Davies and H. W. Kent. July 12th, 1924. (239,651.)

17,953. "Interlocking of electric switch cubicles." A. H. Railing, C. Garrard and P. H. Coales. July 28th, 1924. (239,660.)

18,222. "Means of supplying thermionic valves from alternating-curre mains." R. S. Elven. July 30th, 1924. (Cognate application 1,328/2 (239,663.)

18,638. "Radio telegraphic systems." W. J. Mellersh-Jackson (A. Taylo August 5th, 1924. (239,670.)

19,101. "Electric inductance coils." F. H. Alston. August 12th, 192 (239,674.)

19,783. "Holders for electromagnetically coupled coils." H. A. Yowar August 21st, 1924. (239,679.)

19,798. "Holding-means for inductance coils for use in wireless systems G. A. Mitchell. August 21st, 1924. (239,680.)

20,207. "Electric terminals or other screw couplings." W. J. Polyblar and H. A. Watts. August 26th, 1924. (239,687.)

20,291. "Aircraft lamps." A. L. Davis. August 27th, 1924. (239,688.)

21,394. "Rheostats." C. A. Collins. September 10th, 1924. (239,702.)

21,985. "Cooling arrangements for use with dynamo-electric machines English Electric Co., Ltd., and E. R. Briggs. September 17th, 1924. (239,70

22,860. "Road vehicle lamps." J. Lucas, Ltd., and O. Lucas. Septe ber 27th, 1924. (239,711.)

23,691. "Sound reproducing apparatus." British Thomson-Houston C Ltd. March 27th, 1924. (231,421.)

23,786. "Electrically heated kettles and like vessels or utensils." Hec Electrics Proprietary, Ltd. October 22nd, 1923. (223,836.)

24,069. "Electric fires or radiators." H. H. Berry. October 10th, 192 (Cognate application 2,132/25.) (239,724.)

24,577. "Electric motor control gear." English Electric Co., Ltd., a F. D. H. Bremner. October 16th, 1924. (239,725.)

25,899. "Electric discharge tubes." General Electric Co., Ltd., A. Bartlett, R. Le Rossignol, and H. W. B. Gardiner. October 30th, 192 (239,736.)

26,006. "Electric apparatus for the elimination of aperiodic disturbances H. J. J. M. De Regnauld de Bellescize. December 28th, 1923. (226,784.)

28,764. "Devices for protecting electrical circuits from overheating. Calor Elektrizitats-Ges. and O. Dreyer. December 1st, 1924. (239,741.)

28,922. "Means for adjusting electric lamps." M. J. Railing and E. Randall. December 2nd, 1924. (239,743.)

29,337. "Signalling systems." Western Electric Co., Ltd. (Western Ele tric Co. Inc.). December 6th, 1924. (239,745.)

29,546. "Apparatus for heating liquids by electricity." H. Robinso December 9th, 1924. (239,749.)

29,821. "Variable electrical condensers." H. R. Hodgson and C. Milla December 11th, 1924. (239,751.)

30,146. "Electric accumulators." Chloride Electrical Storage Co., Ltd and B. Heap. December 15th, 1924. (239,754.)

30,259. "Induction furnaces." British Thomson-Houston Co., Lt (General Electric Co.). December 16th, 1924. (239,755.)

1925.

288. "Electrodes for electric furnaces." Det Norske Aktieselskab fur Elek trokemisk Industri Norsk Industri-Hypotekbank. January 17th, 192 (227,821.)

610. "Vacuum electric tubes." Westinghouse Electric & Manufacturi Co. January 8th, 1924. (227,454.)

708. "Overhead lamps." Dr. K. Markau. January 9th, 1924. (Additio to 227,461.) (227,462.)

1,920. "Electric junction boxes and the like." Callender's Cable & Co struction Co., Ltd., and E. Warbrick. January 22nd, 1925. (239,771.)

5,875. "Lighting installations." R. Bosch Akt. Ges. April 3rd, 192 (231,842.)

6,770. "Method of producing cores of powdered and compressed magnet material for induction coils and the like." British Thomson-Houston Co Ltd. (International General Electric Co. Inc.). March 12th, 1925. (239,787

7,481. "Tungsten arc lamps." General Electric Co., Ltd. June 21st, 192 (235,840.)

7,635. "High-pressure mercury-vapour electric lamp." K. Mensing March 31st, 1924. (231,481.)

8,625. "Method of and means for frequency multiplication in electric phenomena." C. Lorenz Akt. Ges. May 31st, 1924. (234,781.)

8,822. "Caps for the carbons of batteries." E. Kleinmann. April 2n 1925. (239,793.)

9,934. "Spring holder for incandescent electric lamps." W. Eberl. Apr 16th, 1925. (239,800.)

13,412. "Coupling device for combined electric starters and dynamos f automobile engines." Soc. Anon. pour l'Equipement Electrique des Vehicule November 18th, 1924. (Addition to 237,541.) (239,809.)

13,432. "Electromagnets." British Thomson-Houston Co., Ltd. May 24t 1924. (234,509.)

13,591. "Electron-discharge apparatus and circuit arrangements emplo ing them." British Thomson-Houston Co., Ltd. May 29th, 1924. (234,809.)

15,680. "Electric control systems." British Thomson-Houston Co., Lt June 17th, 1924. (235,885.)

16,729. "Illumination device for projecting apparatus." A. Konieczny July 7th, 1924. (236,553.)

International Conference on High-Pressure Lines.—I is proposed, subject to there being a sufficient demand, to pub lish an English edition (in two volumes of about 1,100 page each) of the papers read at the International Conference o High-pressure Lines held in Paris from June 16th to 25th 1925. The volumes will also contain a report of the discussions If the demand reaches 400 copies, the price will be four pound for the two volumes, but in the event of 800 copies being sub scribed for, the price will be two pounds ten shillings. I order that an early decision may be arrived at as to whethe to publish an English edition, those wishing to subscribe fo copies are requested without delay to inform Monsieur Tribo Laspière, Union des Syndicats de l'Electricité, 25, Boulevar Malesherbes, Paris, of the number of copies they will require A French edition of the papers and discussions will also b published, provided that not fewer than 1,000 sets are sub scribed for. The price will be 200 francs per set, but afte November 1st, 1925, the price will be increased to 250 francs Orders for the French edition should also be sent to M. Tribo Laspière at the address given above.

A Power Company and a Pumping Failure.—A company in the State of Wisconsin, U.S.A., brought an action against a power company two or three years ago, alleging that the failure of the latter to supply power for pumping during a fire at the claimant's works involved the claimants in additional loss, put at $250,000. The case was at first dismissed but subsequently a jury awarded the claimants $47,000. The Supreme Court of the State, however, has recently reversed this decision and dismissed the action.

The

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Electrical Advance for the 1925-6 Season.

SIMULTANEOUSLY with the altering of the clocks to normal time, the electricity supply industry switched over to full-speed activity. The early days of October have witnessed the beginning of a wonderful electrical forward movement which we hope will continue throughout the entire 1925-1926 season.

It is conceivable that there are electrical undertakings in various parts of the kingdom which notice the change-over from summer to autumn without any particular excitement. All experience heavier loads; a few—the small minority we hope—accept such business as comes without enthusiasm; some make seasonal efforts to stimulate the public interest and to satisfy it enterprisingly in their own separate and local ways; while others, availing themselves to the full extent of all the central and local help that is at their command, combine such help in one grand business-promoting campaign in which their public is carried into an electrified atmosphere in an attitude of interested inquiry and investigation.

Seated as we are at the hub of electrical operations, we have the best opportunity for judging things as a whole. What we see at the moment justifies a full measure of optimism with reference to what is going to happen this season. The need for keener commercial development of electricity supply has been recognised during the past few months, and well-thought-out plans have been quietly preparing in many quarters. These have come to fulfilment during the past week or two, and some account of them appears on later pages of this issue. Electrical exhibitions are in progress, as we write, at Nottingham and Leicester; electrical showrooms have been opened at Hackney, Poplar and Swansea; while at Glasgow a Demonstration Hall of the Scottish Electric Lighting Service Bureau was duly inaugurated on Monday.

This is a good beginning, and we believe it establishes a record opening for any electrical season here.

We hope that this burst of activity will set the pace for authorities in all parts of the Kingdom. It augurs well, we feel, for progressive operations on a grand scale during the next six or seven months, and promises big things for the Christmas and New Year peak-load and present period. The electrical retailer and contractor

probably have in mind the fact that the season when the Christmas buyer is making his purchases is only two months away. Notwithstanding adverse conditions, preparations should be made early in anticipation of a good Christmas Electrical trade.

The recent developments to which we refer in this issue are of three kinds, including temporary electrical exhibitions as at Nottingham and Leicester; permanent showrooms as at Hackney, Poplar and Swansea; and a Service Bureau, as at Glasgow. In addition to these, there is the lecture and demonstration work for which E.L.M.A. is lending its powerful and effective aid in some of these and various other places, and above all we have the all-the-time efficient live operations of the British Electrical Development Association, whose series of free public lectures for everybody in any way electrical made a good beginning yesterday.

We need to do everything in reason during the next six months to keep electricity to the fore. If we continue as we have begun, and find the B.E.D.A. in funds to render it equal to the opportunity now presented, it will be easy to understand why some people connected with the gas industry were so annoyed when we recently, quite legitimately and honourably, let their cat out of the bag.

British Electrical Goods are Best.

Currency having recently been given to reports that large purchases of foreign goods were being made by the Post Office, the Postmaster-General has issued a reply which should effectively dispose of the misrepresentations. He has selected four points for the purpose of his reply. It was complained that British makers were being ignored by the use of electrical date-stamping machines of foreign make to impress the words "British goods are best." To this it is replied that, while the machines were made abroad (but use British-cut dies), this was so because no such machines are produced by any British firm, and the home demand is so small that it is unlikely that they ever will be made here. Second, the Post Office was charged with neglecting British telegraph systems in favour of "the French Baudot machines." The reply to this is: During the past fifteen years the Post Office has purchased no foreign-made Baudot instruments except two specimen sets bought in 1922 from the French Government at a cost of £30; furthermore, British telegraphic inventions are widely used in the service. Complaint three was that a large consignment of German telephone switchboards had recently been delivered at the Central Telegraph Office. Here the P.M.G. shows that the statement can only relate to "One specimen set of a new foreign type of telegraph apparatus procured for experimental purposes," and no "live business" (interesting words!) can afford to refrain from constant experimental trials of the latest inventions. The last of the points selected for reply relates to a large order "running into six figures" about to be placed with foreign manufacturers for glass battery jars "with no better reason than a difference in the tint of glass." Here the P.M.G. is justifiably emphatic and describes the report as "wholly untrue." He might have used stronger language in view of the fact that the order referred to is presumed to be one for less than £2,000 which was given to a British firm which will make the jars at its own factory in Yorkshire. "No tender from the Continent was invited or received, and no order for such jars has been, or is about to be, placed abroad.

It is deplorable that such gross misrepresentations should be made, but one can hardly regret that the opportunity has been created for the head of a great public Department, spending many millions a year on manufactured products, to state so clearly its definitely and consistently pursued policy of buying British goods "whenever possible, even though foreign goods may be obtainable at slightly lower prices," in the sincere belief that "British goods are best." It is very satisfactory to learn that more than 99½ per cent. of the Post Office expenditure on electrical apparatus during the last year has been on goods of British manufacture. May this policy long continue! To certain other authorities let us say: "Go thou and do likewise!"

The Postmaster's testimonial to the quality of British electrical products should be given the widest possible publicity. British goods *are* best, and the world should be let to know it by the full force of advertisement as well as by practical observation and experience gained with the product itself.

Trade and Unemployment.

While considering this question of the policy of Government Departments with reference to the need for Home support to be given to British manufacturers, it is worthy of note that the Ministry of Health issued a statement last week stating that the policy set out in the circulars of 1923 and 1925—already discussed in these pages—has not been altered. It is still made a condition of any grant given expressly to assist the relief of unemployment that contracts for or incidental to such works are to be placed in this country. What other course could reasonably be pursued? But the circular went further than that by urging that in view of the industrial situation here, only under very special circumstances should contracts of local authorities for any works whatsoever be placed with other than British concerns. There is no political question involved—it is a sheer necessity arising from our special unemployment circumstances. But there is another aspect of the matter to which the Ministry of Health, with all its good intentions as aforesaid, has paid regard in connection with a war-time resolution passed at Stoke-on-Trent in 1916, when it was resolved that "no contract should be entered into with any person of German or Austrian nationality." That decision was right enough when it was arrived at, for we were fighting for all we were worth with every available weapon; there are still many amongst us who cannot yield to sweet relenting grace and make friends with their former adversaries, but one cannot shut one's eyes to the fact that since 1916 many things have happened which may legitimately soften some of the former asperities. Anyhow, the idea of the present Government appears to be that in view of the Commercial Treaty recently concluded with Germany, the Stoke-on-Trent resolution of 1916 should now be rescinded, because the said Commercial Treaty was based on the principle of treating German citizens, enterprises, and goods no worse than those of other foreign countries. This policy of the Government, however, does not prevent the Premier from urging every member of his Party to make a point of buying British goods. In his speech at Brighton last week he pointed out that a result of our serious unemployment was that we were faced with a growing excess of imports which if continued would be a "real danger to the economic stability of a country which relies on foreign countries and on overseas for the bulk of its food." The purchase of British goods would give an impetus to our trade which would be felt from one end of the country to the other. This was not counsel to discriminate against the people or manufactures of any particular foreign nationality, but to discriminate in favour of British products against all others with a view to cutting out that cankerous, demoralising and costly growth—unemployment.

Electricity Districts: Some Comparative Figures.

An interesting comparison between the various Electricity Districts (especially those delimited) is deducible from one of the tables in the last Generation of Electricity Report of the Electricity Commissioners. This table gives the total energy generated in each area, and thus shows in a general way their relative importance electrically. The London and Home Counties area tops the list with 1,949 million kWh, which is just over a quarter of the total of the entire country. The next in importance is a district not yet delimited, for obvious

reasons, *viz.*, Northumberland and Durham, which generates 1,041 million kWh. After this comes the S.E. Lancashire District with 838 millions. These three areas therefore account for more than half the units for the whole kingdom (*viz.*, 7,415 millions). Following these come the West of Scotland District, 535 millions; West Riding of Yorkshire, 426 millions; and Mersey and West Lancashire, 387 millions. Of the remaining areas, the totals begin to get small, there being only three with over 200 millions, namely, S.W. Midlands, 309 millions; N.E. Midlands, 265 millions; and South Wales, 206 millions. These districts account for about 80 per cent. of the coal consumed in the steam stations of the whole country.

A further point of interest may be deduced from the tables with regard to the efficiency collectively of the stream generating stations grouped under their several areas. As introduction, it may be noted that the average fuel consumption per kWh of the combined stations of the whole kingdom is 2.5 lb. of coal. Taking each area separately, the average figure is sometimes better, sometimes worse. The best area appears to be S.E. Lancashire, where the collective fuel consumption per kWh works out at 2 lb. The West of Scotland and North-East Coast come close with 2.1 lb., and the N.E. Midlands with 2.2 lb. The areas which approximate to the whole country's average of 2.5 lb. of coal are Mersey and West Lancashire, Edinburgh and Lothian, London and Home Counties, and West Riding. Coming to the higher figures, we have South Wales at 2.6 lb. and Mid-Lancashire at 2.8 lb. The areas averaging between 3 lb. and 3½ lb. are Bedford, North Hants and Oxford, N.W. Midlands, Lower Severn, Kent, S.W. Midlands, E. Midlands, and N. Lancashire. The only other district of importance is N. Wales with 5.6 lb. With regard to the N. Wales area it should be explained that only 11 million kWh is generated by steam power but 46 millions by water power.

Broadly, these figures in some measure show the relative scope for economies as between area and area.

The above analysis refers only to steam stations. The remaining units generated by other methods are, however, less than 5 per cent. Of this remainder about half is generated by waste heat. Gas, oil, refuse destructor and water power of small importance relatively make up the balance. Water power does not amount to 1 per cent.; indeed, except for the N. Wales system, the kWh generated by water would be only about 4¼ millions.

Firemen's Risks.

The accident whereby a London fireman, Sub-Officer Sinden, lost his life through receiving an electric shock in the course of his duty last month, appears to have been unique in the history of the London Fire Brigade—may it so remain! The practice of the Brigade has been to accept the risk, and to take no special precautions when live wires are present—"especially if the wires are only for lighting purposes." It was given in evidence that nearly every man in the Brigade occasionally received shocks, but regarded them as being only disagreeable, not dangerous.

Unfortunately, however, under certain circumstances shocks at pressures below 250 volts, especially if alternating, are unquestionably dangerous to life. The essential factor which appears to attend every case of the kind that we can call to mind is the presence of water, which enables the body to make a low-resistance contact with the earth or one pole of the circuit; that condition satisfied, it only remains for fairly good contact to be made with the other pole. Such accidents therefore usually happen in the bath-room, wash-house, or cellar with a damp floor. In this instance, of course, water was present in abundance; the other condition—contact with a live conductor—was fulfilled by the brass helmet of the fireman touching a "tube containing a live wire." With regard to the latter, Dr. F. J. Waldo, the City Coroner, in his able summing-up to the jury, recalled a fire in 1923 in Redcross Street, which was declared by a jury to be due to a defective electrical installation in slip-socket conduit, and said that "the same bad unsafe system" was in use on this occasion; he described it as "a system condemned in the excellent regulations of the Institution of Electrical Engineers," and said he had suggested the compulsory adoption of those regulations. It is true that "plain slip sockets" do not comply with the regulations, and are very rightly condemned, but unscrewed conduit properly installed with "some form of screwed or grip joint which will give ample and permanent electrical conductivity and mechanical rigidity throughout" is approved. Everything depends upon the honesty and skill of the workman who installs the conduit, but the same can be said of any job that is carried out with earthed metal sheathing, and we should be loath to condemn unscrewed conduit simply because the job can be scamped. The compulsory adoption of the I.E.E. Regulations would not necessarily abolish its use.

As regards the helmet, Dr. Waldo mentioned in his summing-up that "it was made of brass, with loose leather lining strung up inside, and with the one-inch-wide rubber band usually found round the inside rim of the helmets of the London Fire Brigade apparently removed in the present case." Had the rubber band been present, it seems probable that the violence of the shock would have been mitigated and the unfortunate victim might have escaped with a fright. Dr. Waldo raised the question of completely insulating brass helmets, but we doubt the possibility of this. The proper course is to cut off the supply of electricity at the main switch as soon as possible, just as the firemen already make a practice of cutting off the gas. The jury, agreeing that the cause of the fire was unknown, added a rider urging that firemen's helmets should be insulated, surely it is better to remove all possibility of getting a shock than merely to close one of the many possible channels by which it may reach the person.

Charges for Electricity.

At a meeting of the Corporation of the City of London, on Thursday last week, Mr. Deputy Sandle raised the question of the price of electricity in the City, and secured the appointment of a special committee to consider what further steps could be taken to obtain a cheaper supply. It will be remembered that the matter was under discussion about a year ago, and we are not surprised that it is once more brought up. As Mr. Sandle pointed out, during the past six years the two companies which supply the City have paid dividends aggregating 88 and 89 per cent. respectively, and have put to reserve sums amounting to 91 and 75 per cent. respectively—a total of 179 per cent. on the paid-up ordinary capital in one case, and 164 per cent. in the other.

There can be no question that, whatever was the case in bygone days, some of the London companies have been making large profits since the war. A comparison between the prices charged by the municipal undertakers and the companies in the East London area can leave no doubt in the mind of an impartial observer that the rates charged by the latter are greatly in excess of those offered by the former; moreover, the municipalities show more enterprise, seeking to develop the use of electricity and to serve the public, whereas the companies appear to be content with such load as the public brings to their doors. We are loath to make these admissions, seeing that we have always upheld the advantages of private enterprise, which in other spheres of industry is undoubtedly vastly more efficient than any form of communal management—but the facts admit of no denial.

Under the scheme embodied in the new constitution of the London and Home Counties Electricity District a sliding scale will come into force, and with the fear of 1931 removed the companies may change their policy and show less inertia. We hope so. In the meantime, though Mr. Sandle's references to the prices charged for bulk supply are based on a misapprehension, in the main his statements are accurate, and he has made out a strong case for reform.

Practical Nomography.

How to make and Use Nomograms.

By REGINALD O. KAPP, B.Sc., A.M.I.E.E.

(*Concluded from page 572.*)

In some cases, though rarely, an evenly divided scale is essential, and only obtainable if the chart is of the slanting line form. Fig. 7 is an illustration of such a case.

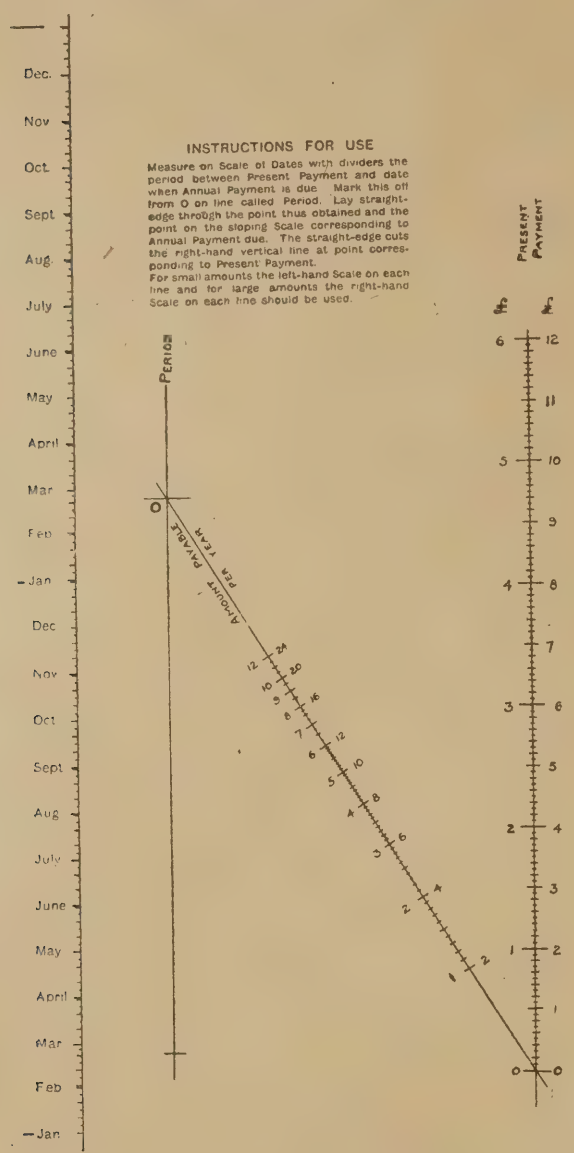


Fig. 7.—Nomogram of Present Values.

Parallel Line Charts with a Grid.

Some formulæ containing four independent variables can be represented by charts without pivot lines so that the ruler need only be laid on the paper once. Two of the variables are represented by intersecting lines forming a co-ordinate system or grid.

As an example, we will consider the well-known chart for finding the efficiency of a transformer at any percentage of full load from the iron and copper losses expressed as a percentage of full load. Let these be Fe and Cu respectively, and the efficiency be η at any proportion β of full load. The iron loss is independent of the load, the copper loss proportional to the square of the load, so that at any proportion of full load

$$\beta\ (100-\eta)=\mathrm{Fe}+\beta^2\ \mathrm{Cu},$$

which assumes the form suitable for parallel straight lines if we write it—

$$\mathrm{Fe}-\beta\ (100-\eta)+\beta^2\ \mathrm{Cu}=0.$$

A chart for this expression is about the most complicated type likely to be met with in practical work. It will be instructive to consider how to make it, but the reader should not allow himself to think it typical of the cases he is likely to meet with. He may skip this section without losing the context of the remainder.

This would give a chart of the parallel straight line type if β were constant. For $\beta=1$ the scales would be identical on the outer A and C lines, and the divisions would be placed at half the distance on the middle B line. We could construct a separate chart for each value of β and if the three lines were equally spaced, the scale divisions on the B and C lines would have to be different on each chart. It has already been explained that any alteration of the position of the B line alters the scale on the C line. By suitably choosing a different position of the B line for each value of β, we can therefore make the scale on the C line the same for all values of β. Then the various charts can be superposed, and will give us one A and one C line, but a number of B lines, one for each value of β. If the B line is moved so that its distance from the C line is p and the distance between the A and C lines is P, it follows from equation (2) given

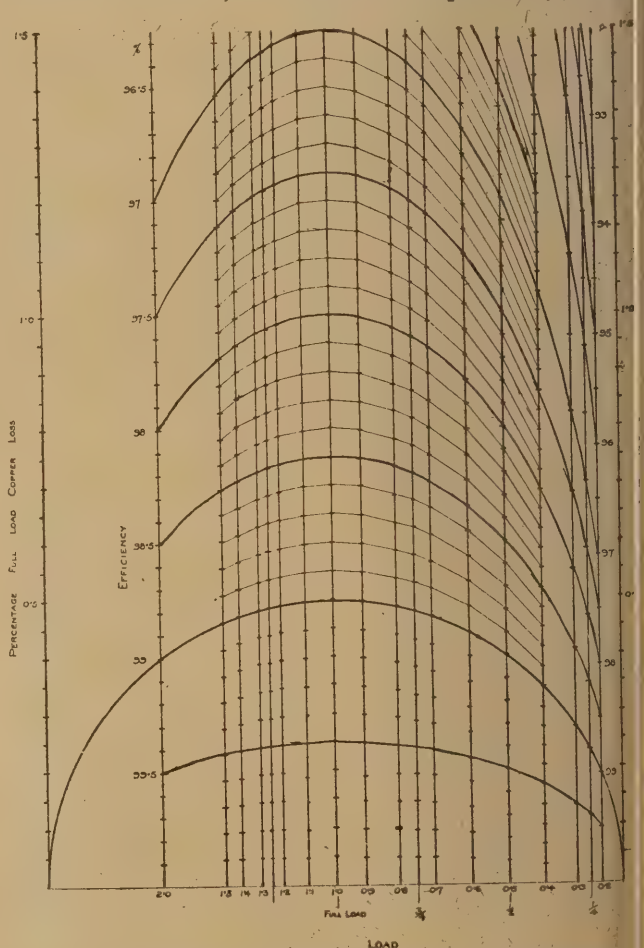


Fig. 8.—Nomogram for Finding the Efficiency of a Transformer at any Load.

already, that the scales are determined by the formula—

$$\mathrm{Fe}-\mathrm{P}/p\times\beta\ (100-\eta)+(\mathrm{P}/p-1)\times\beta^2\ \mathrm{Cu}=0.$$

It is now easy to see where the B line must be in order that the scale of copper loss may be the same as that of iron loss.

What we want to do is to multiply the scale by $1/\beta$. The displacement of the B line from the centre causes it to multiply this scale by $1/(\mathrm{P}/p-1)$. So we must make $\mathrm{P}/p^2-1=\beta^2$ or $p=\mathrm{P}/(1+\beta^2)$. The scale on each B line must be multiplied by p/P, so the functioned scale on this line becomes $\beta/(1+\beta^2)\times(100-\eta)$.

We now have only to choose convenient values for unit length such as, say, 1 per cent. = 10 in., and a convenient value for P such as 10 in., and we can construct all points of the chart, which assumes the appearance shown in fig. 8. It can be shown that the lines connecting points of equal efficiency are ellipses. The reader should not be confused by the fact that on this drawing the A line is on the right and the C line on the left, contrary to our usual custom. The point at which a line connecting the percentage iron and full load copper loss is tangential to one of the ellipses gives the load at which the transformer has its maximum efficiency.

Slanting Line Charts with a Grid.

We can now consider a much simpler type of four variable chart. We have seen that expressions of the form given in formula (3) $A/B=C$ can be represented by slanting line charts. If a fourth independent variable is added to one of the others, giving the form

$$(A+D)/B=C \quad \ldots\ldots\ldots\

arrange to have a factor $1/t$ by which this scale is multiplied. We remember that the scale is affected by the position of the B line between the A and C lines, and so a different distance of the B line from the other two for every value of t is indicated. If the distance between the A and C lines is P and a point on the B line is at a distance p from the C line, we have seen that the geometrical relationship holds—

$$A-P/p\times Bt+(F/p-1)\ C=0.$$

In order that such a chart may give us the required algebraic values unit length on the scale on the C line must be

$$1/(P/p-1)$$

of unit length on the scale on the A line and unit length on the scale on the B line must be $1/P/p$ of unit length on the scale on the A line.

Hence we correct for the influence of the factor t by making $P/p-1=t$ or $p=P/(t+1)$.

The scale on the A line is therefore a functional scale of W/S, the scale on the B line a functional scale of $p/P\times t^2=t^2/(t+1)$ measured parallel to the A and C lines and the functional scale on the D line is a scale of $-d$, or, in other words, an even scale reading in the opposite direction to the other two.

The position of every point for t is therefore a distance from the C line $=P/(t+1)$, and a distance from a line joining O_A and O_C, and parallel to the A and C lines of $t^2/(t+1)$. Fig. 11 shows the completed chart.

If we return to equation (5) we notice that just as we get the expression giving three straight parallel lines if $B'=1$, so do we get the expression giving two parallel and a straight slanting line if $B=0$. This leads us to realise that a more generalised treatment of the subject would have been more scientific. All types of nomogram become in fact special cases of some more general case. A much generalised treatment of a subject, while appealing to the mathematician, is, however, often less comprehensible to the applied scientist than a discussion of special cases.

Summary and Practical Hints.

1. An alignment chart is worth constructing where it is required to solve frequently a mathematical equation containing three or more variables, and a very high degree of accuracy is not essential. The method has the advantage over the slide rule that errors, and particularly errors in the position of the decimal point, are not made so easily.

2. To begin with, the equation must be got into such a form that the variables are separated. By this is meant that the equation is brought into a form in which it represents the *sum* or *product* of a number of terms where each term is a function of only one of the variables. We refer to these terms as A, B, C, D, &c.

3. Wherever possible the equation should be got into the form—

$$A-B+C=0.$$

In many cases this can be done by taking logarithms. In this form the chart consists of three parallel straight lines and is the simplest type to construct.

4. These three parallel straight lines should be equidistant in nearly every case; an exception may be allowed if unequal spacing allows available logarithmic scales to be employed. In the great majority of cases with equal spacing of lines the nomogram consists of logarithmic scales which can be directly copied from the scales on the slide rule.

5. The rule to determine which way the scales run is that if two successive terms are of opposite signs their scales run the same way; if two successive terms are of the same sign their scales run opposite ways.

6. Precise values must be calculated to satisfy one example of the formula. These may be the roundest numbers possible so as to simplify the arithmetic. A straight line called the tie line must be drawn in any convenient position across the paper. At the points where this cuts the scale lines write the values of the example chosen. This fixes the position of the scales. The angle at which the tie line is drawn should be such that all useful values of the variables are conveniently placed. Sometimes one can choose the example for values making all the terms zero. Often it is better to make the example correspond to average values so that the tie line can cut the scale lines at an angle not greatly different from a right angle.

7. If the expression consists of the form $A/B=C$, it can be generally reduced to the previous form by taking logarithms. If this is not practicable the nomogram consists of the slanting line or N type, the A and B lines are parallel, the C line joins the zero of their two scales. In N type diagrams the scale markings on the C line may either be on the portion between the A and B lines or on the C line produced beyond these. In the former case the scale markings may come inconveniently close together. If the markings are between the A and B lines, the scales on these will run in opposite directions, if the markings are outside the A and B lines, their scales will run in the same direction.

8. If the expression is of the form $A-B+C-D=0$, the nomogram consists of five parallel straight lines, the middle one of which is a pivot line. It is often convenient to arrange for the pairs of lines on each side of the pivot line to coalesce, thus reducing the number of lines in effect to three and to mark a scale for one variable on one side and for the other variable on the other side of the same line.

9. If the expression is of the form $(A+D)/B=C$,

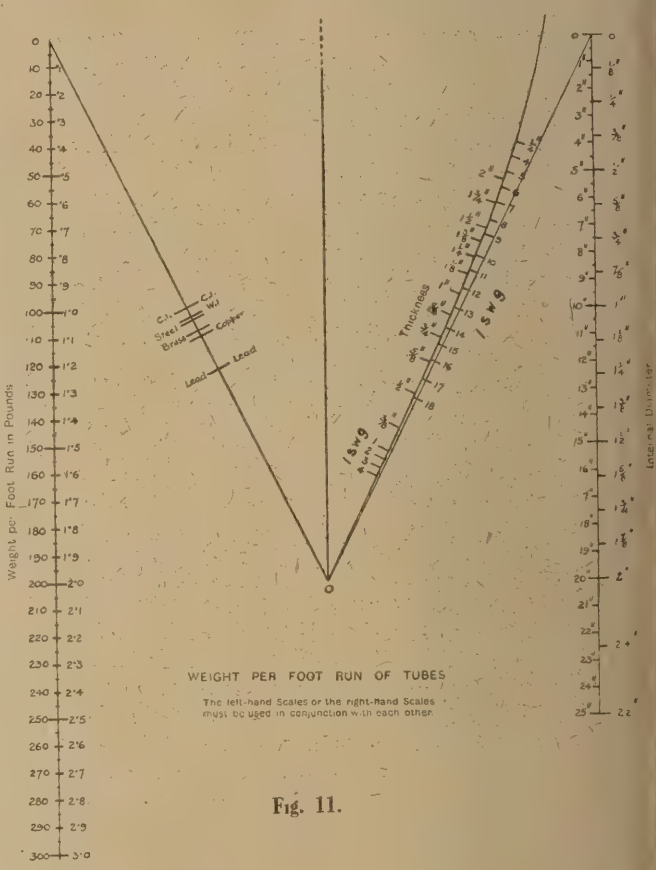


Fig. 11.

the nomogram will be of the slanting line type with a grid, the grid containing the co-ordinate system for the A and D and the A and B terms being on the two parallel straight lines.

10. If the equation is of the form $A-B+B\times C=0$, the nomogram will consist of three lines, of which two are parallel and one is curved.

11. In constructing a nomogram it is convenient to draw it not in the position as generally looked at in which the parallel straight lines are vertical but with these lines horizontal. It is quicker to mark the scale division by moving the light set square than by moving the heavy T-square.

12. It is often advisable to make any scale in two systems of measurements, for instance, in degrees Centigrade and degrees Fahrenheit, the one system being written on one side and the other on the other of the scale, and a great advantage of nomograms is the ease with which this can be done and the resultant saving in the work of converting units.

Electricity in Agriculture.

Rural Electrification and Electric Ploughing.

By J. A. SUMNER.

The uses to which electricity is devoted may be divided broadly under three main headings, *viz.*, industrial uses, household and domestic uses, and to fill the needs of agriculture. Of these, the last is the Benjamin of the trio—in age—but unfortunately not in favour. It is the desire of the writer to indicate the potentialities that exist for the use of electrcity in agriculture and rural areas in general, and, in suggesting methods which will bring it more widely into favour, to hint at some of the difficulties which lie in the path of progress.

It is estimated that England possesses many hundred thousands of acres of land under cultivation each year, the vast bulk of the work being done by the time-honoured if slow and tedious method of utilising the greatest literal horse power that is available and manageable by one man to drag the appropriate plough or other implement that is being used. Let us concentrate for the moment on the skilled operation of ploughing; a comparison between the results achieved by the former method and those which may be attained by the substitution of electrical energy as the motive power may not be invidious. In each case average land is taken as a basis for comparison. A ploughman with two horses would look upon one acre of ploughing as a good day's work, whereas with an electric plough several acres of land may be ploughed in a similar time.

The point in which advantage is gained with an electric motor is that far more power may be concentrated and controlled more easily than is the case with the horse-drawn plough, and whilst the cutting speed of the electric plough is not higher (although this can easily be achieved) since there is a limit to the speed for good ploughing, two or more furrows may be turned at one operation.

The writer thinks it possible that a practical system and machine—employing the tractor method—may be devised which will eliminate the "panning" of the soil due to the passage of the heavy tractor, which causes the soil to become more solid under compression, subsequently "ripping" over in solid layers instead of breaking up as it is thrown over by the plough. The manner of ploughing is an important factor, and it is claimed that with electric ploughing the crop yield has been proved to be from 20 to 35 per cent. greater.

There is another method offering more possibilities, in which the "roundabout" haulage system is employed and a type of plough having four shares, cutting two furrows on each side per journey across the field one way, is used. By a simple system of anchors and pulleys and a drawing rope which is wound at will on one of two winding drums on the motor, unwinding from the other pulley as it does so, the plough is drawn across the field. It is quite possible to utilise this method with only one man in sole charge. The number of ploughs of this type in use in this country is painfully small, being exactly one.

During a recent conversation between the writer and a landed proprietor owning a large estate, the latter stated that he would be unable to break up a large amount of land that was urgently in need of ploughing, as his men had far more to do than they could manage; he had no more horses available for the purpose, and it was impossible to obtain the services of a motor tractor. What was wanted, he stated, was some method that would enable him to plough more land in a given time, with results equal to those obtained at present. Surely electricity can come to his aid! It would seem that if rural supply authorities were initially to do the farmers' ploughing by contract, an immense material benefit might ensue. To the small farmer it would be a boon, in that he would be able to reduce his overhead charges due to the maintenance of an extra horse and plough, and in the limit would only need a horse for carting manure and transporting produce. Experience also shows that the larger farmers would eagerly welcome such assistance, as an auxiliary to their present facilities.

As to comparative costs, in the present state of the application of electricity to agriculture, one cannot be dogmatic in assertion nor are there any definite figures regarding the cost of electrical ploughing that can be taken as a criterion. The following figures will undoubtedly be criticised, as it is hoped, but the basis is one which cannot easily be obtained from manufacturers' costs or from experience; it is one which, the writer hopes, will be the nucleus of a scheme to be worked in Cheshire. Any corrections which are needed or any practical working costs which may be obtained will therefore be welcomed:—

Data: 15-h.p. motor.
Cost of energy, ¾d. per unit.
Rate of ploughing, ½ acre per hour.
Cost of machine and accessories, £500.

Costs based upon one acre of ploughing.
(*a*) Cost of electrical energy, 1s. 7d.
(*b*) Cost of labour (at 1s. 3d. per hour), 2s. 6d.
(*c*) Depreciation = 5 per cent. per annum (assuming 600 running hours = 300 acres per annum), 1s. 8d.
(*d*) To cover capital cost (assume life of machine = 10 years), 3s. 4d.
Total of *a*, *b*, *c* and *d* = 9s. 1d. per acre.

It will be obvious that the cost per acre essentially depends on the number of acres ploughed per day, as will be seen from the following, using the above data.

Rate of ploughing.	Cost per acre.
⅓ acre per hour	13s. 4d.
½ ,, ,, ,, ...	9s. 1d.
⅝ ,, ,, ,, ...	7s. 1½d.
¾ ,, ,, ,, ...	6s. 0d.
⅞ ,, ,, ,, ...	5s. 0d.

The standard prices for ploughing, as given officially, are at the rate of 20s. per acre.

The importance of a higher rate (not speed) of ploughing is obvious, and from a comparison of the prices which obtain and the prices which our basis of costs allows, there is scope for experiment so as to be able to reach a rate of good ploughing of from ¾ to one acre per hour.

It seems clear that the revenue accruing from this operation will not unduly inflate the dividends of the supply company, and also that whilst the capital invested would be covered it would be necessary to have a guaranteed area for work each year, to cover the capital costs incurred; but we must remember that this is pioneer work, primarily to impress the farmer with the usefulness and advantages of electricity for his multifarious purposes. The indirect gains which would be made by the supply undertaker if the operations were shown to be successful are those of a better load factor and an increase in the number of units sold.

The operation of artificially drying hay and corn crops and securing independence of weather conditions is one in which we can render assistance. The long series of finally successful experiments made by independent experimenters and also under the auspices of the Ministry of Agriculture tends to show that the farmer must more and more resort to electrical aid, and we must remember that as agricultural labour is scarce at the moment and is subject to seasonal demands, a reduction in the number of labourers and horses required may be gratefully accepted.

If we can consider our premises to be correct and, as an industry, can be fully convinced of the utility of electrical aids to the farmer, it is perhaps wise to consider the requirements for supplying this aid. That a fairly extensive network of overhead lines is required —adjacent to fields—and at a pressure of, say, 3,000 volts, with suitable cheap tapping points for connection to a transformer for low-pressure supply, is fairly evident. The essentials for such a line would be: freedom from onerous conditions often imposed by landowners upon wayleaves for poles; assistance from the manufacturers of overhead gear, switches, &c.; and an avoidance of regulations which impose a factor of safety of 10 to the *n*th power.

To indicate some of the difficulties which beset our path: First, there is that often conservative and variable factor—the farmer, who seldom sees the benefits that may accrue to him. To say that his fields can be cultivated electrically in a superior manner to his present method of cultivation (this, of course, needs to be a matter of fact) or that scientific methods must supersede more laborious methods, leaves our would-be convert quite cold; but to guarantee to do such work to his satisfaction at a less cost than he can do it himself may cause him to open both heart and purse. Here one may state that the electrical sword may be two-edged, as is shown by the fact that wayleaves are often hard and dear to obtain, the objection being that much more time is required to work around the poles, in addition to the disadvantages of a "lozenge" of land that goes out of cultivation. If the work were done in these early stages by the supply authority under contract, as previously suggested, it would be necessary to justify our claim that a pole in the middle of a field causes little trouble or loss to the farmer, and the onus and penalty of placing a pole in an arable field would devolve upon tnose responsible for such a crime!

Summing up, we may state that for rural electrification to be a success the following are the main desiderata:—

(1) That there be an extensive and cheaply erected network of lines adjacent to land other than permanent pasture, either at a medium pressure of 200-400 volts or at a high pressure of about 3,000 volts. Considerations of cost demand that these should be single- or two-phase, if alternating current, or, alternatively, that they be direct current at, say, 200-800 volts. The former method would involve the use of a 10-15-kVA portable transformer to give a low-pressure supply. These lines would not be used entirely for the purpose of tapping for operations in the field, but they would help to justify the erection of a line to a scattered hamlet or even a farm for domestic use, where normally such a line would not be an economical proposition, and in this way they would *cheapen the cost of erection per mile*. An isolated farm or group of houses such as one commonly meets in rural areas is a fertile place for the installation of electrical apparatus as an aid to comfort, and will become increasingly so as the electrical gospel becomes more and more a part of our normal lives. Possibly it seems as strange to imagine electric ploughs or reaping machines let out on hire, or on a hire-purchase system, as it was to the people of Glasgow to conceive that the electric lamp first used in Lord Kelvin's house would become a commonplace object twenty years later.

(2) That wayleaves for poles be easily and cheaply obtainable. It may be pointed out that the apparently standard rents for poles which the Commissioners seem to be fixing, judging from the results of inquiries, of 8s., 4s., and 2s. per double pole, depending on their position, are far too high for successful rural distribution, and will militate against a reasonably cheap distribution in any except industrial areas with their large consumers.

(3) That initially the responsibility for work involving horses and machines be removed from the farmer to a competent supply authority (the work, of course, being done to his satisfaction) and that not only must the cost of operation per acre be less than previously but that the farmer must be enabled to reduce his overhead charges. Selling a horse which needs feeding with energy at a cost probably far higher per unit than that of electrical energy will enable him to purchase two motors for his dairy or granary.

Condition (1) rests not only with the farmer but with those responsible for the regulations governing the distribution and supply of electrical energy. An engineer recently wished to reduce the cost of overhead lines for 220 volts, a.c., and applied for permission to run a single wire with return *via* Mother Earth. He also had the audacity to state that the system of guarding required by the authorities for the crossing of power lines (e.h.p.) over telephone lines was unnecessarily cumbersome and costly. Why, for instance, should not the crossing and guarding be supported from wood poles instead of from the more expensive steel lattice towers? —and why, if the line were to break—a rather hypothetical happening—should such elaborate precautions have to be taken to ensure that they would not touch the earthed guard erected to catch them?! And he asked for permission to run the single wire, also to erect a cheaper crossing which would still have a sufficiently high factor of safety. Copernicus was not more ill-thought of, and the theological authorities are still debating the motion of the solar system. The question of being able cheaply to tap 33,000-volt lines also arises, since these lines are almost always run through fields and adjacent to the particular type of country with which we are concerned. It is possible to tap a 33,000-volt line at £25 (this being the cost of a 5-kVA transformer and switch), and the saving which may be effected in rural distribution if a tapping can be made from a 33,000-volt line at a cost of, say, £20, makes the matter extremely interesting and important.

Condition (2) will resolve itself, and may hardly be looked upon as a difficulty unless the Commissioners attempt to fix a standard price per pole.

Condition (3), which is in the nature of a suggestion, constitutes a difficulty in itself, and if a few authorities are willing to take over such a responsibility, it will be necessary for a large area to be guaranteed to be at their disposal each year. In any case it means the expenditure of a fair amount of capital which, although the writer thinks it would be covered, might only return a profit of perhaps 1 to 5 per cent.—the amount depending entirely upon the amount of work available. But if the farmer will go to the expense of purchasing, or at least hiring, a petrol-engined tractor plough, which he will state quite frankly does not do the work to his satisfaction, why should he not turn to electrical methods?

In conclusion, I would point out the essential difference between industry and agriculture: the former is mobile, in that it can gravitate to the locality where power is cheap and easy to obtain; but agriculture, with a possibly greater need for an abundant supply of energy available cheaply and easily, is immobile, and it remains a pressing problem for the electrical engineer to erect power lines which will be the means of conveying that energy to the fields and farms.

Monorail in Railway Workshops.—A New York correspondent of *The Times Trade and Engineering Supplement* states that in the shops of the United Railways of St. Louis a very complete monorail system handles various equipment parts with facility. This overhead system extends throughout the different departments of the shop, with branch lines running directly to the work benches and the machine tools. The monorails are so placed with respect to the machines that material is deposited adjacent to them and can be handled with the minimum of labour. Each important machine tool is served by a jib crane in addition to the monorail system. These jib cranes are so arranged that the heavy parts of trucks and railway motors can be lifted readily and placed in position on the tools for machining, an air hoist or a chain block being used, depending upon the height of the lift and the material being handled. In several cases the parts can be transferred directly from one machine tool to another without the intervention of the monorail system. This method of handling parts in the repair shop has effected a marked reduction in wasted time, with corresponding savings in the labour cost.

A Survey of Lighting in Electrical Showrooms.

By W. E. BUSH.

There can be few electrical engineers in this country to-day who are not aware that the methods of employment of electrical energy for lighting purposes are open to vast improvement. Throughout the length and breadth of the land are to be found innumerable examples of bad lighting. In fact, the actual state of affairs, at least so far as shop windows are concerned, is represented by diagram 1. From this it will be seen that 61 per cent. of retail shop windows are poorly lighted, while another 21.5 per cent. are only "fair."

Evidently here is matter for thought. In terms of £ s. d. the value of the field that lies between actual practice and best modern practice is estimated to be worth some £5,000,000. This, it is true, would go to the makers of and dealers in equipment and contractors for electrical wiring, but the increased consumption of electrical energy involved in this change would mean a considerable addition to the revenues of supply undertakings, since, even as things are at present, something like 46 per cent. of their total revenue is derived from "lighting." The difficulty, of course, lies in persuading the shopkeepers to adopt the best methods. Not only must they be told that efficient equipment is available which will mean an increase of income much beyond expenditure, but they must also be shown this equipment in actual use. As the well-known saying has it: "An ounce of practice is worth a pound of theory"; and this is undoubtedly true of electric lighting, for wherever the latest types of lighting units are seen in action their value is appreciated.

Hence it is obvious that in every possible way the electrical trade should set a good example to the ordinary shopkeeper.

Nevertheless, a survey of 139 showrooms of supply undertakings, made with a view to ascertaining how they stood in this matter of window lighting, revealed

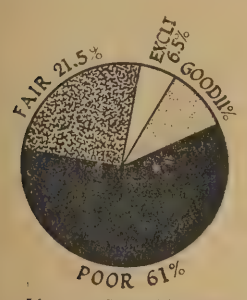


Fig. 1. – Shop Windows.

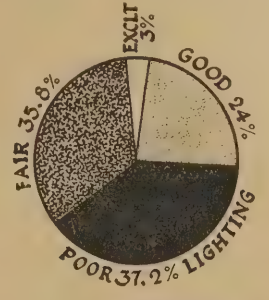


Fig. 2.—Showrooms.

some rather surprising figures. The standard by which they were judged was the same as that applied in the case of the general retail shops, namely, complete absence of glare, use of top reflectors, and the consumption of at least 90 watts per foot run of window. As will be seen from diagram 2, only 3 per cent. reached a level of excellence, while 73 per cent. varied between fair and definitely poor. In only 42.5 per cent. of the windows examined were top reflectors employed, and about an equal number were lighted by pendants, thus leaving more than 15 per cent. with bare lamps. Diagram 3 shows in a compact form the relative proportions in which these types of equipment were used.

After-hour lighting was employed by only 16 per cent. of the total, while just over 11 per cent. made use of colour lighting as a source of attraction. In only 17 per cent. of the cases considered were electric signs employed, in spite of the fact that most supply undertakings are to-day urging their customers to use after-hour lighting and signs as much as possible.

Indeed, on looking the matter squarely in the face, it seems as though the pupil is more learned than his master. A glance at the three diagrams will suffice to show that this is no unfair metaphor. Evidently such a state of affairs is far from desirable, since it involves the possibility of the electrical industry losing prestige as a force sincerely bent on serving the community. It must either lead or be led, and there can be no question as to which alternative it will adopt.

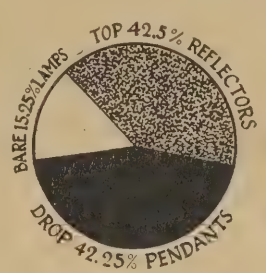


Fig. 3.—Types of Equipment.

During the next few months a great deal can be done to stimulate an interest in good shop lighting. Nearly half the supply undertakings have premises in good-class thoroughfares, and it is therefore possible for these to set such a standard in window lighting as to awaken in even the most apathetic shopkeeper a vague uneasiness not to be set at rest till he has given serious attention to the state of his own lighting equipment.

The Corrosion and Protection of Condenser Tubes.—A publication of the Institute of Metals, "Notes on the Corrosion and Protection of Condenser Tubes," has been prepared at the instance of the Corrosion Research Committee of the Institute by Messrs. G. D. Bengough, M.A., D.Sc., and R. May, A.R.S.M. It contains much new and important information on the subject which has been acquired since the last similar publication in 1921. Three types of factors are closely concerned with the subject of corrosion of condenser tubes, namely, chemical and electrochemical reactions, engineering and physical conditions, and metallurgical factors; on these the "notes" on the causes and methods of prevention of corrosion are based. Six types of corrosive action in condensers are named, and each is dealt with separately, the special conditions under which each action occurs being cited. Several causes of failure due to the tubes themselves are mentioned, the most important consideration in this direction being the composition of the metal. Such metals as lead, iron, manganese and nickel may be included in the composition of the tubes with advantage in a certain proportion, but harm may result from any of these elements being misproportioned. It is interesting to note that aluminium should be rigorously excluded. Great attention is paid to the causes of failure due to external conditions which call for consideration of the following factors: the nature of the vortex or other motion in the water box, the type of disturbance set up by the ferrules, &c., the occurrence of obstructions to flow in the tubes or ferrules even when very small, the size of air-bubbles, the foaming properties of the water, and the supersaturation of sea-water with gases. Of the possible methods of lessening corrosion, several are dealt with under the two main treatments, the water treatment and that of the tube itself. The methods of treating the water are classified as physical (filtration), chemical (softening, neutralisation, &c.), and electrolytic; while the tube treatment includes the following methods: protection by insoluble scales, by metallic layers (tin, lead, &c.), by impervious layers of inert substances, tube cleaning, and annealing at low temperatures in oxidising atmospheres. Each method is described and criticised in turn, and many valuable suggestions are given. Both treatments are given prominence, but the modern tendency seems to favour the tube treatment. Good results have been obtained by protecting the tubes by means of layers of basic salts and also by metallic layers. Unfortunately the annealing process has not given such good results in practice as were promised by the results of laboratory tests. The various methods of preventing corrosion and the fields of application of protective processes are given in tabular form. Considerable information as to the research at present being carried out is also included in the pamphlet.

Electricity Supply in Great Britain.—II.

The Situation in Kent.

In dealing with the County of Kent it will be found convenient to divide the authorised undertakers into two groups, *viz.*, Group 1, those included in the London and Home Counties Electricity District, and Group 2, those outside this District. The area covered by the latter is identical with Area No. 14 in the Electricity Commissioners' publication dealing with the Generation of Electricity in Great Britain, price 1s. 6d. In Table 8 of this pamphlet, the particulars of kWh generated by the different classes of stations are set out, together with the amount of fuel consumed by each class. The last column gives the total number of kWh generated in the area, as follows:—

Year ending March 31st,	1922	31,506,343
Do.	1923	39,716,403
Do.	1924	46,904,432
Do.	1925	55,869,304
Do.	1930 (estimated sold) ...	80,000,000

We have added our estimate for the output sold five years hence, and trust that the undertakers concerned (either individually or collectively) will not fail to justify our forecast. The portion of Kent not included in Fuel Consumption Area No. 14 is, as stated above, included in the London and Home Counties Electricity District. The London County Council publication relating to Electricity Supply in the London and Home Counties Electricity District deals very fully with this, and by putting both sets of particulars together one can obtain a fairly comprehensive record of the County of Kent for the last few years. On referring to the Electricity Commissioners' Volumes of Returns of Administrative, Engineering, and Financial details, it will be found that although the whole county, with the exception of the Isle of Thanet, is practically covered by the various Acts of the Kent, South East Kent, and West Kent Companies, the total annual output of these associated companies is only about ten million kWh sold, including bulk supplies given to other undertakers. As will be seen from the map on the opposite page, the north-west corner of Kent, which lies within the new Electricity District recently confirmed by Parliament, is practically covered by statutory powers.

The whole administrative County of Kent, together with the County Borough of Canterbury, comprises 975,965 acres. According to the 1921 Census, the population comprised 1,141,666 persons and 252,936 resident families. Table 10 shows that there were 12,892 buildings not containing dwellings, so that in all we may reckon that there are about 266,000 potential consumers.

The following is a list of the generating stations in Kent:—

(1) London and Home Counties Electricity District.
Gravesend Corporation.
Beckenham Urban District Council.
Bexley Urban District Council.
Dartford Urban District Council.
Erith Urban District Council.
Sevenoaks and District Electric Co., Ltd.
Bromley (Kent) Electric Light and Power Co., Ltd.
Total—7 stations.

(2) Area No. 14 of Generation of Electricity pamphlet (*i.e.*, the remainder of Kent).
Canterbury Corporation.
Faversham Corporation.
Dover Corporation.
Maidstone Corporation.
Tonbridge Urban District Council.
Tunbridge Wells Corporation.
Gillingham Corporation.
Chatham and District Light Railways.
Isle of Thanet Electric Supply Co., Ltd.
Ramsgate and District Electric Supply Co., Ltd.
Folkestone Electric Supply Co., Ltd.
Whitstable Electric Co., Ltd.
Sheerness and District E.P. & T. Co., Ltd.
Kent Electric Power Co. (Rochester).
Total, 14 stations.
Grand total, 21.

The number of authorised undertakers in Kent at the present time is 26. The area of supply of 23 of these is wholly within Kent, the exceptions being the Weald Electric Supply Co., Ltd., the South Metropolitan Electric Light and Power Co., Ltd., and the Sevenoaks Company. The Weald Company's area extends into Sussex, but as this company has not yet commenced operating, having only just been formed, it will not affect the totals given below. The part of Kent belonging to the South Metropolitan Company is Penge Urban District, and as separate figures are not available for this area, this undertaking is omitted from the following figures. At present, we believe, no electricity is supplied by the Sevenoaks Company to the part of its area outside Kent. The South-East Kent Electric Power Co., Ltd., is also omitted, as it is not now operating. The remaining 23 undertakers have been divided into two groups, as stated above. The Kent Electric Power Company belongs to both groups, but only appears in Group 2, as it is not operating in Group 1.

	Max. Load, kW.	Total kWh sold.
Total for Undertakers in Group 1 ...	13,199	27,301,226
Total for Undertakers in Group 2 ...	16,338	29,283,657
Aggregate for the whole county ...	29,537	56,584,883

These data are the latest published by the Electricity Commissioners, except that the maximum load of the West Kent Electric Co. is assumed to be 2,000 kW.

It is interesting to note that 20 of these 23 undertakers possess generating stations, as can be seen from the map. The Chislehurst, Foots Cray and West Kent Companies purchase the whole of their output.

Space does not permit of a detailed list being given, showing the respective areas of each of the 26 undertakers in Kent, but the information is very clearly set out in the Electricity Commissioners' 10s. volume, published in January, 1925. The only additions to be made since December 31st, 1923, are that the area of the Isle of Thanet Electric Supply Co., Ltd., has been enlarged by the inclusion of the parishes of Westgate-on-Sea and Birchington; and that the new undertaker—the Weald Electric Supply Co.—does not appear prior to 1924. It possesses full powers for electricity supply over the following areas:—Cranbrook Rural District; Tenterden Municipal Borough; Tenterden Rural District (except detached portions); and Ticehurst Rural District (Sussex).

The map is based upon the Ordnance Survey map prepared for the Boundary Commission of 1917, which has been used by permission of the Controller of H.M. Stationery Office. As before, the hatched portions represent the areas already covered by statutory powers, either granted or applied for. Over part of its area the West Kent Electric Company has special powers to distribute electricity to consumers, besides supplying in bulk, and this part has been shaded with dotted lines, with the exception of the parishes of Darenth, Fawkham, Hartley, Horton Kirby, Longfield, and Southfleet, in Dartford Rural District; these parishes form part of the area applied for by Gravesend Corporation, and are shaded therefore by full lines.

The following alterations have been made since the map was engraved:—

(1) Crayford Parish has been created an Urban District.
(2) A small part of Tonbridge Rural Parish has been added to Tonbridge Urban District.
(3) A small part of River Parish has been added to Dover Municipal Borough.
(4) The parish of St. Lawrence Intra has been merged into the parish of Ramsgate, which is now co-extensive with Ramsgate Municipal Borough.
(5) The Urban District and Parish of Footscray has been re-named Sidcup.



Electricity Supply in the County of Kent.

D

Reviews.

Mercury Vapour Rectifiers and Mercury Vapour Lamps. By J. A. Fleming, M.A., D.Sc., F.R.S. Pp. viii + 100; figs. 44. London: Sir Isaac Pitman & Sons, Ltd. Price 6s. net.

This work by Professor Fleming is described by him in the foreword as "a small treatise on the modes of operation and uses of the mercury-vapour rectifier and the mercury vapour lamp."

The author devotes the first two chapters to a *résumé* of the atomic structure of matter and of electricity, and to the phenomena observed in the ordinary carbon arc. The account of the atomic theory is worth reading for itself, and is one of the clearest non-technical descriptions on the subject that we have seen.

The third chapter describes the mercury-vapour lamp in glass and in quartz and gives concrete examples of the theories introduced in the previous chapters. We are surprised that more space has not been devoted to the therapeutic uses of the mercury-vapour lamps in quartz. This "artificial sunshine" so beloved of the daily Press is of great and ever-increasing importance in the treatment of tuberculosis and certain skin diseases. Very valuable work is being done in this country and on the Continent, and it would seem that before many years have elapsed medical practitioners will make extensive use of the "ultra-violet" light of which the mercury-vapour lamp in quartz is the only commercial source at present.

To purely electrical engineers the mercury-vapour lamp is of greater interest as a source of light for general illumination. The author would have assisted them very greatly had he given comparative data of the cost of this lamp and the gas-filled metal-filament lamp.

Chapter IV deals with the glass bulb rectifier made by the Hewittic Electric Company, and Chapter V with the metal cylinder rectifier made by Messrs. Brown, Boveri.

These two chapters give fairly good accounts of both types of rectifier, but contain no more information than may be obtained from literature supplied by the respective manufacturers. The blocks also with but few exceptions have been obtained from the same sources. The same criticism applies with equal force to the chapter dealing with mercury vapour lamps, and we feel that six shillings is too much to ask for 100 octavo pages of such compilation.

An operating engineer's first consideration when choosing plant is reliability, his second, overall costs. If he seeks for information regarding first costs, running costs, and maintenance charges in this book, he will seek in vain. Neither is anything said about the parallel running of mercury-vapour rectifiers with other machines or with other and similar rectifiers.

In the absence of information to the contrary it must also be assumed that motors, supply meters, and instruments do not differentiate between rectified current and d.c. current obtained from dynamos or converters. We believe this is the case, but some engineers have an exaggerated idea of the amount of ripple and are afraid of its influence on their mains and outside plant. We think the various makers would do well to dispel these fears by publishing oscillograms and by practical demonstrations.

It is true that the author refers his readers to a paper by Mr. G. Rogers published in the I.E.E. *Journal* for February, 1925, but we think that a publication aspiring to be a treatise on the subject for the use of engineers should contain within itself adequate data on these all-important questions.

The final chapter deals with the mercury-vapour lamp as a generator of oscillations. This is mainly of theoretical interest and will interest those engaged in high-frequency work.

In conclusion, the book cannot be said to merit the title of a treatise. The information contained therein is certainly accurate, but very meagre. It forms, however, a useful introduction to the subject and then, we fear, engineers desiring fuller information will have to look abroad.

The only English works known to the writer are Mr. L. B. Jolley's book on "Alternating Current Rectification," which was noted in these columns on March 27th, 1925, and the paper by Mr. G. Rogers previously mentioned. The latter is the better one for the operating engineer. It deals almost entirely with the glass-bulb rectifier with which Mr. Rogers has had considerable experience and gives detailed costs.

For similar articles dealing with the metal cylinder genus the reader will be forced to turn to the pages of the *Elektrotechnische Zeitschrift* and the *Revue Générale d'Electricité*. The latter paper has from time to time very interesting articles on the theory of the rectifier, but their reading demands a high standard of French and mathematics.

In passing, it may be said that both types of rectifier are very extensively used on the Continent, but that this country and, singularly enough, the United States have considerable leeway to make up.

Fuel Economy and Smoke Prevention. By J. B. C. Kershaw, F.I.C. Pp. xiii + 268; figs. 91. London: Constable & Co., Ltd. Price 16s. net.

The book under review is the third revised edition of "Smoke Prevention and Fuel Economy," by Mr. Kershaw and the late Mr. W. H. Booth. It has undergone considerable revision and has been extended by additional chapters dealing with the grading of fuel, utilisation of waste steam, and descriptions of recent super-power stations.

Coal will probably remain the principal source of fuel for the world at large, and one of mankind's most pressing problems is how to best use economically, and hence conserve the fuel resources of the world. Low-temperature carbonisation has attracted considerable attention within recent years, but the economic aspect of the question still bristles with technical problems which are now being studied on industrial plant. At present, improvements in the efficiencies of steam-raising plant are being fostered in all parts of the country, and the recently-built large municipal stations have made vast strides in this respect, but it must not be overlooked that by far the larger proportion of fuel is consumed in the smaller plant, the efficiency of which is low. The proposal to establish super power plant at industrial centres throughout the country could not entirely supersede the smaller plants, as the latter supply steam for industrial heating purposes at the factories where they are situated, and no super power plant, however well situated, could attempt to distribute exhaust steam or hot water over a wide area with any degree of efficiency or economic success. The low thermal efficiency of many present-day boiler plants, is due, generally, either to insufficient air supplied at the periods when the hydro-carbon gases are being evolved most rapidly from the fuel, or no proper provision is made for adequate mixing of the heated air and of these hydro-carbon gases. In practice, from 20 to 25 lb. of air is used per pound of fuel, and hence the amount which must be carried either through the fuel or above it into the furnace amounts to between 40,000 and 55,000 lb., or to the enormous volume of between one-half and three-quarters of a million cubic feet per ton of coal burnt. The shortcomings of the present-day methods of burning fuel for steam generation are partly due to faulty boiler and furnace design, and partly due to lack of supervision and efficiency in the operation of the plant. In some of the recently-built power plants, many of these defects have been remedied. The efficiencies of 250 power plants are summarised by Mr. Kershaw, as follows: 98 had efficiencies ranging from 60 to 80 per cent., 109 between 50 and 60 per cent., and 43 of efficiency below 50 per cent. The average efficiency of power plant is highest at paper mills, *viz.*, 71 per cent., compared with 41 per cent. at colliery power plant, which is the lowest; these are significant figures.

In every power plant, large or small, there is scope for the exercise of much ingenuity, and engineering ability in devising inexpensive and simple means for the recovery of the waste heat units.

As the necessity for fuel economy becomes more urgent, it would be well for the chemists and engineers in charge of this highly important section of the plant of our manufacturing industries to examine their steam raising installations, in order to further conserve or recover wasted heat units, without unduly increasing the capital outlay or running costs of the plant. Many problems remain to be solved in this field, and it is important to have in a narrow area of reference, most of the material that makes possible a sorting out of the elements of fuel economy. The whole formation of the book is admirable, illustrations are good, it is well written and interesting alike in the facts it records, and the theories it evolves. The method of presentation of the material is logical and the facts are put forward with clearness and conciseness.

The fairest comment that can be made upon the book, is that the author has accomplished that which he set out to do, and those interested in fuel economy, thermal efficiency, and smoke prevention are indebted to Mr. Kershaw for an extremely useful and stimulating volume. One general criticism should perhaps be registered, and that is the omission of a bibliography.

The Motor-car Show.—The International Motor Exhibition which opened at Olympia on October 8th, has been regarded as the most important of the series from the trade point of view, for there has been no Paris *salon* this autumn. The popularity of the British show is not surprising when the figures issued by the Ministry of Transport last week relative to the number of motor licences in Great Britain from December 1st, 1924, to August 31st last, are considered. The gross receipts amounted to £16,025,527 and the number of motor vehicles for which licences were taken out, excluding tramway-cars, is given as 1,510,000, including: 580,000 cars, taxed on horse-power; 572,000 motor-cycles; 224,000 commercial goods vehicles, and 99,000 motor-hackneys (otherwise omnibuses and other vehicles for hire). The number of motor-cars (580,000) works out at approximately one to every 78 of the population, whereas in America there is one car to about every 11 of the population. The total number of motor vehicles, including those exempt from licences, is given as 1,537,340. The electrical features of the exhibition, which will be dealt with next week, are confined to the lighting, starting, and ignition equipment.

The Manchester Textile Exhibition.—Radical development or alteration in principle of textile machinery has been almost negligible for many years. Nevertheless, new ideas are being promulgated and an inspection of the many exhibits now on view at the City Hall, Manchester, will impress the observer with the fact that great progress is being made. New and radical changes are proposed in many directions, with a view to economy in production, increased output, and better quality of product. A novelty is an electro-automatic loom, details of which we hope to publish in due course, but our review of the show has to be unavoidably held over until next week.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities New Publicity Literature, Liquidations and Failures.

Electrical Activity Abroad.—Several matters of interest have appeared in foreign dispatches to the daily Press during the past week. First the development of the Brown, Boveri schemes in the United States has been before the American investing public, which has quickly absorbed at $50 a share an issue of 260,000 participating shares of the American Brown, Boveri Electric Corporation, in which the well-known Swiss company has a large holding. The intention of the Swiss company to exploit the American market, purchasing a number of individual plants for conversion to its own requirements, has already been fully discussed in these pages. Swiss activity is also noticeable in another of the foreign dispatches, for a *Times* report from Frankfurt states that in connection with the electrification of the railways of the Reich, in the Rhineland, three new power stations are to be erected—partly on Swiss territory—at a cost of £2,240,000. It is added that the concerns financially interested in the scheme are: the North-Eastern Swiss Power Works, the Rheinefelden Transmission Works, and the Baden Works in Karlsruhe. The other report before us relates to Germany and Russia, and it is not one to be viewed with surprise. It is to the effect that an agreement was last week approaching completion between the Russian Elektrotrust and the Allgemeine Elektrizitäts Gesellschaft, by which the former concern will have the right to make use of the A.E.G. technical experience and patents, the company having undertaken to "exchange" technical experience and patents for increased facilities for the sale of A.E.G. products in Russia. So many statements have emanated from Russia lately showing that foreign technical experience and products would have to be resorted to if Russian electrification was to proceed satisfactorily, that the reported discussion does not startle one. A daily paper states that one part of the discussion relates to a large delivery of goods to Russia by the company, for which the Russians require a payment credit of 40,000,000 marks.

The Shannon Scheme Dispute.—The position with regard to the delay of the work on the Shannon scheme has grown more acute, the trade bodies giving support to the unskilled workers, who refuse to accept the wage terms offered by the German contractors, *viz.*, 32s. for a 50-hour week. The Limerick dockers are in sympathy with the men, and no further consignments of equipment are to be handled by them pending a satisfactory settlement. Negotiations between the contractors' representatives, the Free State Government's Labour Director and the men's union, have led to no result. It is stated that the Transport Union has set up a negotiating committee to deal with all questions of wages and conditions of work and that until Messrs. Siemens-Schuckert, the contractors, negotiate with this body no work will be done. The firm, however, shows no disposition to negotiate.

Social Events.—Messrs. Johnson & Phillips, Ltd., of Charlton, held their first staff dance of the season on Friday evening last, October 9th, at the Woolwich Town Hall. Over 250 members and friends were present, and the function was most successful in every way. Prizes were given for "lucky numbers" and "spot" waltzing.

Burnley Electricity Works has won the local cricket club medal competition. The medals were presented to the team by Mr. Starkie, the borough electrical engineer.

The employés of Messrs. C. T. Briscoe & Son, electrical engineers, Blackburn, went for a motor outing to Blackpool on Saturday.

B.I. Works Visit.—Liverpool has just celebrated a Civic Week. Special efforts were made to provide attractions for the great influx of visitors to the city. The Prescot factory of British Insulated & Helsby Cables, Ltd., was thrown open to visitors throughout the whole week. A very considerable number of people took advantage of the opportunity of inspecting the plant and processes for the manufacture of the company's "Prescot" paper-insulated cables.

Belgian Tariff Reductions.—Under a convention with Germany, the Belgian authorities have reduced the import duties on electrical carbons and electric irons weighing less than 10 kg. each. Great Britain also participates in these reductions with other countries entitled to "most-favoured-nation" treatment.

Searchlight Vehicles for Czecho-Slovakia.—It is reported in the financial Press that Messrs. Tilling-Stevens Motors have recently completed an order for the Government of Czecho-Slovakia for searchlight vehicles.

Canadian Electric Power Report.—H.M. Trade Commissioner at Toronto (Mr. G. F. Braddock) has forwarded to the Department of Overseas Trade a copy of the "Statement and Engineering Report by the Hydro-Electric Power Commission of Ontario," submitted to the International Joint Commission respecting the proposal to develop the St. Lawrence River. This is available for loan to British firms interested in order of application to the Department of Overseas Trade (Room 52), 35, Old Queen Street, London, S.W.1. Copies may be purchased from the Commission at $7.50 per copy.

Trade Announcements.—Messrs. L. McMichael, Ltd., have opened new head offices at Wexham Road, Slough. The London offices, Hastings House, Norfolk Street, Strand, W.C., will continue as wholesale showrooms.

The telephone number of the Charing Cross Electricity Supply Co., Ltd., 60, St. Martin's Lane, W.C.2, is now "Gerrard 9134 (4 lines)."

Messrs. R.I., Limited, have appointed Mr. Michael Black, 11, West Nile Street, Glasgow (telephone numbers 917 and 918; telegraphic address "Faneeka, Glasgow") their representative for the whole of Scotland. He will hold a large stock of all "R.I." components and sets, and a special showroom has been opened for trade purposes.

The Ilford Electrical Co. have commenced business at 36, The Hill, Ilford. Catalogues, &c., are asked for.

Messrs. R. A. Rothermel, Ltd., 24 and 26, Maddox Street, Regent Street, London, W.1, announce that owing to increased business the radio section has been taken over by the Rothermel Corporation of Great Britain, Ltd.

Messrs. Carrington & Button, electrical engineers, 44, High Street, Crewe, have opened a new showroom for electrical fittings, glassware, &c.

Catalogues and Lists.—Messrs. Ransomes, Sims and Jefferies, Ltd., Orwell Works, Ipswich.—An illustrated catalogue describing various designs of "Orwell" electric industrial trucks.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—Leaflet 293/1-1, describing truck type switchgear; 301/8-1, dealing with sheet steel cubicle switchboards. Illustrated.

Messrs. Fredk. Braby & Co., Ltd., Petershill Road, Glasgow.—40-page catalogue of structural steelwork; 16-page publication showing steel storage bins.

East London Rubber Co., Ltd., 29-33, Great Eastern Street, London, E.C.2.—Catalogue of over 200 pages prepared on the loose-leaf system, allowing for additions to be made, detailing, illustrating and pricing a very wide range of wireless sets and parts for the trade.

Messrs. Watson & Sons (Electro-Medical), Ltd., Sunic House, Parker Street, Kingsway, London, W.C.2.—12-page pamphlet, describing and illustrating apparatus for the high tension testing of cables and overhead lines by d.c. Illustrated booklet describing hot-cathode valve apparatus for h.p. cable testing with d.c. Illustrated and priced 30-page bulletin No. 73 (supplementing catalogue, Part III, Section 5), describing lamps and apparatus for ultra-violet or artificial sunlight treatment.

Siemens & English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, London, E.C.4.—Two small and effective showcards, advertising Siemens-Xcel electric irons and vacuum cleaners. A catalogue of ceiling and bowl fittings, and booklet of "Silvalux" colour sprayed enamelled lamps. Illustrated and priced. The booklet also contains useful information for wireless users.

The Marconiphone Co., Ltd., Marconi House, Strand, London, W.C.2.—A number of new publications, each of which deals with one of the following lines:—Sterling loud speakers and amplifiers; Sterling receiving sets and accessories; Marconiphone auto series parallel variometer; "Ideal" transformers; Sterling Super "Invicta" battery; Marconiphone receivers and amplifiers; Marconi valves and "Die-cast" variable condensers.

Messrs. Garnett, Whiteley & Co., Ltd., Lotus Works, Broadgreen Road, Liverpool.—Priced leaflet of the Lotus vernier coil holders. Show-card in preparation.

Automatic Telephone Manufacturing Co., Ltd., Liverpool.—16-page list, giving illustrated particulars and prices of the "Xcel" electric domestic appliances. These products are being handled by Messrs. Siemens & English Electric Lamp Co., Ltd., who are supplying quantities of over-printed pamphlets when desired.

Messrs. McKechnie Bros., Ltd., Rotton Park Street, Birmingham.—New edition of their catalogue (24 pp.) of extruded rods, sections, stampings, chill cast bars, and ingots in non-ferrous alloys. Four pages of handy tables.

Z Electric Lamp & Supplies Co., Ltd., 73, Newman Street, Oxford Street, London, W.1.—Compact set of pocket tables of prices of various brands and types of lamps manufactured by members of E.L.M.A.

The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, London, N.17.—Illustrated particulars of their new "Biflector" fittings, shop window fittings, hand lamps, wireless switches, &c., and views of the works are given in the company's September Bulletin.

Ateliers de Constructions Electriques de Charleroi, Charleroi.—October pamphlet, showing motors and dynamos in stock at Charleroi.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., U.S.A.—A booklet describing electric railway material for mines. Illustrated. Also leaflets showing Westinghouse furnace elements, single retort underfeed stokers, measuring instruments, electrical equipment for paper machine drive, type "KD" generator and feeder panels, and motors for Baldwin-Westinghouse mine locomotives.

Messrs. Rose Bros. Electrical Co., Ltd., 25, Milton Street, London, E.C.2.—Priced catalogue of various electrical accessories. Illustrated.

Messrs. C. H. Parsons, Ltd., Britannia Works, Tyseley, Birmingham.—An illustrated and priced list of "Britmac" switches and lampholders.

Automatic and Electric Furnaces, Ltd., Elecfurn Works, 173-175, Farringdon Road, E.C.1.—A booklet containing illustrations, details, and prices of Wild-Barfield electrically-heated industrial ovens.

Superlamp, Ltd., 92-94, Paul Street, Great Eastern Street, E.C.2.—A net trade price list of wireless accessories.

Bowen Instrument Co., 9, Newton Road, Leeds.—An illustrated catalogue and price list describing the "Pyro" radiation pyrometer.

The Sun Electrical Co., Ltd., 118 and 120, Charing Cross Road, W.C.2.—An illustrated and priced catalogue of electric fires of various makes, including "Sunco" fires and radiators.

Messrs. Philips Lamps, Ltd., 60, Wilson Street, Finsbury Square, E.C.2.—Two specimens of a coloured blotter depicting the "Argenta" lamp and girl.

The British Thomson-Houston Co., Ltd., Rugby.—A catalogue showing various designs of "Mazda" electric lamps, also a leaflet describing "Mazda" electric decoration lamp outfits. Illustrated and priced.

The London Electrical Co., 1, Sherborne Lane, King William Street, E.C.4.—A net trade price list of electrical materials and accessories, also an illustrated and priced catalogue of electric fires and other domestic appliances.

Messrs. Johnson & Phillips, Ltd., Charlton, S.E.7.—An illustrated booklet, describing various designs of a.c. and d.c. switchboards.

Messrs. Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.—An illustrated catalogue describing the C.S.W. type of network boxes.

Messrs. Siemens Brothers & Co., Ltd., Woolwich, London, S.E.18.—36-page catalogue 595, revised edition, particularising and showing reduced prices of wireless sets and accessories. The new type large capacity radio batteries are now included and fully described.

The Arora Co., Rosebery Street, Loughborough.—An illustrated and priced folder describing "Arora" cooking apparatus.

Messrs. Joseph Adamson & Co., Hyde, Cheshire.—Pamphlet containing well illustrated matter relating to their horizontal flame tube type waste heat boilers.

Electric Fires, Ltd.—Booklet No. 44. An illustrated catalogue and price list of the "Heatrae" products.

Metro-Vick Supplies, Ltd.—Envelope series No. 4150/9. Deals with several new designs of electric fires. Illustrated and priced.

M. P. Dieny, 20 and 21, Laurence Pountney Lane, Cannon Street, London, E.C.4.—Illustrated list describing the "Wyss" belt-tightening device made by Wyss & Cie, Seloncourt, France.

Bankruptcy Proceedings.—Cyril Bertram Maurice, 14-15, Windsor House, Victoria Street, London, S.W., electrical merchant.—The public examination of this debtor was held on October 6th, before Mr. Registrar Francke at the London Bankruptcy Court, the accounts showing liabilities £745 and assets "nil." Replying to the Official Receiver, debtor said that when he was demobilised in 1919 he commenced business in partnership with another person as electrical merchants and factors at 59-61, New Oxford Street, under the style of Catchpole & Maurice. The assets and liabilities of that business were taken over in June, 1920, by a company then formed to acquire it; as one of the vendors witness received £1,000 in shares, and he acted as director until March, 1924, when the company (Catchpole & Morris, Ltd.), was wound up, his shares being then of no value. Witness next started business as an import merchant at 14-15, Windsor House, where he traded until his failure, which he attributed to his inability to obtain electrical supplies from abroad to meet orders; to loss of £300 in a bookmaking business, which he carried on from May, 1924, to January, 1925, and to law costs. The debt of the petitioning creditors (The C.A.T. Cable Co., Ltd.), was in respect of cables supplied in part execution of his order and for which he was unable to pay when called upon to do so. The examination was concluded.

W. C. Rhodes (L. J. Palmer & Co.), electrical engineer and contractor, 141, Newspaper House, Corporation Street, Birmingham.—Receiving order made October 1st on debtor's own petition.

First meeting, October 19th, at the Official Receiver's office, 191, Corporation Street, Birmingham; public examination, November 11th, at the Court House, Birmingham.

J. R. Pattison, electrical supplies factor, 15, Goldsmith Street, Nottingham.—Last day for proofs for dividend, October 24th. Trustee, Mr. L. A. West, Official Receiver, 4, Castle Place, Nottingham.

L. Backhouse, C. H. Thornton, and S. Evans (Arc Electrical Co.), electrical and wireless suppliers, Palatine Buildings, Victoria Street, Manchester.—Trustee, Mr. A. T. Eaves, 15, Fountain Street, Manchester; released, September 17th.

T. A. Wickham, electrical engineer, Snaresbrook, Station Road, New Milton, Southampton.—Receiving order made October 1st, on debtor's own petition.

H. Fildes, electrical engineer's superintendent, Durham House, 108, Monton Road, Eccles.—First and final dividend of 20s. in the £ and 4 per cent. interest, payable at the Official Receiver's offices, Byrom Street, Manchester.

W. R. J. White (W. R. White), electrical agent, Golden House, 29, Great Pulteney Street, W.—Application for discharge to be heard October 27th at Carey Street, W.C.

G. J. C. Thorne and A. H. Thorne (Lawrance Electrical Trading Co.), electrical engineers, late of 159, High Street, Notting Hill Gate, W.—Last day for proofs for dividend, October 27th. Trustee, Mr. D. Williams, Official Receiver, Carey Street, W.C.

S. H. Bardwell (Bennett, Bardwell & Co.), electrical engineer, 22, Church Street, Basingstoke.—First meeting, October 16th, at the Official Receiver's office, Midland Bank Chambers, High Street, Southampton. Public examination, November 10th, at the Castle, Winchester.

H. McClelland, wireless apparatus merchant, 12, Leigham Avenue, Streatham Hill, S.W., and late of 48, Strand, W.C.—Receiving order made October 6th, on creditors' petition.

Company Liquidations.—Connolly Bros., Ltd. (old company).—Liquidator, Mr. I. M. Henderson, 2, Moorgate Buildings, E.C.2, released September 2nd.

Carter & Mitchell, Ltd.—Meeting of creditors at the office of the liquidator, Mr. C. Latham, 78, New Oxford Street, W.C., on October 22nd. Particulars of claims to the liquidator by November 23rd.

Dissolution of Partnership.—Wood & Tennant, electrical engineers, London Road, Alderley Edge, Chester.—Messrs. F. Wood and E. Tennant have dissolved partnership. Mr. Wood will attend to debts.

Private Arrangements.—W. D. Edwards and S. Fordyce, trading as Edwards & Fordyce, electrical and wireless dealers, 302, Upper Richmond Road, East Sheen, S.W.14.—The creditors interested herein were called together on October 5th at the offices of Messrs. Wilkinson, Howitt & Co., solicitors, 14, Bedford Street, W.C., when Mr. Littlewood reported that the liabilities amounted to £1,036, and the assets consisted of stock £520, valued at £200, and book debts £291, estimated to produce £200. It would appear that the sheriff was in possession and was entitled to sell almost immediately. Mr. Littlewood said that he was instructed to put forward an offer of 10s. in the £ in cash. Replying to Mr. W. Baker, of the Wholesale Traders' Association, Mr. Littlewood said that the business was commenced about five years ago with a capital of £500. There was an amount of £358 due to the bank but that claim had been guaranteed to the extent of £300. The drawings for the year ended December 31st, 1924, were £544. At that date creditors' claims amounted to £1,383. It was also stated that the stock consisted mostly of wireless accessories. After some discussion it was decided to accept the proposed composition of 10s. in the £, payable forthwith, and a small committee was appointed, consisting of Mr. W. A. H. Osborne, representing creditors, Mr. E. H. Hawkins, representing creditors, and Mr. Smith (Foster Engineering Co.). The following are creditors:—

	£		£
British Thomson-Houston Co., Ltd.	64	Pope's Electric Co.	51
Falk, Stadelmann & Co., Ltd.	70	Foster Engineering Co.	76
Edison Swan Electric Co., Ltd.	31	Sun Electrical Co.	20
Jones, F. E.	77	Berry's Electric Co.	32
Spicer Bros.	21	New Syneigi Co.	31
Z. Electric Co.	127	Edwards, C. A.	300
Brompton Accessories Co.	20	Bankers	58
General Electric Co., Ltd.	28	Portable Electric Light Co.	20

Unemployment.—The number of unemployed recorded on October 5th was 1,297,600; this was 38,555 fewer than the previous week, but 82,025 more than a year ago.

Transport Costs.—The Wholesale Produce Merchants' Association has invited Mr. C. Holmes Waghorn, A.M.Inst.C.E., to read a paper entitled "Increasing Profits by Reducing Transport Costs—Improvements in Delivery Systems for Provision Merchants." It will be delivered at 2.30 p.m. on October 28th, at the London Provision Exchange, Hibernia Chambers, London Bridge. The speaker, while dealing with all kinds of road transportation, proposes to refer especially to electric battery vehicles, traffic congestion, and loading dock and garage design.

Our Foreign Trade.—September Figures.—The Board of Trade returns for September show the following values of electrical imports and exports:—

	September, 1925.	Inc. or dec.	9 months, 1925.
Imports.—			
Electrical goods and apparatus	336,091	+ 7,696	+ 815,995
Machinery	857,750	+ 58,398	+1,189,806
(Electrical machinery)	97,202	+ 14,118	+ 51,358
Exports.—			
Electrical goods and apparatus	1,159,974	+307,295	+1,730,826
Machinery	3,959,151	+345,898	+3,848,691
(Electrical machinery)	376,269	− 46,363	+ 557,642
Re-exports.—			
Electrical goods and apparatus	11,424	− 4,493	+ 59,901
Machinery	88,301	− 12,435	+ 214,685
(Electrical machinery)	4,372	+ 56	− 21,641

United States Tariffs.—The U.S. Customs authorities have lately given a decision that "magnetos, dynamos, starters, switches, and parts of said articles comprising the ignition and lighting system for use as parts of automobiles" are dutiable at 25 per cent. as "parts of automobiles finished or unfinished" under No. 369 of the tariff.

For Sale.—Great Yarmouth Corporation Electricity Department invites offers for surplus generating plant owing to the change of system of supply. Mr. H. J. Shaw will sell by auction on October 27th, at 85, Newington Causeway, S.E., the stock of an electrical and wireless goods factor. Manchester Corporation Electricity Committee has for disposal 40 weldless-steel lamp columns and 48 11-amp. magazine flame arc lamps with winches, &c. (See our advertisement pages to-day.)

Japanese Electrical Notes.—Our correspondent says it is reported that the Toso Tetsudo K.K., whose head office is at Aoshima-machi, Shizuoka-ken, has made healthy progress since its establishment and it plans electrifying its whole railway line shortly by doubling its capital of 1,200,000 yen. The project to organise the Seikai Electric Co. is making steady progress under Mr. T. Mirayama, M.P., and Mr. K. Tsuruya, a leading resident of Goshokawahara-machi, Aomori-ken, together with twelve others. The capital will amount to 600,000 yen, of which 375,000 yen will first be paid up. The company will be organised in about December. There will be two hydro-electric power stations, one with 250 kW and another with 150 kW, the completion of which is expected in 1926. With reference to a trackless electric railway project between Yamaguchi and Yuda, Kyushu, it is understood that it is desired to carry it out by the date of an exhibition to be held in the town of Yamaguchi, and an order for motor-cars has been issued to the Hidachi Works. A letter from the same works to Mr. Kasuya, the director of the Electric Bureau of the Yamaguchi Prefectural Office, says that it has been decided to equip the cars with a.c. 3-phase induction motors instead of d.c., the latter being unsuccessful.

Application has been made to the Railway Department by the Seidaiji Light Railway Co. for permission to extend its line for 32 miles, the estimated cost of construction being 4,300,000 yen.

During May, 1925, the following power stations were granted charter :—

Location.	Company.	Name of power station.	Steam or water power.	Electric power. (kW.)
Cifu	Oshirakawa Denryoku K.K.	Hirase ...	Water power	7,004
Cifu	Ibi-gawa Denki K.K.	Nishihira ...	,, ,,	3,700
Cifu	Hozu-gawa Denki K.K.	Hizaka ...	,, ,,	23
Nagano ...	Nagano Dento K.K.	Shigaki ...	,, ,,	1,180
Nagano ...	Nagano Dento K.K.	Sawajiri ...	,, ,,	1,720
Ishikawa ...	Taishoji-gawa Suiden K.K.	Kutani ...	,, ,,	1,300
Shimane ...	Oki-Denki K.K.	Second ...	Gas power ...	100
Kagawa ...	Shikoku Suiryoku Denki K.K.	Deai ...	Water power	6,080
Kagawa ...	Seisan Seiki K.K.	Awashima ...	Gas power ...	10
Niyasaki ...	Miyakonojo Denki K.K.	1st Kirishima	Water power	440
Kagoshima	Yakujima Denki K.K.	Takenogawa	,, ,,	169
Miyagi ...	Kisenuma Denki K.K.	Kisenuma ...	Gas power ...	150
Miyagi ...	Miyagi Prefecture	Onikubi ...	Water power	950
Fukushima	Tobu Denryoku K.K.	Uyeda ...	Steam power	16,000
Yamagata ...	Sukata-machi ...	Sakata-machi	,, ,,	200
Akita ...	Akita Suiryoku Denki K.K.	Tsuchizaki ...	,, ,,	1,000
Hokkaido ...	Yamato Mokuzai K.K.	Wakanai ...	Gas power ...	200
Hokkaido ...	Hokkaido Dento K.K.	Sogyu ...	Water power	3,270

German Failures.—The *Financial Times* states that the number of bankruptcies in Germany during September increased by 171 to 896. The total number of bankruptcies in the third quarter of this year amounted to 2,409, against 2,786 in the corresponding period of last year.

New Telephone Works.—The financial Press reports that in a recent speech Sir Max Muspratt announced that the Automatic Telephone Manufacturing Co., Ltd., which now employs 3,000 to 4,000 people, was about to build additional works in Liverpool.

Lead.—Messrs. James Forster & Co. reported on October 10th that in this country consumption was decreasing slightly, but there was still a shortage of metal in spite of recent imports of lead from the Continent; it was, however, easy to see what course prices would take should the settlement of the shipping strike coincide with freer offerings of lead from America.

Russia to Import Miners' Electric Lamps.—A Reuter Trade Service dispatch from Moscow states that the Yugostal Trust has applied to the Glavmetall for permission to import 9,000 miners' electric lamps for use at the Novo-Smolianinov mines.

Bankruptcy Order Annulled.—H. Fildes, electrical engineer's superintendent, Durham House, 108, Monton Road, Eccles.—Adjudication and receiving order of July, 1925, annulled October 6th, 1925; debts, interest, costs, charges and expenses of the bankruptcy having been paid in full.

Commercial Electrical Travellers' Concert. — The Bohemian concert of the Electrical Trades Commercial Travellers' Association, held on Saturday last at the Manchester Hotel, E.C., was very well attended. During the evening Mr. A. E. Joyce, the chairman, spoke upon the objects and achievements of the Association, and referred to the large amount of good work already done by the Association in spite of its tender age. The vice-chairman, Mr. A. S. Marks, also spoke upon the Association, and gave a list of further social functions arranged by the Entertainment Committee. It was felt that the successful nature of the evening augured well for the further events arranged by the indefatigable entertainments' secretaries, Mr. L. Moir and Mr. J. M. Woolnough, and their band of willing helpers.

Book Notices.—We have received a copy of the first part of "Modern Advertising" (London: Sir Isaac Pitman and Sons, Ltd. 2s.), which is to be completed in 20 fortnightly parts. It contains a number of articles by leading exponents of the business and practice of advertising and publicity, whether through the Press, on the sky, by means of illuminated signs, posters, films, or in shop windows. The preparation of "copy," the lay-out of advertisements, and the amount of a business firm's advertising budget are among the matters discussed in other contributions. In view of the growing importance of good advertising in the trade Press as an aid to salesmanship, the publication should be useful to the increasing number of men who are specialising in the subject.

"The Electrical Educator."—We have received copies of the first two parts of the above work, which is being published by Sir Isaac Pitman & Sons, Ltd., in 30 fortnightly parts (at 1s. 3d. each). Part I was issued on October 3rd. The prospectus of the work covers a wide field of electrical engineering ranging from the elementary principles of electricity and magnetism to advanced theory and practice, arranged in lessons so that each part covers many electrical subjects. Many eminent engineers are contributing. Among them are Col. R. E. Crompton, C.B., M.I.E.E., Sir Charles Bright, F.R.S.E., and Professors Miles Walker, D.Sc., and W. Cramp, D.Sc. The opening article in Part I, "The Education of Electrical Engineers," by Professor Walker, is of particular general interest. Another interesting contribution is "Electricity and Magnetism," by Mr. C. H. Yeaman, City Electrical Engineer, Stoke-on-Trent, in which appears an ingeniously arranged chart showing the relations of the various branches of human knowledge. Part II contains another article of general interest, "The Miner and the Super Power Station," by Mr. Frank Hodges, Secretary of the Miners' International Federation.

"The Restoration of Belgian Public Finance," by A. E. Janssen. London: University of London Press, Ltd. Price 1s. net.

"Report of the Committee of the Privy Council for Scientific and Industrial Research for 1924-25."—London: H.M. Stationery Office. Price 3s. net.

"*Proceedings* of the American Society of Civil Engineers."—Vol. LI, No. 8, October, 1925.

"The Technology Reports of the Tohoku Imperial University," Sendai, Japan.—Vol. V, No. 3, 1925.

"The *Journal* of the South African Institution of Engineers."—Vol. XXIV, No. 2, September, 1925. Price, 2s.

"The *Transactions* of the South African Institution of Electrical Engineers."—Vol. XVII, Part 6, August, 1925. Price, 2s.

The Best-lighted Window.—The first prize awarded by the Bradford Electrical Contractors' Association for the best-lighted window in the recent Bradford Shopping Week has been given to Messrs. Rushworth, Ltd., fancy dealers. The lighting specification was prepared by Messrs. Guy & Laycock, Ltd., of Huddersfield.

New French Company.—La Société Pathe Radio is the name of a new company which has been lately formed in Paris (30, Boulevard des Italiens), with a capital of 1,200,000 francs, to manufacture radio apparatus.

Lighting and Power Notes.

Barking.—Electricity in Bulk.—The Urban District Council has decided to cease generating its own electricity supply and to take a bulk supply from the County of London Electric Supply Co., Ltd. The cost of a new sub-station with the necessary equipment is estimated at £24,157.

Barrow. — New Hydro-Electric Station. — The Town Council on October 5th approved the scheme, subject to the necessary agreements being entered into, for a hydro-electric power station on the River Leven, at Backbarrow, and it was decided to make application to the Electricity Commissioners for their approval to the establishment of the proposed station and for sanction to the borrowing of £90,000, made up as follows:—Works at Backbarrow, £78,000; transmission line, £12,000. It was further resolved to recommend that application be made to the Unemployment Grants Committee for a grant towards the cost of the scheme.

Barry.—Special Order.—The Urban District Council has applied for a Special Order authorising it to supply electricity in the district. It is proposed to obtain a supply from the South Wales Electric Power Distribution Co.

Beckenham.—New Electricity Charges.—The Urban District Council proposes to introduce the following revised electricity charges:—Present tariff: An initial charge based on the kW connected, all electricity used being charged at 2d. per kWh. Revised rate: A charge of 12½ per cent. on the rateable value of premises for the first £75, and 6 per cent. on values above £75, plus 2d. per kWh in houses where electricity is not used for cooking, and 1½d. per kWh where cookers are installed. The Electricity Committee has decided to make an inclusive charge of £5 10s. per annum for 500-W lamps used for outside shop lighting.

Bradford.—Electricity Extensions.—The Corporation Estimates Sub-Committee has approved of the Electricity Committee recommendations for the erection of transformer chamber buildings at Norman Lane (Eccleshill) and Harrogate Road (Apperley Bridge), and the provision of new e.h.p. cables from the Valley Road generating station to the Sunbridge Road sub-station, at an estimated cost for cables of £4,300.

Canada.—Hydro-Electrical Development.—According to *Power*, a report recently issued by the Ontario Hydro-Electric Power Commission gives details of three alternative proposals for the improvement of the international stretch of the St. Lawrence River for navigation and for developing electrical energy of 1,600,000 h.p. One project contemplates all the power being developed at the foot of the Long Sault, another the generation of part of the power near Morrisburg, Ontario, and the third is similar to the second, but with the upper power house situated at Crysler Island. The Commission estimates that it will be necessary to provide new sources of electric power amounting to more than 400,000 h.p. by 1931, which would be increased to over 1,100,000 h.p. in 1936, and states that if authority were immediately granted to develop the international portion of the St. Lawrence by 1935 or 1936, the whole of Ontario's share of the St. Lawrence River power would probably be absorbed by the Ontario markets alone.

Cheltenham.—Loan.—The Town Council is applying for sanction to the borrowing of £5,000 for mains and services.

Chesterfield.—Electricity for Small Houses.—Owing to the increased popularity of the "hired wiring" scheme for small houses, the Corporation is applying for sanction to a further loan of £4,548 to cover the cost of the wiring of 621 additional houses.

Extension of Supply.—Mains are to be extended along Holymoorside Road to Greendale Avenue at an estimated cost of £354, and a supply to the whole of the village of Holymoorside is to be considered at the next meeting of the Electricity Committee.

Price Reductions.—The following reductions have been made in the charges for electricity:—Lighting: From 5½d. to 4¾d. per kWh, with a discount of 5 per cent. for prompt payment. Combined rate to large power consumers: The "unit" charge from .4d. to .380d., with discounts varying from 10 per cent. to 22½ per cent.

Colne.—Electricity in Bulk.—The Town Council has received a request for a supply of electricity to Earby, and proposes to give a bulk supply, subject to satisfactory terms being arranged.

Continental.—The Tyrol.—A telegram from Innsbruck states that German financiers are granting a loan to the Tyrol of ten million schillings, which will be used, among other purposes, for the development of water power.—*Reuter* (Vienna).

Switzerland.—The report on the working of the Basle municipal electricity stations during 1924, states that the original plant, which had a capacity of 8,230 kW, is now only used for emergency purposes. The capacity of the Basle generating stations has been increased to 36,000 kW, while during the past ten years the demand for lighting and household purposes was advanced from 2½ to 12.4 million kWh, and for power purposes from 21.8 to 37.6 million kWh per annum.

Austria.—The Stern-Hafferl Gesellschaft, of Gmunden, has recently established a new hydro-electric generating station at Steeg on Lake Hallstatter for the supply of the power required for the operation of the Salzkammergut section of the Austrian State railways. The electrical plant, which was supplied by the Austrian Siemens-Schuckert Co., of Vienna, comprises six alternators, driven by Pelton-type turbines.

Germany.—With the support of the Thuringian Government, a company has recently been formed to utilise the water power of the River Saale between the Bavarian frontier near Hirschberg and its junction with the Lockwitz. It is proposed to construct a dam which will enable the water of the river along a distance of about 18 miles to be utilised, and to establish a hydro-electric station having an annual output of approximately 60 million kWh.

At a recent meeting of the Baden Government authorities, the Finance Minister gave some interesting particulars of the progress of the Baden Provincial Electricity Supply Co., which is now suppplying electricity to 500 small towns and villages. The Murgwerk power station, completed in 1918, has an output of 67 million kWh per year, a total which will be brought up to 123 million kWh by the Schwarzenbach station, which is rapidly approaching completion. In order to provide ample supplies in excessively dry periods, the Baden Co. is establishing a 100,000-V transmission line to obtain electricity from Swiss power stations as far south as the St. Gotthard, and in the north is linking up with the steam generating station of the Rhenish-Westphalian Co.

Doncaster.—Extension of Supply.—The Corporation Electricity Committee has received an application from the Bentley-with-Arksey Urban District Council for a supply of electricity to 94 houses to be built by the latter Council on the Bentley House Farm estate, and has decided to provide a supply. Subject to borrowing powers being secured, the Committee has agreed to lay a new e.h.p. feeder cable to Bentley, at an estimated cost of £3,300.

Edinburgh.—Year's Working.—We have received from Mr. E. Seddon, engineer and manager of the Corporation electricity undertaking, a copy of his report, together with the statement of accounts for the year ended May 15th last. The total income amounted to £460,454, and working expense were £243,286, leaving a gross surplus of £217,168. The figures for the preceding year were: Income, £429,817; working expenses, £220,100; gross profit, £209,717. Interes absorbed £96,992, contribution to liquidation of debt for capita expenditure £106,516, and income tax £7,485, leaving a balanc of £6,175. The previous year's working resulted in a surplu of £17,687. The capital expenditure during the year amounte to £216.346, the bulk of which was spent on machinery an plant for the Portobello station, and for mains and cables. Th sales of electrical energy increased from 52,781,659 to 65,638,59 kWh. During the year the Electricity Committee considere a number of extensions to generating and sub-statio machinery and recommended the following additions:—On 10,000-kW turbo-alternator; two 65,000-lb. boilers; one cir culating and one boiler feed pump; one 500-kW motor con verter for Gorgie sub-station; sub-stations for the supply o a.c. at Davidson's Mains, Murrayfield, Inverleith, and Black hall; extensions to cable system linking up these sub-stations.

Fleetwood.—Hire of Domestic Apparatus.—The Town Council is applying for sanction to borrow £5,000 for the purchase of electric heating and cooking apparatus to be le out on hire.

Hull.—Loans.—The Electricity Committee is applying for sanction to loans of £188,000 for mains and services, and £79,000 for sub-stations.

Irish Free State.—Edenderry (King's Co.).—The Ministry of Industry and Commerce has refused to sanction a scheme proposed for the public and private supply of electricity for the town, stating that facilities for a bulk supply would be available from the Shannon scheme in a few years' time. A local arrangement for public lighting could meanwhile be made.

Liverpool.—Progress of Extensions.—Mr. H. Dickinson, city electrical engineer, states that rapid progress is being made with the extension of the Lister Drive power station, and that the new 25,000-kW set will probably be put into commission early in the new year. The work of erecting two new boilers is well advanced, the new cooling tower is nearing completion, and the switchgear is in position. When the new set is completed, the station will have a capacity of 100,000 kW, and there is accommodation for plant of a further 100,000 kW. Since opening the new electricity showrooms in Whitechapel, 220 electric cookers have been let out on hire, bringing the total number now on hire up to about 1,000.

London. — St. Marylebone. — In connection with the Borough Council's scheme for late shop window lighting, we are informed that Venner time switches will be employed.

Electricity Charges.—The City Corporation is to consider what steps can be taken to obtain cheaper electricity for the City. At a recent meeting of the Corporation it was stated that the rate was 6d. per kWh maximum, with a secondary charge of 4d., as compared with 4d. and 1d. respectively in Stepney, Bethnal Green, and St. Pancras.

Loughborough.—Wiring of Small Houses.—The Town Council is considering an assisted wiring scheme in connection with the new Council houses, under which the cost of installation is estimated at £17 9s. 9d. per house, and the cost of supplying 100 kWh at 15s. 2d. The annual revenue is estimated at £3 10s. from the consumption of 100 kWh at 8¼d., this including 6d. per kWh for electricity, 1d. per kWh for meter rent, and 1½d. per kWh for hire-purchase wiring, the latter charge to cease after the consumption of 12,000 kWh. The consumer is to pay £7 10s. towards the cost of installation and the Corporation the balance.

Ludlow.—Purchase of Undertaking Abandoned.—At a recent meeting of the Town Council a recommendation of the Finance Committee that no further action should be taken with regard to the proposal to acquire the local electricity undertaking was adopted. The sum demanded by the company was £10,000.

Lytham-St. Annes.—New Electricity Charge.—The Electricity Committee has approved the following new domestic electricity tariff:—20 per cent. of the annual rateable value, plus 1d. per kWh for all electricity consumed.

Maidstone.—Loans.—The Town Council has applied for sanction to loans of £7,500 for services and £1,000 for the purchase of apparatus to be let out on hire.

Melksham.—Inquiry.—Sir Frank Marwood held an inquiry, on behalf of the Minister of Transport, at the Town Hall on October 7th into objections raised by Col. Forster and Mr. H. H. Parry to the proposal of the West Wilts. Electric Light and Power Co. to erect poles on their land in connection with the scheme for the supply of electricity to a large area of Wiltshire. Mr. G. Ferris, for Mr. Parry, stated that the erection of poles would reduce the value of his property by 30 per cent., and he maintained that the lines should be laid underground. Mr. Long, for Col. Forster, complained that the payment of 1s. for the erection of each pole was insufficient, and if the poles were erected, a reasonable rate should be paid. He also suggested that the company should lay the lines underground. Mr. White, who represented the company, stated that a supply could not be given to Corsham until the transmission line was carried over Mr. Parry's land, and it was necessary to erect lines across Col. Forster's fields to complete the supply for Holt. The cost of underground lines would be at least three times as much as that for overhead lines, with a corresponding increase in the cost of electricity to consumers. A bulk supply was obtained from Bath Corporation to supply

the district, and the Corporation had installed plant for this purpose at a cost of £12,000. The Ministry will give its decision in due course.

Moreton.—Electricity Supply.—The local Council has decided that in view of the high price per kWh and the heavy increase in the rates which would be imposed by the electricity scheme of the Wirral Rural Council, the latter be requested to cease any further expenditure on the scheme until the Electricity Commissioners have considered the complaint raised by the ratepayers of the district. It was further resolved that the Council should send a deputation to Wallasey to inquire into the supply of electricity to Moreton by that authority.

New Zealand.—Hydro-Electrical Development.—According to the *Electrical Engineer of Australia and New Zealand*, the South Canterbury Power Board has requested the Public Works Department to send officers to confer with members of the Board and of the Tekapo League on the question of the future power supplies of the district. At present the Board is receiving a bulk supply from Lake Coleridge, but it is considered that immediate steps should be taken to develop hydro-electric power from Lake Tekapo in order to supplement the supply. The Public Works Department is preparing a report on the scheme. It is estimated that at a head of 900 ft. the lake would yield 300,000 kW at a 50 per cent. load factor.

The Public Works Department is taking immediate steps towards the development of a large hydro-electric scheme at Lake Waikaremoana. An agreement has been arrived at with the Poverty Bay Power Board which requires a supply of energy, and the Department has undertaken to have an electricity supply available within three years. The immediate installation contemplated involves plant with a capacity of 40,000 h.p., at an estimated cost of £2,600,000. The site is capable of development up to 130,000 h.p. Pending the completion of the hydro-electric plant, the Poverty Bay Power Board intends to take over and operate the steam plant of the Gisborne Borough Council. The bulk supply from Waikaremoana will be obtained by duplicate transmission lines erected by the Public Works Department.

Northern Ireland.—Rathfriland (Co. Down).—The Newry Rural District Council has obtained permission to erect overhead lines from Newry to Rathfriland in connection with the scheme for an electric lighting installation in the latter town.

Armagh.—The Town Council has approved a scheme submitted by Mr. P. A. Spalding, electrical engineer, Dundalk, for an electricity supply for the town.

Oldham.—Loan Sanctioned.—The Corporation has received sanction to the borrowing of £65,000 for mains, transformers and switchgear.

Preston-Blackpool-Lytham-St. Annes.—Bulk Supply.—An agreement has been entered into between the Preston and Blackpool Corporations respecting a bulk supply of electricity to Blackpool from the new Ribble power station. An agreement is also being arranged for a bulk supply from Blackpool to Lytham-St. Annes Corporation.

Southport.—Loan.—The Electricity Committee is applying for sanction to a loan of £3,000 for the purchase of electrical appliances required in connection with the new showroom shortly to be opened at the Glaciarum.

Sunderland.—Progress of Extensions.—The Electricity and Tramway Committees recently inspected the Hylton Road works of the two departments and the extensions which are being carried out at the electricity works. Two 250-lb. Vickers-Spearing boilers are in course of erection, and four Galloway boilers have recently been sold and removed and the space thus cleared will be used to install more high-pressure boilers. Four Babcock & Wilcox water-tube boilers are the only remaining low-pressure boilers and will probably be superseded. Four new water-cooling towers are being installed, also a new 10,000-kW turbo-generator, which will be completed about the end of October. A second 10,000-kW turbo-generator is expected to be ready by next July. The electricity undertaking has 56 sub-stations and 117 miles of mains, and within the next twelve months a further 60 miles of mains will be laid, this work having recently been commenced so that all the streets of the town will be lit by electricity.

Ulverston.—Electricity Charges.—At a recent meeting of the Urban District Council it was stated that the charge for electricity would be 9d. per kWh. The supply is being obtained in bulk from Barrow.

Tramway and Railway Notes.

Accrington.—Fares.—The Corporation is applying to the Ministry of Transport for an extension of the Order authorising it to maintain increased tramway fares, which expires on December 31st.

Argentina.—Railway Electrification.—The Ferrocarril Central Argentino recently requested authorisation from the executive authorities to electrify its line from Retiro (Buenos Aires) to Villa Ballester and Tigre by the way of Coghlan. The length of this line is 25 miles.—*Commerce Reports.*

Continental.—Hungary.—The electrification of the Hungarian railways has been postponed, the question of electrification being closely connected with the utilisation of the lignite reserves in Hungary, since water power cannot be utilised to a sufficient degree. Two plans for supplying the necessary power are being considered. One is based on the lignite mines near Varpalota, and the other on the deposits in the Matra mountains. An American-Hungarian company wishes to erect in the Matra district a large central power station which would make the electrification of the Budapest-Hatvan-Miskolc railway possible, while the construction of a power station at Varpalota would provide electricity for the Budapest-Királyhida line. The plans have been submitted to the Government.—*Reuter's Trade Service* (Budapest).

Switzerland.—Plans are being prepared for the electrification of the railway on the right bank of Lake Zurich. It is expected that the work will be completed by the end of 1926.

Spain.—A new company has recently been formed in Burgos to construct a system of electric tramways in the town and district.

Birmingham.—Unemployment Relief Scheme.—With a view to providing work for the unemployed during the coming winter, a sub-committee has recommended to the City Council that the tramway track in parts of the town be renewed, at an estimated cost of £110,000.

Chesterfield.—Railless-Car Scheme Rejected.—The Town Council has rejected a resolution to apply for an Order to run railless cars along certain new routes. The Council already possess Parliamentary powers to substitute railless cars for the present railed system.

Grimsby.—Railless Cars.—In connection with the tramway undertaking recently acquired by the Town Council, the rails at present in Freeman Street are to be removed and the street reconstructed at a cost of £31,670, and a railless-car service introduced on the route, at an estimated cost of £13,000.

London.—L.C.C. Tramway Extension.—Work has commenced on the lengthening of the tramway track at the London County Council boundary at Norbury so as to join up the track of the L.C.C. tramway and Croydon Corporation tramway, thus affording facilities for a through journey from Victoria Embankment to Purley, a distance of 13¼ miles. A through service of L.C.C. cars will be instituted during this month.

Kennington Tube Progress.—A contract has been placed for the construction of crossovers and sidings at Kennington underground station, and work is to commence immediately. This station is to be linked up with Charing Cross, and 1¼ miles of tunnelling have already been excavated. It is anticipated that the tunnelling will be completed by next spring. When the scheme is completed, in addition to the present route to the City, there will be a train service to Edgware, Golder's Green, and Highgate, and eventually to Morden.

Manchester.—Track Renewals.—The City Council has decided to renew certain sections of its tramway track, at an estimated cost of £75,000.

Manchuria.—Harbin.—According to the *Electric Railway and Tramway Journal*, a company has been organised in Harbin for the construction of a tramway in the city, at an estimated cost of $2,730,000.

United States.—Railway Electrification.—According to the *Electric Railway Journal*, the electrical operation of the Virginian Railway was commenced on September 21st. The time previously required by steam trains was 2½ hours from Elmore to Clark's Gap, while the electric trains cover the distance in one hour. The system is operated on the single-phase, 1,000-V system. Power is supplied from a 67,500-kW steam plant at Narrows on the New River. At present it is planned to operate electrically between Mullens, W. Va., and Princetown, Va. Plans have been prepared for extending the electrified section eastward to Roanoke, a distance of approximately 134 miles at a cost of $15,000,000. Electrical operation is expected to double the capacity of the line.

Telegraph and Telephone Notes.

Australia.—Telegraph and Telephone Services.—The financial results for the year ended June 30th, 1924, according to the *Electrical Engineer of Australia and New Zealand*, show that in the telegraph branch a total net loss of £188,982 was recorded, while the telephone branch made a profit of £50,677. The profit on the working of telephone exchanges was £90,257, that on the working of the Sydney-Melbourne trunk line, £15,093; that on the Adelaide-Melbourne trunk line, £6,657; and that on the Sydney-Brisbane trunk line, £4,197. On the other trunk lines a net loss of £80,489 was incurred. On non-exchange lines a total profit of £14,952 was made. During the year a commencement was made with the reconstruction of the Sydney-Melbourne telegraph line and the installation of the carrier wave system; preparations were made for installing telephone repeaters between Sydney and Melbourne; the Teletype system of printed telegraphy was introduced on the Melbourne-Bendigo circuit. Several automatic telephone exchanges were installed in the metropolitan areas, and on June 30th, 1924, 32 per cent. of the city subscribers were receiving automatic service.

New Wireless Station.—A wireless station has been opened at Wave Hill, Central Australia, about five hundred miles from Port Darwin.—*Reuter* (Melbourne).

The *Daily Telegraph* points out that this is the first step in the establishment of an inland system in remote parts of the Continent. Another station is at Camooweal, which connects the landline with the air mail. The Commonwealth operates stations which serve large areas in North Australia, and are a great boon to cattle stations and settlers generally. Previously the mail was delivered every six weeks. The cost of the two stations is £10,000, as compared with £60,000 land-line charges at 2d. per word, with a minimum of 2s. 8d. The private wireless plant at Burnett Downs, a station 171 miles from Camooweal, has proved of great value. The new stations will probably result in a network of private installations, and possibly additional Government stations.

Belgium.—New Cables.—The Belgian Post and Telegraph authorities are shortly to commence the laying of new telephone and telegraph cables between La Panne and Herbesthal, between Brussels and Lille, and between Brussels and Rosendaal.

Brazil.—New Radio Station.—A new high-power naval radio station has been opened on the Ilha do Governador, in the Bay of Rio de Janeiro. It is equipped with Telefunken apparatus and has a normal estimated range of 4,500 miles. Communication is established with naval radio stations in the United States, on the Continent of Europe, and at Panama and Puerto Rico. In addition to regular Government work, the station broadcasts weather reports and time signals.—*Reuter's Trade Service* (Rio de Janeiro).

China.—Japanese Radio Proposal.—In the hope that the interested powers will reach a tentative agreement regarding Chinese wireless questions before the opening of the Tariff Conference, Mr. Matsudaira, the Japanese Ambassador at Washington, has been instructed to enter into conversations with Mr. Kellog, the United States Secretary of State, immediately, lest propagandists should use Japanese-American differences to influence the Conference. Japan proposes that China should control and operate omni-wireless stations, guaranteeing the interested powers property rights. It is understood that China's note regarding wireless has not yet been answered, but Mr. Yoshisawa, the Japanese Minister at Peking, has been instructed to communicate with China unofficially with reference to the proposal, and also to advise her that Japan does not approve of a loan for the purchase of wireless rights. Following the conversations at Washington, the Japanese Ambassadors in London and Paris will be instructed to take up the question. Though China will probably not yet be able to carry out the proposal, Japan thinks that a temporary arrangement will be possible whereby the powers will operate until China is ready.—*Reuter* (Tokio).

Sir Charles Eliot, the British Ambassador, and Baron Shidehara, the Japanese Minister for Foreign Affairs, had a conversation on October 12th, which is stated to have been of a very satisfactory nature with regard to the Chinese wireless question. It is also understood that the Japanese Government is emphasising the importance of the powers being united on their Chinese policy, and that it has instructed the Japanese Charge d'Affaires in London to seek Mr. Austen Chamberlain's co-operation to persuade America that a practical settlement of the wireless question is more important than the insistence on legal rights, which rights Japan is prepared to forgo if others will do the same.—*Reuter* (Tokio).

Italy.—Automatic Telephony.—The last of the Government-owned telephone systems has been transferred to private hands, the purchasers being the Società Esercizo Telefoni, of Naples. It is understood that the company, while making no immediate change of installation, intends to construct suitable premises of its own and to replace gradually the present equipment by automatic switchboards and other modern apparatus. —*Reuter's Trade Service* (Milan).

Italy-Argentina Cable.—Inauguration.—The new direct Italy-Argentina telegraph cable was officially opened for traffic on October 12th at Auzio.

Paraguay.—New Radio Station.—The Government of Paraguay has decided to erect a radio station at Fuerte Olimpo. The Minister of War and Marine, Asuncion, will receive tenders for the supply of materials and tools, the cost of which must not exceed 60,000 Paraguayan paper pesos.—*Reuter's Trade Service* (Asuncion).

The Telephone Service.—New Subscribers.—European telephone returns for the past year, issued by the Post Office, show that the "telephone push" in Great Britain is now having good results. During the period reviewed, the increase in the number of telephones in this country equalled 10 per cent., as compared with Germany's increase of 6 per cent. Germany, however, with 2,385,177 telephones (or one to every 28 inhabitants), still shows a greater "telephone density" than Great Britain, which has 1,264,024 (or one to 34). Sweden has 418,303 (or one to 14), and Denmark 303,754 (or one to 10). America, it may be noted for comparison, had 16,159,550 telephones (an average of one to six), and Canada 1,083,964 (or one to eight). During the year Germany added 142,845 telephones, Great Britain 115,929, Belgium 22,139 (18 per cent. increase), and Denmark and Sweden more than 15,000 each (5½ and 4 per cent. increases respectively). It is estimated that when all the returns are in, the total increase for Europe will be more than 460,000 telephones.

Telegraph Conference.—Possible Rate Increase.—Senatore G. Marconi presided at the dinner given by the foreign wireless companies on the occasion of the eleventh International Telegraph Conference at Paris. *The Times* expects that the Conference will decide to increase the terminal and transit charges for all telegrams. It is understood that the increase will vary from 10 to 30 per cent., the countries belonging to the Telegraph Union being divided into a number of categories, entitling them to a greater or lesser increase according to their financial necessities. The British have steadily opposed any increase, and they have the moral support of the American observers, but they were overruled by the majority of the other countries which emphasised the necessity of an offset to the increased working costs. The increase will apply to Press as well as to ordinary and urgent rate messages.

United States.—Cab Proprietors' Telephone Exchange.—The Telephone Development Association has called the attention of British taxicab proprietors to the fact that the Yellow Cab Co., of Newark, New Jersey, has established a private telephone exchange in which more than twenty girls are employed answering free calls for cabs and trade inquiries. The company has also erected kiosks in various parts of the city from which anyone can order a taxicab without payment of a call fee. Telephone wires from all the cab stations of the company terminate on a private switchboard, which, when operated in conjunction with the public system, gives the company most complete arrangements for dealing efficiently with taxicab business. The principle is much the same as that which is proving so successful at Stockholm.

Venezuela.—Telegraph Service.—According to a report recently issued by the Government Telephone and Telegraph Department, there are now 240 telegraph stations in Venezuela.

Radio Notes.

Latvia.—New Stations.—The Latvian Government's monopoly on the sale of radio apparatus will be discontinued when the new broadcasting stations are opened; they were due to commence service on October 1st.

New Zealand.—Proposed New Stations.—Four new stations are to be erected in New Zealand, says the *Morning Post*, which explains that the promoters of a private company have entered into an agreement with the Government to erect four stations at Auckland, Wellington, Christchurch, and Dunedin, and to maintain an efficient service. It has been agreed that the company shall receive 25s. of the 30s. that the licences will cost.

Proposed New Station.—"5 G.B."—It is understood that the station calling itself 5 G.B., which has recently been heard by listeners, is an experimental station of the British Broadcasting Co. at Chelmsford, using 10 kilowatts and a wavelength of 400-420 metres. The tests are preliminary to any other station that may be erected to serve Essex and S.E. England, at present outside crystal range of any station.

Simultaneous Broadcasting.—Land Line Reorganisation. —The reorganisation of the land-line system for the simultaneous broadcast service will be brought into operation on November 1st, when Leeds will become the pivot controlling all the transmissions relayed between the South and the North, says *The Times*. Hitherto, land-line connections between one broadcast station and another have been operated through London, except for a small intercommunication switchboard at Glasgow for linking all Scottish stations. Separate lines have been used between London and practically all other stations, save in one or two cases, and the quality of transmission has suffered by the use of several hundreds of miles of unnecessary land-lines. From November all stations north of Leeds will be linked up by land-lines to Leeds instead of to London. Between London and Leeds four special lines have been set apart by the Post Office for the use of the B.B.C. Generally, only one will be wanted, but spares are provided for alternative programmes, control purposes, and emergency use. The arrangements at Leeds will be much more automatic than they have been from London. The chief function of Leeds as a pivotal point will be to improve the quality of all items it receives from London before they are passed on. In the near future another pivot will be installed to facilitate simultaneous broadcast arrangements between London and the West Country.

South Africa.—Johannesburg.—The Johannesburg Broadcasting Co.'s station, which works on almost the same wavelength as the London station and on a power of from 1½ to 2 kW, now has about 8,000 licence holders. A licence costs £2 5s., and the station has been in operation a little over a year. The company makes no profit, but functions for the Government.

Wave-length Agreement.—Ships' Interference.—*Reuter* is officially informed that the agreement between the British, Canadian, and United States Governments to prevent the use by ships of wavelengths of 300 and 450 metres when within 250 miles of the coast applies only to the coasts of Canada, Newfoundland, and the United States. There is no such prohibition in the case of ships when within 250 miles of the coasts of the British Isles.

Richard Alexander Chattock.

President of the Institution of Electrical Engineers.

As we mentioned in our issue of June 5th, Mr. R. A. Chattock, city electrical engineer to the Birmingham Corporation, who took up his duties on October 1st as President of the Institution of Electrical Engineers, is the first head of a municipal electricity supply undertaking to occupy that distinguished post. That he will confer additional distinction upon the presidential office cannot be doubted, in view of the honourable position which he has attained in the profession during his 25 years' public service as city electrical engineer, of which all but three years has been spent at Birmingham.

Mr. Chattock was born at Solihull, Birmingham, in 1865, and was educated at University College School, London, whence in 1881 he passed to University College, London, for his technical training, winning the Gilchrist Engineering Scholarship. From 1886 to 1889 he served as pupil in the ironworks of Messrs. John Stewart and Son at Blackwall, London, after which he joined the staff of the Metropolitan Electric Supply Co., Ltd., as junior engineer, in due course becoming engineer in charge of the company's generating station at Amberley Road, Paddington. In 1894 he was appointed chief electrical engineer to the Vestry of St. John, Hampstead, but a year later he assumed charge of the large generating station of the City of London Electric Lighting Co., Ltd., at Bankside. Entering municipal employ in 1900, as city electrical engineer to the Bradford Corporation, Mr. Chattock was appointed to his present post in 1903.



Photo by] **Mr. R. A. Chattock, President I.E.E.** *[Lafayette, Manchester.*

Under his control the Birmingham electricity supply business has undergone an enormous development. The capital expenditure has increased from £588,000 to over £5,700,000, and the output of electrical energy from 3¾ million kWh per annum to 193 million kWh, whilst the revenue has grown from £67,000 to £1,200,000. It is interesting to note that in round numbers the original capital has been multiplied by 10, the revenue by 20, and the output by 50, showing what a vast change in the conditions has been wrought in 22 years. Considerable contributions have been made to the borough rate fund, and at the same time large reserve funds have been built up.

Mr. Chattock was responsible for the design and erection of the Summer Lane power station of 30,000 kW capacity, which was opened in 1906 and was a very notable example of d.c. generation on a large scale. When war broke out, heavy demands for electric power for the production of munitions of war, for which Birmingham was an important centre, rendered it necessary to build and equip a temporary generating station of 10,000 kW capacity, which was satisfactorily accomplished in 1915 in the short time of nine months; in the following year the plant was increased to 22,000 kW capacity, but still the demand grew, and in 1918 the Ministry of Munitions authorised the department to construct the Nechells power station, for the design and erection of which also Mr. Chattock has been responsible. The new station was opened by the Prince of Wales on June 12th, 1923, and is now called Prince's Station, Nechells; it contains three-phase generating plant of 75,000 kW capacity, and contracts have been placed for completing it to its full equipment of 105,000 kW. An illustrated description of the station was given in our issues of May 25th and June 1st, 1923.

Owing to the continued increase in the demand for electricity, Mr. Chattock is now engaged on the plans for another capital station; a site of 1,000 acres has already been purchased, with ample facilities for obtaining coal and water in quantities sufficient to meet all future requirements. He has consistently adhered to the policy of supplying direct current at the consumers' terminals, and for this purpose has adopted the mercury-arc rectifier on an exceptionally large scale, no fewer than 30 small automatic rectifier substations having been installed in the outlying parts of the city during the past three years. Similar apparatus has also been utilised for boosting the pressure on outlying sections of the network, thus avoiding a large outlay on long and heavy d.c. feeders. Recently Mr. Chattock has interested himself in the use of pulverised fuel, and after full investigation he has equipped six of the boilers at the Prince's Station with plant for this purpose, with a view to increased economy.

During the war, busy as he was, Mr. Chattock found time to take part in the formation and equipment of the Corps of Birmingham Electrical Engineer Volunteers, of which he was the honorary colonel. Some hundreds of electrical recruits were trained in this force, and were drafted into the Navy and the Army.

He has also been an active member of the leading electrical engineering institutions, and has been President of the Incorporated Municipal Electrical Association, Vice-president of the Institution of Electrical Engineers, and President of the Birmingham Association of Mechanical Engineers. For the past 34 years Mr. Chattock's working hours have been entirely devoted to the development of the electricity supply industry, and no better testimony to the ability and enterprise by which he is characterised could be found than the efficiency and the enormous expansion of the huge electrical undertaking under his control.

E

Electricity Supply at Halifax.

Recent Extensions at the Generating Station.

Since the installation in October, 1923, at the Halifax Foundry Street electricity works of a 10,000-kW turbo-alternator (Electrical Review, November 2nd, 1923), the rapid growth in the output demanded from the station has resulted in the recent extensions to the plant, which were inaugurated on September 3rd last, the opening ceremony being reported in our issue of September 11th. The extensions consist of a second 10,000-kW turbo-alternator, fig. 1, similar to the one referred to above, and the necessary auxiliary plant and switchgear. The turbo-alternator is of the British Thomson-Houston Co.'s manufacture and generates at 6,600 V, 50 cycles, running at 3,000 r.p.m. It will be recalled that the first set had the distinction at the time of its being installed of being the first of its capacity to run at such a high speed. The turbine is of the Curtis compound impulse type, with nine stages, the first stage having two rows of blades, and the remaining eight stages one row each. Steam is admitted at a gauge pressure of 160 lb. per sq. in. and at 180 deg. F. superheat, and exhausts into a 28-in. vacuum. The blades are made of phosphor bronze and the shaft is designed for a critical speed at 1,000 r.p.m.

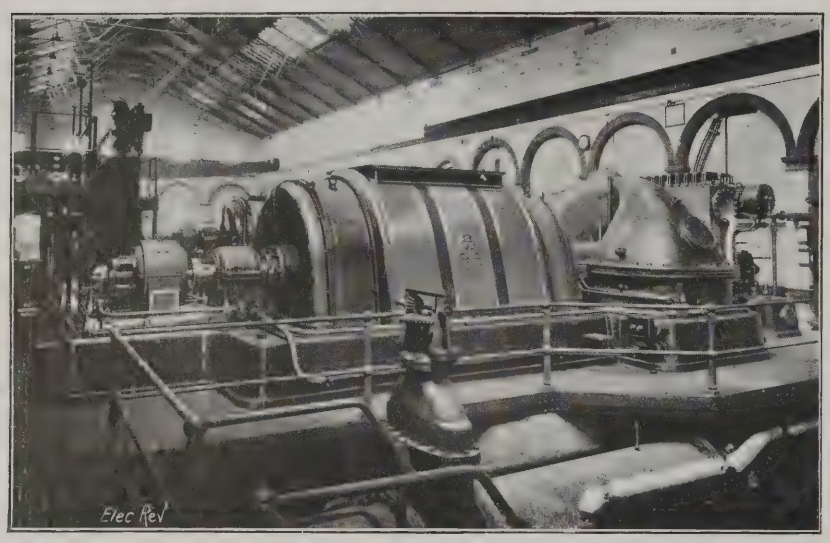


Fig. 1.—New 10,000-kW Turbo-Alternator.

The alternator is totally enclosed, air-cooled, and self-ventilating. In order to facilitate the running of the machine through the critical speed, the alternator outboard bearing is flexible to permit of small play between friction collars, and the radial movement thus allowed, with the resulting work done on the friction collars, completely destroys any tendency of the shaft to whip. A collector ring of steel, fitted with eight brushes, is mounted at each end of the rotor.

The condensing installation was built by Messrs. Worthington-Simpson, Ltd., to the specification prepared by the electrical engineer and manager, Mr. W. M. Rogerson, M.I.E.E. The turbine under full-load conditions exhausts steam at the rate of 125,000 lb. per hour, and the condenser maintains a vacuum equal to 1 lb. absolute pressure by means of specially-designed air extraction pumps. Its 7,300 tubes represent a cooling surface of 23,000 sq. ft.

The centrifugal circulating pump delivers 17,500 gallons of water per minute. The driving motor is of 300 b.h.p. The circulating-water system is interconnected with the other 10,000-kW set and a 6,000-kW set, with the necessary cut-out valves. The steam discharged from the ejectors is condensed in tubular coolers through which the condensed steam from the main condensers is delivered, and all the latent heat from the steam is imparted to the condensate and returned to the boilers.

The switchgear installed in this station was supplied by the British Thomson-Houston Co., Ltd., and is arranged in two distinct banks. The first bank, comprising the generator switches, is connected by two group feeders to the second bank, which contains the switchgear controlling converters and local feeders. By this arrangement local faults of small magnitude are cleared by the circuit breakers of smaller capacity on the feeder bank without disturbing the generator bank. Both banks have duplicate sets of bus-bars, and the h.p. switchgear is of the cellular type. Circulating current protection is provided for the generators, and is used in conjunction with field-suppression equipment. In addition, stand-by overload relays are provided.

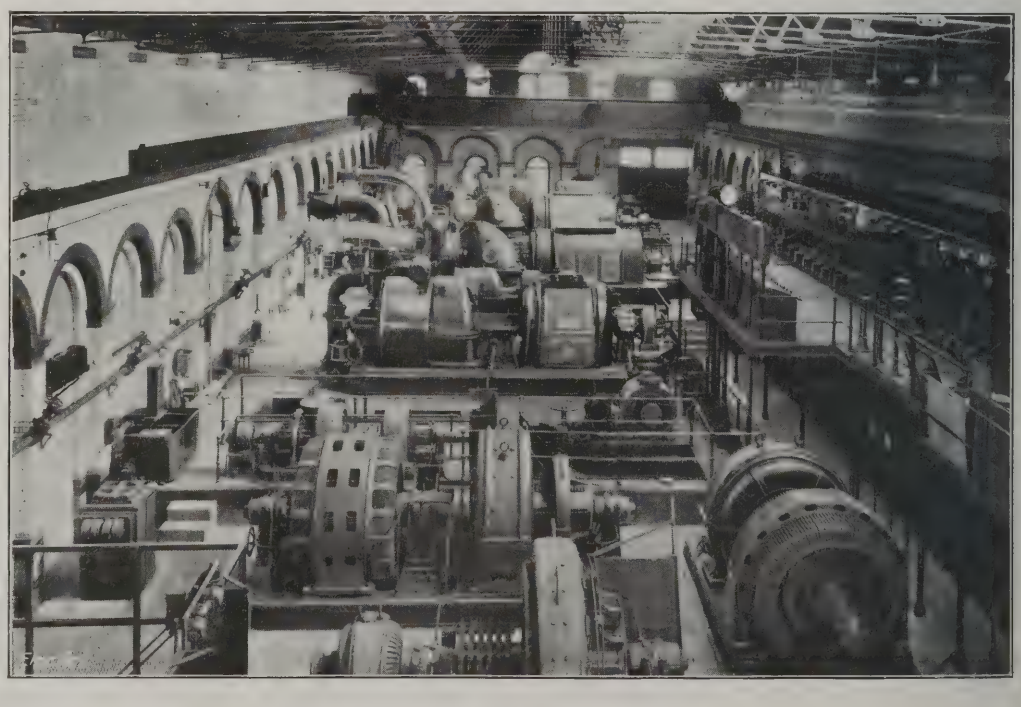


Fig. 2.—Turbo-generator Room at Halifax.

Extensions now being installed comprise two 8,000-kVA feeder circuits on the generator bank for supplying the new sub-station at Highroad Well; they will control the full exchange of power with Huddersfield. The total capacity of the station is now 31,000 kW.

The Supervisory Control of Sub-Stations.

Metropolitan-Vickers Automatic Plant for New Zealand.

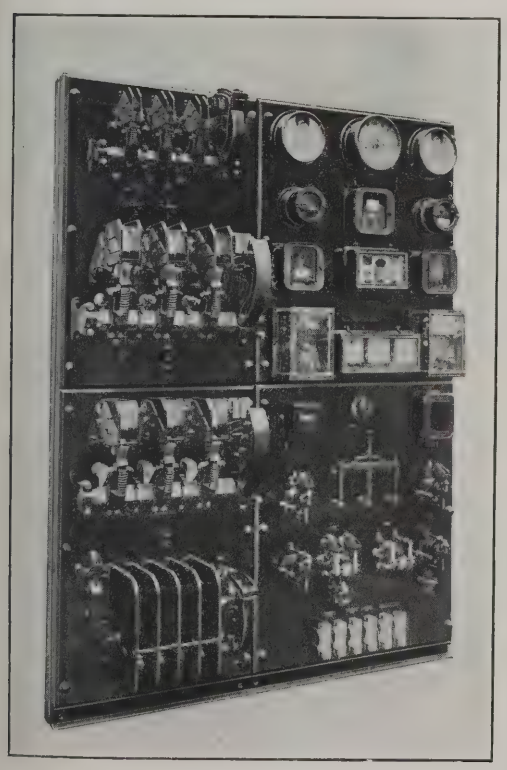
Last week's convincing demonstration of the supervisory control of one of the sets of automatic sub-station equipment which the Metropolitan-Vickers Electrical Co., Ltd., is supplying for the City of Wellington, New Zealand, electricity undertaking is of interest for several reasons. It is the first example of control gear of its kind to be manufactured in this country, and consists of the application of automatic telephone apparatus to the remote control of electrical plant and switchgear. Only three single telephone wires are necessary between the control room and the distant plant, however great the distance, and however many the operations to be performed. Telephone communication can be carried on over the same wires.

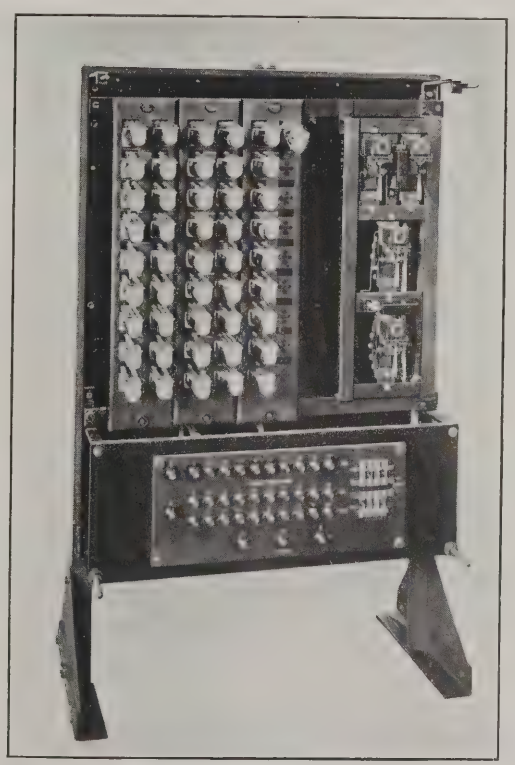
Each of the three sub-stations contains a 750-kW. tap-started rotary converting to 550 volts d.c. When in a residential district, the buildings are constructed sound-proof. Initially there was some doubt about which method of controlling the stations would best suit the local conditions. Accordingly alternative methods were provided for the Newtown traction station (first in commission in the late spring of 1924) either of which can be selected as desired:—Fully automatic, load demand; remote control by two pilot wires; and time switch, in addition to emergency manual control, subsequent operations being entirely automatic. Whichever method of initiative control is used, the starting operations are the same:—(i) The energising of the master contactor completes the control circuit from an auxiliary transformer; (ii) the brushes on the machine are raised, the starting contactor and main oil circuit breaker are closed; (iii) should the machine build up with wrong polarity, a field contactor controlled by a polarised relay corrects it; and (iv) the starting contactor is then opened and the running contactor closed, putting the machine on to full voltage; (v) when the brushes are lowered and the field has been built up, the machine is connected to the d.c. bus-bars through steps of limiting resistances, which are then cut out by shunting contactors if excessive current is not passing.

The protective features provide against the following contingencies:—(*a*) Faulty a.c. supply (low voltage, open or reverse phase); (*b*) excessive a.c. overloads; (*c*) faults (external or *internal to the sub-station) causing unbalanced currents; (*d*) overheated machine and transformer windings due to repeated overloads; (*e*) wrong polarity; (*f*) field failure; (*g*) *overspeed; (*h*) d.c. overloads; (*i*) d.c. reversals; (*j*) overheated limiting resistors; (*k*) *hot bearings; (*l*) *incomplete sequence of starting operations; and (*m*) *earths on machine (flash-overs) on later sets only. In the event of troubles marked * a lock-out relay will shut down the equipment and will prevent it re-starting until hand reset. If the shut-down is due to hot windings or resistors the set will be re-started when sufficiently cool, while the traction feeders are only tripped by the occurrence of faults and not by legitimate overloads, and are automatically restored to service when of a suitable resistance, thereby maintaining the service up to the utmost limit with safety.



Fig. 1.—Supervisory Control Office Desk.





Figs. 2 & 3.—Low-pressure Contactor Panels and Relay Rack in Sub-station.

The Thornton and Karori stations differ from the above-mentioned plant chiefly in that the h.p. gear is of the M.-V. armour-clad type with a.c. motor-operated closing mechanisms on "K.I." oil circuit breakers of 150,000 kVA capacity. The closing mechanism is noiseless in operation, and permits of the use of a small control transformer of approximately 0.5 kVA capacity;

the latter, together with a 3-phase potential transformer, is contained in one tank with h.p. fuses and limiting resistances, and can be withdrawn on wheels without interfering in any way with the remainder of the gear, the live receptacles being automatically shuttered when the tank is pulled forward. Shunt-wound machines with one step of limiting resistances are used instead of level-compounded machines with three steps.

The Karori station is provided with all the methods of control fitted at Newtown, but its a.c. oil circuit breaker and d.c. main and feeder contactors have auxiliary switches so as to permit supervisory control to be added later.

In the case of the Thornton sub-station the supervisory gear has been made by the Automatic Telephone Manufacturing Co., of Liverpool, its arrangement being a joint design. The relays used are identical with those embodied in the automatic telephone exchanges in successful operation in many parts of the world and with those being made for the new G.P.O. London exchanges in course of construction.

The control room equipment comprises a desk with keys for selecting and controlling the desired devices in the sub-station, and indicating lamps to show their condition, together with rotary stepper switches and relays for the transmission and receipt of signals to and from the sub-station. The relays and switches with protective fuses are housed on the left-hand side of the desk (fig. 1). On the sloping top of the desk are the double-way selective keys, each with its four associated lamps, suitably labelled with the names of the devices they control. Each group of lamps consists of two white, one red, and one green. Selective keys are provided (*a*) to start and to shut down the rotary converter, the associated indicators being red for machine a.c. oil circuit breaker closed, and green for the open position. (*b*) To close or open the main d.c. contactor and resistance shunting high-speed circuit breaker. (Provision is made in the sub-station so that, if desired, these contactors will operate automatically, the signals still being sent back.) The associated red and green lamps show whether the main contactor is closed or open. (*c*) To close or open any of the outgoing traction feeders, one key for each feeder with its associated red and green lamps showing whether the corresponding contactor is closed or open. Lamps are provided to indicate if the machine is locked out. Separate from the selective keys is a distinctive operating key, and the purpose of the repeat signal key is to check the indications of the position of all devices indicated, while another stops the bell ringing, which alarm warns the operator at the control office when any device in the sub-station changes its position. A 48-V d.c. supply is necessary for energising the apparatus and indicators.

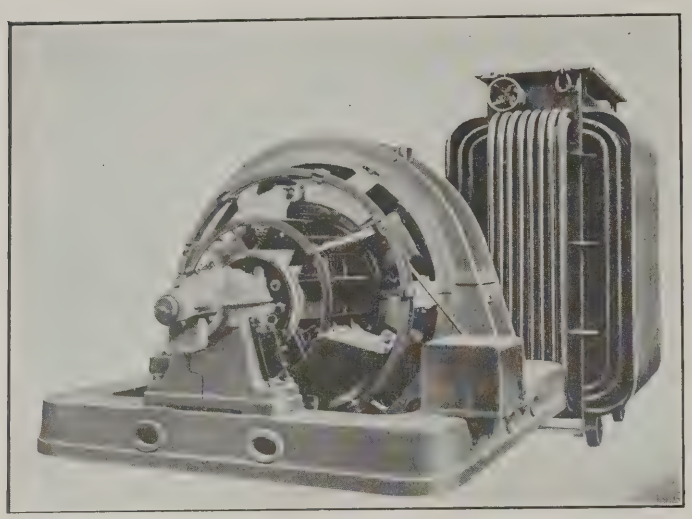


Fig. 4.—825-kVA Transformer and 750-kW Rotary used in Demonstration.

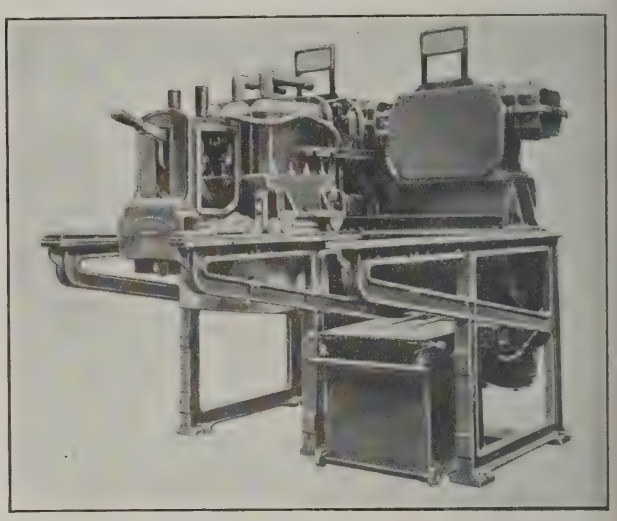


Fig. 6.—High-pressure Switch and Motor-operated Circuit-Breaker, A.C.

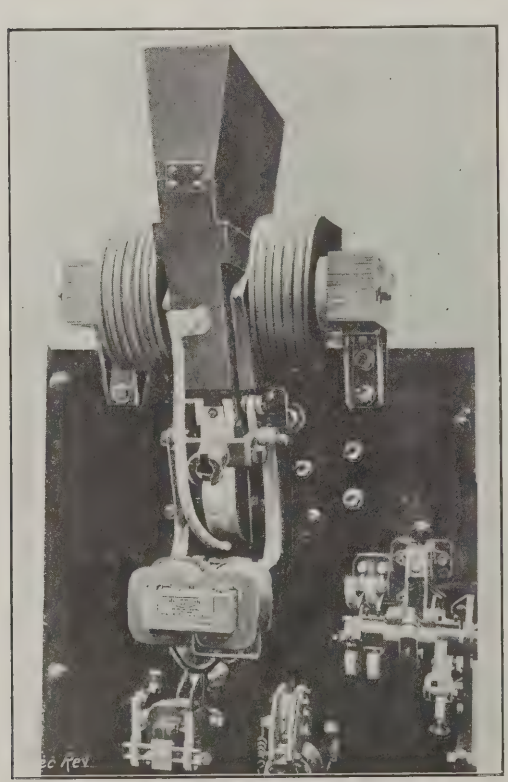


Fig. 5.—High-speed Circuit Breaker, D.C.

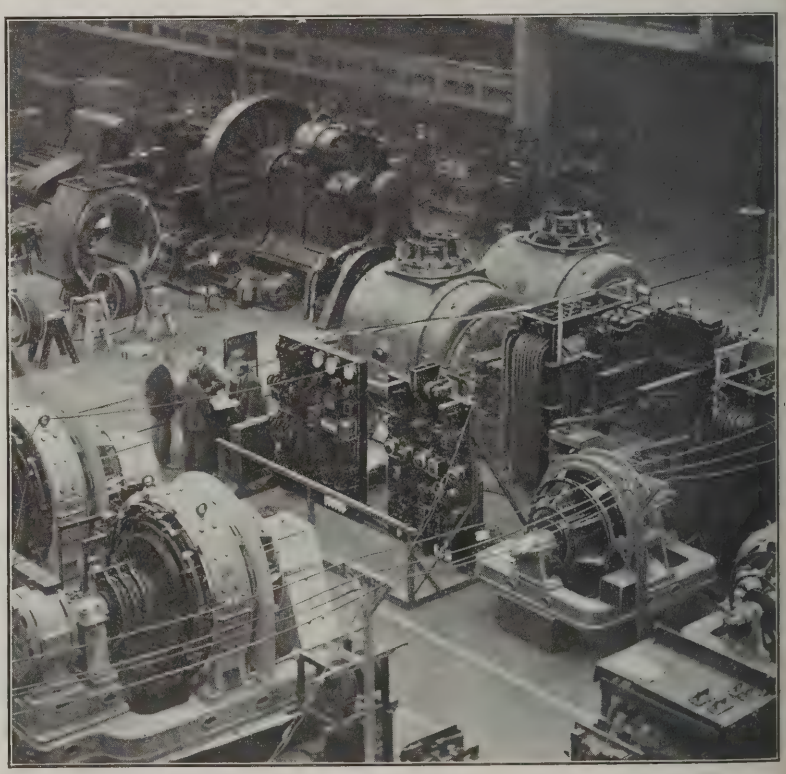


Fig. 7.—Equipment on Test at Trafford Park.

In the sub-station a cabinet contains the necessary relays and stepper switches for receiving signals to select the device to be operated and similar apparatus for the transmission of signals to the control office, whereby the indicating lamps show the position of each device. A Tungar rectifier controlled by a time switch automatically recharges the battery, and there are also interposing relays for linking together the supervisory relays and the devices controlled. Two such relays are required per circuit breaker, one to make the closing-coil circuit and the other the tripping circuit. Each circuit breaker to be indicated is fitted with the necessary auxiliary switches for operating the signal relays.

For convenience of explanation assume the sub-station is shut down; the green lamp corresponding to the "start" selective key will be glowing, indicating the main oil circuit breaker is in the open position. The operator at the control office pushes the "start" key downwards (movement in the upward direction would "close down" if the machine was running). This energises a relay which prevents any other operation signal being sent simultaneously, and also energises a rotary stepper switch having wipers which sends out 25 impulses to the sub-station. The polarity of these impulses is reversed when the stepper switch passes over a contact connected to the particular selective key.

At the sub-station a relay picks up the impulses and starts off two rotary stepper switches (A and B) each with three wipers. When the reversed impulse is received one stepper switch (B) stops, one (A) continues to rotate, and a third stepper switch (C), also with three wipers, starts off. At the end of the 25 impulses these come to a standstill, (A) being then on its 25th contact. One set of contacts on (B) and (C) are connected oppositely together, so that, if conditions are correct, the difference between the impulses taken by (B) and (C) complete a circuit, whereby the sub-station battery sends a current along the pilot wires to operate a relay at the control office to cause the white lamp, corresponding to the selective key which was operated, to glow and show that the device to be operated has been correctly selected. The time taken is about three seconds from moving the selective key to receiving the white lamp signal.

The operating pilot wire is also now suitably connected so that the operator, by depressing the special operating key, completes a circuit energising a pilot relay which, by means of an interposing relay, immediately energises the master contactor of the automatic equipment. The usual sequence of starting operations will now take place, and the supervisory relays will reset themselves to normal when the selective key is returned to its normal position.

When the oil circuit breaker of the machine closes, an auxiliary switch completes the circuit of a relay forming part of the supervisory equipment, which brings into action a stepper switch (D), having four wipers, and also causes the pilot wires to be changed from the impulse-receiving to the impulse-transmitting apparatus. Alternative contacts of one of the wipers is associated with an auxiliary switch on each circuit breaker to be indicated. Impulses of different polarity are sent by the switch (D) to the receiving relays at the control office. The first impulse sent is positive, but the following ones are negative except when the wiper crosses a contact associated with a closed circuit breaker, in which case the impulse is positive.

At the control office three relays are provided, one of which responds to all signal impulses received, another to positive, and one to negative impulses only. When the first (positive) impulse is received at the control office the pilot wires are disconnected from the impulse-sending and connected to the impulse-receiving relays. The relay responding to all impulses causes a rotary stepper switch (E) with three wipers to step in unison with the impulse sender switch (D). Should a positive impulse be received when one of the wipers of (E) is on contact, a relay causes the red lamp to show that its corresponding circuit breaker in the sub-station is closed. Similarly, negative impulses result in the corresponding green lamps being illuminated, showing circuit breakers in the open position.

(To be concluded.)

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—Sydney.—November 30th. Public Works Department. Metering equipment for the Barren Jack hydro-electric development scheme and the Kiama-Nowra transmission line.*

Melbourne.—December 1st. Postmaster-General's Department. Motor-generator sets for charging secondary batteries. (October 2nd.)

December 14th. Electricity Commission of Victoria. 22,000-V insulators. (See this issue.)

Sydney.—December 16th. New South Wales Government Railways and Tramways. 10 single-phase, 1,800-kVA transformers.*

Belfast. — November 2nd. Electricity Department. Motor-generator and transformer. (October 9th.)

Belgium.—Municipal authorities of Ghent. Four or eight electric cranes for the northern quay of the Central Dock. Particulars (Cahier des Charges No. 1,573) from Hotel de Ville.

November 4th. Société Nationale des Chemins de Fer Vicinaux, 14, Rue de la Science, Brussels. Overhead equipment in connection with the electrification of the Binche-Leval-Trahegnies local railway. Particulars for 5 fr. from Bureaux des Services Electriques, 48, Rue Montoyer, Brussels.

Bristol.—October 19th. Port of Bristol Authority. Two 2-ton electric capstans. Specification from the General Manager and Secretary, 19, Queen Square, Bristol.

Dartford.—October 17th. Electricity Works. Small steam coal for 6 or 12 months. (October 9th.)

Dublin.—Electricity Department. Transformers for one year. City Electrical Engineer, Fleet Street, Dublin.

Dublin Borough Commissioners. Electric wiring of 416 houses at Croydon Park. City Architect, Exchange Buildings, Lord Edward Street, Dublin.

Egypt.—Cairo.—December 1st. Ministry of Public Works. Two pumping units and accessories for the Mex pumping station.*

Glasgow.—October 19th. Parish Council and District Board of Control. Stores, including electrical fittings, for six months. Forms of tender from Mr. M. A. Reynard, inspector and clerk, 266, George Street.

Kilmarnock.—Electric lighting work in connection with the Corporation Riccarton housing scheme. Particulars from Mr. Wm. Dunbar, burgh surveyor.

Leeds.—October 20th. Tramway Department. 150 double-deck top-covered tramcars complete, or, alternatively, 150 tramcar bodies, 190 tramcar trucks, including wheels and axles, 190 tramcar electrical equipments. (October 2nd.)

London.—H.M. Office of Works.—November 3rd. Installation of cables, switchboards, &c., and wiring at the Ministry of Pensions Hospital, Orpington. (See this issue.)

November 4th. Electric wiring in conduit at Montagu House. (See this issue.)

Metropolitan Asylums Board. November 4th. Installation of two new hydro extractors at the Western Fever Hospital, Seagrave Road, S.W.; installation of hot-water heating apparatus at St. Anne's Home, Herne Bay; and installation of automatic telephones at the Downs Hospital for Children, Sutton, Surrey. (See this issue.)

Paddington.—November 3rd. Great Western Railway. Telegraph instruments, electrical apparatus, &c., telegraph ironwork and tools, telegraph drysalterers. November 20th. Electrical wires and cables. (See this issue.)

Manchester. — November 6th. Electricity Committee. One 500-kW fully automatic, motor or rotary converter, transformers and switchgear, &c. Three 500-kW fully automatic, motor or rotary converters or mercury-vapour rectifiers, transformers, switchgear, &c. (See this issue.)

Newport (Mon.).—October 28th. Electricity Department. Electrically-driven pumps, pipework, valves, &c.; switchgear; water-screening plant. (October 2nd.)

New Zealand.—Hastings.—February 1st. Borough Council. Diesel engine and a.c. generator.*

Sheffield.—October 20th. Tramways and Motor Department. 50 double-deck vestibule tramcars. (October 9th.)

Sleaford. — October 20th. Electricity Department. Cables, &c. (October 9th.)

Southampton.—November 2nd. Harbour Board. Alterations to the electrical equipment of 12 cranes, supply of cables, disconnecting boxes, switchgear. Specifications from Mr. W. G. Gubbins, clerk, Harbour Offices.

Southend-on-Sea.—Light Railways and Electricity Department. House-service meters and demand indicators. (October 2nd.)

Uruguay. — Montevideo.—December 22nd. State Electricity Supply Works. 200,000 metres r.i. wires and cables.
December 28th. 1,060,000 metres of special cable for outside use.
November 27th. H. and l.p. cables and accessories.*
January 7th. 26,000 kilograms of copper wires and cables.*
January 8th. Black and G.I. wire, &c.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—Sydney.—Electricity Supply Committee. Recommended:—
Gasfilled lamps (£4,594).—Australian General Electric Co., Ltd.
H.p. and l.p. cables.—Siemens Bros. & Co., Ltd. (£91,718); Enfield Cable Works (Aust.), Ltd. (£35,445).
Overload relays (£1,558), leakage relays (£494), reverse-power relays (£1,681).—Metropolitan-Vickers Electrical Co., Ltd.

Postmaster-General's Department.
Accumulator plates (£1,407).—Tudor Accumulator Co., Ltd.

Adelaide.—Postmaster-General's Department.
Telephone switchboard material at the Central, Unley, Norwood, and Hyde telephone exchanges (£4,029).—Western Electric Co. (Aust.), Ltd.
—*TENDERS.*

Barrow.—Electricity Committee. Recommended:—
E.h.p. transmission lines in connection with the supply to Grange, &c. (£16,903).—Johnson & Phillips, Ltd.

Bradford.—Tramways Committee. Accepted:—
20 tons track brake blocks (£190) and 30 tons Peckham hand-brake shoes (£300).—Cole, Marchent & Morley, Ltd.
24 tramcar split-gear wheels (£164).—Alfred Wiseman, Ltd.
100 steel tires for tramcar wheels (£300).—John Brown & Co., Ltd.

Bournemouth.—Town Council. Accepted:—
Reconstruction of the Poole (tramway) line (£19,617).—Alex. Stark and Sons, Ltd.
Tramway rails (£6,390).—Cargo Fleet Iron Co.
20 car sets of electrical equipment (£11,680); 20 B.W. magnetic and track brakes (£5,900); spares (£1,840).—Metropolitan-Vickers Electrical Co., Ltd.
20 car bodies (£27,200); 20 pairs of Maximum traction trucks (£5,700).—Brush Electrical Engineering Co., Ltd.

Chester.—Board of Guardians. Accepted:—
Electrical goods for the Institution.—Commercial Electrical Co.

Colchester.—
Electric lighting installation at Wolterton Hall.—Truslove & Co.

Edlington.—Rural Council. Accepted:—
Wiring houses for electric light (£264).—Building & Colliery Supply Co., Ltd.

Glasgow.—Electricity Committee. Recommended:—
Two 400-kVA transformers for sub-stations (£1,014).—Metropolitan-Vickers Electrical Co., Ltd. Two ditto, ditto (£1,014).—British Electric Transformer Co., Ltd.

Hastings.—Town Council. Accepted:—
Cable (£7,565).—W. T. Glover & Co., Ltd.

Imatra.—It is reported that Brown, Boveri & Co., of Mannheim, have secured, in international competition, an order from the Finnish Government for the supply of high-pressure equipment both for the Imatra hydro-electric works and for six transformer stations. The value of the order is put at £150,000.

London.—London County Council.—Education Committee. Accepted:—
Wiring and fittings for electric lighting at the Paddington and Maida Vale High School (£450).—Star Electrical Co., Ltd.

Manchester.—Paving, &c., Committee. Accepted:—
Re-insulating main cable in connection with penstocks in Essex Street, Old Trafford.—Lancaster & Bowen, Ltd.

Tramways Committee. Accepted:—
Battery-charging equipment.—Lancashire Dynamo & Motor Co., Ltd.
One b.h.p. motor, &c.—Veritys, Ltd.

Education Committee.
Electric lighting installations, Harpurhey High School and Queen Street Central School.—J. A. Somerset & Co.

Newcastle-on-Tyne.—The daily Press states that the City Council has accepted the tender of the United States Steel Products Co. for a tramway junction, the offer being 25 to 30 per cent. lower than any other.

Richmond-on-Thames.—Board of Guardians. Accepted:
Installing electric light at the Grove Road Institution (£609).—Richmond Electric Light and Power Co., Ltd.

Sheffield.—Electric Supply Committee. Accepted:—
Transformers (£2,052).—British Electric Transformer Co., Ltd.

Weymouth.—Electricity Committee. Recommended:—
510 yd. of cable (£228).—Johnson & Phillips, Ltd.

Winchester.—Town Council. Accepted:—
One 1,250-kW geared turbo-generating set (£5,435); condensing plant, with a condenser of 2,450 sq. ft. cooling surface (£2,467); contingencies (£198).—British Thomson-Houston Co., Ltd.

Forthcoming Events.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, October 17th. At the South Wales Institute of Engineers, Cardiff. At 6 p.m. Paper on the "Transmission of Power by Leather Belting," by Mr. T. Cliff Brown.

Electrical Power Engineers' Association (Southern Division).—Saturday, October 17th. At the Hotel Cecil, Strand, W.C. At 5.30 for 6 p.m. Annual dinner.

Batti-Wallahs' Society.—Wednesday, October 21st. At the Hotel Cecil. Luncheon. Speaker, Sir Hugo Hirst, Bart.

Institution of Electrical Engineers.—Thursday, October 22nd. At the Institution, Victoria Embankment, W.C. At 6 p.m. Presidential address by Mr. R. A. Chattock.

(South-Midland Centre).—Wednesday, October 21st. At the Grand Hotel, Birmingham. At 6.45 p.m. Inaugural address by the Chairman, Mr. F. J. Moffett.

(Dundee Sub-Centre).—Thursday, October 22nd. At the University College, Dundee. At 7.30 p.m. Address by the Chairman, Mr. J. S. Thomson.

(Sheffield Sub-Centre).—Wednesday, October 21st. At the Royal Victoria Hotel, Sheffield. At 7.30 p.m. Address by the chairman, Mr. W. F. Mylan, and smoking concert.

Junior Institution of Engineers.—Friday, October 23rd. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "The Construction and Laying of Reinforced Concrete Pipes," by Mr. H. S. Brown.

(North-Western Section).—Monday, October 19th. At the Geographical Society's Room, 16, St. Mary's Parsonage, Manchester. Lecturette, "Engineering Troubles," by Mr. A. N. Haworth.

Birmingham Electric Club.—Friday, October 23rd. At the Grand Hotel, Colmore Row. From 7 p.m. to 2 a.m. Ladies' evening. Ball and whist drive.

Physical Society of London.—Friday, October 23rd. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary scientific meeting.

Engineers' Club (London).—Friday, October 23rd. At the Savoy Hotel, Strand, W.C. Annual dinner.

Institution of Mechanical Engineers.—Friday, October 23rd. At the Institution, Storey's Gate, S.W. At 6 p.m. Presidential address by Sir Vincent L. Raven, K.B.E.

Notes.

Sir Adam Beck's Successors.—Writing with reference to the death of Sir Adam Beck and the consequent new appointments to the Hydro-Electric Power Commission of Ontario, our Canadian correspondent says:—"At the time of Sir Adam's death there was only one other Commissioner, the Hon. J. R. Cooke, serving on the Hydro-Electric Power Commission, although the normal number of Commissioners is three. Since that event the Ontario Government has appointed two Commissioners, bringing the total to three again; these are C. A. Magrath and C. A. Maguire, the former being chairman. The choice of Mr. Magrath was undoubtedly made on account of his intimate knowledge of problems connected with the development of the St. Lawrence river, and few men in Canada can know this subject as he does, for he has been the chairman of the Canadian Section of the International Joint Commission since 1911, and has not yet relinquished that post. During this period this Commission has had referred to it by the Governments of the United States and Canada many problems relating to transportation and water power development on the international waters separating the two countries, including those of the Niagara and St. Lawrence rivers, as well as of the Great Lakes. The new chairman and the Hon. J. R. Cooke are both, it is understood, men who are interested in the eastern section of the province, and no doubt this section will receive somewhat more attention in the future than it has done in the past, although it was perfectly natural that the needs of South-Western Ontario should have been taken care of first, because of early hydro-electric development at Niagara Falls and on account of the greater density of population in that part of the province. Mr. Maguire, the third Commissioner, has for several years taken an active interest in the work of the Hydro-Electric Power Commission of Ontario, and has fought for the cause of public ownership on many occasions, and in 1922 and 1923 he was Mayor of Toronto. The new appointments have been very generally approved in all parts of Ontario."

The Batti-Wallahs.—The Batti-Wallahs' Society opens the new session with a luncheon at the Hotel Cecil on Wednesday's October 21st. Sir Hugo Hirst, Bart., will speak on questions of industrial interest.

The Electrical Association for Women.—The above Association has received an invitation from the E.L.M.A. Lighting Service Bureau (15, Savoy Street, Strand, W.C.) to a lecture and discussion on "Home Lighting," by Miss Florence Hodge, on October 20th, at 3.30 p.m. The main lines of the lecture will be: Light from the point of view of health, comfort, and beauty. An invitation has also been received from Mr. Percy Best to visit a special display of electrical apparatus at Messrs. Shoolbreds (Tottenham Court Road, W.) on November 3rd, at 3.30 p.m. A lecture on "The Artistic Value of Electricity in the Home" will be given. In response to a number of requests from those employed in the electrical industry, domestic science teachers and lecturers, a series of three lectures is being arranged, giving a brief review of the electrical industry, its economic features, meaning and purpose, with simple explanations of electrical phraseology, &c. It is proposed to hold these lectures in the London centre.

Electricity Supply at Stoke-on-Trent.—Hanley Extensions.—Yesterday an addition to the plant of a Metropolitan-Vickers 6,000-kW turbo-generator, with four Stirling boilers and two Davenport cooling towers, was to be officially inaugurated. Particulars will be given in a later issue.

Scientific and Industrial Research.—The report of the Committee of the Privy Council for Scientific and Industrial Research for the year 1924-25 has been published by the Stationery Office (Cmd. 2491, price 3s. net). It will be reviewed in our next issue.

Electric Signals for Road Traffic Regulation.—For many years the state of traffic in Paris was little less than a by-word; there was very little regulation, and taxi drivers went where they liked, how they liked. Some years ago some members of the Paris police were sent over here to study London methods, and things gradually got better, until at present those who were pupils have in some ways improved on their former teachers. In order to aid traffic control illuminated signals have been put up on independent pillars, or have been attached to existing lamp standards. Perhaps the point in Paris with the heaviest traffic is where the Avenue de l'Opéra with the Rue de la Paix and the Rue 4 Septembre meets the Grands Boulevards.

At this crossing a number of circular signal lanterns with top shades have been placed on lamp-post islands, facing towards the oncoming traffic, with a word indicating "Stop" in white letters on a red ground. These lamps are fixed at a height sufficient to enable them to be seen by drivers some little distance away. When traffic is to be held up from one quarter the current is switched on to the lamp, and a red light is shown which aids the policeman on point duty. When the road is about to be made clear an electric bell is rung giving a warning to drivers to stand by, and the lamp



Traffic Control Signal in Paris.

is switched off, another lamp or group of lamps being switched on to block cross routes. At the point in question the lamps are controlled at a central switch box on the kerb in front of the stairs leading down to the underground railway, and a traffic director can therefore control the traffic to and from the seven converging roads. There are apparently repeaters further back which can be switched on when required.

A great improvement also has been made by the arrangement of one-way streets, some quite important thoroughfares being arranged in this way; for instance, the street from the Opera Square in question towards St. Lazare Station. The improvement in general traffic must easily make up for having to go beyond and round through a cross street and back to the point required.

To indicate unidirectional streets there are red disks in minor streets illuminated at night by neighbouring existing street lamps, and in a number of important streets there are standards each with a translucent, semi-circumferential sign, with white letters on a red ground, indicating that the direction facing the indicator is forbidden to traffic. Attention is further drawn to the sign by a flashing red signal lamp placed above the sign, which by the flashes tends to catch the eye of the motor driver.

The Ministry of Transport has investigated this system of lamp signals, which is now used at a number of points in Paris, and is about to carry out experiments in London on similar lines.

Fatalities.—A verdict of "Death by misadventure" was returned at an inquest at Scunthorpe, Lincs., on October 7th, into the death of Walter Bates (27), floor layer, who was killed in the new Crosby Parish Church which was consecrated recently. Bates was working in the church and took hold of a temporary lamp fitting, receiving a shock. The patent jointless floor of sawdust and certain acids made a good conductor, and the man's damp clothing and boots combined to bring about the shock. In returning the verdict the jury added that no blame could be attached to anyone.

The circumstances of the death of Mr. Victor John Scott (33), electrician, employed by Messrs. Geo. Hargreaves & Co., at Calder Pit, Altham, Lancs., whose body was recovered from a lodge, were investigated by the coroner on October 9th. The latter returned a verdict that deceased walked into the lodge by mistake, and thus met his death by drowning accidentally.

Manchester Electro-Harmonic Society.—To-night, Friday, at the Albion Hotel, Piccadilly, Manchester, the seventh season of the Manchester Electro-Harmonic Society will be opened with the first of a series of six monthly concerts. Mr. S. L. Pearce has been compelled to relinquish the presidency, owing to his recent appointment as an Electricity Commissioner and his removal to London. His influence and support have been highly appreciated. Mr. J. A. Robertson, M.I.E.E., is succeeding Mr. Pearce as president. We understand that the prospects for a highly successful season are very bright. The Society was inaugurated to provide an opportunity for those employed in all sections of the electrical industry to meet together for entertainment and social intercourse during the winter months. The President and Committee, therefore, extend a hearty invitation to members of all sections of the industry within easy access of the meeting place, to become members. They also extend a hearty invitation to representatives of electrical companies from other towns who may be visiting Manchester on the dates of the Society's meetings, which are as follow:—1925—October 16th, November 20th, December 18th; 1926—January 15th, February 19th, March 19th. The presentation of a trade card will be sufficient introduction, and no charge is made for admission. The membership is steadily increasing. Mr. W. J. Smith has again consented to act as hon. musical director, and the splendid services rendered in this capacity in the past are a guarantee of the excellence of future programmes. For to-night's concert the artistes will be:—Soprano, Madame Sophie Thomson de Konshen; contralto, Miss May Carrington; baritone, Mr. S. Hutchins; entertainer, Mr. Livingston Eccles; pianist and accompanist, Mr. Granville Hill. Correspondence relating to membership in, or contemplated visits to, the Society should be addressed to the hon. secretary, Mr. C. E. Leak, 196, Deansgate, Manchester, or to the assistant hon. secretary, Mr. W. Kirkham, 14, Ellesmere Road, Chorlton-cum-Hardy. Subscriptions for the season, now due, should be sent to the hon. treasurer, Mr. H. Marlor, the Manchester Corporation Electricity Department, Town Hall, Manchester.

Faraday House Old Students' Association.—The seventeenth annual dinner of the Association will be held at the Piccadilly Hotel, on Friday, November 6th. Mr. H. W. H. Richards, M.I.E.E., electrical engineer to the London and North-Eastern Railway, President of the Association, will be in the chair. Members of the Association are reminded that they may introduce guests, who need not necessarily be Faradians. A musical entertainment will, as usual, follow the dinner, and early application for tickets (price 12s. 6d. each) should be made to Mr. H. W. Fairman, Faraday House, Southampton Row, London, W.C.1.

Electricity Supply in Fulham.—Inauguration of Extensions.—The new extension at the Townmead Road generating station of the Metropolitan Borough of Fulham was opened on Tuesday last by the Mayoress of Fulham, Mrs. E. H. Pritchard, in the presence of a large and representative gathering. The total capacity of the station is now just over 18,000 kW. The new plant comprises two turbo-alternators rated at 6,000 kW at 0.8 p.f., 6,600 volts, 50 cycles; three boilers, each evaporating 40,000 lb. per hour at 275 lb. per sq. in. with a total temperature of 700 deg. F. at the turbine stop valve; Scott-connected transformers; ironclad switchgear; and all the necessary auxiliaries, including mechanical equipment for the delivery of coal and removal of ashes.

Those present at the inaugural function afterwards attended a luncheon in the Fulham Town Hall, at the invitation of the chairman and directors of Messrs. Vickers, Ltd., the sole contractors for the extensions. The chairman at this function was Sir Vincent Caillard, D.L., J.P., who, in proposing the toast of the Borough of Fulham, coupled with the Electricity and Lighting Departments, paid tribute to the many advantages offered by the borough, including that of a progressive policy with regard to electricity supply. Fulham was fortunate in having so excellent a site for its electricity undertaking, with an adequate supply of condensing water, cheap transport facilities for coal, and room for easy and economical extensions as required. In replying to this toast, Councillor D. S. Van den Bergh, chairman of the Electricity Committee, said that the policy in Fulham had been to supply electricity at the lowest possible price consistent with the economical and efficient running of the power station. During the past three years no less than £14,000 had been handed over for the relief of rates in the borough. The cost of electricity for lighting had been reduced by 1½d. per unit, and for power by ½d. per unit, and, with the increased production now possible, it was hoped that the Townmead Road plant would become the cheapest public supply station in London. In placing the order for the present extensions with Messrs. Vickers, the Committee had been influenced by the fact that

the firm's organisation was such that it could undertake the whole contract. British labour and British material had been used throughout, local unemployed had been used wherever possible for work on the site, and the Committee felt entirely justified in having given the contract to a British firm, notwithstanding the lower tenders received from abroad.

Mr. Arthur J. Fuller, M.I.E.E., borough consulting and electrical engineer, also spoke in reply, and gave interesting figures concerning the rapid growth of the undertaking. On account of its admirable site and the efficiency of the works, he said, the Fulham generating station might eventually take an active part in the development of electricity supply far beyond the limits of the borough. The amount of money spent on installing electric lighting, &c., in Fulham averaged about £20,000 per annum, and during the past 18 months 600 small properties had been connected, the average rental of which would not exceed 15s. per week. There could be no doubt that further extensions would be required in the near future. A point of vital importance in the extensions just completed had been the fact that Messrs. Vickers had got the first machine running in six months from the date of signing the contract, notwithstanding the delay occasioned by the building strike and other labour troubles. But for this record performance, it would not have been possible to meet the demand on the station last winter.

The toast of "The Contractors" was proposed by Councillor E. R. Armfield, J.P., vice-chairman of the Electricity Committee, and in his reply Sir Philip Nash, K.C.M.G., C.B., spoke of the advantages accruing from the vast resources of the companies associated in the Vickers group. Last year his own company alone had supplied machinery and equipment to 20 different nations, and it was the experience obtained in this way which made it possible for a single concern to deal with such a comprehensive scheme as the Fulham extension. The health of the Chairman was proposed by the Mayor of Fulham, Councillor E. H. Pritchard, B.A., J.P., and a kinematograph display was then given to demonstrate the progress of work on the extensions and the varied nature of the equipment needed to build and operate a modern power station.

"Reco" Batteries.—Correction.—It appears that our recent remarks regarding the Radio Equipment Co.'s batteries have been taken to imply that these batteries are only suitable for d.c. supply. We are asked to point out that both the high- and low-pressure batteries of this type can be supplied for use on a.c. as well as d.c. circuits.

Appointments Vacant.—Assistant power station chemist (250 taels per month; tael=3s.) for the Shanghai Municipal Council Electricity Department. Two junior charge engineers for the City and County of Bristol Electricity Department. Assistant mains engineer for the Borough of Portsmouth Electricity Department. Switchboard attendant, for Newport Corporation Electricity Department. Meter mechanic, for Rawtenstall Corporation Electricity Department. (See our advertisement pages to-day.)

The "Public Address" System.—The Western Electric "Public Address" system of loud speakers has been installed by Mr. E. J. Allan, for the Corporation, in the Caird Hall at Dundee. On being tested by members of the Town Council the system was described as very satisfactory.

Institution Notes.

Institution of Electrical Engineers.—Midland Sub-Centre.—The Midland Sub-Centre held its opening meeting at Loughborough, when Mr. B. Adair M. Royce, chairman, gave an address on "Energy." Starting from the dictum that energy was the basis of life, the lecturer went on to indicate the sun as the primary source of all energy—the mechanical energy in the rotation of the earth, the heat energy in the interior of the earth, and radio-active energy. If it were possible to increase the length of the day by five minutes, he said, by decreasing the speed of the rotation of the earth, the stored energy released would amount to 1,000 million h.p. for 70,000 years. We made comparatively inefficient use of the energy that we could control. In a modern medium-sized electricity generating station we only got 15 per cent. of the heat of the coal as electrical energy and threw away 61.6 per cent. of this heat in the condensing water. Of 249 million tons of coal raised in Great Britain in 1922, only 2.7 per cent. was used in electrical generating stations, while domestic fuel accounted for 15.2 per cent., probably the most inefficient way of using coal. The figures for the electricity used in 1922-23 showed that 80 per cent. of the population used under 100 kWh per head, and only 1.1 per cent. used 300 or over. In 1920 the figures for the United States were 176 kWh per head, against our 60, and about the same ratio existed to-day. Comparing the efficiency of the human body with generating stations, he said the useful efficiency of the body was about 10 per cent., nine-tenths of the energy being used to maintain the body heat. The average available energy per day was only about 340 foot-tons, or just over a quarter of a kWh, costing about three-halfpence at the Loughborough lighting rate. It was more efficient to buy energy through a meter for every possible purpose in life than to use muscular energy. Mr. W. Pearson presided, and the annual report presented by Mr. J. F. Driver, the hon. secretary, showed that the membership had increased from 110 in 1920 to 321.

Association of Mining Electrical Engineers (London Branch).—The following is the programme of London meetings for the new session:—November 10th, 1925: Presidential address, by J. W. Gibson. December 8th: "Mining in Other Countries," by H. M. Morgans. January 12th, 1926: "Rescue Apparatus for Mines, including Demonstration of Certain Apparatus," by Siebe Gorman, Ltd. February 9th: "Mining Signalling Apparatus and Telephones," by O. D. Kennedy. March 13th: Visit to Chislett Colliery.—"Some Notes on the Electrical Plant at Chislett Colliery," by C. Dawson. April 13th: "Coal Screening, Crushing, Blending and Conveying Apparatus," by F. H. F. Hampton. The meetings will be held at the Engineers' Club, Coventry Street, W.1, at 6.30 p.m.

The Physical Society of London and The Optical Society.—Annual Exhibition.—The Councils of the above Societies have decided to extend the scope of the Exhibition of Electrical, Optical and other Physical Apparatus (January 5th, 6th and 7th, 1926) by including, in addition to the usual display by instrument makers, the following new classes of exhibits:—(*a*) Exhibits illustrating the results of recent physical research and improvements in laboratory practice. (*b*) Selected examples of effective lecture experiments. (*c*) Repetitions of famous historical experiments in physics. Accommodation for these will be provided in a part of the Imperial College distinct from that devoted to the trade exhibits, and a section of the catalogue will be allotted to them. No charge will be made for space or catalogue entries in the new classes, and the facilities of the Imperial College will be at the disposal of exhibitors. The object in view in inviting exhibits of classes (*a*) and (*b*) is to afford to teachers and research workers an opportunity for interchanging ideas and disseminating information on matters relating to their work in practical physics. The exhibits in class (*c*) will be of interest not only to the scientific worker, but to the general public, who will have an opportunity on the third day of attending the exhibition. Offers giving preliminary particulars should be addressed to the secretary of the Physical Society at the Imperial College of Science, South Kensington, as early as possible, and not later than November 16th.

Diesel Engine Users' Association.—Scottish Shale Oil.—A considerable amount of interest was taken in the paper on "The Scottish Shale Oil Industry," which was read by Mr. Edwin M. Bailey at the October meeting of the Association. The author pointed out that as the cost of mining and retorting the shale amounted to about 80 per cent. of the total cost of manufacture of the marketable products, in the Scottish industry at present, it was obvious that cheap shale and cheap retorting might be very important factors in the creation and survival of the new oil industry. In the discussion several speakers referred to the possibility of obtaining supplies of liquid fuel from shale deposits or coal in this country, and to the importance of doing everything possible to establish such a home-industry instead of remaining almost entirely dependent upon foreign imports of petroleum products.

Institution of Engineering Inspection.—At the meeting of the Institution to be held at the Royal Society of Arts, John Street, Adelphi, W.C., on Friday, November 13th, a paper will be read by Mr. W. H. Hatfield on "Modern Developments in Steel Resistant to Corrosion."

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

After 35 years' service in Liverpool and Manchester with the General Electric Co., Ltd., Mr. Fred Crawford, the Liverpool manager, has been presented with a gold cigarette case by the directors, and an illuminated address by his colleagues. The Liverpool staff gave Mrs. Crawford a rose bowl. The presentations were made at a dinner at the Adelphi Hotel, when Mr. J. H. Farthing, the northern district manager, took the chair.

Mr. W. Walker, managing director of Messrs. Baxendale Bros., Ltd., has been installed Worshipful Master of King George the 5th Lodge, No. 3514 Cheshire.

With further reference to the visit to this country of Mr. Forbes Mackay, the engineer and general manager of the Sydney (N.S.W.) Corporation electricity undertaking, we understand that he is now on his way. His visit is for the purpose of calling for tenders for plant required for the new power house, and he expects to arrive in November. The first section of the station will probably comprise 120,000 kW of plant. Mr. Mackay will on his arrival advertise for tenders and will be available at Messrs. Preece, Cardew & Rider's office, 8, Queen Anne's Gate, Westminster, S.W.1, for one or two months, to give information to firms on this side who propose to submit tenders in Sydney.

According to a dispatch from Adelaide to the *Daily Mail*, Sir Frank Heath, Secretary to the Department of Scientific and Industrial Research, London, has arrived in the *Nestor* to investigate the possibilities of Britain and Australia co-operating in the solution of scientific and technical problems affecting trade and commerce.

Indian Engineering just to hand understands that the six months' leave granted to Mr. P. Hawkins, Chief Engineer, and Secretary to the Government of Madras, P. W. D., Irrigation, has been cancelled. Mr. Hawkins will remain as Chief Engineer for the hydro-electric development in Madras. The same contemporary states that Mr. Satyendra Nath Ray, M.Sc., who stood first in B.Sc. with First Class Honours in Physics, has been awarded the Tata Scholarship in Wireless of Rs. 15,000, to carry on researches in wireless and electricity at Faraday House, London. He recently left for England.

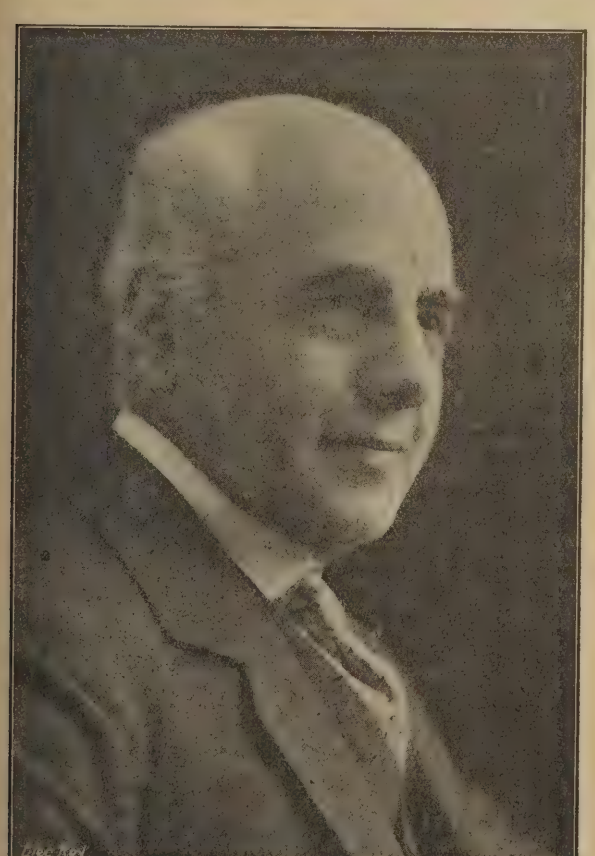
At a meeting of the Council of the University of Birmingham on October 7th, bound volumes for use in the Electrical Engineering Department were received from Mr. J. C. Vaudrey.

Candidates in the forthcoming municipal elections at Bradford include Mr. J. W. Longley (Conservative), consulting electrical engineer, and vice-chairman of the Corporation Electricity Committee for some years past, in Allerton ward; and Mr. Louis Jessop (Jessop & Boydell, Ltd., electrical contractors), who stands as a Liberal for the Great Horton ward.

Mr. C. H. Astle, of the Wrexham Corporation Electricity staff, has been presented by his colleagues with a Jacobean oak mirror on the occasion of his marriage.

Mr. Jos. H. Quicke, A.M.I.Mech.E., recently went out from London to take up the position of general manager to the Madeira Supply Co., Ltd., general engineers and founders, Funchal, Madeira.

Mr. J. William Burr, M.I.E.E., M.I.Mech.E., whose inaugural address to the Western Centre of the Institution of Electrical Engineers, of which he is the chairman, appears in abstract on another page of this issue, is the borough electrical engineer and manager at Swansea. He was born in London, and was educated and served his apprenticeship there, but much of his technical training was obtained on the Continent. Upon his return to England he took up a position at Kingston-on-Thames, but very shortly afterwards he received an appointment at the Deptford works of the London Electric Supply Corporation, where he remained for seven years. He left Deptford to enter service under Mr. John Young, manager of the Glasgow Corporation tramways undertaking, and spent two years there during the construction of the Pinkston power station. Later he came south to Reading and subsequently became deputy engineer and manager at Croydon, which office he resigned in 1914 to take up the post that he now holds at Swansea.



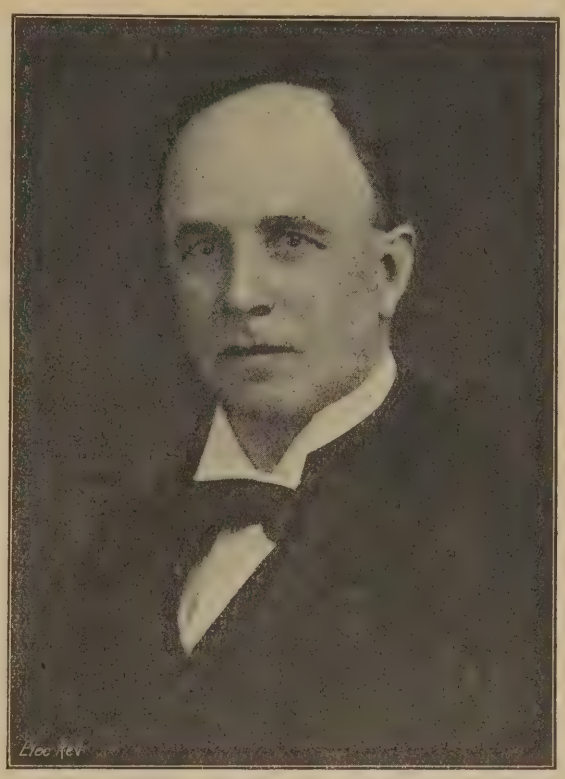
Elliott & Fry] [*London.*

Mr. J. W. Burr.

Chairman of the Western Centre of the I.E.E.

Mr. J. W. Wardle, who has for 19 years been a designer at Newtons' Electrical Works at Taunton, is leaving to become the firm's first direct representative in Australia, and he has been presented by his colleagues with a leather travelling case fitted with toilet requisites.

Mr. B. Adair M. Boyce, whose portrait is reproduced herewith, and who has been elected chairman of the East Midland Sub-Centre of the Institution of Electrical Engineers for the coming session, was educated generally at Jersey and the Bath Grammar School, and in mechanical and electrical engineering at the University College, London. In 1902 he joined the General Electric Co., Ltd., as an assistant designer at its Witton works, which post he vacated in 1911 in order to accept the position of chief assistant designer with the Brush Electrical Engineering Co. at Loughborough. A year later Mr. Boyce was appointed chief electrical designer by the same firm and this position he holds to-day. Mr. Boyce is an active member of the Electrical Research Association and is serving on several of its committees. Mr. Boyce is also an Associate of the American Institution of Electrical Engineers.



Ramsden] [*Leicester.*

Mr. B. Adair M. Boyce.

Chairman of the East Midland Sub-Centre of the I.E.E.

There were 40 candidates for the position of general manager and engineer of Wigan Tramways and Motor Department, rendered vacant by the death of Mr. W. Mayall Milnes. Some have been selected to appear before the Tramways Committee.

At a meeting of the Bradford Education Committee it was reported that Mr. H. J. B. Chapple, Lecturer in Electrical Engineering at the Technical College, had tendered his resignation in order to take up a commercial appointment in London.

Obituary.—Mr. D. I. Dawbarn.—We regret to learn from Messrs. A. Reyrolle & Co., Ltd., of the death which occurred on October 1st, in a motor accident at Milwaukee, Wisconsin, of Mr. David Inglis Dawbarn. Mr. Dawbarn left Messrs. Reyrolle's works last April, to take up his duties as American representative, and he has been rendering excellent service to the company. He was born in 1896. He was educated at Merchant Taylor's School, and took First Class Honours in the Oxford Senior Locals in 1913. He proceeded to the University of Liverpool, and there obtained First Class Honours in the examination as Bachelor of Engineering. After five years spent with the Forces during the war he helped Professor Marchant, D.Sc., for two years with research work for the Board of Scientific and Industrial Research, the results of this work being published in the *Journal* of the Institution of Electrical Engineers. In 1922, he joined Messrs. Reyrolle on a two years' Student Apprentice's Course, on the completion of which he was transferred to the sales department, where he was engaged as an assistant engineer in the contracts and estimates section, before being appointed representative for U.S.A. He was an Associate Member of the Institution of Civil Engineers and at the time of his death was awaiting his election as an Associate Member of the Institution of Electrical Engineers, of which he was a Student Member. He was also awarded one of the Students' Premiums of the I.E.E. for a paper read in 1924 on "Variable-Speed 3-Phase Commutator Motors." Messrs. Reyrolle testify to Mr. Dawbarn's consistent thoroughness and reliability and to the esteem in which he was widely held. The funeral took place in Milwaukee on October 5th.

Mr. A. Handford.—Mr. Alfred Handford, traffic and claims superintendent of the Sheffield Corporation tramways, passed away recently following a seizure. He was 63 years old, and he passed away on his birthday.

Prof. A. Gray.—We regret to learn that Prof. Andrew Gray, D.Sc., LL.D., F.R.S., Emeritus Professor of Natural Philosophy at the University of Glasgow, who succeeded Lord Kelvin at the University in 1899, has passed away. He was 78 years of age. We shall make further reference to his work and career in our next issue.

Mr. R. Ballantyne.—The death is reported of Mr. Robert Ballantyne, a director of Messrs. Stewarts & Lloyds, Ltd.

Captain H. R. Sankey.—At the funeral of the late Captain H. R. Sankey, past-president of the Institution of Mechanical Engineers, on October 7th, the Institution of Electrical Engineers was represented by its president, Mr. R. A. Chattock, M.I.E.E.

Mr. V. Stott.—The death occurred on October 7th of Mr. V. Stott, head electrician at the collieries of George Hargreaves and Co., Huncoat, Accrington. He was 32 years of age. It is stated that in the darkness he accidentally walked into a water pit and was drowned.

Mr. R. F. Halliwell.—We regret to record that Mr. Reginald Francis Halliwell, M.I.Mech.E., principal steam turbine designer to the British Thomson-Houston Co., Ltd., at Rugby, died on October 10th at the age of 54 years, after some weeks' illness, followed by an operation. Mr. Halliwell, after serving as engineer in the mercantile marine, joined Messrs. Willans & Robinson, Ltd., and subsequently Tubes, Ltd., and Messrs. Thornycroft, Ltd. He went to the B.T.-H. Co. in 1903.

New Companies Registered.

Pettigrew & Merriman (1925), Ltd. (208,795).—Registered as a public company on October 3rd with a nominal capital of £250,000 in 125,000 preference shares of £1 each and 500,000 ordinary shares of 5s. each. The cumulative preference shares are entitled out of the profits which the company determine to distribute to a cumulative preferential dividend of 7½ per cent.; subject thereto, the surplus is to be paid to the ordinary shareholders. Objects:—To acquire all or part of the business of mechanical and electrical engineers and wireless instrument manufacturers carried on by Pettigrew & Merriman, Ltd., in the United Kingdom and elsewhere, together with the whole of the assets and undertaking of Pettigrew & Merriman (Continental), Ltd., and to carry on the same and the business of manufacturers of electrical, wireless, and high-tension apparatus, valves, equipment, magnetic, and radioactive instruments, &c. Minimum cash subscription, £7. The directors are:—H. C. Rose, 67, Hervey Road, Blackheath, S.E.3, merchant; T. Pettigrew, 31, Little Heath, Charlton, S.E.7, electrical engineer; E. Merriman, Stanley House, Pitsea, electrical engineer; O. Brunet, 95, Avenue Mozart, Paris, engineer; P. Brunet, 95, Avenue Mozart, Paris, engineer; W. P. Mackintosh, 21, Kenilworth Court, Putney, S.W.15, kinema proprietor. Qualification, £500 stock or shares. Remuneration, £250 each per annum. Solicitors: Herbert Smith, Goss King and Gregory, 62, London Wall, E.C.2.

Nottingham Electrical Contractors' Trading Association, Ltd. (208,897).—Private company. Registered October 8th. Capital, £1,000 in £1 shares. Objects: To carry on in the U.K. or elsewhere all or any of the businesses of buying, selling, letting on hire, hire-purchase, or easy payment system of electrical appliances, installation, fitting, machinery, motor cars, taxicabs, tramcars, charabancs, motor lorries and wagons, and motor vehicles of all kinds, bicycles, coaches and carriages, agricultural implements and machinery, airships, aeroplanes and balloons, manufacturers of and dealers in wires, lamps, fittings, accumulators, batteries, dynamos, telephonic and telegraphic instruments, wireless goods, &c. The subscribers (each with one share) are:—R. B. Baggaley, 27, Tavistock Drive, Nottingham, chartered accountant; C. Thompson, 31, Burlington Road, Nottingham, chartered accountant. The first directors are not named. Secretary: C. Thompson. Solicitor: J. E. M. Crowther, 23, Abingdon Street, Westminster.

Euradic Electric Co., Ltd. (208,792).—Private company. Registered October 3rd. Capital, £1,000 in 2,000 founders' shares of 1s. and 900 ordinary shares of £1. Objects: To adopt an agreement with H. C. Pontet and Muriel I. Pontet to develop and turn to account the business referred to therein, to manufacture and deal in wireless, telegraphic and telephonic apparatus, machinery, conveniences, valves, electrical, magnetic and radio-active instruments, electricians, &c. The directors are:—H. C. Pontet, 4, Seymour Street, Euston, N.W.1, electrical engineer; Mrs. M. I. Pontet, 4, Seymour Street, Euston, N.W.1 (both permanent). Qualification, 50 ordinary shares. Secretary: A. E. Kent. Solicitors: Foster, Martindale and Clark, Millbrook Chambers, Camden Town, N.W.1.

McKenzie & Holland, Ltd. (208,915).—Private company. Registered October 9th. Capital, £100 in £1 shares. Objects:—To carry on the business of manufacturers of railway signals, locking apparatus, and safety appliances, mechanical engineers, and electricians, &c. The subscribers (each with one share) are:—H. G. Brown, "Four Winds," Bidborough, Kent, electrical engineer; R. Payne, 77, Braxted Park, Streatham Common, S.W.16, chartered accountant; B. H. Peter, 82, York Road, King's Cross, N.1, engineer. The first directors are to be appointed by the subscribers. No share qualification required. Solicitors: Linklaters and Paines, 2, Bond Court, Walbrook, E.C.4. Registered office: 82, York Road, King's Cross, N.1.

Official Returns of Electrical Companies.

Warnolite, Ltd.—Issue on September 26th, 1925, of £90 debentures, part of a series already registered.

Arrota Electrical and Motor Accessories Co., Ltd.—S. P. Child, of 36-37, Queen Street, E.C., was appointed receiver on July 15th, 1925, under powers contained in mortgage debentures dated May 11th, 1922.

Direct Spanish Telegraph Co., Ltd.—Particulars filed of £100,000 debentures authorised August 14th, 1925, charged on the company's undertaking and property, present and future, the whole amount being issued on October 1st, 1925.

Crampton & Co., Ltd. (109,328).—Return dated December 31st, 1924 (filed August 1st, 1925). Capital, £2,500 in £1 shares. All shares taken up. £2,500 paid. Mortgages and charges, nil.

Peterborough Electric Traction Co., Ltd. (74,562).—Return dated May 4th (filed September 16th), 1925. Capital, £60,000 in 6,000 preference and 6,000 ordinary shares of £5 each. 4,400 preference and 4,000 ordinary shares taken up. £42,000 paid. Mortgages and charges, £21,000.

H. P. Electrical Co., Ltd. (187,715).—Return dated September 15th, 1924 (filed March 12th, 1925). Capital, £1,000 in £1 shares. 654 shares taken up. £654 paid. Mortgages and charges, nil.

Keswick Electric Light Co., Ltd. (28,820).—Return dated April 9th (filed August 10th), 1925. Capital, £20,000 in 15,000 preference and 5,000 ordinary shares of £1 each. 3,420 ordinary shares taken up. £3,420 paid. Mortgages and charges, £10,100.

Edmundson's Electricity Corporation, Ltd. (52,013).—Return dated July 28th, 1925. Capital, £800,000 in 400,000 ordinary and 400,000 preference shares of £1 each. All shares taken up. £600,400 paid on 200,400 ordinary and 400,000 preference shares. £199,600 considered as paid on the remainder. Mortgages and charges £919,295.

Foster & Pullen, Ltd. (108,579). — Return dated August 21st, 1925. Capital, £5,000 in £1 shares. 4,436 shares taken up. £2,436 paid. £2,000 considered as paid. Mortgages and charges, £500.

Llangefni Electric Light and Power Co., Ltd. (111,909).—Return dated December 23rd, 1924 (filed August 26th, 1925). Capital, £3,000 in 2,750 preference and 250 ordinary shares of £1 each. 2,566 preference and 250 ordinary shares taken up. £2,566 paid. £250 considered as paid. Mortgages and charges, £2,400.

St. Helens Cable and Rubber Co., Ltd. (87,774).—Return dated May 27th, 1925. Capital, £100,000 in £1 shares. 84,000 shares taken up. £84,000 paid. Mortgages and charges, nil.

Walters Electrical Manufacturing Co., Ltd. (94,300).—Return dated July 28th, 1925. Capital, £18,000 in £1 shares. 16,875 shares taken up. £6,875 paid. £10,000 considered as paid. Mortgages and charges, nil.

Wark and District Electric Lighting Co., Ltd. (186,144).—Return dated May 14th, 1925. Capital, £1,500 in £1 shares. All shares taken up. £1,500 paid. Mortgages and charges, nil.

Presteign Electric Co., Ltd. (170,355).—Return dated May 15th, 1925. Capital, £5,000 in £1 shares. 630 shares taken up. £630 paid. Mortgages and charges, nil.

Blackburn, Starling & Co., Ltd. (61,302).—Capital, £12,000 in £1 shares. Return dated August 4th, 1925. All shares taken up. £8,100 paid. £3,900 considered as paid. Mortgages and charges, nil.

Vaughan Crane Co., Ltd. (61,526).—Capital, £150,000 in 50,000 preference and 100,000 ordinary shares of £1 each. Return dated September 4th, 1925. 16,780 preference and 53,578 ordinary shares taken up. £43,569 paid. £26,789 considered as paid. Mortgages and charges, nil. A further 100 preference shares were allotted, payable in cash, on September 7th, 1925.

Reason Manufacturing Co., Ltd. (64,701).—Capital, £52,500 in 5s. shares (200,000 preference and 10,000 ordinary). Return dated April 7th, 1925. 92,000 preference and 10,000 ordinary shares taken up. 5s. per share paid on 9,397 preference shares. £2,349 5s. paid. £23,150 15s. considered as paid on 82,603 preference and 10,000 ordinary shares. Mortgages and charges, £14,000.

Kalgoorlie Electric Tramways, Ltd. (73,127).—Capital, £250,000 in £1 shares. Return dated August 13th, 1925. All shares taken up. £250,000 paid. Mortgages and charges, £132,980.

Chili Telephone Co., Ltd.—Capital, £750,000 in £5 shares. Return dated July 23rd, 1925. All shares taken up. £431,000 paid. £319,000 considered as paid. Mortgages and charges, nil.

Royce, Ltd.—Capital, £170,000 in £1 shares (70,000 preference and 100,000 ordinary). Return dated September 7th, 1925. 34,955 preference and 72,487 ordinary shares taken up. £27,461 paid (being £1 per share on 4,955 preference and 6 ordinary and 15s. per share on 30,000 preference. £79,981 considered as paid (being £1 per share on 72,481 ordinary and 5s. per share on 30,000 preference). Mortgages and charges, £21,520 12s.

Newquay Electric Light and Power Co., Ltd. (85,451).—Capital, £15,000 in £1 shares. Return dated January 14th, 1925 (filed June 3rd). 18,124 shares taken up. £2,944 paid. £10,180 considered as paid. Mortgages and charges, £15,400.

Anglo Electric Co., Ltd.—Particulars filed of £3,000 debentures authorised September 25th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Argentine Light and Power Co.

The directors' report for the year ended March 31st, 1925, states, according to the *Financial News*, that the financial years of each of the company's subsidiaries in Argentina close on March 31st. Owing to the growth of the businesses it was found impossible to complete the audit of local accounts and have them dispatched to London for incorporation in this company's accounts in time to permit of the annual meeting being held before the summer vacation, as has been customary. "During the year the balance of share capital of the Argentine Tramways and Power Co., Ltd., was acquired. Whole of share and loan capital of that company, as also of Cordoba Light and Power Co. and Cordoba (Argentine) Electric Tramways Construction Co., Ltd., is therefore now the property of this company. Owing to improvement in the average rate of exchange on London, the loss on remittances was not so great as in the previous year, being £29,499, compared with £41,538. The sum received by way of interest and dividends from undertakings owned and other investments, together with sundry other receipts, totalled £192,545. After providing for administration expenses, interest on debenture stock, loss on exchange, and taxes, the profit and loss shows credit of £108,306; plus £13,766 brought forward, making £122,072. There is set aside for

debenture stock redemption £12,043, for share capital redemption £5,000, for general reserve £25,000." The directors recommend a dividend at the rate of 2½ per cent. on 952,211 ordinary shares for the year (after deduction of tax), leaving to be carried forward £15,133. The meeting is taking place in London to-day (Friday).

West India and Panama Telegraph Co., Ltd. The directors' report for the year 1924 states that the receipts amounted to £94,995 and the expenses to £90,106, leaving £4,889. This has been placed to reduction of the debit balance brought forward, which at December 31st, 1924, amounted to £77,190. The Government competitive system of cables and wireless was opened on December 1st, 1924. Annual subsidies of £26,300 ceased on September 30th, 1924, but, by request of the Pacific Cable Board, the company continued its service between those two dates, receiving remuneration for doing so; consequently the new competition is not reflected in the year's results. In November last a circular was sent to share and debenture holders conveying an offer made by the Cuba Submarine Telegraph Co. to purchase shares and debentures of the company. The offer was accepted by shareholders whose holdings exceeded the necessary majority of 80 per cent., as stipulated by the Cuba Submarine Co. The whole of the outstanding debentures have also been acquired by the Cuba Submarine Co. According to the *Financial News*, the former directors, with the exception of the nominee of the International Ocean Telegraph Co., resigned as at December 31st, 1924, and their places have been filled by members of the board of the Cuba Submarine Co.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Brisbane Tramway Trust.—£500,000 5¼ per cent. Brisbane Tramway stock, 1944-54, issued at 98¼ per cent., partly and fully paid.

Shropshire, Worcestershire, and Staffordshire Electric Power.—10,650 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,135,206 to 1,145,855.

Stewarts & Lloyds.—8,725 deferred shares of £1 each, fully paid, Nos. 2,671,159 to 2,679,883.

Belgian Companies.—In order to extend their sphere of operations to meet the ever-increasing demand, several of the electricity supply undertakings in Belgium have lately made additions to their capital. Thus, the Société d'Electricité du pays de Liége has invited subscriptions for 20,000 new preference shares of 500 fr. each and 20,000 special shares of a similar value, a total of 20 million fr.; and the Société d'Electricité du Bassin de Charleroi for 1,000 new ordinary shares of 500 fr. offered at 800 fr. each.

United River Plate Telephone Co., Ltd.—The directors have decided to issue 152,000 ordinary shares of £5, ranking *pari passu* with the existing ordinary shares, and they are being offered at par to the holders of ordinary shares registered September 25th in the proportion of one new share for every complete multiple of five existing ordinary shares held. The new shares will not participate in the interim dividend to be paid in November in respect of 1925.

Brisbane Tramway Trust.—The Trust has been offering for public subscription in this country an issue of £500,000 5¼ per cent. Brisbane Tramway Stock 1944-1954, at £98 10s. per cent., the proceeds to be applied in the erection of new tramway sheds and for the necessary extensions to the system. The list was to close on or before last Monday.

Hurst, Nelson & Co., Ltd.—After placing to reserve £10,000, the directors recommend a dividend of 2s. and a bonus of 6d., both less tax, on the ordinary shares, leaving, after reserving £16,000 for interim ordinary dividend on May 15th next, £16,091 to be carried forward.

United Electric Tramways Co. of Caracas, Ltd.—According to the *Financial Times*, the net revenue for the year ended June, 1925, was £23,011, plus £17,741 brought forward. A dividend of 10 per cent., less tax, is recommended, leaving £22,796 to be carried forward.

Dundee, Broughty Ferry and District Tramways Co., Ltd.—It is proposed to pay dividend on ordinary shares at the rate of 7 per cent. per annum for the year, less tax, and to place to renewals fund £1,500, leaving to carry forward £145.

Western Electric Distributing Corporation, Ltd.—The dividend recommended by this company in its report for the year ended June 30th, 1925, makes a total of 10 per cent. on the ordinary shares, not 8 per cent. as stated in our last issue.

Anglo-American Telegraph Co., Ltd.—Interim dividends for the quarter ended September 30th: 15s. per cent. on the ordinary stock and £1 10s. per cent. on the preferred stock, less tax at 4s. in the £.

Oriental Telephone and Electric Co., Ltd.—The directors have declared interim dividends of 3½ per cent., less tax, on the 7 per cent. cumulative preference shares, and 4 per cent., free of tax, on the ordinary shares.

Yates & Thom, Ltd.—A dividend of 7½ per cent., less tax, on the ordinary shares for the year is recommended, carrying forward £15,554.

Monte Video Telephone Co., Ltd.—Final dividend of 5 per cent., less tax, making 7 per cent., less tax, for the year ended July 31st.

Babcock & Wilcox, Ltd.—Interim dividend of 5 per cent., free of tax.

Indo-European Telegraph Co., Ltd.—Interim dividend at rate of 5 per cent. per annum, free of tax.

Stocks and Shares.

Monday Evening.

The outstanding market in the Stock Exchange remains that for rubber shares, but there is a good deal of business going on in other departments, and, taking it all round, the Stock Exchange can scarcely complain of being unemployed. The excitement over rubber shares appears to have given something of a fillip to the speculative spirit. Any industrial shares are readily taken if they offer the prospect of capital improvement. People once more are begging their brokers to buy them something that stands a chance of an early rise, frankly declaring that they, the purchasers, disregard dividend considerations and put capital appreciation before anything else. This speculative flame serves to brighten the prices in a good many sections of the Stock Exchange, and it has its counter-effect amongst investment securities through the necessity for money to be raised from the sale of first-rate stocks by those people who are putting capital into shares of a more risky order.

On the other hand, investment pure and simple is fortified in the knowledge of a 4 per cent. Bank Rate and of the easy money conditions that this ensures. No doubt there will be the usual autumn rush of new issues, though fresh borrowing has been, during the past month or two, mercifully slow. It is known that the Government policy aims at conversion of short-dated stocks into some other security that shall mature later on, which means that there will be fairly constant offers of British Government security in exchange for existing stocks, a factor which lends its weight to keeping prices down amongst the investment securities. Nevertheless, the first-class Industrial debentures and preferences, for instance, such as those of the electrical and telegraph market, remain in such steady demand as to render the floating supply a very modest one, and, in spite of all the temptations to gamble, there are investors who refuse to be drawn away from the paths of safety and 5 per cent.

North Metropolitan Electric 6 per cent. preference shares have strengthened to 1½. Westminsters are better at 44s. 6d. Demand for South London led to 1/16 rise to 2 9/16. Save for these slight changes, the London list shows no alteration.

With perseverance worthy of a noble cause, the Southern Counties Electric Light & Power Supply, Ltd., continues to push its offers of debentures and participating preference shares. The first director's name on the application form is that of Sir Charles B. H. Soame, Bart. The company's covering letter is dated July, 1925, but there is a rubber-stamped "Sep.," above the earlier, printed date. The same application is used as that which accompanied the offer of the same issues last April, the only difference being that the latest form is printed upon paper coloured a vivid green.

Brazilian Tractions have gained another 3 points, and now stand at 77. The buying is still rumoured to be on behalf of people said to desire control of the company. Anglo-Argentine 5 per cent. debenture hardened to 77½. Argentine Light and Power ordinary have re-entered the dividend list, after an absence of 13 years. It is proposed to pay 2½ per cent., and this has induced a certain activity into the shares, which have risen to 12s. The company's 7 per cent. preference braced up to 20s. 6d. The British Columbia Electric Railway announces details of an ambitious programme for establishment of a power scheme, at a total cost of about 30 million dollars. Prices of the company's stocks are better on the idea that the proposals may involve an issue of new capital upon terms likely to give a bonus to present proprietors. It happens sometimes that the actual offer of stock tends to induce sales on the part of shareholders who exchange from the old into the new securities.

In the group of cable stocks, the quotation ex dividend of Eastern Extensions and Eastern Telegraph ordinary served to bring in a few buyers, and part of the deductions was recovered. Great Northerns are 5s. higher. Indo-Europeans remain at 42½, unaffected by declaration of the usual 5 per cent. tax-free interim dividend. United River Plate Telephones rallied to 7 1/16. Animated dealings in the new shares have resulted in an advance to 38s. premium. Canadian Marconis attract a good deal of attention around 7s. The parent shares are a quiet market again.

Babcock & Wilcox have declared an interim dividend of 5 per cent. free of tax, and the price keeps steady at 2½. Iron and steel issues are rather better, the market recovering from the unexpected postponement of the interim dividend payment upon Armstrong's junior preferences. Johnson & Phillips fell back to 46s. 3d. British Insulated rose sharply to 70s. buyers, a brisk demand coming upon a market bare of supply. Henley's advanced to 3¼. Edisons can be bought at 8s. or a little cheaper. Brush have gone back to 22s. and General Electrics to 26s., both being 1s. down on the week.

Metropolitan Consolidated gained 2, to 70½, but the recent rise in Districts has brought in profit-takers: the price eased off to 44. Underground Electrics are firm. Home Railway stock maintains a tolerably steady front, although a good deal has been sold by tired holders who have turned the proceeds into rubber shares. The market in these latter has received something of a check to its buoyancy owing to talk of early permission being granted to the companies to accelerate their production. This led to selling by speculators in the raw material and to a sympathetic, though slight, reaction amongst rubber shares.

Share List of Electrical Companies

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Oct. 12. 1925.	Rise or fall.	Yield p.c.
Home Electricity Companies.						
Bournemouth and Poole	1	13	14	2 1/16	—	4 15 4
Brompton Ordinary	1	10	10	1 1/4	—	*5 14 3
Charing Cross Ordinary	1	14 1/2	15	10/-	—	6 2 5
do. do. 4 1/2 Pref ...	1	4 1/2	4 1/2	17/6	—	5 2 10
Chelsea	1	12	12	1 1/4	—	6 8 0
City of London	1	15	15	48/3	—	6 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	28/6	—	5 12 4
County of London	1	15	15	57/-	—	5 5 8
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation ...	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12 1/2	—	5 16 8
Lancs. Light and Power	1	7 1/2	7 1/2	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.... ...	5	6	6	5 1/2	—	5 7 10
Metropolitan	1	10	11	39/3	—	5 11 4
do. 4 1/2% Pref.	1	4 1/2	4 1/2	17/6	+6d.	5 2 10
Midland Counties	1	5 1/2	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary ...	1	6	7	1 1/2	—	6 4 5
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	24/6	—	5 14 3
Notting Hill 6% Pref.	10	6	6	9 1/2	—	6 6 4
North Met. Elec. 6% Pref. ...	1	6	6	22/6	+6d.	5 6 8
St. James' and Pall Mall	5	17 1/2	17 1/2	14 1/4	—	5 17 8
South London	1	15	15	2 9/16	+ 1/16	5 17 1
South Metropolitan Pref. ...	1	7	7	1 1/4	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref. ...	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/6	+6d.	6 14 10
Whitehall Elec. Invst. 7 1/2% Pref.	1	7 1/2	7 1/2	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6
Home Rails.						
Central London Ord. Assented	Stock	4	4	66	—	6 1 3
Metropolitan	,,	4	5	70 1/2	+2	7 1 10
do. District	,,	3 1/2	3 1/2	44	— 1/2	7 19 1
Underground Electric Ordinary	10	Nil	Nil	2 1/4	—	Nil
do. do. "A" ...	1/-	Nil	Nil	6/6	—	Nil
do. do. Income	Bonds	6	6	97	—	*6 3 9
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	102 1/2	—	5 17 1
do. Def.	,,	1 1/2	1 1/2	23 3/8	—	6 6 4
Automatic Telephone	1	3	6	47/6	—	2 10 7
Chili Telephone	5	6	5	5 1/4	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6 1/4	—	8 0 0
Eastern Extension	10	10	10	17 1/2xd	+ 1/8	*5 16 9
Eastern Tel. Ord.	Stock	10	10	17 1/2xd	+1 1/2	*5 17 4
Globe Tel. and T. Ord.	10	10	10	17 3/8	—	*5 13 4
do. do. Pref.	10	6	6	10 3/8	—	5 10 4
Great Northern Tel.	10	22	22	33 1/4	+ 1/4	6 12 3
Indo-European	25	7	8 1/2	42 1/2	—	*5 2 5
Marconi	1	10	10	1 7/16	—	6 19 2
Marconi Marine	1	10	7 1/2	7/8	—	8 11 6
Oriental Telephone Ord. ...	1	12	12	2 1/16	—	*5 16 4
United R. Plate Tel.	5	8	8	7 1/16	+ 1/16	5 13 3
Western Telegraph	10	10	10	16 1/2	—	*6 4 0
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref. ...	5	5 1/2	5 1/2	3 3/8	—	8 3 0
do. do. 2nd Pref. ...	5	6	6	3 3/8	—	8 17 10
do. do. 5% Deb. ...	Stock	5	5	77 1/2	+1	6 9 0
British Electric Traction Ord. ...	,,	6	6	121 1/2	+ 1/2	4 18 9
do. do. 6% Pref. ...	,,	6	6	107	—	5 12 2
Brazil Traction	100	4	4	77	+3	5 4 0
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	89 1/2	+1	5 11 9
do. do. Preferred	,,	96/-	96/-	92 1/2	+1	*5 3 0
do. do. Deferred	,,	129/5	129/5	112 1/2	+1	*5 15 4
do. do. Deb.	,,	4 1/4	4 1/2	77 1/2	—	5 9 8
Lond. & Sub. Trac. 5% Pref. ...	1	2 1/2	Nil	4/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	42 1/2	—	9 8 4
Mexico Trams, 5% Bonds ...	—	5	5	63 1/2	—	7 17 6
Mexican Light Common ...	100	Nil	Nil	32	—1	Nil
do. Pref.	100	Nil	Nil	62	—1	Nil
do. 1st Bonds ...	—	5	5	69 1/2	—3	7 3 11
Yorkshire (West Riding) ...	1	5	—	18/9	—	5 6 8
Manufacturing Companies.						
Babcock & Wilcox	1	12	12	2 1/2	—	*4 16 0
British Aluminium Ord.	1	5	10	33/9	—	5 19 5
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3 1/2	+ 1/16	4 5 9
Brush Ord.	1	10	10	22/-	-1/-	7 13 10
Callenders	1	15	15	3 3/16	—	4 14 1
do. 6 1/2% Pref.	1	6 1/2	6 1/2	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	5/8	—	... ...
Edison-Swan	4/-	10	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	80 1/2	—	6 4 3
Electric Construction	1	10	10	30/-	—6d.	6 13 4
Enfield Cable, Pref.	1	7 1/2	7 1/2	1 1/2	—	6 0 0
English Electric	1	5	5	17/3	—	5 15 3
do. do. Pref.	1	6	6	20/-	—	5 17 1
Gen. Elec. Pref.	1	6 1/2	6 1/2	23/9	—	5 9 5
do. Ord.	1	5	7 1/2	26/-	—1/-	5 15 5
Henley	1	15	16	3 1/2	+ 1/16	4 18 6
do. 4 1/2% Pref.	5	4 1/2	4 1/2	4 1/2	—	5 6 0
India-Rubber	1	5	5	1 1/16	—	*4 14 1
Johnson & Phillips	1	10	10	47/-	—2/9	4 5 1
Met-Vickers, Ord.	1	8	8	22/6	—	7 2 3
do. Pref.	2	8	8	2 3/8	—	6 14 9
Siemens Ord.	1	—	7 1/2	29/6	+6d.	5 1 8
Telegraph Construction	12	20	20	26 1/2	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c		Price October 13th.	Fortnight's Inc. or dec.
a Acid, Oxalic	per lb.	5 3/4d.	...
a Ammoniac, Sal	per ton	£60	...
a Ammonia, Muriate (large crystal)	,,	£52	...
a Bisulphide of Carbon	,,	...	...
a Borax	,,	£25	...
a Copper Sulphate	,,	£25 10s.	...
a Potash, Chlorate	per lb.	4d. to 4 1/2d.	...
a ,, Perchlorate	,,	5 1/2d.	...
a Shellac	per cwt.	£15 15s.	...
a Sulphur, Commercial	,,	£7 15s.	...
a ,, Roll	,,	£7 15s.	...
a Soda, Chlorate	per lb.	3 1/2d. to 3 1/2d.	...
a ,, Crystals	per ton	£5 to £5 5s.	...
a Sodium Biobromate, casks ...	per lb.	4d.	...
METALS, &c.			
b Aluminium, Ingots	per ton	£120 to £125	...
b ,, Wire	per lb.	1/9 to 2/6*	...
b ,, Sheet	,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net	£249	£20 inc.
Grade II	,, ,,	£178	£11 inc.
Grade III	,, ,,	£101	£6 inc.
c Brass (rolled metal 2" to 12" basis)	per lb.	10 1/4d.	1/4d. inc.
c ,, Tubes (solid drawn) ...	,,	1/- to 1/0 1/2	...
c ,, Wire, basis	,,	10 3/8 d.	1/4d. inc.
c Copper Tubes (solid drawn) ...	,,	1/1 1/2	...
c ,, Bars (best selected) ...	per ton	£91	£1 dec.
c ,, Sheet	,,	£91	£1 dec.
c ,, Rod	,,	£91	£1 dec.
d ,, (Electrolytic) Bars ...	,,	£63	10s. inc.
d ,, ,, Sheets ...	,,	£143 10s.	...
d ,, ,, Wire Rods	,,	£78	10s. inc
d ,, ,, H.C. Wire	per lb.	9 1/32d.	1/2d. inc.
f Ebonite Rod	,,	2/3 to 2/4	...
f Sheet	,,	2 3to 2/6	...
n German Silver Wire	,,	2/8	...
h Gutta-percha, fine	,,	8/9	...
h India-rubber, Para fine	,,	3/1 1/2	1d. inc.
i Iron Pig (Cleveland Warrants) ...	per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qual.	,,	£21	...
g Lead, English Pig	,,	£40 10s.	...
g Mercury	per bot.	£13 10s.	5/- to 10/- inc.
e Mica (in original cases) small ...	per lb.	3d. to 4/-	...
e ,, ,, medium	,,	4/- to 8/-	...
e ,, ,, large ...	,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	,,	1/3 1/2	...
p ,, ,, drawn bars & rods	,,	1/3	...
p ,, ,, rolled strip & sheet	,,	1/2 1/2	...
p ,, ,, wire	,,	1/3 1/2	...
o Platinum	per oz.	£26	...
d Silicium Bronze Wire	per lb.	1/0 1/2	...
r Steel, Magnet, in bars	,,	7 1/2d.	...
n Tin, Block (English)	per ton.	£277 5s. to £277 15s.	£12 5s. to £12 10s. inc.
n ,, Wire, Nos. 1 to 16	per lb.	4/1	2d. inc.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
o C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Paisley Association of Electrical Engineers.—A large number of the members of the Paisley Association of Electrical Engineers met in Gibson's Tea Rooms on October 6th to hear Mr. James Neil give his presidential address on the electric wiring of houses. He emphasised the importance of building construction as a part of the training of apprentices, as it was very necessary that wiremen should have a knowledge of this subject. Mr. Neil dealt in a very practical way with every aspect of house wiring, giving his experience and knowledge of a subject on which he was well qualified to speak. The members present, says the *Paisley Daily Express*, were very much interested to hear all the different points raised, and a discussion took place after tea had been served, and was entered into with much enthusiasm by Messrs. Humphriss, Heys, Scott, Bruce, W. Blair Smith, Adam, Graham, Dodson, and Young. A vote of thanks to Mr. Neil for his very able paper was proposed by Mr. Barbour.

The Illumination of Firpo's Hotel, Calcutta.—In the lighting of the recently-opened Louis XVI ballroom of Firpo's Hotel, Calcutta, a highly original effect has been achieved. Each shade contains six Osram colour-sprayed lamps and one central 200-watt Osram clear gasfilled lamp, the latter on an entirely separate circuit and used for ordinary illumination only. A specially designed bank of switches, driven by a small G.E.C. motor, operates the six colour-sprayed lamps, producing the striking effect of revolving coloured lights. The installation was a great success, and was described in the local Indian Press as something unique for Calcutta. We understand, in addition, that four spotlights, a central prismatic mirror-bowl, and a specially designed flashing sign carried out in Osram daylight blue sign type lamps have since been installed.

Electrical Exhibitions and Showrooms.

Recent Developments in Local Undertakings.

We refer in a leading article in this issue to the optimism with which we look forward to the progress to be made in electrical operations in this country during the coming season, which is fostered by our observations of the electrical exhibitions which are in progress and of the enterprise which is being shown by some electrical undertakings in the development of permanent electrical show and demonstrating rooms.

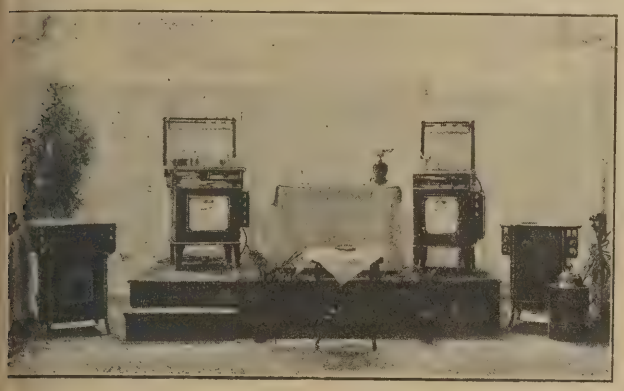


Fig. 1.—Demonstration Platform, Swansea.

We are able to give below some account of what is being done in the directions indicated in connection with some of the recent developments.

The electrical showroom of the past was a place where consumers or prospective consumers, if they happened to be near at hand, during the payment of the quarterly bill, for instance, could see how effectively and perhaps efficiently electric lighting could be introduced into the showroom. It is encouraging to see to-day showrooms which prove a real attraction to the public and a driving force in promoting the utilisation of electrical energy. The modern showroom or demonstrating theatre brings home to the consumer how effectively and economically electricity can be applied for its numerous uses in his home, office, works, &c. He receives valuable education and is inspired, by the interest and attractiveness of the place and by the courtesy and competency of the attendants, with a desire to impart his knowledge at the first opportunity to his friends.

The tendency prevailing is also to combine the showrooms and the demonstrating rooms, so that a demonstration can be given to a prospective purchaser at short notice while he is "on the spot" and his interest in the subject is at its height. Some of the modern showroom buildings are also far from lacking in fine external appearance and attraction, and to the Hackney and Swansea electricity undertakings our congratulations are due on their splendidly-designed premises.

The undertakers and promoters of the exhibitions and showrooms to which we refer below are to be congratulated on the results of their enterprise. Another encouraging point is the willingness of manufacturers to co-operate with the local undertakings by lending the necessary apparatus and equipment for exhibition and demonstration purposes.

The official opening of the North-East Coast Lighting Service Bureau, Dial House, Northumberland Street, Newcastle-on-Tyne, by the Lord Mayor of Newcastle, Councillor Walter Lee, J.P., on October 13th, was another event, the development of which we look forward to with interest.

The New Swansea Showrooms.

The new showrooms and offices of the Swansea Corporation Electricity Department, which were opened by the Mayor of Swansea on September 17th, *vide* Electrical Review, September 25th, are contained in a four-storey building situated in Oxford Street, a main thoroughfare of the town. The building contains some prominent features in structure and design, and some idea of its magnificent frontage can be gained from the view of the premises shown in fig. 2; the original photograph was, of course, taken after dark so that the results of the very effective flood lighting of the building are depicted. The showroom proper occupies the ground floor, and is provided with an imposing main entrance, double doors set well back being arranged centrally between spacious, well illuminated curved windows, forming an attractive porchway of considerable dimensions. In the interior of the showroom fittings and apparatus of every description are exhibited amid pleasing and decorating surroundings. A basement to the building, which was previously used as a restaurant, is now equipped as a lecture theatre, and it is suitably equipped for the purpose of giving demonstrations. It will accommodate between 150 and 200 persons. Fig. 1 shows a platform on which the demonstrations are given, and it will be noticed that ample room is given for cooking demonstrations. Since the inauguration of the showrooms several cookery demonstrations have been given, and the accommodating capacity of the basement has been severely taxed.

Several exhibits are arranged in various parts of the show and demonstration rooms, illustrating the uses and advantages of electricity for specific purposes. A fully furnished dining room is arranged with modern pendant and pedestal lighting. Another corner or portion of the premises is fitted out as an up-to-date bathroom equipped, of course, with an electrical geyser. Fig. 4, p. 632, shows a part of the premises set out as an "all-electric" kitchen. Another feature is the representation of a linendraper's showrooms illustrating the value of electric lighting in that direction.

Offices accommodating both the technical and clerical staffs are arranged on the three upper floors of the building.

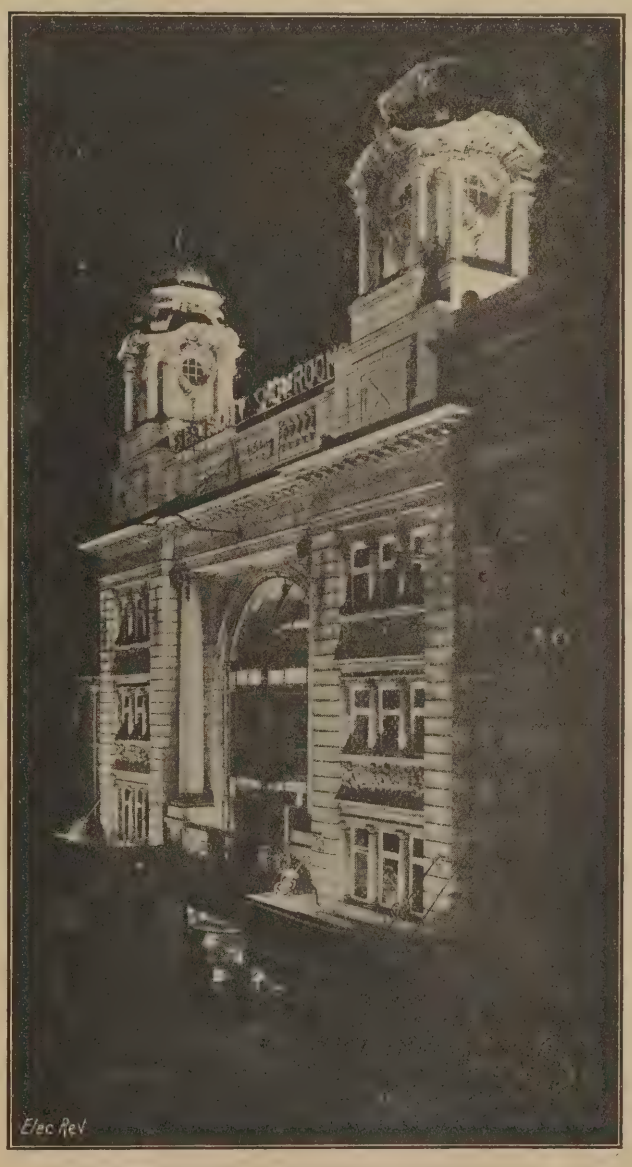


Fig. 2.—Exterior of the Swansea Premises.

The New Hackney Demonstration Halls.

Simultaneously with the inauguration of the new showrooms at Poplar, his Worship the Mayor of Hackney, Councillor E. J. Farmer, J.P., performed the opening ceremony of the new palatial demonstration halls and offices of the Hackney electricity undertaking at Lower Clapton Road, on October 8th. In the layout of these premises the principles for the promotion of the business interests of electricity suppliers and contractors have been borne in mind. The building consists of a central section rising to a height of 55 ft., with single windowed wing towers supporting it on each side. On the ground level a loggia extends the full length of the centre section, covering the two main show windows and the centrally placed main entrance leading to a large vestibule hall. To the right and left of the vestibule are two spacious showrooms where fittings of every description are effectively displayed. A demonstration hall which will accommodate comfortably 100 persons, is situated beyond the vestibule at a slightly lower level. Show-

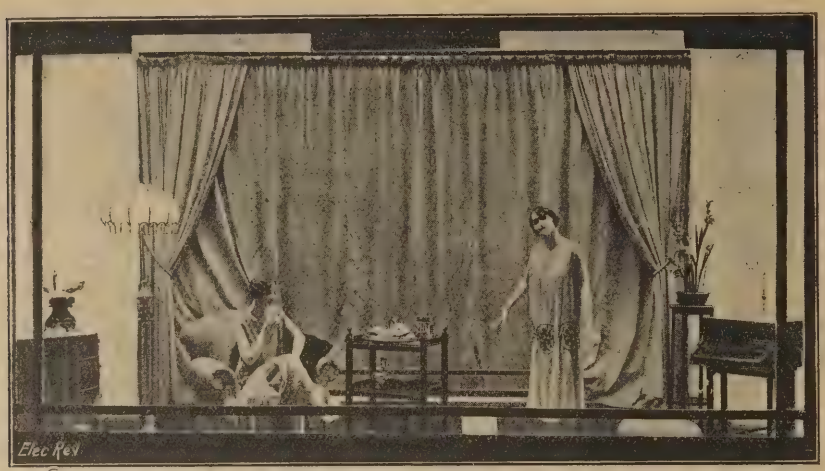


Fig. 3.—Hackney Display Window.

cases are arranged around this room and contain excellent displays and the necessary equipment for lecture and kinematograph demonstrations. By the side of this compartment are arranged a suite of model rooms where the actual demonstration of electrical appliances can be given in their normal surroundings, thus creating the desired atmosphere. One of these is a sitting room provided with all the latest home comforts, complete with a window and a garden scene: Another room is furnished and electrically fitted as a bedroom; while an electrically equipped kitchen and a bathroom similarly fitted up are included in the suite. A factory and workshop demonstration room is an important feature of the halls; this is designed



Fig. 4.—All-Electric Kitchen, Swansea.

for the suitable demonstration of workshop appliances. The building is one of four storeys. The first floor contains the offices, &c., the mains and meter departments are accommodated on the second floor and on the third floor is a suite of electrically equipped rooms provided for the caretaker.

Fig. 3 shows one of the display windows; it is equipped with the "Gecoray" system of lighting and includes a number of colour screens. The installation is connected up to a flasher and five-colour mixing effects are obtained. In addition, three flood lights are fitted with colour screens; these illuminated for a few moments make the sixth movement in the cycle of operations. Many manufacturers have given valuable assistance to the department in connection with the equipping and stocking of the premises.

At the King's Hall, Hackney Baths, where the inaugural speeches were made, there was an attendance of over 1,000 persons, including Mr. Joseph Richmond, who was chairman of the Borough Electricity Committee twenty years ago.

Councillor G. Green, the present chairman of the Committee, in his opening speech, said that the undertaking was now fourteen times bigger than it was twenty years ago. For 24 years the various electricity committees had been perfecting their methods of generation, making necessary extensions to the works, installing new machinery, and re-arranging tariffs to meet the needs and conditions of the area they served. To-day the undertaking was in the proud position of being first in its group of generating stations for fuel economy.

Councillor Davy (vice-chairman of the Electricity Committee) in handing the Mayor a special key of the new building, said that if the people of the Borough would visit the showrooms there would be no difficulty in converting them to the use of electricity.

The Mayor, in reply, said that electricity had revolutionised the means of transport, it had added very greatly to the efficiency of workshops and factories and it had added comfort to the homes of the people. He concluded with a tribute to the work of Mr. L. L. Robinson, the borough electrical engineer. At the conclusion of the proceedings a large number of visitors were conducted throughout the new building.

Additional Showrooms at Poplar.

The official opening of the new and additional showrooms and offices of the Poplar Electricity Department took place on Thursday of last week, when Mr. J. W. Beauchamp, director of the British Electrical Development Association, officiated. The inauguration was of particular interest in that it marked the twenty-fifth anniversary of the commencement of electricity supply in Poplar. The new premises, Electric House, 65-67, Bow Road, are situated on an important corner site opposite the Bow Road District Railway station. They form the third set of showrooms of the undertaking. In July, 1911, the first offices and showrooms of the undertaking were opened at 121, East India Dock Road, to improve the facilities for consumers and the development of service to prospective customers. Larger premises were taken and opened early in 1919 at 97-99, East India Dock Road, to accommodate the staff necessary to cope with the increased volume of business. The recent provision forms a new departure which is calculated to improve business facilities with consumers, particularly in the northern district of the borough, and to promote confidence with present and prospective consumers.

Forty feet of pavement separates the building line of the premises from the curb, and the frontage available for window display amounts to approximately 120 feet. Five floor levels

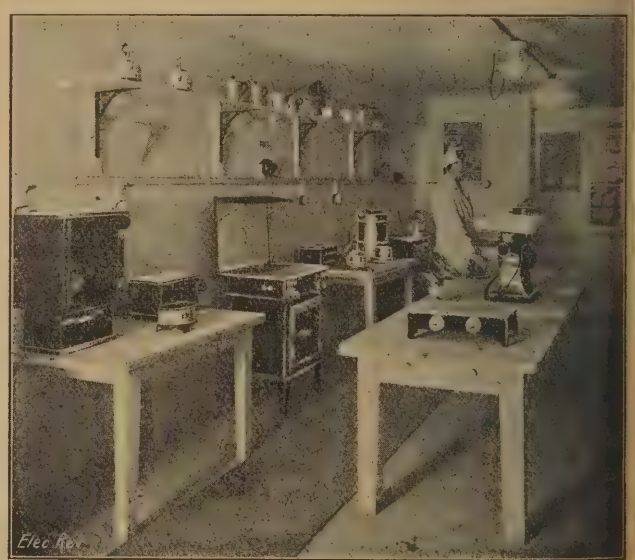


Fig. 5.—Demonstration Room, Poplar.

are included in the premises, excluding a basement, which is to be used for demonstration and lecture purposes; this has a seating capacity for 100 people. Fig. 5 shows some of the cooking equipment arranged for demonstrations in the basement. The ground floor constitutes the main show room, which is bordered on two sides by the display windows. Fig. 6 shows the main entrance and one of the windows. These are provided with modern systems of lighting, a special feature being the equipment of a special demonstration window in which incorrect and correct methods of illumination are depicted, fig. 6. Nine examples are shown and include lighting with coloured, flood and spot-light effects. Each method is automatically switched on in turn and an illuminated indicator board informs the observer as to the style of lighting in each case. A special feature of the demonstration compartment is the provision of cubicles in which the effects of various lighting fittings and

fires can be easily seen. Some of these cubicles are shown in fig. 7.

All types of fittings and apparatus are displayed, most of which have been provided by several of the manufacturers of this country for exhibitional purposes. Among the special items of interest is the bread-wrapping plant installed at the instance of Messrs. Young & Burton, Ltd., of Stratford. Sausage making by the Empire Provision Co. with "Hobart" and "Dayton" machines is also a feature, while an interesting exhibit is the "Little Marvel" potato peeler of Messrs. Mabbot and Co., Ltd. Great interest is shown in an exhibit of Mr. Herbert, of the Benjamin Electric Co., Ltd., which illustrates lighting devices from the "Aladdin" oil lamp to modern electric lighting. It is interesting to note that it is the intention of the undertaking to give demonstrations in the de-frosting of meat,



Fig. 6.—Poplar Show Windows and Entrance.

apart from bread baking, &c. Industrial exhibits such as electric cutting and grinding tools are given by Messrs. Wolf. All the usual domestic appliances are fully displayed and form an attractive feature. The general atmosphere of the showroom is enlivened by an electric piano kindly lent by Messrs. Keith Prowse, Ltd.

At the inauguration ceremony Mr. Beauchamp was introduced by the Mayor of the Borough, Councillor E. J. Lansbury, J.P. Mr. Beauchamp congratulated the undertaking on the position of "Electric House" and on its 25th anniversary of its commencement. He referred to the No. 2 station which was being built at Poplar, and said he looked forward to a further advance in that direction. He also alluded to the sympathy which the Electricity Commissioners showed towards the local development of electricity supply. He paid a tribute to the work done by Mr. J. H. Bowden, the general manager and chief engineer of the undertaking, and his staff. A vote of thanks to Mr. Beauchamp was proposed by Councillor W. Lyons, chairman of the Poplar Electricity Committee.

The Electrical Exhibition at Leicester.

The first "all electric" exhibition held at Leicester was opened in the Junior Training Halls on Thursday, October 8th, by the Mayor of the City (Councillor H. Simpson), and will be continued until Saturday, October 17th. Although the number of different firms which exhibited at the opening was satisfactory for an initial venture, the spacious halls were not well filled and the thirty-three participants could have had their number trebled without any overcrowding. There was a comprehensive display of electrical appliances, however, and some of the stands were of unusual interest. As might be expected, wireless goods were well to the fore, and were, indeed, the strongest feature of the display; and domestic appliances were also much in evidence. One of the largest stands was that of the Leicester Corporation Electricity Department, where were featured the entire range of domestic aids now offered by the undertaking to its consumers. It was an excellently arranged stand, calculated to do the maximum amount of educational work in the cause of domestic electricity. Another most interesting display was staged by Messrs. Gent & Co., of Faraday Works, Leicester. A conspicuous object of attraction was their "Pul-synetic" electric clock systems and time discipline apparatus, the clock, with its movement exposed, being studied with close attention by all visitors. The full range of the "Tangent" specialities of this firm were shown on a separate large stand. The Edison Swan Electric Company had an interesting show of domestic appliances as well as of accessories to meet office and factory needs. Messrs. F. J. Yates and Co., Leicester, specialised on electrical equipment for the manufacturer and merchant, and also had fitted up an all-electric bungalow which proved a centre of attraction and an eye-opener to the hundreds of ladies who inspected it. Messrs. Adcock & Shipley, machine tool manufacturers, Leicester, had an interesting display of electrical drilling machines, &c. An extensive range of electric fittings for all purposes was shown by Messrs. Brooks & Clayton, of Leicester. The Trent Electric Wireworks, Ltd., of Shardlow, Derby, staged a comprehensive outfit of wires and cables; and an exhibition of its storage batteries was given by the Ace Battery Company, Lutterworth.

Among the other firms which exhibited were the A.E.G. Machinery & Apparatus Company, recorders and other specialities; the Hendon Electric Lamp Co., Southampton Row, lamps and illuminated signs; G. W. Robinson, Great Windmill Street, London, lighting fittings, time switches and other devices; "Sadias" Ely Place, London, the "Zent" electric thermo-storage boiler; the Electric Heating and Hardware Co., of Birmingham; the General Electric Co., Ltd., domestic accessories; Belling & Co., Upper Edmonton, electric fires; Heatley and Co., Leadenhall Street, the Alcock electric defroster; the British Electric Transformer Co., London, electric cookers and fires. A notable feature of the exhibition was the activity of the Electrical Association for Women, which illustrated the progress made in lighting by electricity with working models of the various types and systems of electric lamps and installations, &c.; demonstrations were also given in how to avoid glare; and the correct utilisation of electricity in industry.

During the week a series of lectures on the use of electricity in the home was arranged by Miss Margaret Partridge, B.Sc., and the B.B.C. provided entertainment in the shape of concerts on the "wireless."

At the opening ceremony the Chairman of the Leicester Electricity Committee (Councillor A. H. Swain) presided, supported by the Mayor and the Mayoress (Mrs. Simpson); Mrs. A. H. Swain, Alderman G. Banton (Chairman of the Tramways Committee), Alderman H. Hand, Miss Clara Haslett (Director of the Electrical Association for Women), and a number of other ladies and gentlemen, including Mr. T. P. Bentley, the promoter of the Exhibition, were also present.

Councillor Swain briefly introduced the subject of exhibi-

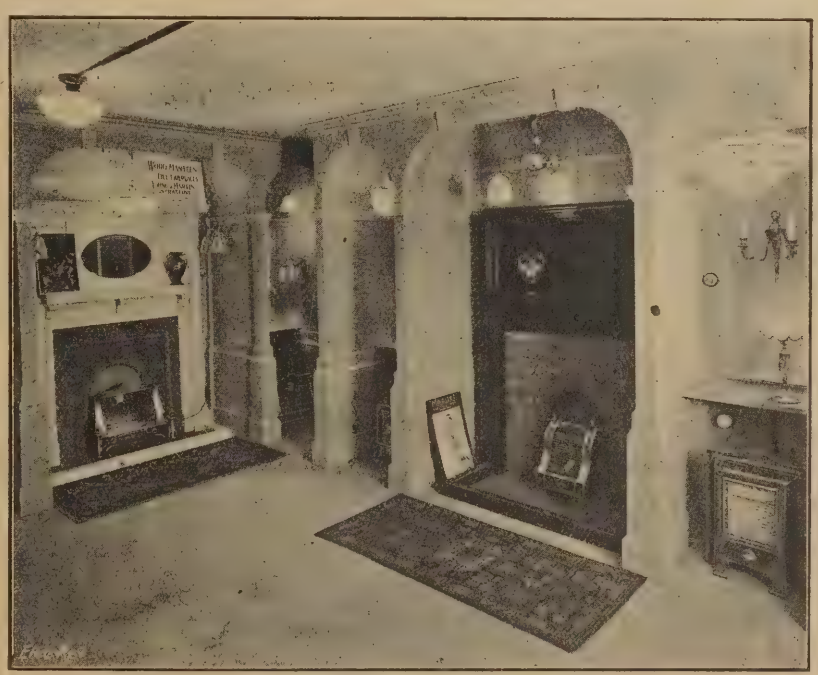


Fig. 7.—Demonstration Cubicles, Poplar.

tions, and commended the project in Leicester, as he claimed that electrical development would go far to relieve the country of its industrial problems.

The Mayor, in declaring the exhibition open, said it was advertising a not inconsiderable local industry, and that was a benefit to the city. The City Council was greatly interested in the exhibition, as it believed that electricity in the home would go far to ease the burden on the housewife and thus greatly promote health.

Miss Haslett, in seconding a vote of thanks to the Mayor proposed by Councillor Acton, congratulated Leicester on its progress electrically, and said she had noticed that electrical appliances were placed within the reach of the poorest people, while she had the authority of the Home Office for stating that the city occupied a high place for the use of electricity in

factories. The immediate need was to educate women as to the advantages of electricity in the home.

Alderman Banton, who supported, expressed his belief that it was to the use of electricity they must look for the suppression of the smoke nuisance.

The Nottingham Electrical Exhibition.

Following quickly upon the opening of the city's new electricity generating station, an opportunity is being afforded at Nottingham of witnessing an electrical exhibition of great variety and interest, embodying appliances of the latest types for lighting, cooking, heating and power purpcses. The display which was opened by the Mayor (Mr. J. Clarkson) on Thursday of last week, and, like the Leicester exhibition, is to be continued until to-morrow, has been arranged in the Drill Hall, Derby Road, an admirably adapted building, responsibility for the project devolving upon the local branch of the Electrical Contractors' Association, members of which have received the support of the Corporation Electrical Department. It is in view of a possible early reduction locally in the price of energy, that the exhibition derives additional interest as affording a ready means whereby prospective, as well as present, consumers of the Corporation may realise the value of adjuncts now available. The municipal electricity committee has afforded a generous measure of assistance to the venture, providing gratuitously all the energy needed and connecting up each stall free of cost. Besides its own exhibit, which is of considerable technical interest, it has undertaken the distribution of a great deal of instructive literature, bearing upon the subject of electricity supply for domestic and other purposes. It was a happy thought which led to the Corporation's participation in the display taking the form of a delicately furnished bungalow in which varied devices have been exemplified to the most skilful advantage, the municipal committee having contributed substantially to the success of the project generally by making itself responsible for an expenditure approximating £1,000. Among the largest of the exhibitors are Messrs. Henry Barker and Co., of Angel Row, Nottingham, who make a most varied display, beside having been responsible for most of the attractive decorative work in connection with the Corporation bungalow. The Edison Swan Electric Company has, through its local branch, provided a stand replete with interest, among the labour-saving appliances there brought under notice being the "All British Little Glutton" suction cleaner, presenting many valuable features. Ediswan fires are also being shown, together with alabaster bowls and electric vases, the whole presenting a very artistic effect.

Among the principal exhibitors is a well-known local firm. Messrs. Pearson Bros., of Long Row, who make an extensive display of domestic apparatus, including, prominently, products of the Western Electric Company. Among these are washing and ironing machines, in which the facilities for effective work are strikingly demonstrated. Amplifying their show of wireless apparatus, Messrs. Attenborough & Turpin, of Goldsmith Street, Nottingham, have afforded the opportunity for the inspection of a Wolseley electric generating plant, of a size commensurate with the requirements of a large house which may not be able to obtain a public supply of electricity. Their stand also, which is typical of several others, includes a great variety of labour-saving domestic appliances. Articles for the manufacture of which the General Electric Co., Ltd., is responsible are to be found upon most of the stalls. One of the most interesting stands in the exhibition is that of Messrs. J. & S. Farr, Ltd., a well-known Nottingham firm, who show a wide range of electrical appliances. Messrs. Thomas Danks and Co., of Nottingham, have also contributed substantially to the success of the exhibition, one of their specialities being electrical apparatus for water heating. The British Thomson-Houston Co. also make a comprehensive contribution. The wireless side of the exhibition is of great variety and interest, a notable feature being the cheapness of many of the sets. Keen interest has been manifested in relation to the display which has attracted large numbers of visitors, including many from surrounding districts, and has admirably fulfilled the municipal purpose of exemplifying the value of electricity for all its varied purposes. Incidentally, following upon the opening of the new power station, it has served also to stimulate considerably the demand for electrical energy, it being altogether encouraging from the municipal point of view to know that the department has been lately inundated with applications from those who are desirous of obtaining supplies.

Of particular interest on the opening day were successful tests made by Mr. L. H. Pearson, a local inventor, whereby electric current was controlled by speech. Mr. Pearson claims to have perfected a device which makes it possible to command electric light to switch on and off by word of mouth. Briefly, the device transforms sound waves in such a manner that they will control any electrical circuit. He startled the onlookers by starting up a motor merely by the sound of his voice. Mr. Pearson hopes to adapt the invention to surgery, so that patients' heart-beats could be recorded at some distance away.

The Scottish Lighting Service Bureau.

The Scottish Electric Lighting Service Bureau at 20, Trongate, Glasgow, an offshoot of a similar bureau in London, and the first of its kind in Scotland, was formally declared open on Monday by the Lord Provost in the presence of a large gathering of those interested in electric lighting. The bureau, which is conducted by Mr. Henry E. Hughes, district engineer, has as its prime object the educating of the public in the modern principles of electric lighting, and a commodious demonstration room, in which numerous electric fittings are installed, will be used to show the correct and incorrect methods of lighting in the home, shop, and factory, and also on the street. The elimination of "glare" is one of the principal features of the demonstrations. Particularly interesting is the display of shop window lighting, showing the attractive powers of spot and flood lights, while there are also displays of illuminated sign and poster lighting. In a central lecture room contrasts will be shown in shop interior and street lighting, while house lighting methods are demonstrated in an apartment fitted up as a sitting room. Lectures open to the public will be given each day by Mr. Hughes as well as by experts from London. Many Scottish electrical bodies, including the Glasgow Corporation lighting and electricity departments, are interested in the work of the Bureau, which has been established purely for educational purposes.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

An Automatic Motor Acceleration Device.

The Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, has produced an automatic accelerating device for use with liquid controllers applied to motors driving

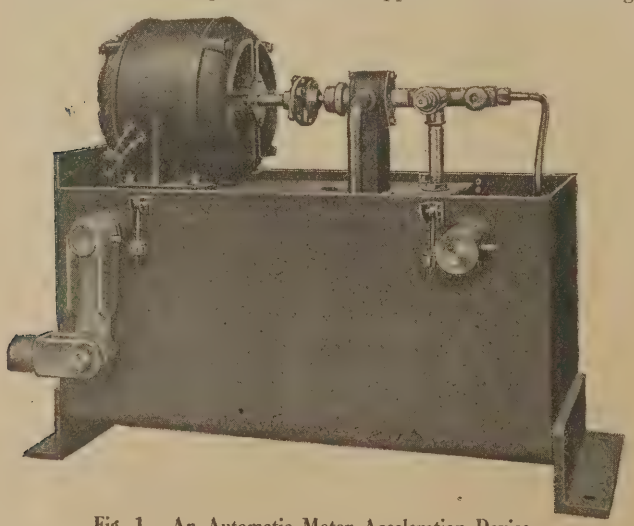


Fig. 1.—An Automatic Motor Acceleration Device.

electric winders, haulages, and the like. By means of this apparatus the maximum safe rate of acceleration can be obtained automatically, thus securing maximum economy. The device prevents too-rapid acceleration and ensures that when the operating lever is pushed from zero to the full-speed position, the motor attains full speed in the time for which the apparatus is set. But whilst preventing too rapid acceleration, and giving automatic attainment of the correct economic speed, full power is retained to run at any lower speed that may be desired, or to obtain inching for decking purposes.

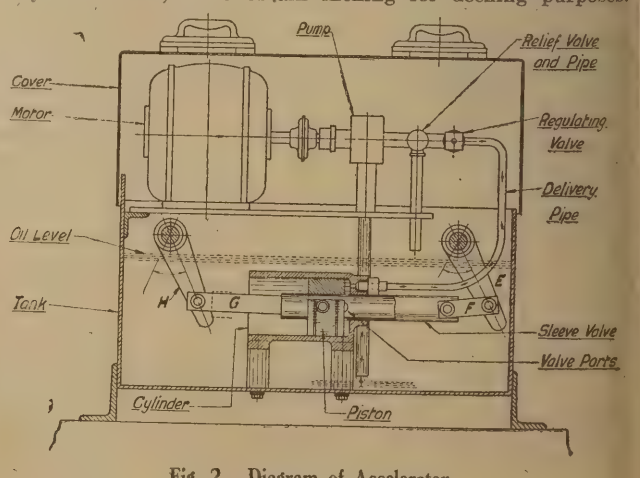


Fig. 2.—Diagram of Accelerator.

Should a different time setting be required, the process of effecting this is a very simple one. Moreover, an easy adjustment is provided whereby the automatic action may be dis-

connected and full manual control restored should this ever be necessary. The device is illustrated in fig. 1, while fig. 2 is a diagram showing the method of operation. Referring to fig. 2, the principal parts are a steel tube forming a simple sleeve valve connected with the operating lever through links E and F; a piston connected with the controller through links G and H and an external link; and a motor driving a pump which circulates oil (at uniform pressure to ensure uniform acceleration) through a delivery pipe fitted with relief and regulating valves. When in the position shown, oil drawn from the bottom of the tank and pumped into the cylinder, escapes through four port holes in the sleeve valve. Directly the sleeve valve is moved into the full speed or any intermediate position, the piston is forced by oil-pressure to follow the valve until the port holes are again sufficiently uncovered to allow the oil to escape. The rate at which the piston moves forward, and consequently the time taken for automatic operation of the controller is determined by adjustment of the regulating valve. In deceleration, the sleeve valve is moved back in unison with the operating lever, and the immediate return of the piston is arranged for by having the moving parts of the controller biased by means of weights so that there is a force tending always to push the piston to the back of the cylinder. To avoid any possibility of jarring, spring buffers are fitted. When installing the apparatus, the regulating valve must be set so that the controller is moved from its off to its full on position in the number of seconds given on the performance diagram, after which no further adjustment is required.

An Electric Organ-blowing Equipment.

The accompanying illustration is of a new type of single stage electric organ-blowing equipment that has recently been developed by the Rockingham Engineering Co., Beulah Road, Thornton Heath, Surrey, specially designed to meet the requirements of instruments having low and medium pressures, and where an effective and inexpensive type of blowing apparatus is desired. The blower is built up with cast-iron diaphragms and sheet steel castings. The fan or impeller is mounted on the electric-motor shaft and the blower and motor are arranged on a combined steel bedplate as shown, making a solid engineering job of compact construction. The impeller is designed to secure the highest efficiency in operation and is proportioned according to the output of volume and wind required. Three forms of construction can

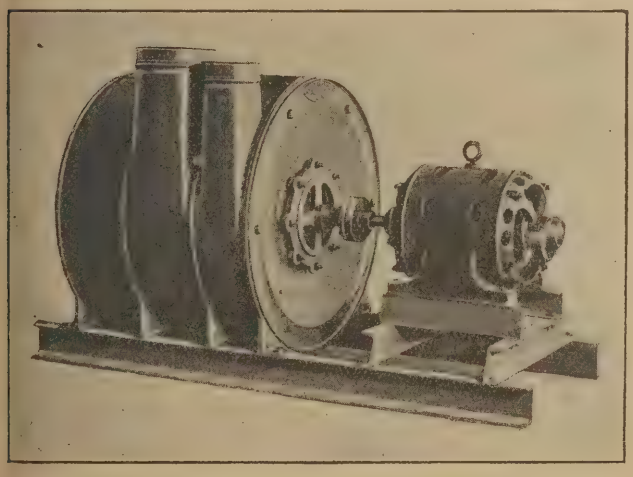


Fig. 3.—Electrical Organ-Blowing Equipment.

be employed according to requirements, one with an open intake on the motor side; one with an internal intake chamber and a non-return valve; and one with a piped intake so that the air may be drawn from another source, this being specially desirable where the apparatus is placed in a heating chamber and avoiding the use of hot air laden with dust and sulphurous fumes. From the outlet of the blower (which can be arranged vertically or horizontally), the wind trunk is run to the main organ reservoir, where the control valve is fixed, automatically regulating the supply of wind according to the demands of the player. The electric motor runs at normal speed while in use (the apparatus being controlled on the wind side only), but owing to the particular construction of the blower portion, the load on the motor varies with the wind output actually taken. For large organ blowing installations and instruments in which higher wind pressures are employed, the muti-stage type of blower is adopted (fig. 3) from which wind at varying pressures may be taken by separate wind trunks. For still higher pressures an independent booster is used to deal with a portion of the wind required, this booster being belt driven or direct coupled to the main motor and blower.

It is interesting to note that the magnificent organ at the Liverpool Town Hall, originally blown by two steam engines, has been equipped with an electric blowing installation by the Rockingham Engineering Co. This plant consists of a 15-h.p. three-phase motor, running at 1,440 r.p.m. direct coupled to the main blower, which has a capacity of 3,500 cubic ft. of air per min. This blowing plant is placed in the basement of the building and controlled by a push button at the organ keyboard working in conjunction with an automatic contactor panel in the blowing chamber.

Smoke Abatement.

A Conference at Buxton.

The annual conference of the Smoke Abatement League of Great Britain was held this year at the Palace Hotel, Buxton, from October 2nd to October 5th. It will be recollected that in November, 1924, a lengthy conference combined with an exhibition was held in Manchester. Since that time many lessons have been learnt, chief amongst which is the fact that the reading of lengthy papers, however admirably prepared, is not conducive to action in the great problem of educating public opinion. Again, by holding the conference in the form of a "Smoke Week-end" in a quiet place, it was thought that further headway would be made. It would appear certain even at this early date that the action of the Executive has been more than justified, and the Buxton Conference will no doubt be regarded as the most successful in the history of the League In the words of Dr. R. Veitch Clark, the Medical Officer of Health for the City of Manchester, "it is evident that the movement is being reborn."

The League is extremely grateful to those members of the electrical profession who from time to time have rendered to it valuable assistance, but it was unfortunate that amongst those assembled at Buxton there were very few representatives of the industry. To the most casual observer it must have been apparent how useful the presence of a few electrical experts and commercial heads would have been. It is to be hoped that in future years the industry will take an even larger part than it has done in the past, as, after all, the final solution of the problems will rest to a very large extent with it.

After the hotel dinner on the Friday night an informal meeting was held under the chairmanship of Dr. F. Ashworth (Medical Officer of Health for Rochdale), who has done much towards the solution of the problem of smoke abatement under the exceptionally difficult conditions obtaining in his town. At this meeting the hon. secretary (Mr. C. Elliott) gave an account of the main objectives of the League. He explained that the main line of all its actions must be the education of public opinion, and as a central point in this the League advocated the setting-up of independent advisory bureaux and showrooms for the dissemination of the knowledge of the principles of heating and ventilating.

The annual meeting of the League was somewhat protracted and many important details were discussed. Two of the points, however, require emphasis; one was the desire of the Executive to remove any feeling that the League was a "Manchester" affair, and the second was the question of the establishment of branches. During the course of the meeting it transpired that another conference was likely to be held in Glasgow early in 1926, and, as is now well-known, the Bingley Hall at Birmingham has been reserved for an exhibition in September, 1926. The election of the General Council was a matter over which great care was taken, the meeting being adjourned to give further time for discussion. Amongst those re-elected was Ald. W. Walker, of Manchester. A number of gentlemen who were unable to devote the necessary time were replaced, and an active and strong council is now in readiness to deal with the important constructive programme unanimously endorsed by the conference.

The chair was taken by Coun. J. H. Robson, of Huddersfield, and short papers were read by Mr. R. H. Clayton, B.Sc., and Miss M. Fitzgerald, A.R.S.I. The meeting was devoted to the study of the best methods of educating public opinion. Coun. Robson, after a brief reference to the absence of smoke during the coal strike of 1921 and also at such Continental towns as Barmen, Elberfeld, &c., emphasised the importance of teaching the public actual facts, not merely through the ear but through the eye as well.

Mr. R. H. Clayton commenced with a vigorous denial of the accusations made against the owners of power plants for making black smoke. Not more than 5 per cent. of the industrial chimneys of Manchester emitted serious quantities of smoke, he proceeded, and other towns should follow suit. It was the domestic fire which formed the greatest difficulty. In spite of the efforts of the gas and electricity departments of the various Corporations a glance on each side of the railway passing along from Stockport into London Road (Manchester) would satisfy anyone as to where the trouble laid. Too little attention was paid to the cost of smoke, estimated so far as Manchester was concerned at about £1 per head of the population. This point should be continually pressed on the public. It was not appreciated so much by the rich, said Mr. Clayton, as by the poor. The rich man got away from the smoke as soon as his work was done, but he forgot to calculate the cost not only of time and money spent in travelling, but also the serious situation which arose by the alienation of the master from his employés. This was a point worthy of consideration even apart from the effect of smoke upon the health of the worker and consequently upon his output. Public bodies relied on the gas and electricity departments or on the medical officer of health. This was not the right way. The question of air pollution should be dealt with on the same lines as those on which the purification of rivers had been attended to. In the latter case, the public had no objection to money being spent with only a distant hope of a monetary return. Air purification, on the other hand, had the certainty of an immediate profitable return. He advocated the setting up of independent fuel heating and ventilating departments. Ventilation was most important and could not be divorced from heating. "Smoke areas" should be arranged on the lines of those "regions"

already set up around the large towns, and a sum of £10,000 per annum allotted to each heating and ventilating department. On the ten million people around Manchester this would involve a very small rate. The department would be under the Sanitary Committee without bias from the gas or electricity departments. Practical study, work and experiments (with the co-operation of ladies) would be carried on. In a word, "Public Education." All reforms, said Mr. Clayton, came from the people, and to attain them, practical demonstration, not lectures, was required.

Miss Marion Fitzgerald then put forward her views on the best methods of educating public opinion, and in a short practical address she pointed out that first of all the object must be to convince the housewife that the evils need not be tolerated, and then to show her how they could be avoided. The chief arguments to use were health, civic benefit, and, above all, the now popular labour-saving devices. The League should associate itself with all civic and social societies working for the betterment of the conditions of the people. The Association was grateful to the Press for its assistance in the past. The domestic science teacher should be approached through the Boards of Education. What the people required was real information, not counsels of perfection. She would give her full support to the independent department alluded to by Mr. Clayton and urged the League to do so.

Mr. H. G. Clinch, the chief inspector of the Halifax Health Department, in the course of a short speech after the discussion had commenced, alluded to the fact that in his town they were well backed up by the gas and electricity departments.

Mr. J. Munro, of the Health Department, Glasgow, gave some details of the excellent work carried on in that city, and said that the Air Purification Committee was "sub" to the Health Committee.

Dr. Barlow (Medical Officer, Wallasey) alluded to the fact that local authorities had now legal powers to spend money on propaganda work in this connection.

Mr. S. H. Moore, Chief Sanitary Inspector of Chester, held that the new department should not be separate but should be under the control of the medical officer of health.

Dr. R. Veitch Clark (Medical Officer, Manchester) said that the medical officer who thought he could deal with the smoke question without outside aid was a fool. He required the full weight of public opinion. The Smoke Abatement League should be put into such a financial position as would enable it to send lecturers all over the country. It was not a problem of single authorities but of large "Smoke Areas."

(To be concluded.)

The Electrical Import and Export Trade of Austria.

Progress of Exports.

The following table gives particulars of Austria's imports and exports of electrical machinery and apparatus in 1923 and 1924, the total values in gold crowns being stated, together with the total weights in quintals and the weights by countries of origin and destination. The steady progress which has been made in almost every branch of Austria's export trade in electrical goods, which is carried on chiefly with neighbouring countries, is clear testimony to the recovery that has taken place in Central Europe.

	Imports, 1923.	Imports, 1924.	Exports, 1923.	Exports, 1924.
Dynamos and motors.—				
Value in 1,000 gold crowns	1,572	2,448	7,837	7,875
Number	11,546	12,930	7,217	8,617
Weight in quintals	3,581	5,612	20,821	18,536
Belgium	—	—	612	507
Bulgaria	—	—	1,311	1,218
Germany	2,462	2,661	2,056	625
Italy	44	64	1,587	857
Poland	—	19	3,498	2,633
Rumania	—	—	2,658	3,303
Jugo-Slavia	73	1	3,711	2,939
Czecho-Slovakia	186	1,027	1,920	2,950
Hungary	702	1,627	1,474	1,976
Parts of ditto.—				
Value in 1,000 gold crowns	1,657	1,649	942	1,205
Weight in quintals	4,249	3,808	2,568	2,763
Germany	2,110	768	20	211
Switzerland	198	68	49	—
Czecho-Slovakia	1,926	2,964	776	859
Dynamos and motors joined to mechanical plant.—				
Value in 1,000 gold crowns	90	258	210	600
Number	910	1,819	1,434	3,778
Weight in quintals	227	380	576	984
Germany	212	351	176	113
Great Britain	—	1	30	164
Rumania	—	—	50	77
Jugo-Slavia	—	—	145	222
Czecho-Slovakia	1	2	67	66
Brazil	—	—	—	49
Parts of ditto.—				
Value in 1,000 gold crowns	4	90	3	1
Weight in quintals	11	121	8	1
Rotary transformers.—				
Value in 1,000 gold crowns	—	—	28	—
Number	—	—	3	—
Weight in quintals	—	—	81	—
Stationary transformers.—				
Value in 1,000 gold crowns	311	401	2,374	1,657
Number	2,337	1,991	4,843	7,13[illegible]
Weight in quintals	1,074	1,403	7,529	4,86[illegible]
Germany	976	1,098	31	4[illegible]
Italy	—	—	255	55[illegible]
Poland	—	—	1,310	1,03[illegible]
Rumania	—	—	1,154	33[illegible]
Jugo-Slavia	1	7	1,486	1,14[illegible]
Parts of ditto.—				
Value in 1,000 gold crowns	15	67	110	3[illegible]
Weight in quintals	46	192	393	9[illegible]
Telegraph and signalling apparatus.—				
Value in 1,000 gold crowns	182	257	101	357
Weight in quintals	165	110	134	10[illegible]
Germany	132	106	11	[illegible]
Great Britain	32	1	—	[illegible]
Jugo-Slavia	—	—	23	1[illegible]
Czecho-Slovakia	—	—	50	1[illegible]
Telephones and microphones.—				
Value in 1,000 gold crowns	281	747	2,163	4,521
Weight in quintals	221	467	2,697	2,833
Germany	210	382	529	84
Great Britain	2	17	458	446
Italy	—	15	300	262
Poland	—	—	223	170
Rumania	—	—	228	229
Jugo-Slavia	—	2	172	164
Czecho-Slovakia	1	1	538	1,176
Railway safety and signalling apparatus.—				
Value in 1,000 gold crowns	18	21	395	601
Weight in quintals	16	14	353	455
Poland	—	—	144	106
Rumania	—	—	1	18
Czecho-Slovakia	—	—	208	331
Electricity meters and measuring apparatus.—				
Value in 1,000 gold crowns	1,460	1,073	1,483	2,337
Weight in quintals	1,622	1,690	2,048	2,724
Bulgaria	—	—	179	144
Germany	1,505	1,436	212	16
Italy	—	—	161	343
Portugal	—	—	257	384
Switzerland	51	199	4	3
Czecho-Slovakia	4	1	339	231
Hungary	51	47	38	87
Incandescent lamps.—				
Value in 1,000 gold crowns	2,230	3,749	14,563	10,660
Weight in quintals	1,448	2,343	24,724	18,137
German ports	—	—	4,177	5,048
Germany	1,133	1,784	7,305	3,190
Great Britain	1	2	3,191	2,372
Italy	3	—	1,912	1,695
Poland	—	—	1,372	178
Trieste	—	—	766	655
Hungary	277	528	61	106
United States	—	—	1,395	953
Heating and cooking apparatus and electric irons.—				
Value in 1,000 gold crowns	39	70	166	229
Weight in quintals	110	176	638	716
Germany	82	147	7	82
Italy	5	11	79	95
Switzerland	22	6	3	11
Jugo-Slavia	—	—	154	165
Hungary	—	—	90	107
Other electrical apparatus.—				
Value in 1,000 gold crowns	3,382	5,220	4,342	6,602
Weight in quintals	6,763	7,909	11,764	11,385
Germany	6,367	7,080	209	257
Italy	10	46	331	221
Poland	1	1	1,691	2,032
Rumania	—	—	1,286	1,144
Switzerland	65	129	45	62
Jugo-Slavia	—	—	2,493	2,532
Czecho-Slovakia	248	430	3,531	2,951
Hungary	55	160	740	715
Insulating tubes.—*				
Value in 1,000 gold crowns	4	205	204	1,126
Weight in quintals	22	310	1,178	1,701
Cables and insulated wire.†—				
Value in 1,000 gold crowns	53	203	2,753	6,107
Weight in quintals	212	534	12,454	16,174
Germany	118	214	103	349
Great Britain	2	—	261	1,143
Italy	83	261	358	226

* Exported in 1924 to neighbouring countries and Egypt.

† Exported in 1924 to neighbouring countries, Egypt, Cuba, and Uruguay.

	Imports, 1923.	Imports, 1924.	Exports, 1923.	Exports, 1924.
Accumulators and plates.—				
Value in 1,000 gold crowns	28	32	183	445
Weight in quintals ...	199	119	1,455	2,042
Germany	195	83	19	32
Jugo-Slavia	—	—	639	1,446
Czecho-Slovakia ...	—	15	506	217
Hungary	4	20	113	87
Carbons for lighting.—				
Value in 1,000 gold crowns	17	13	124	60
Weight in quintals ...	105	63	934	427
Great Britain	—	—	527	197
Canada	—	—	—	110
Electrodes.—				
Value in 1,000 gold crowns	540	340	75	253
Weight in quintals ...	25,651	11,307	1,257	3,160
Germany	18,989	5,802	57	929
Jugo-Slavia	6,234	5,174	23	51
Other electric carbons.—				
Value in 1,000 gold crowns	102	119	44	76
Weight in quintals ...	170	198	125	216

The Consumption of Electricity in Relation to Population.

By J. W. BURR.

(*Abstract of Chairman's Address: Western Centre of the* Institution of Electrical Engineers.)

We are told that in 1922-1923 some eighty per cent. of the undertakings in Great Britain had not reached a stage of development corresponding to a sale of one hundred kWh per annum per head of the population and that sales of three hundred kWh, or over, per annum per head of population had been attained in a few cases only. The Electricity Commissioners also state in a review of their return of statistics of electricity undertakings, that on the basis of the Census of 1921, the aggregate population of the areas of supply of the local authority undertakings included in the return was approximately 22.8 millions, thus denoting an average sale in 1922-1923 of about 98 kWh per head of the population in such areas. The corresponding average figure for the supply companies' areas is not given, but we may assume that it does not differ from the above figure to any appreciable extent. Compare these figures with those given by Continental engineers, at the World's Power Conference. In Norway the estimated annual consumption per head of population was 2,000 kWh. I am quite aware that these figures apply to hydro-electric stations; all the same I see no reason why the difference should be so great. It would appear that we have barely touched the fringe of the domestic load in this country and it is certainly up to we engineers to find out the reason.

Do we realise that domestic consumers can easily become the greatest and most important of all users? We must be prepared to give the consumers what they want and not what we think they ought to have; educational publicity is in my opinion necessary, together with enthusiasm. We must be enthusiastic and after all we have reason to be; we must, of course, temper our enthusiasm by scientific knowledge.

"Is electricity available to all who require it?" The answer is decidedly in the negative. Many people could not at present have a supply of electricity, whatever their wishes might be, simply because the cost of running mains or transmission lines is so high. If a supply is to be available in the rural districts the Government should be asked to increase the grant or the cost of the work must be reduced in some way or other. This can only be done by co-operation with the cable, transformer and switch manufacturers, and I believe that great reduction in prices can be made if they will only take the matter in hand. Further, I would point out to manufacturers that this is a problem for them to solve and not for the supply authorities, as the cost of generation does not enter into the matter to any great extent. In regard to legislation, I am decidedly of the opinion that the Electricity Supply Acts restrict real expansion and attempts should be made to remove many of the restrictions which not only hamper the industry, but are in my view unnecessary.

Have we a suitable tariff for domestic apparatus and, if not, is it possible to obtain one? Tariffs vary in different parts of the country but, generally speaking, they can be grouped under two heads; the "flat rate" system, and the "two part" system of charging. It would appear that no tariff obtains to-day in this country such as to induce the domestic consumers to use electricity for all purposes, and it may, of course, be partly due to the cost of the apparatus.

Our generating costs are made up of the two factors: Annual charges on capital expended; and running costs. It necessarily follows that this fact will increase the total cost of generation. I suggest that as soon as a new station could show a saving on the cost of supply to the consumer equal to the annual capital charges on the old station, the latter should be shut down forthwith, as by that time it has outlived its usefulness. I do not think that any interest, municipal or company, should be allowed to stand in the way of this being done. In my view the Electricity Commissioners should have compulsory power in this respect, and their decision should be absolutely final.

When I referred to the erection of new stations I was not talking of super-stations but of medium-sized generating stations with modern plant situated about 20 or 30 miles apart, the exact distance depending upon the electrical density of the area. These stations should be suitably interconnected, provided the generating stations are not too far apart, as not only would the expenditure on generating plant be reduced thereby, but it would also improve the load factor and reduce operating costs. It would further secure continuity of supply to a great extent.

In regard to the much talked of super power station and its possibilities of reducing generating costs, I have always held the view that while the thermal efficiency of a medium-sized station, *i.e.*, one with a plant capacity between 25,000 and 50,000 kW, might be less than the thermal efficiency of a modern super power station equipped with all the heat saving appliances, it may easily be that the actual cost per kWh sold will be actually higher with the more efficient plant. It may also be that the larger station has to distribute electricity over a wider area and as a result will have to bear higher capital charges for main and transmission lines and also higher C^2R losses. It is possible for these conditions to neutralise the difference in the thermal efficiency between the two stations. I am assuming that the super power station is striving for the highest thermal efficiency and that its plant would probably consist of boilers suitable for a working pressure of between 350 and 500 lb. per sq. in. and a total steam temperature between 700 and 750 deg. F.; of air heaters instead of water economiser; of water heaters for raising the temperature of the condensate on its way to the boilers, fed with exhaust steam and steam bled from the turbine at various stages. The turbine units would be as large in capacity as possible and run at the highest speed to conserve space. With all the heat-saving apparatus and best modern plant obtainable, it is not possible for any super station to obtain an operating thermal efficiency of more than 25 per cent.

Briefly, then, I consider a medium sized station, well equipped with modern plant of the ordinary type, well situated in regard to the electrical centre of gravity and the supplies of coal and water, can supply consumers as cheaply as any super station distributing over wide areas. I would also say that in my opinion, the storage of large quantities of coal, the removal of ashes and the provision of a plentiful supply of cooling water, are problems it is often difficult to solve. In regard to generating stations generally, it is interesting to note that the maximum thermal efficiency of the most modern station erected was slightly under twenty per cent.

As much attention should be paid to the possibility of reducing distribution costs as to that of reducing generating costs. Cannot some method be devised for putting cable underground without disturbing the surface of the roadway? Thrust boring has been tried with a small measure of success. The present boring plant, however, is not suitable for all subsoils and reliable information in regard to the nature of the sub-soil and obstructions is not always obtainable. The idea, however, is good and needs developing. Co-operation is required between the Post Office, Electrical, Water and Gas Departments, so that in the event of one department opening up, the others could take advantage of the excavation, if required. When a roadway is made up or relaid it will probably pay to lay ducts on both sides of it, even although the prospective demand in the district does not justify the laying of a main at that particular time.

Every effort should be made to reduce the annual capital charges on the distribution system, not by "skimping" the copper (this may be false economy), but by reducing the cost of laying as much as possible. The running costs should also be reduced to a minimum.

I do not think it is generally realised what difference it makes in the works costs if the staff and men all work together instead of against each other. While I have no wish to "scratch the back" of the workmen, I would say that if more time was spent in trying to get the employés interested in their work and pulling together, than in reducing wages, I think it would be better for the undertaking generally.

Having produced our energy at the lowest possible cost, we must see that it is sold at a price which will give a reasonable return on the capital expenditure involved. In my view any profit should be returned to the consumer in the form of a reduction in the price of electricity, and a loss would have to be met by an increase in the price.

The tariff which obtains mostly on the Continent is, I believe, one in which the charge is the same irrespective of the use to which the energy is put. It is so much per kW year. If, therefore, a consumer pays for 1 kW year he may consume 8,760 kWh for any purpose he likes. The simplicity of the charge would appeal to the consumer, and the exit of the integrating meter would appeal to the engineer.

In order to completely solve our problem we must deal with the wiring and equipping for all domestic purposes.

I estimate that at present the cost of suitably wiring and fully equipping a villa residence of any seven rooms for all purposes, at £115. I believe that by mass production this price could be reduced enormously. If the undertakers are prepared to take a risk by offering a suitable low "all-in" tariff to all consumers proposing to use electricity for all purposes, I think the manufacturers should also be prepared to take a risk in the way of producing electrical apparatus in mass at a low price and chance the market.

New Electric Fires.

Designs for the Coming Season.

(*Concluded from page 594.*)

F. Turner & Co.

The employment of an electric fire in the place of a coal fire often means the leaving of an ugly gap which the fire is unable to fill. A number of firms which manufacture fires also produce a means of closing up this space. An example of this work is illustrated in fig. 27. This is an art metal surround of handsome though plain appearance made by Mr. F. Turner, Birmingham. It is adjustable and can be fitted in fireplaces measuring from 24 to 42 in. in width. It is made in brass or copper, or with an oxidised silver finish.

Inventum Electrical Appliances.

The principle feature of the fires of this make is the "plug in" elements. This arrangement renders the replacement of elements as simple a matter as the changing of an electric lamp. It is claimed that the elements are scientifically focused along the focal line of the parabolic reflectors. A very cheery appearance is given by these fires when in use. Fig. 30 is a wall design of fire which is supplied in either black, satin brass or florentine bronze. It is fitted with brass reflectors and the elements are designed for either 500 or 750 W loading.

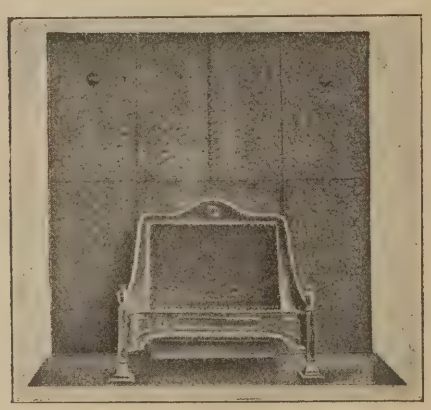


Fig. 27.—An Art Metal Fire Surround.



Fig. 28.—Reflecting Well Fire.



Fig. 29.—Bowl Reflector Fire.

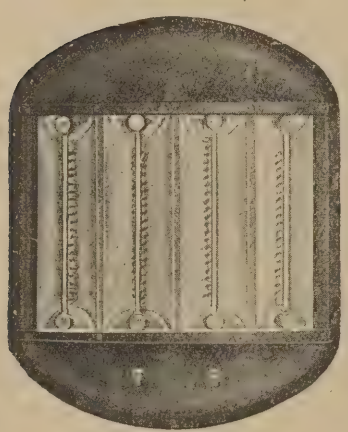


Fig. 30.—Wall Fire.

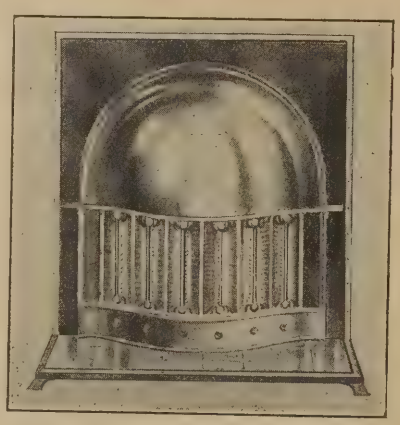


Fig. 31.—Fire with Tiled Hearth.

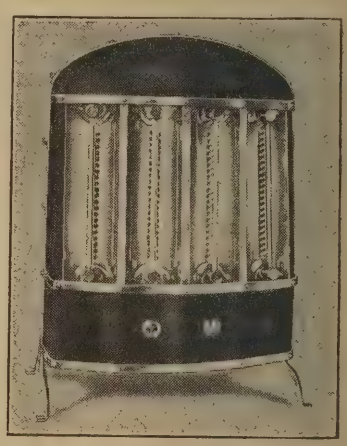


Fig. 32.—Sheet Metal Fire.

Fig. 31 is a new design depicting the hand made fire with a screen covering the aperture above the elements as provided in an ordinary coal fireplace. The screens are made to measure. These fires are supplied with detachable tiled hearths of any colour for decoration purposes. The elements are supplied in standard sizes for 500 W and 750 W loading.

Fig. 32 is of a particularly effective design finished in crystallised black with nickel relief. Each plug-in element is provided with a separate parabolic nickel reflector. As in the other designs the elements are made in two sizes for 500- and 750-W loading.

Wm. Geipel & Co.

The "Quead Junior," model Q 20, fig. 29, and the "Queen," model Q 21, fig. 28, are two attractive designs which this company has placed on the market. In the former the bowl reflector, which is of the usual design, is hinged to the pedestal so that it will tilt and lock firmly at any angle. The reflector is made of stout solid copper of excellent finish and the pedestal is of cast iron with a black enamel finish. The element is readily adjusted, and is made in three standards, for pressures of 100/120 V, 220/220 V, and 240/250 V. Its loading is 600 W. A strong and neat guard of copper finish is designed to accommodate a kettle when the bowl is tilted to a horizontal position. The latter is an attractive design of reflecting well fire. The reflector is of the usual copper finish, and is fitted with cast aluminium sides of artistic design. The element is of the usual "Quead" patented type. The consumption is 1,000 W ordinarily, or 2,000 W with a snap switch. It is made in standard sizes for pressures up to 250 V. A heavy coppered finish guard is provided.

A New Electrical Process for the Manufacture of Steel.

By HENNING FLODIN.

(*Abstract of a Paper read before the* IRON AND STEEL INSTITUTE.)

THE paper deals with a series of experiments in the direct smelting of ore by electrical means, carried out by the Electro-Chemical Section of the Royal Technical High School at Stockholm during the years 1923-25. The object of the trials was to ascertain whether malleable iron and steel could be extracted direct and continuously from iron ore, and at the same time to reduce the percentage of phosphorus and sulphur content in the ore and coal. An electric furnace was specially constructed for the purpose, working with a load of about 30 kW. A few trials alone sufficed to establish that iron with 0.02 per cent. carbon and upwards could be produced without difficulty. Sixty-five such trial reductions were made in a furnace of the particular construction mentioned, the results of which fully bore out that the method pursued was on the right lines.

The effects were so encouraging that it was decided to test the process thoroughly on a reasonably large industrial scale at the ironworks at Hagfors, Sweden. An electric furnace with a load of 250 to 300 kW was used, and up to the time of writing 114 tappings had been made. It was found that there was no difficulty whatever in producing iron and steel of any desired carbon percentage at successive tappings without interruption of the process, showing that the process could be controlled in the same manner and quite as easily as the discontinuous open-hearth process. The manganese and silicon contents are controlled in the same manner as in the open-hearth process. From the heat No. 3, containing 0.78 per cent. carbon, an ingot was taken and rolled out at the Forsbacka Ironworks, Sweden, and the material was used for making chisels for pneumatic hammers, drills, and miners' sledges, mainly for the purpose of testing the material. The chisels have proved to be fully equal to those made of the firm's own Bessemer steel, and a drill penetrated 0.4 metre into granite in a wet borehole without regrinding. The total radiation surface of the experimental furnace was 30 square meters, and when running empty the consumption was about 100 kW. At a load of 300 kW the furnace was therefore working with 200 effective kW.

A 3,000-kW furnace would have a radiation surface 2.33 times larger than the experimental furnace, or 70 square metres, so that the heat loss in this case would be 2.33×100=233 kW. The effective load would therefore be 3,000−233=2,767 kW. The losses due to water-cooling in the moulds, in contact rings and refrigeration, &c., would amount to 263 kW, making the total loss 500 kW.

The loss on energy at a load of 300 kW in the experimental furnace was 33.3 per cent., and in the 3,000-kW furnace it would be 16.65 per cent. At a load of 300 kW 1 ton of iron was produced in the experimental furnace, with an expenditure of 2,700 kWh; deducting 100 kWh for empty running, the production thus amounted to 111 kilogrammes per hour. If the 3,000-kW furnace worked with a net amount of 2,500 kW (3,000 less 500 kW loss), the production would therefore be:—

2,500 kWh×111 kg. per hour/200 kWh=1,388 kg. per hour. The gross expenditure of energy in the furnace would thus be:—

3,000/1.388=2,162 kWh per ton of iron.

The heat content of the waste gases would amount to between 2,700 and 2,900 calories.

The process works direct on a mixture of ore and coal in a single furnace, and the product is in the form of malleable iron and steel capable of being teemed into chills or other moulds in the usual manner. The process, however, does not only work direct as "one single process," but is continuous, interruptions occurring only at the moments of tapping, when the continuous feeding in of the mixture of ore and coal ceases, to recommence immediately after the tapping is complete. The operations must, of course, be carried out in such a manner that the furnace is fed with the mixture of coal and ore in quantities corresponding to the capacity of the amount of electrical energy supplied for reduction and fusion.

The reduction of the iron proceeds uninterruptedly and continuously. The metallic iron particles reduced from the ore may be compared to a fine rain continually dropping through the slag bath to the bottom of the furnace, where the molten malleable iron constantly accumulates. Practically speaking, the iron is in a fit condition at any moment for tapping in varying quantities in proportion to the rate of reduction, and it is hardly to be imagined that a higher degree of continuity can be reached in any process for the production of iron.

The raw materials used at Hagfors in the experimental furnace were Swedish hæmatite ore, and both English pit coal and Swedish charcoal. No refinement in special furnaces is necessary for the removal of phosphorus and sulphur to a sufficiently low point, the process being based on the principle that in the reaction the molecules are in contact, thus facilitating the transfer of the phosphorus and sulphur to the slag. A specially low-carbon material produced by the "one single process" may perhaps meet certain requirements for electric and magnetic purposes, and the product is generally suitable for any purpose where an extremely low percentage of carbon in the iron is desired. After the thorough tests to which both the iron and steel materials produced at Hagfors have been subjected, the author is satisfied that their quality is superior both to the open-hearth and the Bessemer products. While it is true that no scientific investigations have been made into the causes which make such results possible, we are justified in assuming that the superiority of the product of this electrical process is due to the relative absence of gases and the small amount of slag. The process works constantly under exclusion of air, and with a slight over-pressure in the furnace. Attention is specially directed to the low percentage of carbon (0.02), and it may confidently be expected that cheap stainless iron and steel produced by the "one single process" will soon appear on the market.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Metal Finishes.

I wonder if you can explain what is meant by the term "real B.M.A.," in relation to metal-work finishes, and why this particular finish should be so costly.

My knowledge on this question is extremely limited, but I was always under the impression that silver finishes were the most expensive. Is "real B.M.A." finish applied to ordinary brass-work, or must it be used only in conjunction with a special metal? Is it a "finish" or is it a special metal alloy?

Contractor.

October 9th, 1925.

Broadcasting Power.

I was very pleased to see in the current issue of the ELECTRICAL REVIEW Mr. H. P. Amphlett's comments on the above subject. Since Professor Low's article some discussions by misled wireless enthusiasts of my acquaintance have sounded like the tales of the "Arabian Nights."

In view of the poor transmission efficiency compared with present-day methods I think Prof. Low is looking "well ahead."

R. C. G. Knight.

West Hartlepool, *October 10th*, 1925.

Is the Contracting Business Degenerating?

According to "Polyphase," it is doing so, but perhaps he is one of those sort of contractors who walk about telling others what to do; if this is so, it is certainly adding to the expense, and in addition he may have a showroom with assistants, a portion of which must surely be added on to his quotations. He certainly overlooks the fact that there are many contractors like myself, who work hard on their own installations and do their booking, &c., in the evenings. I, for instance, can carry out work on new buildings at 10s. 6d. per point in all-British materials (C.J. tubing and Grip fittings) within a radius of twenty miles of London, installation tested and fully guaranteed, and can easily earn 25s. a day; in addition, I usually sell some article or other, which altogether brings in a very handsome income. The days are gone when a contractor sits at home, while others work hard to keep him; why should they?

I find that the contracting business is better to-day than ever it has been before, with plenty of new buildings, and electrical companies opening up in every direction; there is hardly a house built, that does not have electric light, but perhaps "Polyphase" is one of those people who go about paying twopence more per lb. to their tradespeople, &c., and giving their cheeseparing grocer presents? How can he expect the British public to pay a pound for ten shillings' worth of work? He forgets that we are all business people, it is he who is degenerating.

Hard Working Ex-Service Electrical Contractor.

October 9th, 1925.

The Æsthetic Aspect of Advertisements.

I wonder if your correspondent in his travels through Progress Town has ever visited the slums of that city in which so many of us toil.

Here he would find a street which, in the dusk or the fog that mercifully obscures both the palace and the hut, rows of tall, stately houses, he might at first take for the homes of the aristocracy of business—he will indeed read here and there in gold letters, still distinguishable on their grimy window frames such fine old names as John Reactionist, Merchant, Tory Inertia and Tory, The Archaic Manufacturing Company, and a host of others, who in council hall and platform so vigorously opposed the building of Advertising Street.

Let him enter one of the tall mansions, it is also no longer more than a tenement of noisy dens and garrets, candle lit, unappetising, and strangely, although each room is tenanted, there is never a name on the door, and the grim janitor who guides him assures your correspondent that tenants do not live here long—some fatten it is true, bloat, and explode, the victims of a disease to which has been given the name "Integrity in Commerce." Here lurk the long firm, the manufacturer of adulterated foodstuff, all the parasites of business who prey on the good names of their brother traders. There is no rent to pay in Obscurity Street—there are no morals—no rules save one: "Thou shalt not tell."

Progress Town is large, there are many districts; in one your correspondent may find a temple to the Goddess "Truth." Before the temple stands a plain but noble statue erected by the people of the world. It is dedicated curiously enough to the pioneers of Advertising, and perhaps you will permit me to give to the readers of the ELECTRICAL REVIEW the epitaph:—

"These men wrought well, wrought for all, and took just pride in that they wrought. They swore that never would they fail the little world who believed in them, and to this they set their brand and name. That others might have of their service, they risked their all to publish far and wide advertisement of their pledge to which they set their brand. Their names are to-day in every mouth, their memories are happy ones. They were so sure that they wrought well that they told all the world. In Life they gained prosperity, at death they left behind a Good Name, than which there is no greater legacy."

Advertiser.

Liverpool, *October 9th*, 1925.

Electric Wiring.

In your notes in this week's issue you give an extract from *The Dominion* (a New Zealand publication) which goes to prove how things are done "out there."

No country is so lax in framing or carrying out the existing regulations with regard to wiring as Britain, and one wonders just how far our Rip Van Winkle authorities will allow the present state of matters to drift.

The plumber, decorator, &c., have been discussed many times in your "Correspondence" columns, but indeed these individuals seem to be getting more rope than ever, and are even backed up by our law courts. What a contrast! In Australia it has been reported that incompetents are fined for carrying out electrical work, but in this country a law court decision has gone against a certain Corporation for having refused to connect an installation which had been wired by a plumber. Ugh!

I have raised this question with prominent supply company officials, and I am given to understand that anyone is allowed to carry out electrical work, no matter whether they are tailors, bakers, plumbers, &c.

The foregoing facts are (in my opinion) the cause of the scandalously low prices at present ruling in the contracting business. Granted, the incompetent tenderer soon hangs himself—but a new one jumps up, and so the game goes on.

What would happen if I attempted to practise as a doctor, lawyer, &c.? In these professions I contend my knowledge

is equal to that of numerous incompetent persons who are at present practising as full-blown electrical engineers.

Some of your correspondents may be able to suggest a remedy for this unfortunate state of affairs. I admit. it is beyond me.

Polyphase.

October 10th, 1925.

Individually Driven Textile Machinery.

You published an article under the above heading in your issue of September 11th on page 410.

A statement is made that with 1,000 h.p. of motor working at full load for 2,200 hours per year and energy at 1d. per unit, the saving is over £60 per annum. This is based upon high-performance machines having 6 per cent. higher efficiency than normal.

We think the amount of £60 is incorrect, and that the actual saving is £456 per annum.

It will be seen from this corrected figure that the extra cost of high-performance machines is more than justified.

Accepting Mr. Haigh's statement that these machines cost 5 per cent. more than ordinary motors, then with an installation of motors costing £5,000, the additional cost is wiped out in a little over six months.

Drake & Gorham, Ltd.

W. Hartley, *Chief Engineer.*

Manchester, *October 8th*, 1925.

[The error was set right by the author in a note which appeared on p. 466 of our issue of September 18th; for £60 read £600, and for 25 per cent. read 240 per cent. The correction, however, could not be given the same prominence as the original article, and in view of its importance we are glad of the opportunity to repeat it.—Eds. Elec. Rev.]

Rural Electricity Supply.

I have to thank Mr. Bartholomew for quoting the case of Mid-Cheshire in his attempt to convict me of "overstatement." Mr. Bartholomew, when quoting from my letter, omitted the essential point which demolishes his charge and puts the boot upon the other foot. Your readers have only to add the words "every paltry interconnecting circuit," which just preceded the part comprising Mr. Bartholomew's quotation and limited my remarks to that class of circuit, intermediate between trunks and subscribers' connections. We have in our scheme to cross several of these circuits; they are not delicately balanced and compensated as is the case with "trunks." They are ordinary simple lines, just a little heavier than subscribers' lines, and they run between Northwich and the neighbouring towns. They are run underground in the towns and suburbs and overhead in the intervening country—the latter purely on account of cost. In more congested areas they run underground all the way. These lines are not, in fact, either long or critical. They consist of half-a-dozen circuits, more or less, to each town, but the Post Office refuses to put them underground. It transpired when I asked "why these circuits could not be put underground," that *the Post Office Rule is to refuse* to put underground any but subscribers' connections, so that, as I stated, the talk of speech efficiency is a mere smoke screen to hide the fact that these lines, or many of them, could be put underground but for the "Rule." It follows logically that Mr. Bartholomew has greatly overstated the consideration given to each case, seeing that all that is done is to sort the crossings into two types—Subscribers' Lines and others. The 23 points where the Post Office offers to put its lines underground in fact include only subscribers' lines, and all of that type to which my statement applied are refused.

Mr. Bartholomew might have the records investigated and state how many town connections or "junctions" the Post Office has offered to put underground for my company and for other undertakings, or if he still states that there are serious difficulties he might write a technical article showing why such interconnection lines cannot be put underground. He should, I suggest, take the Northwich, Middlewich and Winsford lines as an example. We cross them twice, and the cost of our doing so underground would be £500 against £50 or so if the Post Office goes underground, so that the expressed anxiety of the Post Office to help has something substantial to actuate it. Mr. Bartholomew can justify his statement in the future by seeing that his assistants give that individual consideration to speech efficiency, &c., in each case—including those in Mid-Cheshire referred to by him—which he, I am sure, *thinks* has been given in the past, but which, in fact, has not been given. By so doing he will earn our gratitude and a great step will have been taken to ease the situation, because the inevitable result will be that many of the "paltry interconnecting lines" will be put underground for us.

Mr. Bartholomew will, I know, forgive those of us who make ourselves a nuisance in order to secure a change of policy. He, as a member of the Post Office staff, knows that this is the only way to secure reform in dealing with a huge organisation bound on all sides by rules—many of them handed down from times when conditions were different. The Post Office staff itself knows that persistent agitation was necessary to secure for itself reasonable treatment from the Government. Our history is one long record of reform wrung from reluctant authorities by means far more forcible than I have advocated.

The Post Office itself is making an attempt to give the rural dweller a telephone service on a specially cheap construction by means of party lines; we hope that the "golden rule" will be carried out by it, and that we shall have the help of the higher officials in securing the removal of obstructions. Personally, having carried out contracts for the Post Office years ago, putting these subscribers' lines underground—and be it noted also town interconnecting lines, such as those we now find in our way in the country districts between towns—I can add my tribute to that of Mr. Borlase Matthews and of yourselves to the personal qualities of sectional engineers. I have none but pleasant recollections of them in the past, and in my present dealings with them. The trouble is that they can do nothing for us—we must get at the higher officials, and we are glad that Mr. Bartholomew has taken notice of the situation.

It is the policy of some companies and local authorities to confine their operations to the towns and to underground work. They say overhead work is too troublesome; the delay is too great and the Post Office too obstructive. In the meantime some of us are energetic enough to stretch out as far as is possible from moment to moment. We have to make ourselves a nuisance to those who block our way by the ramparts of "things as they are," and eventually we get them to move out of our way and allow "Things as they ought to be." Our successors will have the comfort our present discomfort will secure for them, but we will have had the pleasure of pioneering a great movement.

W. Fennell.

Northwich, *October 12th*, 1925.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

27,545. "Dry cells." R. Baillie and M. A. Adam. March 3rd, 1924. (239,565.)

1924.

9,687. "Windings for electrical regulating apparatus." Scintilla. May 4th, 1923. (215,335.)

9,784. "Electric switches." A. G. Bullem and R. L. Jenkinson. April 17th, 1924. (239,897.)

11,756. "Electric heating devices disposed within an enclosing envelope." Naamlooze Vennootschap Philips Gloeilampenfabrieken. November 22nd, 1923. (225,166.)

12,029. "Indicators for use with wireless receiving and like apparatus." J. Bamford. May 15th, 1924. (239,899.)

12,100. "Dynamo-electric machines." British Lighting & Ignition Co., Ltd., and J. C. Hutton. May 15th, 1924. (239,900.)

12,202. "Incandescent cathodes for electric discharge tubes." Naamlooze Vennootschap Philips Gloeilampenfabrieken. May 18th, 1923. (216,160.)

14,553. "Asynchronous induction motors." V. Martinetto. June 20th, 1923. (217,899.)

14,583. "Electric ignition devices." M. Strelow. June 17th, 1924. (239,921.)

14,632. "Electrical resistances." H. M. Dowsett and H. B. Tilley. June 17th, 1924. (239,926.)

14,647. "Electric radiators." T. H. McQuinn. June 17th, 1924. (239,938.)

14,657. Electric power distribution systems." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). June 17th, 1924. (239,929.)

14,779. "Telephone receivers and the like." W. J. Palmer. June 18th, 1924. (239,935.)

14,856. "Means for supplying current to radio tubes and the like." E. L. W. Byrne (E. G. Gage). June 19th, 1924. (239,939.)

14,869. "Rotors of mercury bath electricity meters." S. Z. de Ferranti and Ferranti, Ltd. June 19th, 1924. (239,940.)

15,022. "Winding of duolateral inductance coils." C. S. Hodson and A. A. Tarbuck. June 21st, 1924. (239,944.)

15,353. "Electrical condensers." H. R. Van Deventer. June 25th, 1923. (218,301.)

15,439. "Electric circuit switches." N. Lemlyn. June 29th, 1923. (218,311.)

15,518. "Push-button control systems for electric motors and other apparatus." Waygood-Otis, Ltd., and E. Clemence. June 27th, 1924. (239,950.)

15,940. "Telephone cables." A. Rosen. July 2nd, 1924. (239,957.)

17,002. "Interrupter devices for electric circuits." British Lighing and Ignition Co., Ltd., and J. C. Hutton. July 15th, 1924. (239,968.)

17,559. "Manufacture of telephone cables." Siemens Bros. & Co., Ltd., and E. P. Elwin. July 22nd, 1924. (239,976.)

17,715. "Electrodeposition of metals." T. W. S. Hutchins. July 24th, 1924. (Cognate application 9,552/25.) (239,977.)

17,900. "Filling of joint boxes for electric cables and apparatus thereof." Callender's Cable & Construction Co., Ltd., and A. E. Wilson. July 26th, 1924. (239,978.)

19,131. "Method of and apparatus for electric welding by means of resistance." D. Sciaky. August 13th, 1923. (220,628.)

22,540. "Electric circuit-breakers." Electrical Improvements, Ltd., and R. W. Gregory. September 24th, 1924. (240 005.)

23,093. "Electrical sub-stations." Metropolitan-Vickers Electrical Co., Ltd. October 1st, 1923. (222,865.)

25,571. "Adjustable electric condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (L. Edenburg). October 27th, 1924. (240,019.)

25,577. "Electrical structures containing condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (240,020.)

27,671. "Electric discharge tubes." Naamlooze Vennootschap Philips Gloeilampenfabrieken. November 20th, 1923. (225,218.)

29,336. "Signalling systems" Western Electric Co., Ltd. (Western Electric Co., Inc.). December 6th, 1924. (240,034.)

30,524. "Coating bodies with tungsten electrolytically." Naamlooze Vennootschap Philips Gloeilampenfabrieken. June 28th, 1924. (236,153.)

30,708. "X-ray photography." G. Pearce and Watson & Sons (Electro-medical), Ltd. December 20th, 1924. (240,040.)

30,794. "Electric relays for automatically controlling pressures, temperatures, liquid levels, and for like purposes." Piepmeyer & Co., Kommandit-Ges. April 24th, 1924. (232,917.)

1925.

6,915. "X-ray tubes." Naamlooze Vennootschap Philips Gloeilampenfabrieken. March 27th, 1924. (231,467.)

8,166. "Thermionic valves." W. R. Bullimore. March 26th, 1925. (240,078.)

8,283. "Electric motor starters." Alos Apparatebau Ges. March 27th, 1924. (231,517.)

8,338. "Electrical braking systems for vehicles equipped with more than two electric motors." Forges & Ateliers de Constructions Electriques de Jeumont. April 17th, 1924. (232,575.)

8,587. "X-ray tubes provided with an incandescent cathode and an envelope which consists partly of insulating material and partly of metal." Naamlooze Vennootschap Philips Gloeilampenfabrieken. April 10th, 1924. (232,902.)

The

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Men of Vision.

IF the ELECTRICAL REVIEW were to organise a competition asking its 13,000 supporters and its 40,000 readers (somebody has given the number of readers as three per copy circulated) to record a vote showing whom they regarded as the outstanding figure in the British electrical industry, what would be the result?

Where shall we look for the man whom the majority opinion would place upon this high and proud pedestal? Would he be an inventor?—a manufacturer? an Association man? a manifold director? a Commissioner? a contractor? Would he be any or all or none of these things? Each section, no doubt, has its own leading spirits, but where is the one comprehensive person possessed of all the electrical virtues to enable him to speak with authority to and for all?

There are amongst us men renowned as scientists and discoverers, as manufacturers, as organisers, as public policy specialists, as financiers. Their merit in their own particulars sphere is unquestionable. Some of them filled a large space in their younger days, but with the inevitabilities of passing years they have to rest content with achievements recorded and with honours won, adding here and there a little to their contribution to progress, but conscious of Nature's limitations.

It has been our privilege to witness the first appearance on the electrical stage of many electrical men, to welcome their progress and advance to positions of eminence, to note their bearing as, favoured with success and laden with many honours, they have passed meridian and seen the wisdom of leaving to others the conquering of battlefields upon which they once hoped to see further duty. They have made their magnificent contribution, and the electrical industry will for ever remain their debtors. We recall, as we write, man after man who, once the most active, popular, and honoured in our ranks, and still interested in electrical affairs, is practically unknown to a large proportion of the electrical *personnel* of to-day. We greet them in passing on our way searching for the leader who would meet with general acclaim to-day if we needed one to lead us with experience and energy, enthusiasm, and greatness of vision.

Leaders are always in the making. Necessity is the mother of invention, emergencies make heroes, and

opportunities produce leaders. There are plenty of men amongst us who to-day are just a little known, who in a few years will be "at the top of the tree"—in the nature of things it must be so. Can we by anything we say accelerate the rate of their progress? The opportunity in the electrical industry is surely great enough—there never were such times—and the men are on their way no doubt; some may already be before the footlights while others are lost for a time in the quietness that enfolds associated deliberations; but they must be there, and sooner or later they will emerge.

It used to be said that there were no millionaires in the electrical industry on this side of the Atlantic. We do not mind so much if there are none to-day. It is not men of big wealth that we are seeking at this moment—if Britain's industries are allowed to flourish again we shall have them as an accompaniment of our progress—what we want to unearth or to encourage are men of big views, of large vision, who look upon electrical expanse as limitless. There are too many who by Nature's limitations, or owing to their own circumstances, are content, or shall we say compelled?—to continue long engaged in a mass of petifogging details which prevent their own development and yet which often enough were better left to others. An industry, however, needs all grades, and every man can render an essential service necessary for the efficiency and well-being of the whole; but it needs outstanding leaders, and a recent article in the *Electrical World* inclines our thought to the very interesting question whether the present golden opportunity is producing in, or attracting to, the electrical industry of Britain, men of the grand vision type.

In recent years we have seen restless ambitious men breaking down through over-zeal; we have seen men becoming directors of innumerable companies, but discovering that natural limitations have prevented them from becoming master of more than one or two of them. Yet big things are afoot; big opportunities are at hand; and big and commanding personalities may be required in an industry whose electrical stake is so many millions as to make it a colossal affair before it is anything like fully expanded.

This need for big men is recognised on the other side, though things electrical there have reached a much more advanced stage than they have here, and is expressed in the contemporary referred to, by Mr. E. W. Lloyd, the chairman of the National Commercial Section of the National Electric Light Association.

The particular aspect of our subject with which Mr. Lloyd is concerned, is the need for big commercial men with vision at the head of American public utilities. Have we no such need here too? In reply to a question put to him by our New York contemporary, he has no hesitation in saying that the need of commercial departments of utilities is for more leaders with broad enough vision to see the real problem that lies ahead. Utility managements need to realise that commercial departments require as leaders men of outstanding ability to see that the big problems of those departments are economic as well as technically commercial. "Many of the problems of future growth are first of all economic and commercial; many undertakings, although entirely feasible as an engineering project and easily financed and even popular with the public, may yet be commercially unsound." Developing the theme, two companies operating in similar cities with equal possibilities of development, do very different total business; one sells two and a-half times as many kWh per residence as the other. Why is it? There is something lacking somewhere! Mr. Lloyd asks how many executives have even gone so far as to know what other companies or cities like their own have accomplished. With all that we hear of the more general use of electricity *per capita* in the States, it still seems that by no means all executives sense the value of statistical comparisons, and the question is put: "How many sales managers know enough of the economic situation in their territory to establish a real basis for judgment of performance?"

The organisation of electricity supply in the States differs in many respects from what obtains here, so that what Mr. Lloyd declares to be an essential in the States may not be our own need, but seeing our low consumption *per capita*, there is deep necessity for those in command here to indulge in keen rivalry respecting rate of progress and efficiency of commercial control making for that end. We have not to judge by what we have already achieved—we have to be urged forward by the possibilities that await the pursuance of a policy of full enterprise. The lament of Cecil Rhodes should give us our impetus: "So little done!—so much remains to do!"

Without entering too closely into Mr. Lloyd's advice to American utility authorities, it is necessary to quote a few sentences to sufficiently indicate what its general purport is, and leave it to electricity and other authorities in the United Kingdom to see how far the counsel can be adapted to English conditions. "Every holding company could well afford to have as the head of its commercial activities a man who is able and willing to investigate, study and compare the economic, industrial, and commercial condition existing in every part of the company's territory. Instead of waiting for the various commercial district representatives to report how well they were doing their job in their own territory, the real commercial executive should know in advance what to expect from each territory and should be able to place his finger on the cause for failure and to point with accuracy to the prime cause of success. . . . The real commercial leader of the present needs not so much to know the features and characteristics of the particular appliance and services he has to sell as to know the economic habits, industrial practices and home customs of the community he is trying to serve."

As chairman of the Commercial Section of the National Electric Light Association, Mr. Lloyd is concerned with the manner in which that organisation is filling the bill. If his Section is to act effectively, commercial executives of every member company should attend a convention to consider the big economic and commercial problems facing the industry, the discussions being contributed to by men of authority in that industry; the technical discussion of commercial problems and other detailed matters are subjects for interim report and executive discussion. We have many excellent organisations, but we never have had anything corresponding to the National Electric Light Association, though it has often been suggested. No doubt if we had such, it would be a suitable ground or platform assisting in the development of big men. It would probably be able to embody, or act in co-operation with, existing organisations, and spread throughout the supply industry a thrill for progress. As the day of big areas is with us, the parochial spirit will give place to the larger view and create conditions favourable to the development of big men.

Summing the whole matter up in its bearing upon United Kingdom development, we judge that while there are many excellent chiefs amongst us, we labour under a shortage of men with big ideas, big determination, and big push—leaders who, when armed with authority, can carry their fellows along with them to a flood tide of success. We may surely say with Mr. Lloyd:—"Utility managements that have the wisdom to use commercial executives of vision, able to see the economic as well as technical problems of their job, and who will back such an executive in a comprehensive study of the company's markets and an analysis of the company's sales performance . . . will have a commercial department of which to be proud."

Factors in Electricity Supply.

On Friday last, at the annual dinner of the Electrical Power Engineers' Association—which marked an epoch in the history of that body, in that the Minister of Transport, the Chief Electricity Commissioner, and the President of the Institution of Electrical Engineers honoured it with their presence—all three of these gentlemen referred hopefully

to the electrification of our railways and the influence that it would have upon the future of electricity supply. In the *Observer* recently Sir Philip Dawson, M.P., also dealt with this question; both he and Mr. R. A. Chattock laid stress upon the cheapening of electricity for all purposes that would result from the better load factor that would be obtained at the generating stations. Sir Philip feared, however, that little would be done "until the present apathy of the directors and of the management of many of our railways has been overcome, an apathy which has been materially increased as a result of the grouping." This apathy, he thought, could only be overcome by demands from the public; it was not finance that stood in the way, but the disinclination of many railways to make any change, however beneficial.

It may be that main-line electrification has been deferred by the grouping of the companies, but we doubt whether the electrification of the south-eastern suburban lines would have come about so speedily had that system remained isolated. For the rest, we hope that the pressure of public opinion to which Sir Philip appeals will be forthcoming, for we wholly agree with him, and with Mr. Chattock, that the general electrification of our railways will confer great benefits upon all consumers of electricity, besides facilitating the supply of electricity in many rural districts which will otherwise be difficult of access. Sir John Snell, by emphasising more than once the importance of rural applications of electricity, and Mr. Chattock, by drawing attention to the necessity of reducing the cost of distribution of electricity in such areas, fortified our belief that the tide is setting in the direction of modifications of the regulations for overhead lines whereby the cost of construction and maintenance will be reduced to a reasonable figure, and we earnestly hope that the committee which has been appointed by the Institution of Electrical Engineers to consider regulations suitable for country districts will lose no time in drawing up a code better adapted to the requirements of the case than those which at present hamper the efforts of enterprising station managers. A similar committee was appointed by the I.M.E.A. Council some time ago, for the purpose, as stated in the annual report, of considering "the possibility of drafting Regulations which, while giving the public ample protection, will be simple to carry out and involve less expenditure in the execution of works."

Another point which was touched upon by Mr. Chattock was the possibility of a *rapprochement* between the electricity and gas industries, whereby the problem of securing a more efficient utilisation of fuel might be achieved; he urged his hearers to do all that they could to promote co-operation with the gas industry—an object with which, as we have shown on previous occasions, we are in hearty sympathy.

As for the question of load factor, we have repeatedly urged that this is by far the most effective and promising means of cheapening electricity. With the average coal consumption of the whole country already reduced to 2½ lb. per kWh in our generating stations—only half a pound more than the Electricity Commissioners have suggested as the practical attainable limit—improvement in that respect is becoming increasingly difficult; but by raising the load factor from 25 to 50 per cent., the price of electricity can be halved right away. We are glad that Mr. Chattock has emphasised this point, the importance of which cannot be overestimated.

Wireless Exhibitions.

A letter in this issue from Mr. L. F. Fogarty prompts us to raise a question that must have been present to the minds of most visitors to the wireless exhibitions which have recently been held in Kensington and Westminster respectively—namely, why should there be two exhibitions, neither of which is complete or fully representative of the industry?

Of course, the answer of the National Association of Radio Manufacturers and Traders is not far to seek: the Association desires to compel all manufacturers of radio sets and accessories to come into its fold, and to convey to the public the impression that within that charmed circle alone are the reputable concerns to be found. That is a perfectly comprehensible policy to which, in the abstract, no one could take exception; the industry needs a representative organisation to look after its interests and to defend it against foreign competition, and whilst we do not endorse every item in its programme we are in full sympathy with its main aspirations. But it cannot be claimed that the Association as yet embraces all the leading firms, and there is a large number of the smaller ones outside its ranks.

Now, an association of British manufacturers owes a duty not only to its members, but also to the nation, and we cannot think that by inducing the wireless public to visit two exhibitions of the same class of products it is serving the best interests of the community. We suggest that next year one exhibition only should be held, open to all British manufacturers; within its doors the exhibitors might be divided into two groups of members and non-members of N.A.R.M.A.T. respectively, or other means could be adopted to distinguish between them. Only by holding one large exhibition can our manufacturers produce the same impression as the large exhibitions held in the United States and on the Continent. Co-operation and mutual support are indispensable to our success in competition with our neighbours.

An important matter ventilated by Mr. Fogarty is the admission of manufacturers of wireless apparatus of all descriptions; instead of confining the display to broadcast receiving sets and accessories, let it be a real Wireless Exhibition. Broader and longer views are called for on the part of the organisers. The system in vogue at present is wasteful of effort, prodigal of outlay, and detrimental to our national prestige. We strongly urge the directors of both exhibitions to consider the matter with open minds and do better next year.

Scientific and Industrial Research.

The report of the Committee of the Privy Council for the year ended July 31st, 1925, takes note of "the growing appreciation on all hands of the contribution that science can make" to the solution of present-day problems, and expresses the belief that the depression in our staple industries does not arise from the neglect of science. On the other hand, it comments on the very great "time-lag between the new discovery in the laboratory and its commercial exploitation," which appears to us to be very much the same thing. It is one of the functions of the Department of Scientific and Industrial Research to shorten that time-lag and to accelerate the adoption of new methods and processes, which are, above all, necessary at a time of depression. It is regrettable to read that many of the existing associations are only keeping their research organisations "in existence" with the help of the Department, whilst awaiting the return of prosperity; surely it is precisely when trade is sluggish that activity in research will have the most immediate and welcome effect in stimulating the revival of industry. In this connection we are glad to see that the Advisory Council is "making an intensive study of the activities of the Department in aid of industry," and that the Committee looks forward with interest to its report. We hope that the Council will examine its policy with the utmost rigour, and in particular will inquire whether it has been niggardly where it should have been generous. The fact that out of a million pounds paid over to it for immediate needs it still possesses at the end of nearly ten years no less than £518,000 is not a matter for congratulation, but for reproof. The Council deplores that after that period its facilities for the conduct of research are not sufficiently widely known. We are pleased to see that the Department is prepared to consider suggestions for the conduct of research at any of its stations, not only for firms and associations, but also for individuals when the results are likely to be of general interest or when facilities for the work do not exist elsewhere, on favourable terms.

Electric Baking Ovens.

An Important Application of Electricity.

From our point of view the principal attraction of the recent Bakers' Exhibition at the Agricultural Hall, which was briefly mentioned at the time of the show, was the three examples of electric baking ovens exhibited by well-known electrical firms.

The largest equipment was shown by the Metropolitan-Vickers Electrical Co., Ltd. This was the "Metrovick" conveyor oven illustrated in fig. 1, a development of the Westinghouse reel oven introduced into this country some three years ago. The reel oven had a capacity of just over half a sack; it was automatically controlled and easy to operate, but it was designed for the usual American 1½-lb. loaf, and the baking shelves were too narrow to take the size of baking sheet generally used in this country. The whole oven was accordingly re-designed and many improvements were made. The oven proper is a comparatively light but very rigid all-steel frame, enclosed by double-cased sheet-steel walls, divided into separate panels to facilitate dismantling. The panels are packed with 2½ in. of slag wool backed up with 2½-in. blocks of asbestos magnesia. This improves the thermal efficiency of the walls and considerably prolongs their life. Mounted on an inner framework is a chain conveyor carrying seven shelves, each 73 in. long by 20 in. wide. These form a baking area of 71 sq. ft., and during the baking process the conveyor continuously travels slowly round the oven, being driven by a small motor at such a speed that each shelf passes the door about once a minute. The conveyor can be instantly started or stopped by a small switch below the oven door. The heating elements are specially designed for heavy service, being wound with ribbon ½ in. wide. Stout steel bus-bars carry the current from the mains to the heaters. The latter are mounted on a light framework fitted with rollers which can be drawn out for inspection. The heaters in the bottom of the oven are connected in two circuits, six (25 kW) being automatically controlled, and the other four (17 kW) being controlled by a hand switch. A thermostatic device is fitted to maintain the oven at a predetermined temperature.

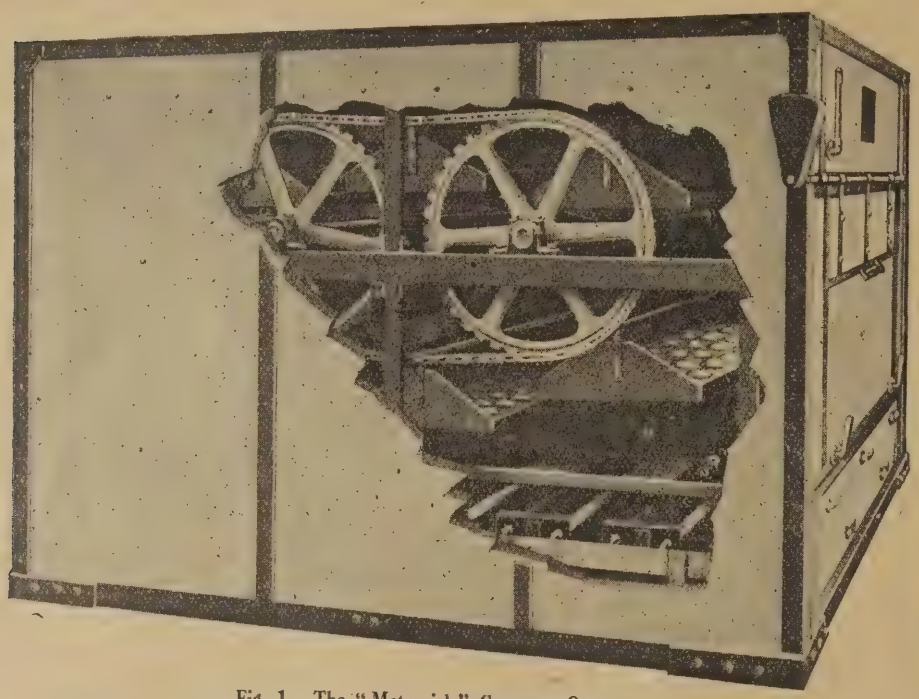


Fig. 1.—The "Metrovick" Conveyor Oven.

The Artofex Engineering Works, Ltd., showed a typical example of its baking-oven manufactures (see fig. 2).

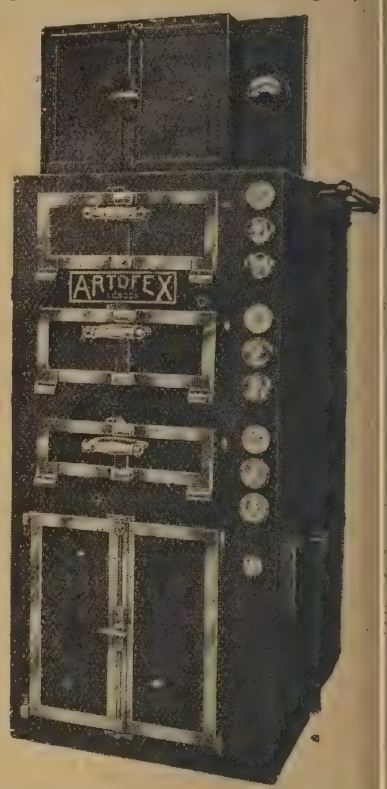


Fig. 2.—An "Artofex" Baking Oven.

The oven is constructed on the "unit" principle, that is, the main portion consists of a single baking chamber, with its controls, beneath which is a hot cupboard. Upon this additional baking chambers can be mounted as required, being simply secured at the sides, and if desired another hot cupboard can be placed on the top. The hot cupboards have slides to receive trays. Each baking chamber unit can be regulated for top and bottom heat. The range of heating is covered by seven combinations, and each unit comprises the necessary switches, with fuses, thermometer, and vent pipe. The heating elements are rigidly constructed, and are so

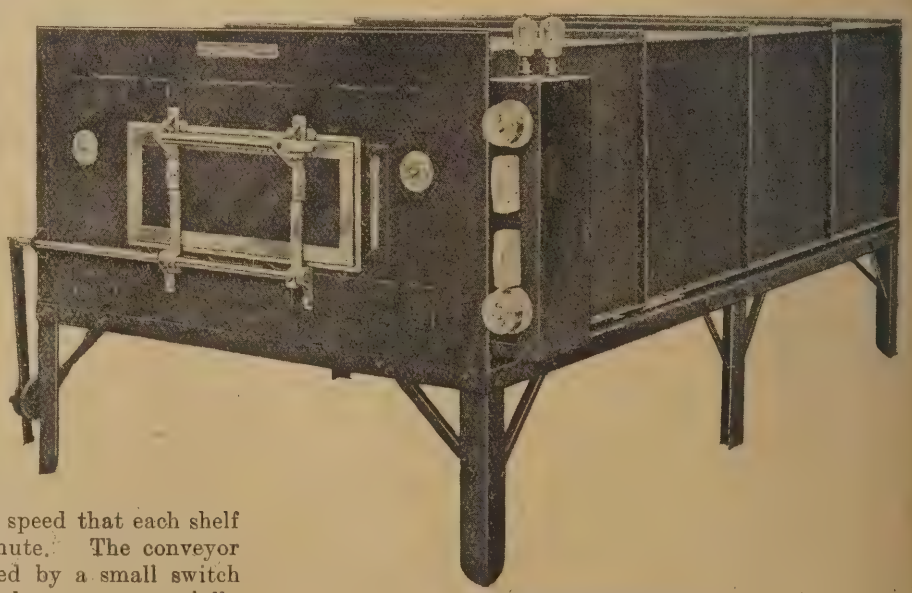


Fig. 3.—The "Magnet" Baking Oven.

graded in wattage as to ensure a uniform heat, as the losses at the sides as compared with the centre are naturally larger. All elements are readily detachable, and they are efficiently insulated to conserve the heat. The consumption of the ovens ranges from 5 to 14 kW, and the weight from 7 to 19 cwt., according to the size and combination of the units. The baking chambers are made in three sizes, *viz.*, 28½ in. by 20½ in., 36 in. by 20½ in., and 40 in. by 28½ in. They are fitted with three slides on each side of the interior to receive trays, so that if three trays are fitted the total baking surface of each chamber is trebled for the baking of flat articles. Nine combination sizes are available, the area of the baking chambers varying from 5 sq. ft. to 24 sq. ft., and the hot cupboard space from 5 cu. ft. up to 16 cu. ft.

The third example is a product of the General Electric Co., Ltd., to which brief reference has been made in our pages on a previous occasion. This baking oven is depicted in fig. 3. The body is of best-grade sheet steel mounted on a rigid angle-iron framework, double-cased and heavily lagged to prevent heat loss. The cast-iron door is fitted with suitable balance weights. The sole of the oven is fitted with special removable firebrick tiles, and the heating elements are arranged at the top and bottom, each set of elements being separately fused and controlled by three-heat switches with indicating lamps. By this means a wide temperature range is obtainable. The heating elements are inserted from the side of the oven, the wiring being arranged so that the poles are at either end of the element, and by disconnecting it at both ends the element can easily be removed. The top elements are screened, and the bottom ones are fitted below the tiled floor of the oven to prevent contact with the steam produced in baking operations. In common with the other types of electric oven, the apparatus is self-contained and portable; no flues are required; and ease of operation, absolute cleanliness, and continuous working are ensured.

Another Wireless Exhibition.

A Review of the Novelties at the Horticultural Hall.

The second London radio exhibition of the season was housed in the Horticultural Hall from October 10th to 16th, and afforded an opportunity to those manufacturers and traders who are not members of the N.A.R.M.T. to display their wares. It was on much the same lines as the show held last year at the "White City," but cannot be compared with last month's Albert Hall exposition.

The majority of the exhibits were in the form of components and "gadgets"; a number of firms made a feature of appealing to the public direct, and the hall was well filled, but amongst the complete sets few were noticed that can be described as quality instruments.

Receiving Sets.

Complete 3-, 5-, and 6-valve portable sets with frame aerials mounted in the wooden or leather case which houses the entire outfit were displayed on several stands, but the portable set, as a type, is somewhat of a freak and cannot be expected to produce as good results as the conventional pattern. The quality of Western Electric receiving apparatus is well known to those who can afford it, and amongst the Peter Curtis "Duodyne" regenerative sets an 8-valve super-heterodyne outfit was noticed for which big claims are made. On other stands there were several supersonic receivers, which type of multi-valve circuit is of undoubted superiority when properly constructed. An attractive outfit is supplied by the Igranic Electric Co., Ltd.; it consists of the essential units and special accessories necessary to construct a 6-valve receiver of this sort, the diagram and instructions, together with the special method of mounting the components (a distinctive feature),

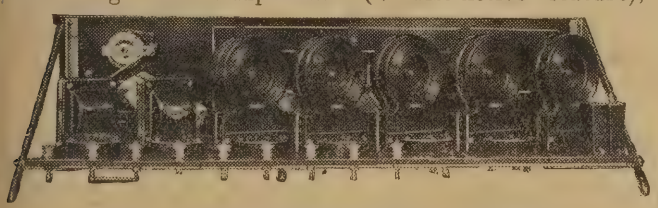


Fig. 1.—Igranic Super-heterodyne Set; Back View.

enabling the set to be assembled, as shown in fig. 1, without difficulty. The various components may also be employed to construct a receiver to any design favoured by the constructor and in conjunction with accessories of other makes that he may already possess.

Amongst the crystal sets, Mr. A. Hinderlich had an oscillating crystal in operation; that is to say, an electric current was fed from a battery through the cat's-whisker itself to the crystal. The metal plate "crystal" exhibited by Kathoxyde, Ltd., is mounted in a small brass cup and may be soldered, screwed, or clamped in any ordinary type of cup holder. Care should be taken not to scratch the surface, but it can be cleaned by wiping gently with a dry cloth. For short-distance work a zinc-iron ball cat's-whisker is used and graphite for long-distance operation, both of which types are provided with springs for attachment to detector arms.

Novel Condensers.

Several novel forms of variable condenser are of considerable interest. The "Newey," fig. 2, noticed on the stand of Messrs. Pettigrew & Merriman, Ltd., is a "zero-loss" square-law type, the vanes being rectangular plates of brass with an exceptionally fine clearance between them, and they are all bonded

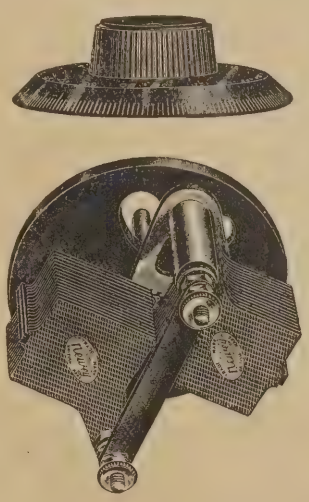


Fig. 2.—"Newey" Rectangular-plate Condenser.

together. Both sets are rotated in such a way that the overlapping section is always a perfect rectangle; the two brass spindles are separated by two air gaps, and there is no end plate, just a light Bakelite tie bar for rigidity. The tuning knob, dial, and also gearing are all made of Bakelite, the square vanes being bonded, as one unit, to Bakelite sectors moulded with involute teeth and gearing, with a central pinion in the ratio of 4½ to 1. Very fine adjustment is the feature of another condenser of unusual appearance. Shown by Rapinet, Ltd., its fixed vanes are all of different sizes, the first being semi-circular and the last a segment little more than half this size. Consequently the set of movable vanes comes into mesh with the fixed set one at a time, while a geared control causes the axle to move up and down the centre spindle and so enables the clearance between the vanes to be varied at will.

Another condenser of unorthodox appearance was noticed on the stand of the Fellows Magneto Co., Ltd.; the usual multiplicity of vanes is replaced by two sheets of copper foil separated by a sheet of mica, and the variation in capacity is effected by altering the distance between the copper sheets with the aid of a cam of a suitable profile to give a square-law effect.

A New Aerial Insulator.

The feature of the "Everdry" aerial insulator, shown by the Silvertown Co. (India-Rubber, Gutta-Percha, and Telegraph Works Co., Ltd.), is indicated by its name. It is made of rubber, the strain being taken by very fine cotton threads, the fibres of which are impregnated with rubber similar to a motor-car

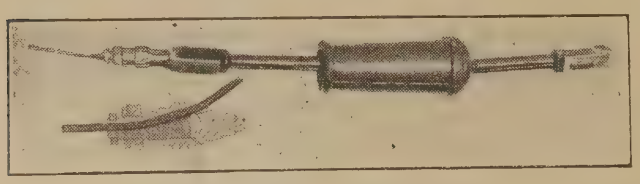


Fig. 3.—"Everdry" Aerial Insulator.

tire; the threads pass round ebonite blocks at each end, and are covered with rubber, the whole being vulcanised together. The rubber is protected from the atmosphere by a coating of non-hygroscopic enamel; moisture does not condense on this type of insulator, and, as is indicated in fig. 3, a cup is provided which keeps a portion of the insulator dry in wet weather. The illustration shows the non-slip grip, and swivels are provided at each end, the shackles being made of "Duralumin" to reduce the weight. The diameter of the insulator shown is 5/16th in., and the length of the insulated portion is 7 in.; it weighs 2¼ ounces, and the breaking strain exceeds 350 lb., but a smaller type weighing ¾ oz. is available.

A Simple Rectifier.

A neat rectifier for charging batteries, economical alike in operation and first cost, was shown by the Fellows Magneto Co., Ltd. From fig. 4 it will be seen that the base contains a transformer which is plugged

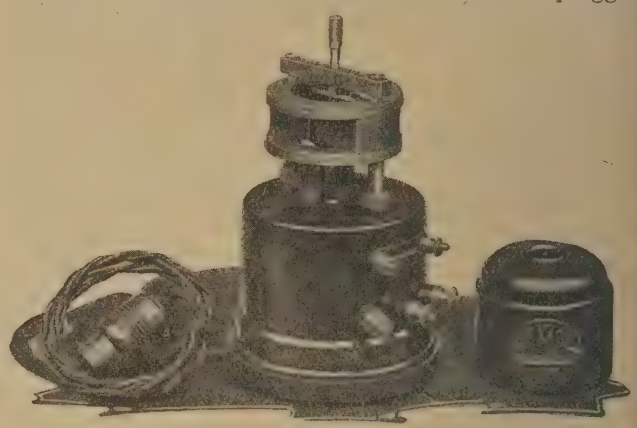


Fig. 4.—A Battery-Charging Rectifier.

into a lamp socket, and the spindle of the motor at the top projects through the casing so that the machine may be set in motion by a twist of the finger and thumb. The two upper terminals are for a fuse, and the three lower ones are provided to give 4- and 6-volt charging pressure as desired.

(To be concluded.)

The Supervisory Control of Sub-Stations.

Metropolitan-Vickers Automatic Plant for New Zealand.

(Concluded from page 623.)

The fact should be borne in mind that, for the operation of the plant described last week, only three single wires are necessary between the control point and the distant sub-station. Ordinary telephone communication can be carried on over these same wires, which may consist of 20-lb. telephone wires, or their equivalent in multicore cable, say, 3/22 per core; one wire is used for sending selective signals or receiving indication signals, another is for performing operations, and the third is a common return. The usual telephone guard circuits and protective devices are provided, and provision is made so that if a circuit breaker changes its position while impulses are being sent from the control desk to select a device for operation, the sub-station signal is stored until the incoming impulses are completed, when the latter are cancelled and the stored signals sent through to the control office as usual.

Although for 600-V tramway requirements M.-V. quick-acting contactors are suitable, it was decided that in one sub-station an M.-V. high-speed circuit breaker should be installed in conjunction with the load-limiting resistor. This breaker is of a type that has been tried out on exacting railway service at 1,500 volts; it also has been subjected to a series of some 50 short-circuit tests at 1,500 V on 2,500-kW rotary converters, during which tests 45,000 kW of generating plant was on the bus-bars in the Barton (Manchester) station, from where a feeder was run direct to the site of the tests. In addition to the closing coil, the breaker has a hold-on coil for maintaining the breaker in the closed position against powerful throw-off springs; also an impulse coil is connected in shunt to the blow-out coils. In the event of a sudden rate of change of current, due to a short circuit, the impedance of the blow-out coils gives rise to a high voltage across the impulse coil which causes a high momentary rush of current that acts so as to shunt the flux away from the armature of the hold-on magnet; the throw-off springs thereupon open the breaker. A splitter assists to extinguish the arc as it is blown upwards through the arc shute, and the average speed of operation of these breakers is approximately 0.008 second. In addition to the operation of the impulse coil on faults, the high-speed breaker is tripped by a current relay (to cut in the limiting resistor) should the load exceed the safe capacity of the machine. Emergency hand operation is provided for the breaker and the main and feeder d.c. contactors; the latter when under manual control are latched in and are fitted with a trip coil and overload attachment.

To protect against earth leakage on the machines, the bed plate is insulated (a concrete foundation is sufficient) and connected to earth through a flash-over relay, which will operate in the event of a fault to earth to shut down and lock out the machine affected.

The fact that supervisory control is looked upon as having passed the experimental stage is evidenced by the fact that an order has been received by the Metropolitan-Vickers Co. for supervisory apparatus for a rotary converter system aggregating 20,000 kW, which this company also supplied in its entirety.

In addition to the two above-described 750-kW rotary converters arranged, with their eight traction feeders, for automatic operation by means of supervisory control, the Metropolitan-Vickers Co. has in hand similar equipments for sixteen 1,250-kW rotary converters for the

Bombay, Baroda and Central Indian Railway. A large number of automatic equipments have also been supplied for control on other systems. In process of erection in the shops at the present time there are no fewer than 15 such equipments, of which particulars are given in Table I, while Table II indicates the principal equipments which have been dispatched from the works and are now either in operation or in process of erection.

Table I.

Automatic Equipment in Progress.

(Excluding two 750-kW and sixteen 1,250-kW supervisory controlled equipments.)

Three 1,500-kW rotary converter and four feeder equipments for the City and South London Electric Railways.

Two 750-kW rotary converter equipments for the Manchester Corporation.

Two 500-kW rotary converter equipments for the Birmingham Corporation.

One 500-kW rotary converter equipment, with seven feeder equipments, for Johannesburg, South Africa.

Two 500-kW rotary cenverter equipments (conversion of existing machines) and eight 750-ampere traction feeder equipments for Bradford Corporation.

One 500-kW rotary converter equipment with three 800-ampere traction feeder equipments for Durban Corporation, South Africa.

One 500-kW rotary converter equipment for the Ilford Corporation.

Two 300-kW rotary converter equipments for the Charing Cross Electricity Supply Co.

One 150-kW rotary converter equipment (conversion of existing machine) for Dumfries Corporation.

Table II.

Automatic Equipment Already Supplied.

Liverpool Corporation ...	2	500-kW rotary sets
Barrow Corporation ...	1	250-kW rotary set
Hull Corporation ...	1	500-kW motor-conv'rter set
Wellington, N.Z., Corporation	1	750-kW rotary set
Durban Corporation ...	3	500-kW rotary sets
Manchester Corporation	1	500-kW rotary set
N.S. Wales Government Railways	2	4,500-kW rotary sets
	2	1,500-kW rotary sets
	1	1,000-kW rotary set
Perth Corporation (Western Australia) ...	4	400-amp. reclosing feeder equipments
Teviot E.P. Board, N.Z.	2	125-kW water-wheel alternator equipments
Wackare Monea, N.Z. ...	1	500-kW and one 350-kW water-wheel d.c. generator equipments
Sydney Municipal Council	12	Automatic induction feeder voltage-regulator equipments
Copenhagen Municipality	2	1,000-kW rotary sets
Mexico City	1	1,000-kW rotary set
Birmingham Corporation	2	500-kW rotary sets

Most of the above installations include a varying number of automatic feeder-control equipments, while the Copenhagen sets are the only automatic ones on the Continent of Europe.

This record is of particular interest in view of the short time which has elapsed since the first automatic sub-station to be set to work in this country was installed in October, 1922, by the Metropolitan-Vickers Co. for the Liverpool Corporation, which equipment has carried out the duties expected of it without any attendance and with only periodic inspection.

The attention of those who are apt to consider that automatic sub-station plant is complex, and that it needs specially trained men for its erection and supervision, is drawn to the fact that the New Zealand plant referred to above was "erected by the Corporation staff," and tests on site showed the overall efficiency to be better than that guaranteed. "Although the economy in running an automatic sub-station, as compared with a manually-operated station, primarily influenced the recommendation in favour of this type of equipment, the greater reliability in operation revealed by the investigations"—which Mr. M. Cable, M.I.E.E., chief electrical engineer, Wellington, N.Z., personally carried out in America and England in 1922—"was a determining factor in the decision to adopt fully automatic plant."

Messrs. Preece, Cardew & Rider were the consulting engineers.

Distribution systems, owing to their recent accelerated growth, have become complicated and more difficult to control. When interruptions of supply occur on manually-operated systems, much time is lost in receiving telephone reports from the sub-stations and transmitting instructions to the operators, but with supervisory equipment the engineer in his office is warned by a bell on the occurrence of anything unusual and receives a visual indication within two or three seconds of any change in the position of the circuit breakers on the system. He can take immediate measures by manipulating the keys on the supervisory desk for dealing with the situation, closing or opening any of the circuit breakers at will. These remarks probably apply with even greater force to the control of high-pressure distribution networks than to traction converter systems. Other forms of remote control, if they have to cover an extensive area or long distances, become prohibitive in cost, owing to the number of control wires required.

Anti-dazzle Vehicle Lamps.—In the presence of the Home Secretary (Sir William Joynson-Hicks) and members of the National Council of the Commercial Motor Users' Association, Mr. E. S. Shrapnell-Smith, president of that association, gave a lecture and demonstration at the Savoy Hotel recently on the subject of "Dazzle Mitigation." It is six months since Mr. Shrapnell-Smith undertook, at the request of the National Council of the Association, to stimulate investigations into various methods of mitigating dazzle by the use of tinted electric headlamp bulbs. Whilst he has come to the conclusion that no one tint or method of treatment holds the field exclusively, he believes that the substitution of tinted and treated translucent bulbs for colourless transparent ones offers a quick and ready method of mitigating dazzle.

According to the *Daily Telegraph* his other conclusions are:—

That yellow or cobalt blue gives the best results in filtering out the offending red rays, and that cobalt blue properly applied yields the nearest approach to true daylight or white light.

That clear yellow or blue glass only eliminates dazzle attributable to light radiated from a white-hot filament, and that a slight degree of opacity on or in the wall of the bulb is required to mitigate the dazzle attributable to the reflected image of such a white-hot filament.

That dazzle can be mitigated to a noteworthy extent by treating half areas of the surface of any headlamp bulb, but that still better results are to be expected from treating the entire bulb.

That incorporation of a pigment in conjunction with the requisite degree of opacity in the wall of the bulb during its primary manufacture may ultimately be found preferable to any method of dipping or spraying.

That where treatment of a bulb is limited to its top half, the best results can be obtained only when the line filament is mounted behind the focus of the parabolic reflector.

That the Association's terms of reference can be met in all respects, and that in the case of one make of treated bulb which has given highly promising results under test, the additional retail charge per headlamp is only ninepence.

That the driving light resulting from the use in headlamps of standard B.A.S. bulbs tinted and treated by either of the methods indicated, possesses the additional merit of penetrating fog and mist to a helpful extent.

The Ministry of Transport has every hope that time will be found when Parliament meets next month for the reintroduction of the Lights on Vehicles Bill, says the *Daily Mail*. The Bill is based on the recommendations of a committee, and its principal clause provides for the limitation of the height of the beams of headlamps so that they fall below the line of vision of pedestrians and the drivers of approaching vehicles.

Electricity Supply in Great Britain.—III.

Hertfordshire and Essex.

The shading on the map on the opposite page is intended to indicate the areas in which statutory powers for general supplies of electricity have been granted or applied for.

The North Metropolitan Electric Power Supply Co. also has various statutory powers under its Acts over all the *unshaded* parts of Herts. (including Waltham Holy Cross and Chingford Urban Districts in Essex), except those parishes which lie to the west of St. Albans Rural District. The Metropolitan Electric Supply Co., Ltd., has bulk supply powers in the south-west corner of Herts. In addition to these two undertakers, there are 28 others whose areas of supply are wholly or partly included in the map. A list of these is given below, the asterisk denoting that the undertaker is in the London and Home Counties Electricity District:—

Local Authorities.

*Barking Urban District Council.
Clacton Urban District Council.
Colchester Corporation.
*East Ham Corporation.
*Grays Thurrock Urban District Council.
Harwich Corporation.
*Hertford Corporation.
*Ilford Urban District Council.
*Leyton Urban District Council.
Luton Corporation.
Saffron Walden Corporation.
Southend-on-Sea Corporation.
*Walthamstow Urban District Council.
Walton-on-Naze Urban District Council.
Watford Corporation.
*West Ham Corporation.

Companies.

Bishop's Stortford, &c., Gas and Electricity Co.
*Brentwood District Electric Co., Ltd.
Chesham Electric Light and Power Co., Ltd.
*Colne Valley Electric Supply Co., Ltd.
*County of London Electric Supply Co., Ltd.
Electric Supply Corporation, Ltd.
First Garden City, Limited.
Frinton-on-Sea and District E.L. & P. Co., Ltd.
*Northwood Electric Light and Power Co., Ltd.
Stevenage Electric Light and Power Co., Ltd.
*Welwyn Garden City Electric Supply Co., Ltd.
*Wickford and District Electric Supply Co., Ltd.

The following particulars in respect of the administrative counties of Hertfordshire and Essex and associated county boroughs are taken from the 1921 Census:—

Acres.	Persons.	Resident families.	Buildings not containing dwellings.
1,384,055	1,803,452	416,108	16,564

The maps which we have used were prepared in 1917 for the Boundary Commission, and are reproduced here by permission of the Controller of H.M. Stationery Office. In order to bring the maps up to date, the following amendments should be noted:—

(1) The Parishes of Dovercourt and Saint Nicholas have been united to form the new Parish of Harwich, which is co-extensive with the Borough of Harwich.

(2) Letchworth Parish has become an Urban District.

(3) Hertford Borough has been enlarged by small parts of parishes being added to the Borough.

(4) The Parish of Walsworth has been merged into the Parish and Urban District of Hitchin.

(5) Watford Urban District has been created a Municipal Borough. Its area as an Urban District had been enlarged, and the Borough has been extended recently.

(6) Welwyn Garden City Parish has been created.

(7) The Parish of St. Andrew Rural has been merged into the Parish of Hertingfordbury.

(8) Rickmansworth Urban District has been enlarged.

Middlesex and London.

Maps of the other Home Counties will follow, to complete the metropolitan area, but we do not propose to include maps of Middlesex and the County of London in the series, as practically the whole of these two counties is covered by statutory powers for the supply of electricity, the list of undertakers concerned being given below. All of them own generating stations, except those marked with an asterisk.

Local Authorities.

Battersea Met. B.C.
Bermondsey Met. B.C.
*Bethnal Green Met. B.C.
Ealing Corporation.
Finchley Urban District Council.
Fulham Met. B.C.
Hackney Met. B.C.
Hammersmith Met. B.C.
*Hampstead Met. B.C.
Heston and Isleworth Urban District Council.
Hornsey Corporation.
Islington Met. B.C.
Poplar Met. B.C.
St. Marylebone Met. B.C.
St. Pancras Met. B.C.
Shoreditch Met. B.C.
Southwark Met. B.C.
Stepney Met. B.C.
Stoke Newington Met. B.C.
*Wembley Urban District Council.
*Willesden Urban District Council.
Woolwich Met. B.C.

Companies.

*Brentford Electric Supply Co., Ltd.
Brompton & Kensington E.S. Co., Ltd.
†Central Electric Supply Co., Ltd.
Charing Cross Electricity Supply Co., Ltd.
Chelsea Electricity Supply Co., Ltd.
Chiswick Electricity Supply Corporation, Ltd.
City of London Electric Lighting Co., Ltd.
*Colne Valley Electric Supply Co., Ltd.
County of London Electric Supply Co., Ltd.
Egham & Staines Electricity Co., Ltd.
*Harrow Electric Light & Power Co., Ltd.
*Hendon Electric Supply Co., Ltd.
*Kensington & Knightsbridge E.L. Co., Ltd.
§Kensington & Notting Hill Companies.
London Electric Supply Corporation, Ltd.
Metropolitan Electric Supply Co., Ltd.
North Metropolitan Electric Power Supply Co.
*Northwood Electric Light & Power Co., Ltd.
*Notting Hill Electric Lighting Co., Ltd.
*St. James' and Pall Mall Electric Light Co., Ltd.
South London Electric Supply Corporation, Ltd.
South Metropolitan E.L. & P. Co., Ltd.
Tottenham District Light, Heat & Power Co., Ltd.
Twickenham & Teddington E.S. Co., Ltd.
Uxbridge & District E.S. Co., Ltd.
Westminster Electric Supply Corporation, Ltd.
Woking Electric Supply Co., Ltd.

*Does not own a generating station.

†No authorised area of supply. Company only authorised to supply in bulk to other undertakers.

§Kensington and Notting Hill Joint Station. (Bulk supply only.)

Traction.

The most important tramway and railway generating stations in the London and Home Counties Electricity District are the following:—

Name of station.	Owned by.
Greenwich	L.C.C. Tramways Dept.
Lots Road	London Electric Railways.
Wood Lane	Central London Railway.
Neasden	Metropolitan Railway.
Park Royal	Great Western Railway.
Stonebridge Park ...	London, Midland & Scottish Railway.
Wimbledon ...	Southern Railway.

The following particulars in respect of these counties have been obtained from the Census of 1921:—

Acres.	Persons	Resident families.	Buildings not containing dwellings.
223,542	5,737,525	1,419,334	51,968



Electricity Supply in the Counties of Hertfordshire and Essex.

The Quality of Steam.

The Importance of the Production of Clean, Dry Steam.

By E. W. DICKINSON.

Steam is usually considered to be a gas which can be heated, compressed, expanded, &c., in conformity with well-known laws. It may also, and with equal correctness, be looked upon as essentially a vehicle for heat energy, and with this idea in mind the steam engineer should see to it that, so far as is humanly possible, it conveys to his steam engine or turbine nothing else.

The miller of old—who wore a white hat—carefully sifted the bran from the flour after grinding, in order to deliver good flour to the baker, and the distinguishing mark of a true craftsman all the world over is that the article he produces is fitted for its intended purpose and is perfect of its kind. The steam engineer is no exception to this generalisation, and should, therefore, see to it that his steam engine or turbine is fed with steam free from moisture and every form of impurity.

It is curious how casual an interest is taken in a subject of such importance as the production of clean dry steam. This is to be regretted, especially when it is remembered that as a conveyor of heat its value falls quite remarkably when it contains even a small quantity of moisture. A pound of steam, for instance, at 212 deg. F. containing 5 per cent. of its weight in moisture shows a reduction in heat-carrying capacity of over 4 per cent. as compared with dry steam, while at 215 lb. absolute pressure the drop, though less, is still about 3½ per cent. (see Table I). But when

TABLE I.

Steam		Total heat in 1 lb. dry steam from water at 32° F.	Total heat in 1 lb. 5% wet steam from water at 32° F.	% drop in heat value.
Press. lb. per sq. in.	°F temp.			
14·7	212	1,150	·95 × 1,150 = 1,032 ·05 × 162* = 8 Total 1,100	4·35
215	388	1,199	·95 × 1,199 = 1,139 ·05 × 361* = 18 Total 1.157	3·5

* Heat in liquid form 32° F.

consideration is given to the small quantity (25 per cent.) of the total heat of steam converted into work in the more economical of our large turbines, as compared with the large amount—75 per cent.—almost wholly lost through transfer to the circulating water *via* the condenser, it will be realised that the *usable* heat energy in any given quantity of dry steam is reduced by about 14-16 per cent. when it contains 5 per cent. of its weight in moisture. In other words, as a carrier of heat to be converted into useful work, by means of a modern turbine, steam suffers, by the introduction of 5 per cent. moisture, a diminution in usable heat capacity of about 14-16 per cent.; and this reduction may, when using uneconomical steam plant, amount to 25 per cent. or even 30 per cent. The practical effect of this is that within small limits the weight of the water pumped from the condenser on any given load increases proportionately with the increase in moisture and with the consequent increased drop in usable heat energy contained in the steam fed to the prime mover. The figures obtained on steam consumption trials using wet steam should therefore be regarded with caution and with knowledge of the moisture content of the steam used. Many of the exaggerated claims made years ago, and still made, as to the economies to be effected by the use of superheated as compared with saturated steam, may be traced to a lack of knowledge of the quality of the non-superheated steam used.

It may here be pointed out that wet steam, and the apparent increase in steam consumption due to its use, does not imply loss in fuel. It means simply that the heat generated by the combustion of the fuel has not been transferred to the mixture of steam and water in such quantities as to convert the whole of it into dry saturated steam. The steam leaves the boiler burdened with moisture and impurities, condenses freely with the slightest drop in temperature, finds its way out of pipe joints and valve spindle packings to the despair of the responsible engineer, and finally calls for careful rejection to the hotwell through steam traps. Here it usually increases the alkalinity and total solids content of the boiler feed water.

Where steam is used for heating liquids, as is the case in many industries, its quality must be carefully watched. In the process of dyeing, for instance, it is a matter of concern to raise the temperature of the contents of the dyeing vat with a minimum increase in liquid volume. Wet steam not only unduly increases this volume, as compared with dry steam, but invariably carries over with it other objectionable matter.

Steam can, of course, and usually is, dried by superheating. The dirt is released it is true, but in so finely divided a state that it remains in suspension to be carried forward and deposited later in heated fluid or on steam pipe, valve, or turbine blading surfaces. We are on safe ground in attributing dirt in steam to original moisture, and it is consequently useful to consider how wet steam comes about and how it may be avoided.

Wet steam is steam containing a quantity of unevaporated water projected by small bubble explosions into the steam space either in a fine cloud or in mass (priming) by and in contact with dry saturated steam. It is usually traceable to one or more of the following causes:—

(1) Restricted water surface.
(2) Restricted steam space.
(3) Defective circulation.
(4) Excessive evaporation.
(5) Dissolved matter in boiler water.
(6) Sudden and abnormal steam demands.
(7) Dirty (solid particles) or cold feed water.

The first three causes can only be removed or rendered less manifest by careful boiler design, having regard to the conditions under which the boiler will eventually operate. The care exercised as to the state of the feed and boiler water in a large modern power station is not, for instance, observable on the fringes of the Empire; but even under most favourable conditions it is sad to relate that responsible engineers are not infrequently faced with laxity in design. Too little attention is given to the fact that 60 to 70 per cent. of the total evaporation occurs in the first three or four rows of the tubes nearest the furnace; and, in the consideration of the need for great freedom of boiler water circulation, involving as it does the avoidance of counter currents, much more time might profitably be spent. As to the four remaining causes, dependent as they must be to some extent on design, they are within the control of the operating engineer who, if wise, will early find the limit of output of each type of boiler under varying degrees of boiler water alkalinity and varying amounts of dissolved solids. Only by constant laboratory tests and regulated blowing down of the boiler will he keep within these limits and obtain maximum efficiency. The tendency to prime, it has been found, is not so high on the slightly inclined water-tube type of boiler as on the more vertical type, using boiler water of the same alkalinity and total dissolved solids; but this is not to say that in all respects the slightly inclined water-tube type is the better boiler.

However, when every precaution is taken with the best of boilers, managed in the best of ways, perfectly dry steam cannot be found. In the Lancashire and Galloway types, having ample steam space and water

surface, the moisture at rated output may be taken to vary from 2 per cent. to 4 per cent. under average practical conditions, whilst with certain types of water-tube boilers anything from these figures to 10 per cent. or 15 per cent. wet steam may at times be found.

The right thing to do obviously is to try to leave the moisture behind in the boiler. Many devices have been suggested and tried with more or less success, from the extra boiler steam drum set well above the working drums, and receiving steam from the quieter of them, to the baffling or centrifugal separator. No doubt the part played by the superheater makes less obvious the need of drawing from the boiler just prior to delivery to the superheater, steam free so far as is possible from moisture. The miller, already referred to, was careful to sift the bran from the flour before dispatch to the baker. So by elimination of moisture in the early stages of steam production, unpleasant incidents, such as choked superheater tubes and later on turbine blading, &c., can be avoided. It is a more than doubtful course so to design a boiler as to make the production of wet steam almost a certainty and then leave it to the superheater to carry on the evaporation. A demand is made on the superheater alien to its function; its capacity is reduced, and an inroad is made into the productiveness of capital.

It is indeed in the consideration of capital use or expenditure that we find ourselves seriously engaged, for could a boiler be designed to produce perfectly dry steam, its capital value would be enhanced directly in proportion to the percentage drop in moisture. Let us take a water-tube boiler having a capacity of 30,000 lb. evaporation per hour, not fitted with a superheater, and costing complete with buildings and accessories £10,000, and assume it evaporates on load steam of the reasonable figure of 94 per cent. dry, and that this degree of dryness by some means, say, by redesigning the boiler or installing a steam dryer, could be brought to 98 per cent. There would then be a distinct gain of 14 to 15 per cent. in the usable heat energy delivered to the steam engine or turbine. In other words, the value of the boiler-house equipment would be increased by £1,500 because its capacity for doing useful work at any selected time had been extended in this proportion.

Now money spent on boiler-house plant may safely and fairly be taken as subject to redemption and interest at a total rate of 11 per cent. per annum; £165 per annum represents either an important saving, if considering a new layout, or a useful addition to the power of the plant, if already installed; and this sum does not include the value to be given to greater freedom from dirt and breakdown in the prime mover and its auxiliaries.

Even if we take a boiler unit supplying superheated steam, the same arguments apply, since the resultant steam is passed forward to the prime mover at a lower temperature when the boiler steam is wet than when it is dry, since part of the superheater acts as a boiler. The heat carried away by each pound of steam to the prime mover will be decreased in proportion to the extent the superheater is overworked. Consequently the useful heat energy conveyed per lb. of steam will be diminished as in the case of saturated steam, and the boiler plant will in a similar manner suffer loss in capacity.

In conclusion, it can fairly be stated that, whether a high quality of steam is obtained by having regard to suitable boiler design, particularly in the matter of good circulation; by careful attention to alkalinity and chlorine content of the boiler water; or by steam baffling or some form of steam separator fixed within or near the boiler steam space, thereby eliminating moisture and its co-related dirt—a return well out of proportion to the thought and care given, or expenditure made, may confidently be looked for.

Notes on Engineering Education.

College and University Technical Societies.

(Communicated.)

No technical college or university is keeping abreast of progress if it does not possess its own engineering society. Fortunately, most of them have such societies, and very bright and sparkling are their doings; for the student engineer may be permitted a liberty of speech and action denied his sober elders in their membership of the great engineering institutions of the country, and he can travel paths and pursue lines of action that will only present themselves during his college days. The value of a properly-organised engineering society to a student, from an educational point of view, is incalculable; it presents opportunities for gaining knowledge which can never be obtained in the lecture theatre, and full advantage should be taken of them. The society should be organised, financed, and controlled by the students themselves, and new students should join it as a matter of course, thus ensuring that the loss due to students passing out is continually being made up.

The main features of the work of the society should be papers, lectures and discussions, and visits to works. The reading of papers and the discussions thereon are of the utmost importance. Practically all the papers should be written by the students themselves, and the practice of asking outside authorities to read papers on their pet subjects should be strictly limited. It is the student himself who wishes to gain knowledge and information, and it cannot be too often emphasised that the man who learns most from an engineering paper is the man who writes it. Outside advice and assistance should not be entirely shunned, however, for they can render very valuable aid. It is quite a good plan to invite one of the lecturers or professors to occupy an honorary position in the capacity of a president, so that his advice and experience are always available. A man rich in learning and young in spirit (one who has not forgotten his own student days) will prove the best "father" to the society. Then, again, whilst outside contributions should be definitely restricted, they should not be excluded altogether. A good lecture from one who is an authority on some subject will be a change, and should also stimulate students to still greater efforts.

As stated above, the man who learns most from a paper is the man who has written it: the man who sits and listens—and does nothing more—learns very little. The amount of work involved in writing a paper is remarkable, and is known only to those who have done it. The theories that are checked, the problems solved, the dozens and dozens of references which have to be made, are unknown to him who merely listens; but even more important to the general body of students is the discussion which should follow the paper. Here the opportunity is equal for every man, and every man may make what use he desires of that opportunity. It is in the time occupied in the discussion of a paper that a student will obtain the best return for his membership of the society. Discussion and argument, even though it reaches no definite conclusion, does ensure that a point is viewed in a variety of ways, and, generally speaking, a good discussion means that a problem is attacked from every possible angle.

The discussion on a paper has an even greater value

than the dissemination of technical information; it provides the student with an opportunity to gain confidence in his own voice. The value of confidence in one's own power of speech cannot be expressed in mere £ s. d. It is the key to the enchanted land; it enables one to enter realms otherwise closed; it is the "Open, sesame" to the higher walks of the profession. How many men are there, brilliant men, men of high intellect, who occupy subsidiary posts to-day at £400, £300, and even £200 per annum when they ought to be getting as many thousands, because of their lack of confidence in themselves, and their betrayal of that lack of confidence in their manner and speech? Their number is legion! Both in this country and in America numbers of men command a good income by providing courses, wonderful and fearful systems most of them, which will enable you to "Overcome your nervousness," and "Gain confidence in yourself." These are direct and striking evidence of men's inability to express themselves clearly, forcefully, and emphatically. In our great profession of engineering such qualities are absolutely essential. Therefore, Student, discuss, argue, query; get used to expressing your opinion in front of others; do not be afraid to ask questions; be prepared always to challenge dogmatic assertions. But in all, let your language be simple and accurate, and your manner modest whilst emphatic.

That part of the society's activities concerned with visits to works is of almost equal importance, especially if full advantage be taken of the opportunities they offer a student for adding to his store of knowledge. For many students the works visits of the society constitute their initiation into that mysterious world where are carried on the practice and application of the principles they are taught in the lecture room. Very often they do not realise the enormous privilege they enjoy. They are honoured guests; their hosts are ready and willing to explain anything they wish to know; the whole organisation of a manufacturing concern is open to their inspection. It may not always be so, therefore it behoves each man to make the most of his opportunity. Most value can probably be extracted from a works visi if a serious effort is made to line-up the practice o the shops with the theory of the lecture room. Th student should be specially on the watch for differen methods of applying theoretical reasoning. The prin ciples underlying manufacturing operations should b noted, and mental correspondence made with th lecture-room treatment of the subject. Any apparen deviation from basic principles should be speciall noticed and the reason sought. In short, a works visi is something more than an afternoon's outing, an only if it is taken seriously will full value be obtaine from it.

It should be the aim of every student to make hi education as wide as possible. Specialisation is good but even a specialist is of more value if he has a goo knowledge of the correlative branches of his subject Therefore, in addition to joining the society connecte with his own particular branch of science, I woul suggest that the student join another society also Many, for instance, in addition to engineering, ar interested in chemistry; some are keen geologists mathematics attracts others. Thus the student coul join the Geological Society or the Chemical Society, o whichever branch he felt inclined to cover. A society dealing with English literature is often welcomed b engineers, for the change in the direction of thought and study from engineering to literature often prove highly beneficial to the hardworking student. B joining one of these other societies a student is brought fairly constantly into touch with matters outside hi own immediate sphere, and yet related to it. Thus there is less danger of engineering occupying a distorted position in the mind of the student; an ever-present danger under conditions of intensive study.

Whilst the technical society should be one of the distinctive features of an engineering student's college training, he should remember that definite exertion on his part is necessary; that he will only reap benefit from it as he puts effort into it.

Scientific and Industrial Research.

Report of the Committee of the Privy Council.

Last week the report of the Committee of the Privy Council for Scientific and Industrial Research was issued. (Cmd. 2491; H.M. Stationery Office. Price 3s. net.) It states that the estimated outlay for the year 1925-26 is £380,263, compared with £328,281 last year, and £276,863 for 1923-24. To fill the vacancies created by the deaths of Sir George Beilby and Sir Maurice Fitzmaurice the Committee has appointed Sir William Ellis, G.B.E., and Dr. J. H. Jeans, secretary of the Royal Society, to be members of the Advisory Council. The Department has incurred increased responsibilities due to its closer contact with important questions of Government policy, the natural outcome of the efforts of successive administrations towards the better co-ordination of scientific work done for the State, and of the growing appreciation on all hands of the contribution that science can make to the solution of the difficult problems of modern administration and economic reconstruction.

The Department has been studying the low-temperature carbonisation of coal on a "works" scale for seven years, and the cost of the Fuel Research Station has amounted to over £400,000; though the production of smokeless fuel, fuel oil, &c., in this way has not proved to be commercially profitable, it is claimed that results have been obtained in other directions which have brought profit and savings to industry and the nation exceeding the above expenditure. Science alone, it is maintained, cannot save industry from its present troubles, but it can help by making many small improvements in existing practice.

The trade depression has borne hardly on many of the existing research associations, and help has been given where necessary to keep them in existence in the hope of placing them on a permanent footing when prosperity returns.

The survey of the coal seams of the country is proceeding satisfactorily, and four tests have been made of full-scale plants for low-temperature carbonisation, &c., belonging to private owners. Arrangements are being made for the intensive study at the Fuel Research Station of the problem of obtaining liquid fuels and other oils from coal under high pressures at moderate temperatures.

During the year 28 applications for patents have been filed by the Department, and six have been allowed to lapse. The new ones cover improvements relating to cathode-ray oscillographs, radio-telegraphic direction-finders, selective devices for radio-telegraphic reception, sound-absorbing plasters, means for determining impurities in gases, &c.

The expenditure of the National Physical Laboratory during 1924-25 amounted to £173,455. Of this sum £50,004 was provided by fees for tests and special investigations for outside firms or by contributions of co-operating bodies, and £29,965 from repayments from the Service departments for work undertaken directly for them.

The expenditure on fuel research during 1924-25 amounted to £50,471, of which £37,050 represents the cost of work carried out at the Fuel Research Station. Receipts from testing fees and the sale of by-products amounted to £2,285.

The expenditure of the Department incurred on the recommendation of the co-ordinating research boards and their committees during the year 1924-25 amounted to £24,077, while researches costing £27,252 were undertaken for these boards and committees at the National Physical Laboratory.

There are at present 21 industrial research associations in active operation. Grants to associations for the financial year ended 1924-25 amounted to £100,118, and the balance of the Million Fund remaining unexpended on March 31st, 1925, amounted to £518,200. A substantial part of this balance will be required to complete the payment of grants to associations which have not reached the end of their first grant periods, and for the payment of additional grants promised to certain associations that have completed their first quinquennia. From the balance provision must also be made for new research associations that may be formed hereafter.

The income derived from the interest of the unexpended balance of the Million Fund amounted during the year to £38,669. From this income, expenditure amounting to £10,065

vas incurred on industrial research, and the surplus, £28,603, vas applied towards the cost of research work of value to ndustry generally, for which purpose it was appropriated in id of the Vote of the Department.

During the academic year 1924-25 258 grants were made o research workers and students-in-training. Of these 193 vere allowances to students to enable them to take advantage f the facilities in training in research afforded by various niversities and colleges or other research institutions, 47 were ersonal grants to research workers to undertake independent esearch or to act as scientific assistants to other investigators, nd 18 were personal grants to scientific workers to enable iem to employ laboratory assistants or to purchase equipment. he total expenditure on these grants during the year is esti- ated at £35,000, as compared with £40,820 during the ademic year 1923-24. The expenditure during the financial ear 1924-25, covering half of each of these academic years, as £37,523.

The expenditure of the Department on headquarters admini- ration during the year was £35,920. The total expenditure the Department during the year was £539,199. This sum as made up of £311,286 from the Exchequer, £38,669 from ie interest on the Million Fund, £100,118 from the capital t the Fund, and £89,126 from fees for tests and special ivestigations for outside bodies, &c.

The Report of the Advisory Council to the Committee refers, *ter alia*, to the approaching completion of the new chemical boratory at Teddington, the new building of the National hysical Laboratory for the high-pressure transformer, and ie commencement of a Physics Laboratory building. It is ggested that the facilities of the Department for the conduct research likely to lead to results of benefit to industry e not sufficiently widely known; "the Department is pre- ired to consider any suggestions for the conduct of research any of its stations, provided the results are likely to be of neral scientific or industrial interest." The Department is prepared to arrange for research to be undertaken in its vn laboratories on behalf of industries on the same terms it offers to research associations"; and "it is willing to rry out on suitable terms special investigations of scientific industrial interest for any outside body or person," when cilities for the work do not exist elsewhere. The charges ade will depend upon whether the results are or are not ade available for publication.

Investigations on the production of intense magnetic fields ve proved of general scientific interest, and have been under- ken under the direct supervision of the Council; a grant has en made to Sir Ernest Rutherford for the construction of ecial apparatus for the purpose, which is being installed the Cavendish Laboratory.

The Radio Research Board is an effective centre for the co- dination of research required for Government purposes, d for the discussion of general radio problems of funda- ental importance. It is now considering the best type of ve for direction-finding at sea, and has done valuable work connection with the theory of propagation of waves. The gineering Research Board has extended the work on the operties of materials at high temperatures; the results have en extremely promising, and the Board will co-operate with e Non-Ferrous Metals Research Association in a general ack on the subject, under a special committee. Arrange- nts are being made for the co-ordination and extension of rk on electrodeposition. Progress has been made with the eliminary programme of research on illumination, and addi- nal facilities are to be provided at the N.P.L. to enable comprehensive programme of work to be prepared. The vestigation of the Severn Barrage scheme was delayed by e death of Sir Maurice Fitzmaurice, but eventually his firm s appointed to act with Sir John P. Griffith, and the com- ttee has reported to the Committee of the Privy Council.

The scope for electrical research, says the report, is almost thout limit. "The British Electrical and Allied Industries search Association, as evidenced by the review of its acti- ies by independent scientific experts, is carrying out admir- le work for the industry, although its sphere of usefulness the wide field it has to cover has naturally had to be stricted to correspond with its comparatively limited re- urces. We have recommended further grants to this Associa- n based on a total expenditure of £16,000 per annum. We ognise, however, that this sum represents only the bare nimum required to keep the Association in active existence, d that it in no way represents the amount required to able the Association to meet effectively the demands that y properly be made upon it. If therefore the Association prepared to embark on a more extensive scheme of work in next few years, we would give every encouragement pos- le, and we have indicated our willingness to consider sym- hetically any application the Association may wish to make a limited measure of further grant from the Government h this end in view."

With regard to grants to individual research workers, the ncil says: "Only when local industry, local education, l every other local activity are linked up with and sup- ting research will science make her greatest contribution the life of the nation. We are, therefore, glad to be able record a very real increase in local support for post-graduate search during the past ten years."

Rules have been approved by the Committee under which pendent members of research boards and committees will future be appointed for not more than four years, and will be ineligible for reappointment for one year. Chairmen will be appointed for five years.

In addition to summaries of the work done by the N.P.L., the Fuel Research Board, and other Research and Co-ordinating Boards, there are nine appendices giving the personnel of the Boards and Committees of the Department, statements of grants made, lists of researches, statements of expenditure, particulars of Research Associations, research developments in Dominions, lists of publications by persons in receipt of grants and papers by the scientific staffs of the Services, and a list of departmental publications issued during the year.

Electrical Power Engineers' Association.

Annual Dinner.

The annual dinner given by the E.P.E.A. (Southern Division) to the members of the National Executive Council, was held at the Hotel Cecil, London, on Saturday last. Mr. A. E. Ricketts presided, and there was a record attendance—about 350 members and guests.

After the loyal toast, Col. Wilfrid Ashley, M.P., Minister of Transport, proposed "The Association," expressing cordial approval of the two chief objects of the society—the general advantage of the industry, and the improvement of the status of engineers. There would be an enormous increase in the use of electricity during the next few years; whilst we consumed only 200 units per head per annum, in other countries the rate was 800 or 900 units. Some thought that such increase would be at the expense of a rival commodity, but there was room for many forms of heat and power, and the electricity and gas industries had progressed together. The electrification of suburban railways, he hoped, would be followed by that of the main lines, and the supply of electricity would be quintupled in 12 or 14 years. Great opportunities lay before the members. The public services increasingly relied on electrical energy, and he was confident that the Association and its members would remember their responsibility towards those services and to the whole country.

Responding, Mr. R. R. Telford, president, said the Association was a trade union of great power, as all the big generating stations were controlled by its members; but increased power brought with it enhanced responsibility, which was realised by them. To-day there was complete accord between them and the employers; an arbitration clause had been agreed upon two years ago, but no disagreement had arisen during that period. Given reasonable men and reasonable employers, the Whitley system might avert many catastrophes. They were proud of the Association and its principles, and grateful to the employers' representatives on the National Joint Board, especially to Ald. W. Walker, for the great help they had rendered in developing the scheme for training power engineers. He concluded with thanks to the National Executive Council for its excellent work and to the Southern Division for the admirable entertainment it had organised.

Mr. A. J. Ostler, making a presentation to the immediate past president, Mr. T. A. G. Margary, spoke of the burden of duties which he had borne on behalf of the members, and the great interest he had shown in the scheme of training. The presentation took the form of a silver coffee service, with a gold slave bangle for Mrs. Margary. Musical honours were accorded to Mr. Margary, who, in returning thanks, said the Association had up to now been preparing the way and had hardly begun its real duties; its ideal was "Service," and it had seized upon the Whitley system as the only means of ensuring peace in the industry. With the collaboration of the employers a scheme of training for power engineers was about to be launched. It was their intention to include all men on the technical side of the industry in one professional Association, from the chief engineer to the lowest trainee.

Sir John Snell, G.B.E., chairman of the Electricity Commission, proposed "The Electricity Supply Industry," and contrasted the conditions of 40 years ago with those obtaining to-day; in this country 8,000 million kWh was now generated annually, and the rate of increase was 15 per cent. There was every indication that in the years immediately to come there would be very great development, and it was of great satisfaction to him to know that the members of the Association were imbued with a sense of their responsibilities and a full intention to carry out their duties and pull their weight. Congratulating Mr. R. A. Chattock on his taking up the duties of president of the Institution of Electrical Engineers, Sir John referred to the many interests of that body and expressed the view that electroculture, which had been found to add on the average 33 per cent. to the yield of corn—sometimes as much as 80 per cent.—was going to be of great service to mankind.

Mr. R. A. Chattock, responding, said the great developments of the past 40 years had been brought about by the technical staffs, and the rate of progress now was even greater than it was 10 or 15 years ago. It had been uphill work for a young industry in competition with big vested interests, but there was room for both. There were signs that gas and electricity were becoming more friendly—that would afford a solution to the problem. The Association should do all that it could to work hand in hand with the gas industry; thus more perfect combustion of fuel could be achieved, and they would

benefit by the experience gained by gas engineers during the past 30 or 40 years. It was important to increase the load factor of electricity undertakings; the average here was from 20 to 30 per cent., but in the United States 45 to 50 per cent. was commonly attained, largely due to the supply of electricity to railways and collieries, which had 24-hour loads. He hoped that railway electrification would come *soon*, as it would benefit all classes of users of electricity. They had reduced generating costs, but the cost of distribution was going up, and that problem should be studied carefully, especially in rural districts, where otherwise it might be greater than consumers could afford. The educational work of the E.P.E.A. was very valuable; the training of qualified electrical engineers was most important, as they must be prepared to move up into higher positions as time went on. Chief engineers should exercise discretion and sympathy in dealing with the older men, who could not be expected to pass examinations; tolerance would smooth the way for both young and old.

Mr. W. J. Oswald proposed "The Visitors," and Ald. W. Walker, responding, said the two sides of the National Joint Board had arrived at an understanding, and the realisation of the scheme of training was close at hand. That would show that the Board had a higher ideal than salaries and working conditions—namely, that of improving the training and status of engineers, thereby benefiting the nation, the industry, and the individual.

During the evening a full programme of song and story was performed, and the chairman took occasion to put on record the gratitude of the assembly to those responsible for the entertainment, above all to the hon. secretary, Mr. Hyatt.

Legal.

Nikola Tesla Patents.

Mr. Fletcher Moulton applied to Mr. Justice Tomlin in the Chancery Division on October 13th, for permission to withdraw a petition to extend the period of the patents taken out by Nikola Tesla in 1910. The petitioners were in America, he said, and he asked for the petition to be withdrawn but without prejudice to the presentation of a petition for extension on account of war losses.

Mr. Dighton Pollock (for the Board of Trade) said that his department had received no notice of the application. No accounts had been filed and there was no evidence of any kind.

His Lordship said he did not understand what was meant by withdrawing a petition. If Counsel consented to have it dismissed then there was an end of it.

Mr. Fletcher Moulton consented to have the petition dismissed, and this was done.

Radio Instruments, Ltd., v. Dawson.

Mr. Justice Tomlin in the Chancery Division on October 13th had before him an unopposed motion by Radio Instruments, Ltd., for an injunction restraining George Dawson, of Balls Pond Road, N., from selling the applicants' transformers at less than the stipulated price.

Mr. Shelley said defendant had agreed to submit to a perpetual injunction and to pay the taxed costs of the proceedings.

Radio Instruments, Ltd., v. Charles & Co.

In the Chancery Division on October 13th, Mr. Justice Astbury granted an injunction restraining Charles & Co., Mare Street, Hackney, from infringing a patent of Radio Instruments, Ltd., by selling the latter's radio transformers in breach of the terms of a limited licence as to price.

Mr. Shelley, appearing for the plaintiffs, said a letter had been received from defendant saying he did not propose to attend and in these circumstances Counsel moved *ex parte*. He explained that the terms of the licence which were printed on the box containing the transformer specified that the price at which the article was to be sold should not be less than 25s. The defendant had been selling at various prices and had sold one transformer at the price of 19s. 6d. instead of 25s. The article was bought by an employé of the plaintiffs who saw it in defendants' window.

An affidavit by Mr. Appleton, a director of the plaintiff company, setting forth the terms of the licence, was read, and his Lordship, in granting the injunction, suggested that the plaintiffs' solicitors should see the defendant with a view to his agreeing to have the injunction made perpetual.

General Radio Co., Ltd., v. Kear.

A King's Bench Divisional Court, comprising Mr. Justice Salter and Mr. Justice Fraser, recently dismissed an appeal by the General Radio Co., Ltd., the plaintiffs in a claim against Ernest Kear, a wireless expert, of Clifton, Bristol, for £25, the price of a receiving set. The defendant contended in the Westminster County Court, where the claim was heard, that the set was not according to the description under which it was sold by the plaintiffs, and that he had rejected it as he was entitled to do within a reasonable number of days. The County Court judge took this view and gave judgment for the defendant. The plaintiffs appealed on the ground that there was no evidence upon which the learned judge could find that there had been rejection of the set, and Mr. Humfrey Edmunds, their Counsel, argued before the Divisional Court that the defendant had accepted the instrument.

Mr. T. Simpson Pedler, for the defendant, said that his client stipulated for seven days within which he could approve or disapprove of the instrument. The article did not give satisfaction: he said he could not get signals from certain places and could pick up only Cardiff. Therefore he rejected the set.

Mr. Justice Salter said the question for that court was not the quality or capacity of the instrument but whether there was notice of rejection. There was ample evidence on which the learned judge could find that there was unequivocal rejection within a reasonable time.

Mr. Justice Fraser agreed.

Unsuccessful Customs Prosecution.

The Times reports the hearing of a summons before the Lord Mayor at the Mansion House on October 15th. The matter was one in which the Board of Customs summoned Ernest A. Moses, of Warwick Court, Holborn, for having, in a statutory declaration, made a false statement as to the value of certain wireless valves, contrary to the Customs Consolidation Act, 1876. Defendant pleaded "Not Guilty."

On behalf of the Customs authorities it was stated that the case related to the importation of 400 wireless valves from Belgium by the G. and L. Electric Supply Co., Ltd., of Warwick Court, of which the defendant was the secretary. The valves were made in Vienna. The defendant represented the value as £28 15s., on which the import duty would have been £9 10s. 8d. It was alleged by the Customs that the real value was £61 or £62, on which the duty would be £20.

Solicitor for the defendant said that the Customs had detained the goods since January last, and it was only on the threat that legal proceedings would be instituted for the recovery that this prosecution was launched. The declaration gave the actual purchase price in Belgium. The defendant was merely secretary to the company, and knew nothing of the circumstances.

The Times states that evidence as to these statements was given after which the Lord Mayor dismissed the summons allowing the defendant ten guineas costs.

Bauxite in France.—French bauxite is discussed by a French economist in a series of articles published in Paris (*L'Information*). Confronted by the development of the industry in other countries, he states that the French industry is energetically defending itself. After the falling off of the production during the war, the output, which declined in 191[illegible] to 56,000 tons, or one-sixth of that in 1913, recovered to 186,000 tons in 1920, and to 314,000 tons in 1923, and rose to 389,000 tons in 1924, or a total greater than in any previous year. Similarly the exports, which were 168,000 tons in 1913, reached 130,000 tons in 1921; 166,000 tons in 1922; 192,000 tons in 1923; and 202,000 tons in 1924. These results are considered to testify to the high quality of the ore and to a commercial organisation which many industries might envy. As to the production of the raw metal, it is mentioned that France turned out 13,500 tons of aluminium in 1913, but since the end of the war the output capacity has been increased, and further water power is to be utilised for developing the industry. According to researches made by M. Suhr, of the Compagnie d'Alais, Frogés et Camargue, the world's production in 1923 amounted to 163,000 tons of aluminium; in 1928 or 1929 the world output might be 200,000 tons, when France would be able to make about 50,000 tons or 25 per cent. of the aggregate. The quantity of bauxite required would be 500,000 tons per annum, which tonnage is claimed to be capable of being maintained for many years. In fact, having regard to the circumstance that the deposits are now known to be more extensive than had been assumed to be the case, it is contended that France has bauxite resources which will last for a century, if not for two centuries. Under the circumstances, it is held to be unnecessary to conserve the existing resources excessively for a distant and problematic future. On the contrary, the question is to favour the exchange and the sale of heavy materials, so that there should be no idea of export vetoes or even restriction of exports. It has been contended that the Lorraine iron ore industry is unable to exist without an intensive production, supported by continuous exports, and this will be true to-morrow in the case of the modernised bauxite industry. The State has performed what was considered to be impossible with regard to satisfying the requirements of the producers of iron ore in the region of Briey, and it is considered that the moment would be ill-chosen for treating those of the Herault and the Var in a different manner.

Proposed Institute of Wireless Engineers.—After obtaining the views of several highly placed wireless engineers, it has been decided to hold a general meeting in London on October 31st, with a view to discussing the advisability of continuing with the proposed British Institute of Wireless Engineers. The chair will be taken by Mr. James Nelson, M.I.E.E., who is an ardent promoter of the scheme. Persons interested may attend the meeting and particulars can be obtained from the temporary hon. secretary, Mr. Y. W. Evans, 66, Oxford Road, Manchester.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities New Publicity Literature, Liquidations and Failures.

Insulated Wire for Uruguay : The Contract Date.—Our orrespondent writes :—" The invitation extended to manufacurers of electrical supplies by the Administracion General de as Usinas Electricas del Estado de Montevideo for a first conignment of 1,060,000 metres of insulated copper wire should raw attention to the possibilities of this field for supplies; itherto it has been almost neglected by British manufacurers. Unfortunately, the time, namely, December 28th, llowed for sending in bids, is almost too short to enable 3ritish exporters to tender (unless by cable); but inasmuch s it is understood that this order for copper wire—large as it s—is only a preliminary one, it should be worth the while of xporters of electrical goods generally to get into communicaion with the Administracion General at Montevideo, since in ts hands are lodged nearly the whole of the electrical industries n the Republic."

New Municipal Showrooms.—Premises to be erected in it. Stephens Place, Chesterfield, are to be rented at £130 er annum by the Chesterfield Corporation for the purpose of lectricity showrooms.

The new Southport electricity showrooms at the Glaciarium, ord Street, were opened by the Mayor on October 19th.

British Industries Fair.—We learn that the eleventh 3ritish Industries Fair, to be held in London and Birmingham rom February 15th to 26th next year, promises already in nany ways to be the most successful, interesting and represenative fair of the series. Although forms of application for pace have been in the hands of potential exhibitors only a ew days, over 100,000 square feet of space has already been pplied for, and new applications are being received daily by he secretary of the Fair. No doubt many firms realise the dvantage of exhibiting in a fair, on the advertising of which he Government has decided to expend £20,000 in a wide-orld publicity campaign. The charge for space has been educed this year at both London and Birmingham; the harge in London is 2s. 6d. per square foot. Early last week pplications had been received from over 110 different firms equiring space at the London section.

Important Indian Railway Contract.—It is reported that he Government of India has sanctioned the electrification of he Bombay-Igatpuri-Poona lines of the Great Indian Peninsula ailway, about 300 track miles. An expenditure of £5,000,000 s anticipated, and it is said that the whole of the machinery nd plant will be obtained from the United Kingdom.

The Shannon Scheme Dispute.—Work upon the Shannon ydro-electric scheme is still held up by the refusal of the abourers to accept the terms offered by the contractors—the iemens-Schuckertwerke. A number of unfortunate " incients " have occurred in which German workmen and officials ave been assaulted. The Limerick Water Works Committee as refused to supply water to the German vessels, containg materials for the scheme, which are lying off the city. he Government is apparently taking no active steps to end he dispute, but there is some talk of mediation by an outside ody.

Better Lighting.—The General Electric Co., Ltd., Magnet louse, Kingsway, W.C., has issued for the use of electrical ealers a brochure entitled, " Osram More Light Recommenations," and containing a reproduction of " Osram " trade dvertisements directed to selected lighting spheres within the cope of the electrical contractor. The illustrations and matter et forth the case for the modern lighting of the shop window nd the home, offices, workrooms, factories, &c. It also overs decorative lighting, out-of-door lighting, floodlighting, nd electric sign advertising, and provides the dealer and conractor with a reminder of the wide and varied field for xploitation and development that lies to his hand.

Sydney Power House Contracts.—The electricity supply ommittee of the Sydney City Council has decided, says the *ydney Morning Herald*, that in the matter of tenders for the achinery and equipment for the City Council power-house, ll Australian firms should be free to tender, but that " tenerers must submit with their tenders a statement setting ut briefly the experience and facilities at their disposal for arrying out works of the magnitude and nature of the items ndered for." Previously a resolution had been passed by he City Council to the effect that firms tendering should ow that they had manufactured and had had working for at ast 1,500 consecutive hours, machinery within 70 per cent. f the magnitude of the machinery tendered for. This reso-ution the council was asked to rescind.

" As She is Writ."—A well-known British electrical anufacturing company has recently received the following hoice communication, conspicuous more for its interest than or its clarity, from a Colonial correspondent :—" Dear Sir, I ust in forming you this few short of line as I had saw your ame that tell you are the man of selling bisses & I Hop at you will be Please & sent me the note book sow that I an see what I want from your Shop Sir Please & be faithlly Kind Sir I Can be very Glad if you Can Sent it for me ir & do be Please & Reply Sir I remain Your faithfully."

Lead.—Messrs. James Forster & Co., reporting on October 17th, stated :—" In face of the poor state of demand for lead on the Continent, particularly in Germany, consumption on the decrease at home and the prospect of full supplies from Australia from December onwards, it is difficult to see how present prices can be maintained for long."

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from the dates mentioned. In the case of foreign applications, the names and addresses of the British representatives are also given.

October 7th, 1925.

C. A. V. (lettering and design). No. 456,655. Class 6. Dynamos, magnetos, self-starters, &c., and their parts. No. 456,656. Class 8. Secondary electric batteries, electrically-fitted switchboards, ignition coils, searchlight apparatus, voltmeters, ammeters, loud speakers, wireless telephone and telegraph receiving and transmitting sets, electric regulators, contact breakers, &c., and parts thereof. No. 456,657. Class 13. Carriers for electric batteries, electric switches (ordinary), electric bulb lamps, electric light fittings, sparking plugs, electric horns, junction boxes, dashboard plug adaptors, &c. No. 460,915. Class 40. Cases of ebonite for batteries and spare parts.—C. A. Vandervell & Co., Ltd., Warple Way, Acton Vale, W.3.

Sfen. No. 460,250. All goods in Class 6. No. 460,251. All goods in Class 8. Super Selectodyne. No. 460,254. All goods in Class 6. Super Neutrodyne. No. 460,270. All goods in Class 6. Superhetradyne. No. 460,259. All goods in Class 8. Superpentadyne. No. 460,263. All goods in Class 8. Superhexadyne. No. 460,267. All goods in Class 8. La Société Radio Française, 79, Boulevard Haussmann, Paris, France. (Marks & Clerk, 57-58, Lincoln's Inn Fields, London, W.C.2.)

Excelsior. No. 461,874. Class 6. Electrical vacuum cleaning machines.—Harold E. Chamberlin, 19, Buckingham Street, Strand, London, W.C.2.

Concertome (lettering and design). No. 458,627. Class 8. Receiving sets for use in wireless-telephony and telegraphy.—William Lyons, 8, Bank Hey Street, Blackpool.

C. A. X. (lettering and design). No. 459,071. M. A. X. (lettering and design). No. 459,072. P. A. X. (lettering and design). No. 459,073. A. T. M. (lettering and design). No. 459,074. All goods in Class 8.—Automatic Telephone Manufacturing Co., Ltd., Milton Road, Edge Lane, Liverpool.

Neutroceiver. No. 461,180. Neutroceiver-Grand. No. 461,181. Class 8. Instruments and apparatus, and parts thereof, for wireless-telephony and telegraphy.—Fada Radio, Ltd., Alexandra House, 31, Kingsway, London, W.C.2.

Crystastat. No. 461,313. All goods in Class 8.—Neutron, Ltd., Sentinel House, Southampton Row, W.C.1.

K. (lettering and design). No. 461,494. Class 8. Electrical condensers.—Wates Bros., Ltd., 12-14, Great Queen Street, London, W.C.2.

Radiolux. No. 457,716. Class 8. Apparatus for the generation and application of high-frequency currents for surgical and curative purposes.—Electricitäts Gesellschaft " Sanitas," 131d, Friedrichstrasse, Berlin, N.24, Germany. (Herbert Haddan & Co., 31-32, Bedford Street, Strand, London, W.C.2.)

Aspiral. No. 461,479. Class 13. Electric incandescent lamps.—Naamlooze Venootschap Philips Gloeilampenbrieken, Eindhoven, Holland. (Boult, Wade and Tennant, 112, Hatton Garden, London, E.C.)

October 14th, 1925.

Cabtyrit. No. 460,712. Class 4. Indiarubber compounds.—St. Helen's Cable and Rubber Co., Ltd., Bath Road, Slough.

Askania (lettering and design). No. 454,548. Class 8. Electro-technical measuring, signalling, and controlling apparatus, electric cables, &c.—Askaniawerke Gesellschaft vormals Centralwerkstatt Dessau & Carl Bamberg Friedenau, 87-94, Kaiser Alle, Friedenau, Berlin, Germany. (Boult, Wade and Tennant, 112, Hatton Garden, London, E.C.1.)

Thermiodyne (lettering and design). No. 457,500. Class 8. Instruments, apparatus, and parts thereof, for use in wireless-telephony and telegraphy.—Thermiodyne Radio Corporation, 33-39, South River Street, Plattsburg, N.Y., U.S.A. (White, Langner, Stevens & Parry, Jessel Chambers, 88-90, Chancery Lane, London, W.C.2.)

Sunstar (lettering and design). No. 458,078. Class 11. Non-automatic lamps for use in light therapy.—Thomas C. Angus, " Pitreavie," Carroll Hill, Loughton, Essex.

Ferrodes. No. 460,850. Class 13. Flux-coated electrodes for use in electric welding.—Ferro-Arc Welding Co., Ltd., 12, Grosvenor Gardens, London, S.W.1.

Clemateite. No. 461,050. Class 50. Electric insulating material, consisting of asbestos and mineral substances.—Dacier, Ltd., Balfour House, Finsbury Pavement, London, E.C.2.

Trade Announcements.—The telephone numbers of the London depôt of the Cable Accessories Co., Ltd., have been changed to " Central 9028 and 9029."

Messrs. W. G. Walter and H. V. Walter have commenced business as Walter Bros., electrical power engineers, at Keward Works, Monmouth Place, Bath, specialising in arc welding, rewinding, repair, and installation work. The business is quite separate from that carried on by Mr. W. G. Walter, at Southey House, Westgate Buildings, Bath.

The Vickers Spearing Boiler Co., of which Vickers, Ltd., are the sole proprietors, will in future be known as the Vickers Boiler Co., Ltd. The management of the company will be as follows :—Mr. Douglas Vickers, chairman (chairman of Vickers, Ltd.); Sir Vincent Caillard, D.L., director (director of Vickers, Ltd.); Commander C. W. Craven, R.N., director (director of Vickers, Ltd.); Mr. W. F. Sadler and Mr. J. Kerr Bock, joint managing directors; Mr. G. T. Williamson, general manager; and Mr. Harold B. Clark, secretary. The address of the new company will be the same as before—20, Kingsway, London, W.C.2. Mr. A. H. Spearing has retired from the company.

The Igranic Electric Co., Ltd., has recently opened a new office at British Dominions House, Tramways Centre, Bristol.

Messrs. R. H. Patterson & Co., Ltd., makers of battery mine locomotives, &c., Newcastle-on-Tyne, have appointed Messrs. A. Fleming Brown and William Sharp, of 11, Carteret Street, S.W.1, as agents for the London and Southern districts. Telephone : " Vic. 6529."

Since 1919 the British Electric Plant Co., Ltd., has been closely associated with the Harland Engineering Co., Ltd., both companies having a common directorate and a unified policy. It has now been decided, for reasons of efficiency and economy, to undertake the whole of the work done by both companies, under one name only, *viz.*, the Harland Engineering Co., Ltd. This arrangement took effect as from October 1st.

Mr. A. B. Blakey has removed his offices to Daimler House, Paradise Street, Birmingham.

Messrs. James Gordon & Co., Ltd., Windsor House, Kingsway, London, W.C.2, inform us that Mr. R. B. Davies has left their service. They desire all correspondence regarding the "Duplex Mono" recorder to be addressed to them direct.

Mr. R. C. Fitzsimons has commenced business as an electrical contractor at 73, Basin Road, Chichester, and he asks for trade catalogues and price lists.

Messrs. Kelly & Co., electrical engineers and wireless experts, have opened premises at 59, North Road, Durham.

Messrs. Burnage-Epps, Ltd., of 82, High Street, and 19-23, Park Street, Ashford, Kent, have opened a department for wireless components.

Mr. G. J. Scragg, electrical engineer, of 125, Mill Street, Crewe, is opening new showrooms for electrical fittings and domestic appliances.

The Huddersfield Radio Co., of which Mr. C. W. Beaumont is manager, has opened premises at 8, King's Head Arcade, Cloth Hall Street, Huddersfield.

Messrs. Hill, Upton & Co., Oxford, have opened new showrooms, offices, and works.

Catalogues and Lists.—The British Aluminium Co., Ltd., 109, Queen Victoria Street, E.C.4.—Hints on the working of aluminium. No. 14, Aluminium Tubes.

Brookhirst Switchgear, Ltd., Chester.—An excellently illustrated booklet, outlining the history of Chester, with special reference to the company's switchgear works in the city.

Ateliers de Constructions Electriques de Charleroi, Charleroi, Belgium.—No. C.1,343, describing various designs of the company's paper-insulated cables.

Welsbach Light Co., Ltd., Welsbach House, 344-354, Gray's Inn Road, King's Cross, W.C.1.—List No. 503. Catalogue of domestic appliances, lamp shades, and other electrical accessories.

Sir William Arrol & Co. (Swansea), Ltd., have issued a handsome brochure describing their new structural works at King's Dock, Swansea. It is beautifully illustrated with coloured pictures and photographs of some of the contracts that have been carried out since the works were started up in 1923.

Messrs. Archibald J. Wright, Ltd., 395, City Road, E.C.1.—An illustrated net trade price list of wireless components, and an illustrated and priced leaflet of wireless receiving sets and accessories.

The Siluminite Insulator Co., Ltd., The Green, Southall, Middlesex.—A folder describing "Siluminite" Grade 2.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A folder describing "Osram" flashlight lamps. Illustrated and priced. A priced folder showing "Gecoray" silvered glass reflectors for shop-window lighting, and "Unalux" dustproof lighting units for interior lighting.

The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.—List No. 800. A well-produced catalogue of industrial, commercial, and general lighting products, also a pamphlet illustrating lamp reflectors.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., Engineering Department, 11, Holborn Viaduct, E.C.1.—An illustrated and priced booklet describing "Isco" cut-outs.

Messrs. J. W. Brooke & Co., Ltd., Adrian Works, Lowestoft.—No. MM/25, a well-produced catalogue describing various types of Brooke marine motors. Illustrated and priced.

The Sun Electrical Co., Ltd., 118-120, Charing Cross Road, W.C.2.—List No. 430, containing illustrations, particulars and prices of electric fires of various makes. Also priced and illustrated pamphlets Nos. 423 and 427, dealing respectively with "Sunco" wires and cables and cartridge fusegear.

Messrs. John Lawton & Sons, Ltd., St. George's Works, Harford Street, Birmingham.—A comprehensive priced catalogue of electric lighting fittings and accessories.

Bankruptcy Proceedings.—Edward Moses Lewis, "Rosedene," St. Martin's Road, Caerphilly, late 23, Charles Street, Cardiff, electric storage battery agent.—The public examination of this debtor was held recently at Cardiff. The statement of affairs showed a deficiency of £447. Debtor admitted that his books had not been properly kept and that his capital was not sufficient to keep him out of debt. He could not account for an item of £500, and said he supposed goods had gone out which had not been entered in the books. The examination was adjourned.

A. L. Dyer, Marsh Street, Newcastle-under-Lyme, Staffs., electrical engineer.—The public examination of this debtor was held on October 14th at the Town Hall, Hanley. The statement of affairs showed gross liabilities of £187 and assets of £17, leaving a deficiency of £166. Debtor stated that he commenced business without capital in May, 1924, as an electrical engineer at Newcastle. In March of this year he took the tenancy of a workshop at Marsh Street, Newcastle, and had since carried on business there. His turnover during the last 12 months had been about £325, and had yielded a net profit of £125. He attributed his failure to not keeping his expenses within the limits of the net profits. He stated that he was now employed on electrical work by a firm in London. The examination was closed.

W. R. Squire, electrical engineer, 11, Steward Street, Springhill, Birmingham.—Receiving order made October 13th on debtor's own petition.

H. McClelland, wireless apparatus merchant, 12, Leigham Avenue, Streatham Hill, S.W., late of 48, Strand, W.C.—First meeting, October 30th at 29, Russell Square, W.C.1. Public examination, November 26th at the Court House, Wandsworth.

S. Scarfi (Scarfi Bros.), cycle, gramophone, and wireless agent, 78, Alexandra Road, Newport, Mon.—First and final dividend of 4d. in the £, payable October 26th at 4, Charterhouse Square, E.C.1.

T. A. Wickham, electrical engineer, Snaresbrook, Station Road, New Melton, Southampton.—First meeting, October 23rd, at the Official Receiver's office, Midland Bank Chambers, High Street, Southampton. Public examination, November 18th, at the Court House, Southampton.

S. L. Bapty and L. Miles (Wireless Instrument Manufacturing Co.), wireless instrument manufacturers, Avenue Works, Avenue Road, Willesden, N.W.—Supplemental dividend of 2d. in the £, payable at 4, Charterhouse Square, E.C.

Company Liquidations.—The Hudson Irving Radio Co., Ltd., Pitt Street, Glasgow.—A meeting of creditors was held recently in Glasgow, when a statement of affairs was presented which showed liabilities of £1,349 and assets estimated to realise £482. No allowance was made for bad or doubtful debts in the statement of affairs. Up to 1924 the business was carried on in partnership, and in July of that year the limited liability company was formed with a nominal capital of £1,000. A branch business was carried on at Greenock. Originally that branch was profitable, but after the company was formed losses were sustained, and it was closed down at the end of last year. In the first year the company had a turnover of £2,802, with a loss of £482. In addition, there was a loss of £400 on the Greenock business. There had been a further loss on the trading at Glasgow during the present year. A wholesale business had been conducted and the margin of profit, which equalled 10 per cent., had been insufficient. The creditors confirmed the voluntary liquidation with the liquidator already appointed, and an informal committee.

H. W. Smith & Co., Ltd., electrical wire and cable manufacturers, Lydbrook, Gloucestershire.—The statutory first meeting of creditors and shareholders was held on Monday in London. In the absence of a quorum the meetings were formally adjourned for a week, and the chairman intimated that the liquidation would then doubtless be left in the hands of the Official Receiver. Our report of the proceedings is unavoidably held over.

Middleton Electric Traction Co., Ltd.—Winding up voluntarily. Liquidators, Messrs. T. Bower and T. H. Underhill, 88, Kingsway, W.C.2. Meeting of creditors at 88, Kingsway, W.C., November 2nd.

Associated Electric Traders, Ltd.—First and final dividend of 10½d. in the £, payable at Carey Street, W.C.

Alklum Electrics, Ltd.—Liquidator, Mr. T. W. Meldrum, 9, New Square, W.C., appointed September 23rd.

Standard Electric Sign Co., Ltd.—Liquidator, Mr. H. E. Burgess, Senior Official Receiver, Carey Street, W.C., released October 14th.

British Portable Radio, Ltd.—A petition for the winding up of the above-named company has been presented to the High Court by the Marconiphone Co., Ltd., of Marconi House, Strand, W.C., creditors, and was to be heard in London on October 20th.

3B Wireless Telephone Co., Ltd.—Winding up voluntarily. Liquidator, Mr. G. Gradon, 43, Gower Street, W.C. A meeting of creditors was called for October 21st, at the offices of the Liquidator.

Clemmons Aluminium, Ltd.—A first and final dividend of 1s. 8d. in the £ is being paid. Liquidator, Mr. C. T. Appleby, 26, Corporation Street, Birmingham.

Dissolutions of Partnership.—Parry & Blood, electrical and mechanical engineers, the Crown Hotel Garage, Pwllheli.—Mr. R. Parry and Mr. R. Blood have dissolved partnership. Mr. Parry will attend to debts and continue the business.

Lisle Radio Co., wireless set and accessory dealers, 37, Lisle Street, Leicester Square, W.C.2.—Mr. H. G. B. Wither and Mr. P. Parry have dissolved partnership. Debts will be attended to by Mr. Wither, who will continue the business.

Deed of Assignment.—H. W. Sutton (C. A. Sutton and Co.), wholesale electrical supplies merchant, 110, Dale Street, Liverpool.—Particulars of claims to the trustee, Mr. R. A. Latimer, 81, Dale Street, Liverpool, by October 23rd.

Calendar.—We have received from the E.G.S. Co., Ltd., a wall calendar for 1926, with monthly slips and an excellent view of Warwick Castle.

American Loans to Germany.—An Exchange dispatch to the *Financial Times* states that as a result of the warning of the Reichsbank President, Dr. Schacht, it has been decided to restrict the issue of local German municipal loans as much as possible. The negotiations for a big municipal loan in America will not be concluded before all requests for loans from German towns have been re-examined. Only the most urgent loans will be sanctioned.

Unemployment.—There was a fall of 38,828 in the number of registered unemployed during the week ended October 12th, the total at that date being 1,258,800. The total at the equivalent period of last year was 1,210,201.

For Sale.—Mr. H. J. Shaw, in conjunction with Messrs. Seymour & Seymour, will sell by auction on November 5th, at 550, Oxford Street, W., a quantity of wireless goods and material, including headphones, cable, transformers, &c. The Superintending Engineer, N.W. District, Air Ministry, Uxbridge Depôt, invites offers for surplus generating sets, boilers, pumps, &c., now lying at the R.A.F. station, Aldergrove, Belfast. Sutton Coldfield Corporation Electricity Department invite offers for one d.c. feeder booster, with switchboard. (See our advertisement pages to-day.)

Copper, Lead, and Rubber Prices.—Messrs. F. Smith and Co. report, October 20th: No change in the prices of copper (electrolytic) bars, sheets, wire rods, and h.c. wire.

Messrs. James & Shakespeare report, October 20th: Copper bars (best selected), sheet and rod, £92 per ton, £1 inc. English pig lead, £40, 10s. inc.

Messrs. Edward Till & Co. report, October 20th: India-rubber, Para fine, 3s. 5d., 3½d. inc.

Local Exhibitions.—Under the auspices of the Yorkshire Electric Power Co., an exhibition of domestic electrical appliances was held from October 15th to 24th inclusive at the premises of Messrs. Hopwood & Deacon, electrical contractors, Keighley Road, Skipton. The exhibition was opened by the Chairman of the Electricity Committee of the Skipton Urban District Council.

An exhibition of domestic electrical appliances, held under the auspices of the Electricity Committee of the Stockton-on-Tees Corporation, was opened by the Mayoress on October 19th.

Book Notices.—"More Things That Matter" is the title of a recent volume by Lord Riddell (Hodder & Stoughton, Ltd., price 7s. 6d. net), containing some 40 articles which originally appeared in *John o' London's Weekly*—essays which range from the philosophy of ancient Greeks to the art of the modern commercial traveller, touching upon Winston Churchill, the drink problem, Fords, and the law of property *en route*. Needless to say, we find few references to electrical subjects in this book; but it is full of what, after all, is vastly more important—the knowledge of man and his ways—which is communicated to the reader in a flowing, chatty style which never flags, so that when one reaches the close of one of these short "things" one regrets that there was not more of it. It is interesting to note that in proving that Britain is not a back number the author relies largely upon the many inventions connected with electricity, and shows a remarkably wide acquaintance—for a layman—with the history of electrical developments. As a book for casual reading it can be thoroughly recommended.

"Electrical Estimating for Industrial Lighting Installations," by J. C. Connan. Pp. 214; illustrated. London: E. and F. N. Spon, Ltd. Price 12s. 6d. net.

"Post Office Electrical Engineers' *Journal*." Vol. XVIII. Part 3. October, 1925. London: The Electrical Review, Ltd. Price 2s. net.

"The *Journal* of the Institution of Electrical Engineers."—Vol. LXIII. No. 346. October, 1925. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"Memoirs of the College of Engineering, Kyoto Imperial University." Vol. III, No. 9, June, 1925.

"Exercises in Practical Physics," by Sir A. Schuster and G. H. Lees. Pp. ix+373; figs. 136. London: Cambridge University Press. Price 12s. 6d. net.

"Molesworth's Pocket Book of Engineering Formulæ."—9th edition. London: E. & F. N. Spon, Ltd. Price 6s.

"Transmission Circuits for Telephonic Communication, Methods of Analysis and Design," by K. S. Johnson. Pp. viii+426; illustrated. London: The Library Press, Ltd. Price 21s. net.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIV. No. 10. October, 1925. New York: The Institute. $1.

The *Mining Electrical Engineer*. Vol. VI, No. 61, October, 1925. Price 1s.

Chinese Electrical Notes.—The Yuan Ming Electric Light and Power Co. has recently been organised in Wanan, Anhwei province. The company proposes to mill rice, besides supplying the district with electric light. The Kung Ho Electric Co. at Pingwang, Kiangsu province, has recently been sold to the Kung Hsin Electric Co. The Peking Telephone Administration has submitted a report to the Ministry of Communications to the effect that the Administration has made preparation for opening a North Office in Peking, and that a site at Kwen Chieh has been purchased for the erection of offices. The Ministry has instructed the authorities to proceed with building and installation preparations at once. The Ministry of Communications is in receipt of a wire reporting the installation of the Peking-Kalgan long-distance telephone line. Chen Liu has been appointed director, with instructions to make connections with the Peking Telephone Administration.—*Chinese Economic Bulletin.*

American Radio Apparatus.—We have received a copy of the *Radio Dealer* Year Book for the season 1925-1926, published by the *Radio Dealer*, of New York (264 pages, 5s. 6d.). It is a directory of the numerous producers of radio material in the United States. The contents are arranged in classified form, and in some cases prices are quoted—indeed, the publication claims to be a price list and catalogue of American radio apparatus. Mr. A. J. Smith, of Church View House, Solihul, Birmingham, is the representative handling the book in this country.

Lighting and Power Notes.

Abergavenny.—Electricity in Bulk.—At the October meeting of the Town Council it was reported that the Hereford Town Council had offered, in connection with the supply of electricity in bulk, to make the minimum payment for the first year £500 and in the second and third years £750 per annum, and to supply electricity at 1.7d. per kWh. It was also reported that the Electricity Commissioners had asked for a revised report from the Council's consulting engineer, seeing that the last one was made in January, 1924, and it was decided to obtain a revised report based on the offer of the Hereford Corporation, and forward it to the Commissioners.

Australia.—Sydney.—According to the *Industrial Australian and Mining Standard*, an area of land at Bunnerong Point, Botany Bay, has been selected as a site for the Sydney City Council's power house. A tunnel about 1,500 ft. long will be driven under Bunnerong Point so that the water from Yarra Bay may flow to the power house, ensuring a continuous supply of cold water for the turbines. Mr. S. Y. Maling, deputy general manager, who will have control of the building operations during the absence of Mr. Mackay in London, states that it is proposed to construct the new power house in three sections, each of 100,000 kW. The present power house at Pyrmont has a capacity of 50,000 kW. When the three sections are in operation the Pyrmont power house is to be used mainly as a relief supply for the generation of electricity needed to meet the peak load demands during the busy hours of the afternoon. The cost of erecting and equipping the first unit at Bunnerong Point is estimated to cost approximately £2,000,000, and when completed the power house will have cost nearly £5,000,000. It is hoped that the first portion of the new power house will be in operation by the end of 1928.

Barnoldswick.—Objection to Order.—The Urban District Council has lodged formal objection to a proposal of the Electrical Distribution of Yorkshire, Ltd., to apply for an Order empowering it to distribute electricity in the district, as the Council itself is proposing to apply for an Order to distribute electricity in its area. The Council has decided to invite representatives of the Earby Urban District Council to attend a conference to discuss the question of electricity supply in both areas.

Bedwas and Machen.—Electricity Scheme.—The Urban District Council has adopted an electricity scheme for the Bedwas and Trethomas Wards, submitted by the electrical engineer, Mr. S. Thomas. A bulk supply of electricity will be obtained from the South Wales Power Co. and a sub-station erected at a total cost of £5,459.

Bradford.—Year's Working.—The report of the city electrical engineer, Mr. T. Roles, on the working of the Corporation electricity undertaking for the year ended March 31st last shows a total income of £483,385, as compared with £250,595 in 1923-24. Working expenses amounted to £259,468, as against £250,595, leaving a gross profit of £223,917 (£258,936), to which was added a Government grant for works for unemployed of £910, making a total of £224,827. Capital charges, &c., absorbed £186,103, and there was a net surplus of £38,723, as compared with £97,609 in the preceding year. A contribution of £23,600 was made to the district rate. The capital expenditure during the year amounted to £219,429, the chief items being £79,554 for plant, &c., at Valley Road station, and £115,070 for mains and services. The sales of electrical energy increased from 67,359,496 to 69,347,691 kWh, and the average price per kWh obtained fell from 1.72d. to 1.592d. The installation of e.h.p. armour-clad switchgear for the 16,000-kW turbo-alternator which has recently been added to the plant was completed during the year, and a 1,350-kW motor-converter was installed at Sunbridge Road sub-station. Orders were placed for additional converting plant at Thornbury, Odsal, and Four Lane Ends sub-stations.

Extension of Supply.—The Corporation has applied for an Order authorising it to extend its area of supply to Clayton. Cables run at present to the Bradford-Clayton boundary, and it is estimated that the township and district can be supplied within six months from the time of sanction. The estimated cost of the scheme is £11,000.

Loans.—The Corporation Finance Committee has rescinded an authority given on April 4th, 1924, to apply for sanction to borrow £1,474 in connection with the erection of a new transformer chamber at Harrogate Road, Apperley Bridge, and in lieu thereof has authorised application to borrow £2,517 for larger works now proposed. Sanction has been received to the borrowing of £10,310 for the replacement of e.h.p. feeder mains between Undercliffe and Apperley Bridge.

Cannock.—Extension of Supply.—The Urban District Council has approved a scheme for the supply of electricity to the villages of Cheslyn Hay and Great Wyrley. The estimated cost of the scheme is £26,000.

Cardiff.—Year's Working.—We have received from Mr. C. G. Morley New, city electrical engineer, a copy of his report, together with the statement of accounts, on the working of the electricity undertaking for the year ended March 31st last. The revenue amounted to £224,702, and working expenses were £109,070, leaving a gross profit of £115,632. The figures for the preceding year were: Income, £217,226; working expenses, £89,224; gross profit, £128,001. To the gross

profit was added income from other sources, making a total of £127,597. Capital charges absorbed £75,697, leaving a net surplus of £51,899. This was carried to appropriation account, together with a balance of £90,282 from the previous year, making a total of £142,181, and was distributed as follows:—Works of a capital nature, £14,524; rate relief, £14,153; balance carried forward, £113,503. The result of the previous year's working was a surplus of £50,483. The capital expenditure during the year amounted to £78,100, and included £16,850 for machinery and £43,364 for mains and services. The sales of electrical energy increased from 23,854,136 to 25,671,031 kWh, and the average price obtained per kWh fell from 2.18d. to 2.10d. The maximum supply demanded rose from 12,062 to 12,940 kW.

Carlisle.—Extension of Supply.—The Corporation Electricity Committee has recommended that application be made for an Order to extend the cables outside the existing area of supply at Scotby at an estimated cost of £2,297, and that the consent of the Rural District Council to the extension be sought.

Colchester.—Railway Station Supply.—The London and North Eastern Railway proposes to take a supply of electricity from the Corporation for its station at Colchester, and the sheds, yard and laundry. Its requirements will be from 35,000 to 40,000 kWh per annum for lighting, and 60,000 kWh for power.

Dartford.—Objections to Order.—Objections to the Special Order applied for by the Urban District Council to include the parish of Stone in its area of supply have been lodged by the Kent Power Co., the West Kent Power Co., the Dartford Rural District Council, and the Port of London Authority.

East Lothian.—Electricity Supply.—The Lothian Electric Power Co. is extending its area of supply so as to include Aberlady and Gullane.

Edinburgh.—Shop-window Lighting.—We are informed that the Corporation has decided to hire out Venner time switches for late shop-window lighting.

Guatemala.—Electrical Development.—Authority has been issued by the Administration for an extensive survey of the State, to be completed within six months, with the view to constructing an electrical distribution system for a wide area. The first scheme contemplated will include the use of the Government-owned power plant at Santa María, and a supply will be extended to Patzun. The second scheme will serve a district between Santa María and Retalhuleu.—*Reuter's Trade Service* (Guatemala City).

Lancashire.—Electrical Development.—According to the *Manchester Guardian*, the Electricity Commissioners have approved the scheme for bulk supplies of electricity for Blackpool and Lytham-St. Annes, to be obtained from Preston power station, and the line of route is now being surveyed for overhead cables. Blackpool will take from 5,000 to 10,000 kilowatts. Preston will commence to supply Leyland, through the Lancashire Electric Power Co. on November 1st, and the work in connection with the linking-up of Blackburn with Preston is nearing completion. Preston Corporation is expected to proceed shortly with extensions to its power station.

Lincoln.—Loans Sanctioned.—The Town Council has received sanction to loans of £17,000 for mains, and £2,415 for a transformer and sub-station equipment.

Maybole (Ayrshire).—Electricity Scheme.—The National Electric Construction Co., Ltd., has written to the Town Council offering to give a supply of electricity to the town. A representative of the company is being asked to meet the Council and discuss the proposed scheme.

Moreton.—Electricity Supply.—It was reported at a recent meeting of the local Council that Wallasey Corporation was prepared to provide electricity at 5d. per kWh for lighting, 2d. per kWh for power, and 1d. per kWh for heating.

Motherwell and Wishaw.—Electricity in Bulk.—The electrical engineer has submitted a report to the Town Council on the question of obtaining a bulk supply of electricity from the Clyde Valley Electrical Power Co., and the Council has decided to cease generating its own supply and to enter into an agreement with the Clyde Valley Co. for a supply in bulk. The estimated capital expenditure involved in the change-over is as follows:—Rotary converting plant (4,500 kW), £24,908; reconstruction of Motherwell station, £1,200; purchase of plant for Wishaw sub-station, £4,000; cost of new switchboard, £2,500. Application is to be made for sanction to a loan to cover the cost of the scheme.

Northern Ireland.—Rathfriland (Co. Down).—The new electric lighting scheme, which has been carried out by the Banbridge Gas and Electricity Co., was inaugurated on October 13th. The plant consists of a twin-cylinder Crossley crude-oil engine of 68 h.p., with a 35-kW Newton dynamo. The system is 220 V d.c.

Plymouth.—Inquiry Decision.—In connection with the applications of the Corporation, Plympton St. Mary Rural District Council, and Messrs. Hurrell & Heath, for an Order to supply electricity in the rural district of Plympton St. Mary, which formed the subject of a recent inquiry, the Electricity Commissioners have granted the application of the Rural District Council in respect of the whole of the rural district.

Loans Sanctioned.—The Electricity Committee has received sanction to the borrowing of £1,000 for two transformer chambers at the North Prospect Housing Estate and £7,450 for additional converting plant.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Sheffield.—Prices of all energy charged at 2d. per kWh or under, reduced from 20 to 10 per cent., on the basic rate, and of all energy over 2d. per kWh from 10 to 5 per cent., on the basic rate.

Doncaster.—Uniform rate of 1d. per kWh throughout the year for heating and cooking. Domestic rates, ¾d. per kWh for the summer months, and 1d. per kWh for the winter months.

Rotherham.—Power: A reduction of 10 per cent.

Sheffield.—Electricity Extensions.—The Electric Supply Committee has approved extensions to mains for general distribution purposes at an estimated cost of £14,928, and extensions of feeder mains and the necessary works at an estimated outlay of £9,242.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them for the supply of electricity by Blackburn Corporation in the parishes of Witton and Livesley.

Application has been made by Bradford Corporation for an Order authorising it to extend its area of electricity supply so as to include the urban district of Clayton.

Sunderland.—Street Lighting.—Taking advantage of the laying of a new tramway in Durham Road, the Corporation has decided to light the route by electricity from overhead mains, at an estimated initial expenditure of £1,288. The estimated cost of maintenance is £799 per annum.

Torquay.—Loans Sanctioned.—The Electricity Commissioners have given sanction to loans of £10,000 for transmission lines in connection with the bulk supply of electricity to Paignton, £6,143 for building extensions, and £41,300 for additional generating plant at Newton Abbot power station.

Electricity in Bulk.—At a recent meeting of the Electricity Committee, the Town Clerk pointed out that the question of the provision of a main transmission line to Totnes arose through the request of the Urban Electric Supply Co., Ltd., at Dartmouth, and the Electric Supply Corporation, Ltd., at Totnes, for a supply in bulk; but the Corporation could not afford such a supply until it was known whether the Electricity Commissioners proposed to grant the Central South Devon Electricity Order for the supplying of electricity in the territory between the Torquay area and the area of the above-mentioned companies, as the result of a recent inquiry held at Newton Abbot into the matter. The engineer gave particulars of the following schemes:—(1) Provision and laying of an e.h.p. main from Newton Abbot power station for the purpose of giving a supply in bulk to the borough of Totnes at an estimated cost of £18,054; (2) The provision and laying of an e.h.p. main from Paignton to Totnes to complete ring main, Newton-Torquay-Paignton-Totnes-Newton, at an estimated cost of £13,513; (3) The provision and laying of one e.h.p. main from Paignton to Dartmouth to give bulk supplies to the latter town and to Brixham at an estimated cost of £12,500. The Committee has recommended the Council to adopt provisionally the three schemes suggested in the event of the Central South Devon Electricity Order not being granted.

Electricity Charges.—The Corporation has approved the following schedule of charges for electricity:—A flat rate for lighting of 10d. per kWh, and for power of 1d. per kWh, with a minimum payment of 12s. 6d. per quarter for the winter quarters and 8s. 4d. for the summer quarters. A combined rate for lighting, heating, cooking, and domestic supplies of 3s. 9d. for each 40-watt lamp or equivalent, plus 1d. per kWh for electricity consumed. Power supplies: A quarterly standing charge of 12s. per h.p., with a minimum payment of 3s. 4d. per quarter, the charge not to exceed 3d. per kWh. Specially low rates to consumers taking a supply at 11,000 V, 3 phase, 50 cycles. The standing charges are subject to a discount of 5 per cent. for prompt payment.

Tynemouth.—Wiring of Houses.—In connection with the scheme for deferred payment for wiring, the electrical engineer has recommended that the slot meter system be adopted for small houses, and for larger houses that payment be made quarterly. The Council has adopted the recommendation in respect of installations the cost of which does not exceed £12, and has decided to set aside a sum of £5,000 from the accumulated profits for this purpose.

Ulverston.—Progress of Electricity Scheme.—Good progress is being made with the laying of mains from Barrow Corporation's power station and it is anticipated that an electricity supply will be available early in November.

Walsall.—Loan.—The Town Council is applying for sanction to a loan of £30,000 for extension of mains, this being the estimated expenditure during the ensuing three years.

Electricity Supply in Fulham.

Extensions at the Generating Station.

As recorded in our last issue, important extensions have been carried out at the Townmead Road power station of the Metropolitan Borough of Fulham, trebling the capacity of the plant. Early in March, 1924, the contract for the whole of the work was placed in the hands of Messrs. Vickers, Ltd., at £123,815, with the stipulation that additional energy should be provided in time for the following winter's load. The shortness of the period available for construction necessitated the execution of the contract under high pressure, and the borough consulting and electrical engineer, Mr. Arthur J. Fuller, M.I.E.E., collaborated with the contractors in planning the work so as to ensure the utmost expedition. The feat, which is understood to constitute a record in this country, was duly accomplished, including, besides the manufacture and erection of the plant, the building of the turbine room and the erection of a 50-ton travelling crane.

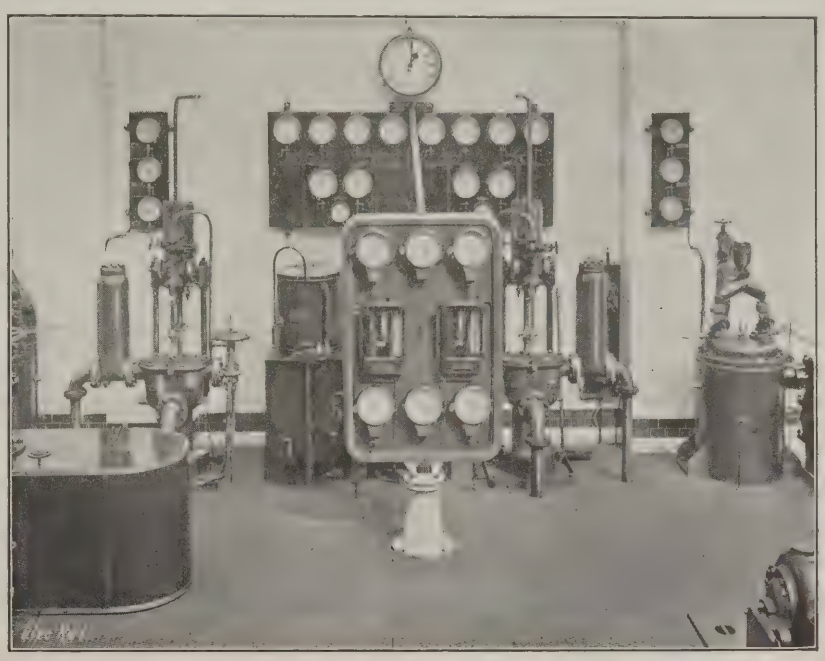


Fig. 1.—Controls on Turbine Platform.

The two new turbo-generators are of the Rateau impulse type, with multi-exhaust blading, and generate three-phase current at 6,600 volts, 50 cycles, when running at 3,000 r.p.m.; they are rated at 6,000 kW each, with a power factor of 0.8, and can carry an overload of 25 per cent. for two hours. They are designed for a steam pressure of 250 lb. per sq. in., superheated to 700 deg. F., and a vacuum of 28.8 inches of mercury; the full-load thermal efficiency is 25.2 per cent., and the steam consumption 10.22 lb. per kWh. The turbines are equipped with heaters, integral with the low-pressure casing, for bleeding steam from a stage shortly before the final stage for heating the feed water. The condensate, after passing through the surface heaters of the ejectors, is led through the turbine integral heaters, in which its temperature is raised to about 150 deg. F., thus effecting an economy of nearly 5 per cent. The rotating element is of the Metropolitan-Vickers standard design having a velocity wheel, 10 Rateau stages, and two multi-exhaust stages.



Fig. 2.—The New Turbo-generators.

E

All the diaphragm blades are of stainless steel, as are also those of the rotor in the region of the dew point.

Lubricating oil is tapped from the pressure side of the turbine oil system and passed through a diaphragm to the Fox filters. Thence it passes to a tank which allows it to settle for one hour, and returns by gravity to the turbine oil tank. The filtering starts automatically with the turbine, and no extra running plant is required. The whole of the turbine oil is in this way filtered once every six hours.

The condensing plant was designed, manufactured and erected by the Barrow-in-Furness branch of Messrs. Vickers, Ltd., and is of the "Contraflo" type (fig. 6). The cooling surface in each condenser is 8,500 sq. ft., and at full load each condenser requires 8,800 gallons of circulating water per minute. The shells of the condensers are of mild steel plate — a speciality of the Vickers Barrow works.

The air pumps are of the "Contraflo" two-stage steam ejector "Compact" type, with the ejectors in series, the discharged steam and vapour being condensed by contact with brass tubes through which the whole of the main condensate flows in two passes, thus heating the feed water, while the non-condensable gases are released to the atmosphere. Stability of operation throughout the whole range from atmospheric pressure to the highest possible vacuum is secured by means of a specially designed stabiliser fitted to the second ejector. The steam nozzles of the ejectors are of rustless steel.



Fig. 3.—Switchgear Gallery, from Turbine Platform.

The condensate is withdrawn from the main condensers by centrifugal pumps driven by electric motors, the whole being of Metropolitan-Vickers manufacture.

Circulating water is derived from the river by way of a sump below the existing pump house, and is carried in steel pipes 36 in. in diameter to the condensers and back to the river. The pumping plant was supplemented by a 21-in. Mather & Platt pump, of the vertical-spindle type to suit the space available in the pump house, as well as a smaller centrifugal pump on an upper floor; both pumps are driven by Metropolitan-Vickers two-phase slip-ring motors. The pipe line was erected for Messrs. Vickers, Ltd., by Messrs. John Spencer, Ltd., Wednesbury; an existing pipe line had to be demolished, without interfering with the running of the generating plant.

The alternators have bar-wound stators with mica insulation, and solid forged rotors; the cooling air is circulated through the alternators and coolers on the Metropolitan-Vickers patent closed-circuit system by fans mounted directly on the rotor shafts. The exciters are of the M.-V. standard design with radial commutators.

The output of the alternators is converted from 6,600-volt three-phase to 3,000-volt two-phase for connection in parallel with the existing supply by Metropolitan-Vickers Scott-connected transformers, three pairs of single-phase shell-type transformers rated at 2,000 kVA per pair being installed. They are oil-immersed and self-cooled, being mounted in boiler-iron tanks with external tubes. Adjusting tappings of + or − $2\frac{1}{2}$ and 5 per cent. are provided on the low-pressure side, to enable the voltage to be regulated on the Fulham system whilst the alternators are run at a



Fig. 4.—Boiler-house, Firing Floor.



Fig. 5.—Passage between Boilers; Chimney Base.

boosted pressure to supply Hammersmith and Battersea. The 6,600-volt switchgear, fig. 3, consists of five duplicate bus-bar Metropolitan-Vickers compound-filled armour-clad units, type K3, arranged for remote electrical operation. These control the two alternators and three Scott-connected transformer groups. The indicating instruments and control switches for the various circuits are mounted on black enamelled slate panels forming a vertical-type control board.

For controlling the low-pressure side of the three Scott-connected groups a 3-panel M.-V. truck-type 2-phase board has been supplied.

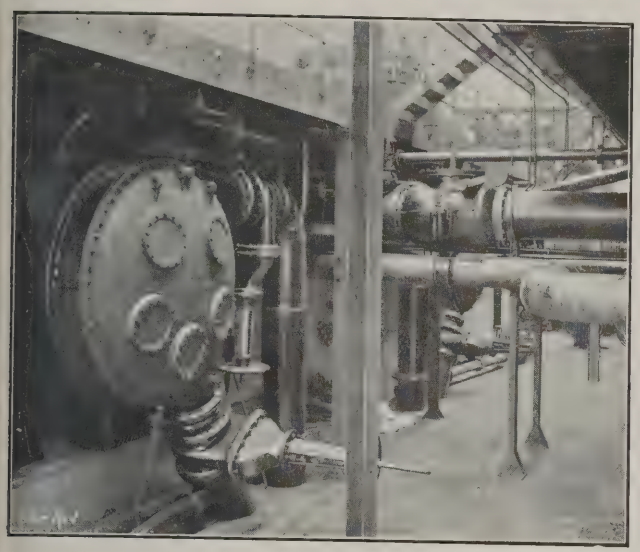


Fig. 6—Condenser and Piping in Basement.

The whole of the new 6,600-volt cables, together with the cables for the auxiliaries in the engine-room and boiler-house, were manufactured by Messrs. W. T. Glover & Co., Ltd., and installed by the Metropolitan-Vickers Electrical Co., Ltd.

The alternators are fitted with the Merz-Price circulating-current system of protection. A special arrangement is made by which the protective relay trips not only the main oil circuit-breaker but also an automatic circuit-breaker in the alternator main field, so that in the event of an internal fault, the possibility of damage is reduced to a minimum. The pillar containing this circuit-breaker is situated adjacent to the alternator.

The boiler plant, fig. 4, consists of three Vickers 5-drum, bent-tube type boilers, each having a heating surface of over 10,000 sq. ft., and giving a normal evaporation of 40,000 lb. per hour, at a working pressure of 275 lb. per sq. in., and a total temperature of 700 deg. F. at the turbine stop valve with feed water at 200 deg. F. Each unit includes a superheater, economiser, forced-draught fan and "Prat" induced-draught fan and chimney. The boilers are equipped with Diamond soot blowers. The stokers are of the Erith-Roe type, and consist of 11 retorts. The three economisers are of the Green ringstay type, each consisting of 256 tubes.

The feed pump equipment includes three Weir "Roto" feed pumps, each capable of delivering 6,000 gallons of water per hour.

The boiler equipment includes the whole of the steam, feed and blow-down pipes, the steam and feed water being recorded by "Ken" measuring apparatus, and for the temperature and CO_2 recording, a complete outfit of Cambridge instruments is installed. All the motors and control gear for the boiler-room auxiliaries were supplied by the Metropolitan-Vickers Electrical Co., Ltd.

The existing Gibbons ash conveying plant has been extended to provide ashing arrangements for the new boiler plant, and an ash elevator of new design replaces the original ash breaker. Concrete coal bunkers of 184 tons capacity have been erected in the new boiler house, and to facilitate the coal-handling arrangements, new bunkers of slightly smaller capacity have also been provided in No. 2 boiler house, the whole of these bunkers being fed by a Mitchell belt coal conveying plant.

In the turbine room a 50-ton Arrol overhead travelling crane, with Metropolitan-Vickers motors and control gear, has been installed.

For the foregoing particulars and the photographs here reproduced we are indebted to Messrs. Vickers, Ltd.

The Egyptian Government Workshops.

Recent Developments of the Ministry of Public Works.

Considerable improvements have recently been made by the Egyptian Government to the workshops of the Ministry of Public Works, which are situated on the east bank of the Nile at Bulak, Cairo, and are responsible for the maintenance and repairs to the Government inspection steamers and motor boats.

A new floating dock is in the course of construction, and is designed to take a load of 350 tons dead weight, making it suitable for docking the largest Government steamer on the Nile; the pumping plant is electrically operated by 20-b.h.p. motors.

The workshops are well equipped with log-saw and wood-working machines, and a foundry with an output of about 25 tons of iron and non-ferrous castings per week. A machine shop is provided with the most modern machines, including, in the steel construction section, electrically driven pneumatic power hammers, punching and shearing machines, plate and angle rollers, &c. Other sections are provided with electric welding plant and equipment for electroplating, &c. A siding from the Egyptian State Railways facilitates the transport of goods, and a 50-ton wharf crane is positioned so as to lift from either trucks on the siding or barges on the river, while an overhead runway connects the

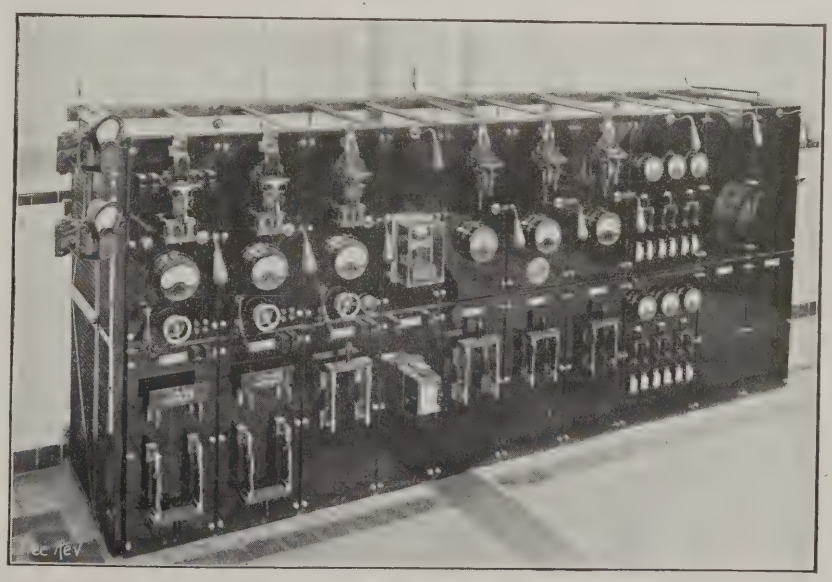


Fig. 1.—Main Switchboard.

main siding with the central stores and sections of the workshops.

The electricity supply is obtained from three 150-h.p., 4-cycle Diesel engines, each coupled to a 100-kW, 110-V, d.c. generator. The engines, fig. 2, which run at 250 r.p.m. and are capable of dealing with a 10 per cent. continuous overload, were suppied by Messrs. Sulzer Bros. They are of the vertical type, and each is fitted with a 3-stage vertical compressor directly driven from the main crankshaft. Each engine is provided with its own cooling-water pump, the suction and discharge pipes for which are interconnected, the water being lifted from a common artesian well and discharged into a large cooling-water tank on a steel platform outside the engine room. On the same platform are located the main fuel oil storage tanks, these being duplicated so that cleaning operations may be carried out without interfering with the normal running of the plant.

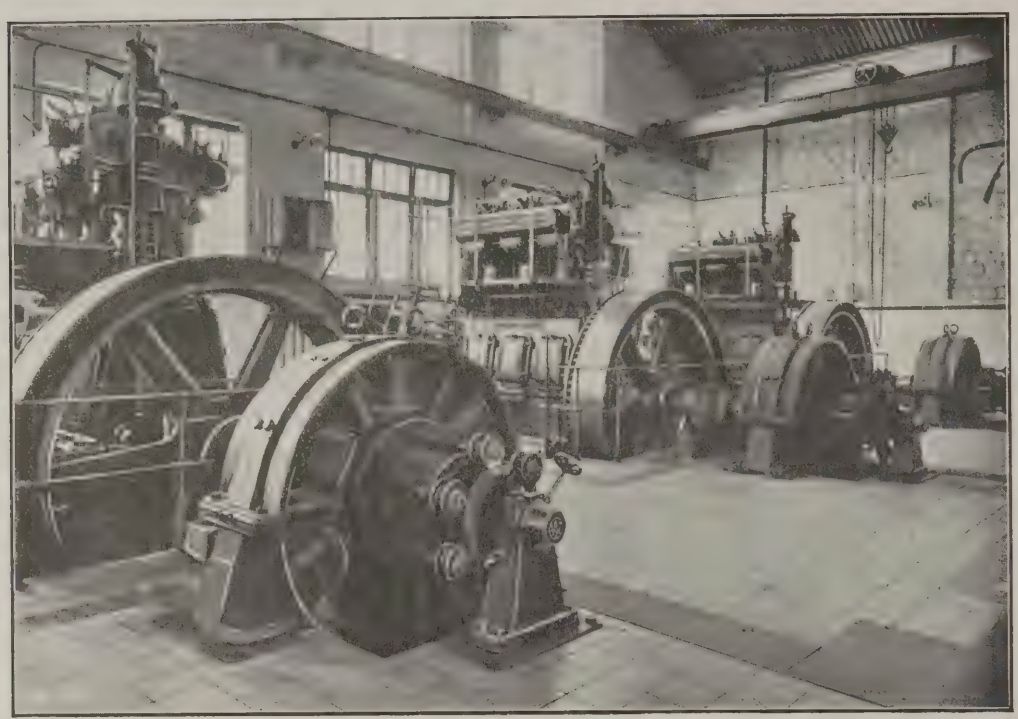


Fig. 2.—Generating Plant.

The electrical generators, supplied by the British Thomson-Houston Co., Ltd., Rugby, are of the multi-polar shunt-wound type, capable of sustaining an overload of 25 per cent. for two hours. The other electrical equipment, motors and control pillars, main switchboard, distribution panels, cables, &c., were also supplied by the B.T.-H. Co.

The switchboard, fig. 1, comprises three 100-kW generator panels, three power-feeder panels, one meter panel equipped with Everett-Edgcumbe instruments, one lighting-circuit panel, and two blank panels for future extensions. Synchronising apparatus is mounted on swing brackets on the first generator panel. The feeders from the main switchboard distribute the whole of the energy to three 6-way distribution fuseboards, suitably positioned to serve the 20-b.h.p. and smaller motors. These fuseboards are of the "Fluvent" enclosed ventilated type of Messrs. Parmiter, Hope & Sugden, Ltd., with d.p. porcelain bridge fuses, so arranged that when the fuse carriers are withdrawn no live metal is exposed.

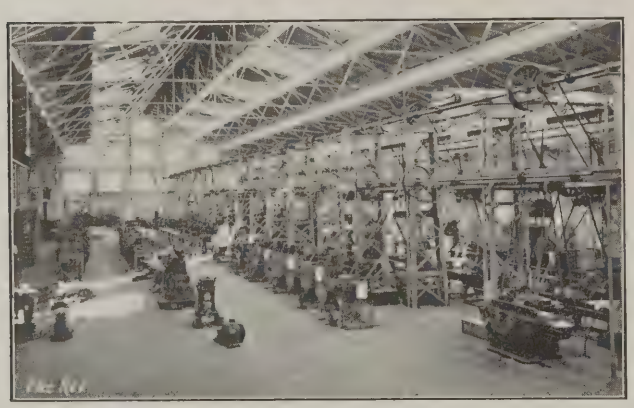


Fig. 3.—Fitting Shop.

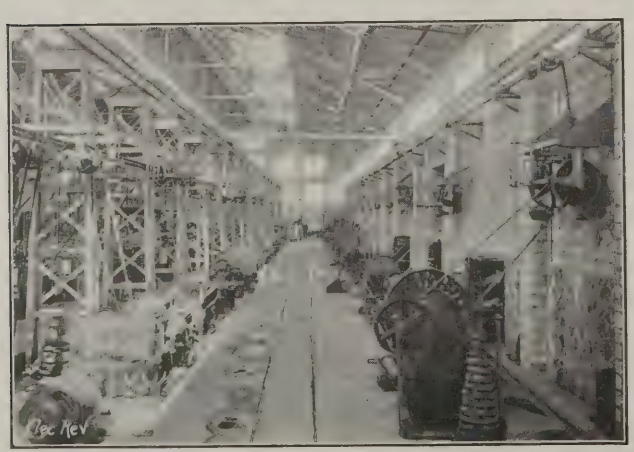


Fig. 4.—Heavy Machine Shop.

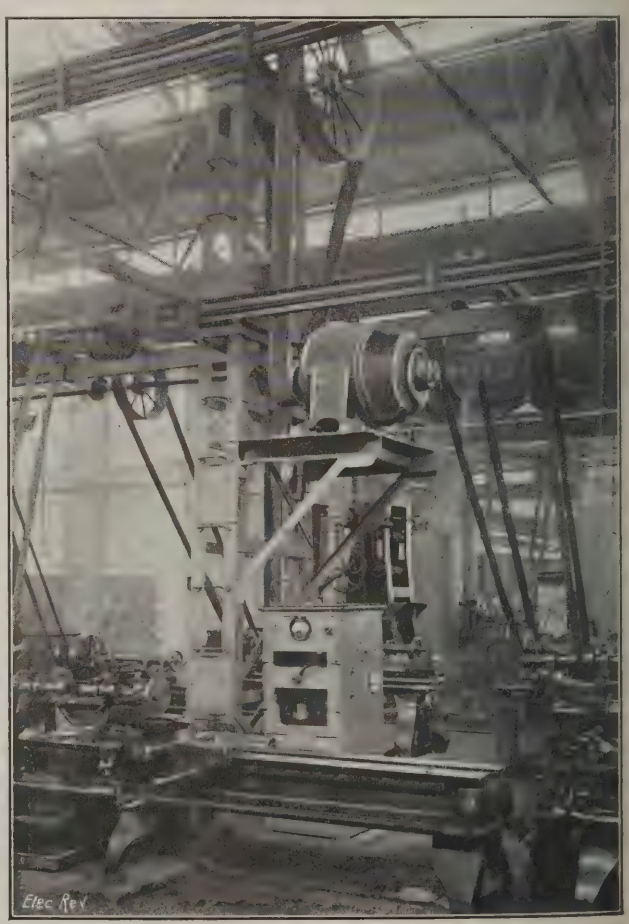


Fig. 5.—One of the Drive Groups.

The drives for the metal- and wood-working machine shops are arranged on the group system, main shafts running the whole length of the building, provided with "Skefko" ball bearings, being so arranged as to drive eight equal groups of machines of about 20 h.p. Each group is belt driven by a B.T.-H. 20-h.p. shunt-wound motor, 800 r.p.m. The control pillars for the motors are of the ventilated drip-proof design, equipped with d.p. contactor-type breakers and isolating switches and starting rheostats, &c. Fig. 5 shows one of the group drives; motor, shafting, &c.

A general view of the heavy machine shop, which is covered by a 3-ton "Herbert Morris" travelling crane, is shown in fig. 4. A feature of this department is the securing arrangement of the countershafts. Steel channels are carried the whole length of the workshops on latticed supports, thus enabling the countershaft bearing frames to be hung in any position by hook bolts without drilling. This was found to be particularly useful in the reconstruction, as the dismantling of the old shafting and re-arrangement of the new progressed simultaneously. Fig. 3 is a view of the fitting or light machine shop.

In planning the power supply, a reasonable reserve was allowed for future developments. It is anticipated that with the new status of the country, coupled with the higher training and experience gained by the Egyptian engineers and artisans, local production will rapidly increase.

It is interesting to note that the reconstruction of the building, including the steel structural work, and the rebuilding of the roofs, was carried out by the staff and workmen of the workshops, to whom credit is due.

Tramway and Railway Notes.

Colchester.—Railless Cars.—The Town Council has under consideration a proposal to introduce railless cars or motor-omnibuses in the town, and has appointed a special committee to obtain full particulars of the proposed schemes.

Continental.—Germany.—In anticipation of the proposed electrification of the German railways, especially in the Rhine district, it is planned to construct three power stations on the Rhine at Schwoerstadt, Dogern, and Reckingen. The erection of the first two works is to commence immediately. The cost of the complete erection is estimated at 56,000,000 Swiss francs.

Switzerland.—Work will shortly commence on the construction of a new electric tramway between Oerlikon and Affoltern, near Zurich.

Derby.—Year's Working.—The report on the working of the Corporation tramway undertaking (manager, Mr. F. Harding) for the year ended March 31st last shows a total revenue of £131,336, as compared with £121,757 in the preceding year. Working expenses increased from £87,473 to £91,625, leaving a gross surplus of £39,711. After providing for capital charges, &c., a net surplus of £27,767 remained, a record for the undertaking. The previous year's working resulted in a surplus of £21,749. The number of passengers carried increased from 17,710,109 to 19,292,279.

Doncaster.—Railless Cars.—The Corporation has decided to abandon the tramway track in the Bentley-with-Arksey urban district and substitute railless-car services. Provisional terms have been arranged between the Corporation, the Urban District Council, and the West Riding County Council with regard to the cost of road construction to carry these services. The change will cost the Corporation about £44,000, including contribution to the road reconstruction. Twelve new railless cars will cost £24,000, and alterations to overhead and electrical equipment about £5,000. An extension of the existing route is contemplated.

Liverpool.—New Routes.—The Corporation has received powers for the construction of the following new tramways:—Mill Lane and Lake Road, Mill Street, Beloe Street, Dingle Mount and Dingle Lane, Marybone, Gardner's Row, Bevington Bush and Bevington Hill, Great Crosshall Street, Brownlow Hill and Ullet Road and Walton Hall Avenue to Stopgate Lane.

Manchester.—Railway Electrification.—Local authorities are supporting representations to the railway company and the Ministry of Transport with regard to the electrification of the Manchester South Junction and Altrincham Railway.

Ramsbottom.—Year's Working.—The working of the Urban District Council's railless-car system for the year ended March 31st last resulted in a loss of £4,912, reconditioning of cars being responsible for £3,000. The motor-'bus service showed a profit of £728.

Sheffield.—Tramway Extension.—The Minister of Transport has issued an Order authorising the Corporation to extend the Handsworth tramway to Carr Lane, Woodhouse.

Telegraph and Telephone Notes.

Rugby Radio Station.—Telephone Plant Complete.—It is understood that the radio-telephone apparatus which the Western Electric Co. has installed at the wireless station at Rugby has been completed; so far as the company is concerned, everything is now ready for transmission, and the Post Office has taken charge. According to the *Morning Post*, transmission tests to America are likely to take place shortly.

Spain.—Radio Fog Signal.—On November 1st, a wireless fog signal installed at Cape Silleiro, on the Galician cost, will come into operation. The letters O R will be broadcast on a musical note of 800 vibrations per second during 30 seconds every five minutes. The wave-length used will be 1,000 metres, and an ordinary ship's wireless receiver will be able to pick it up at 30 miles distance. *The Times* points out that this is the first signal of its kind upon the Spanish coast.

Telegraph Conference.—Increased Charges.—Subject to the approval of a plenary meeting of the Conference, the Tariffs Committee of the International Telegraph Conference has agreed that the increased terminal and transit charges for telegrams shall come into force on April 1st, 1926. A Drafting Committee has been appointed to put the Tariffs Committee's recommendations into final shape. The date of their submission to a plenary meeting of the Conference has not yet been fixed. The increases, which it is considered certain will be formally adopted despite British opposition, merely constitute the maximum rates chargeable and are not obligatory.—*Reuter* (Paris).

Tariffs.—The Conference has been sitting since the beginning of September, and another important recommendation was that henceforth the charge per word to the public for telegrams by wire and wireless shall always be identical in all inter-European traffic, thus preventing any future under-cutting of rates by wireless. The reason why this is only to apply to traffic between European countries is that the International Telegraph Convention has never fixed maxima for tariffs for extra-European telegrams. Thus, the increase in terminal and transit charges will only be applicable to European countries, but it may affect traffic between Europe and the rest of the world in so far as the terminal charges at the European end can be increased. It is understood that Great Britain, which has fought against all increases throughout the Conference, is determined that increases which are not compulsory shall not be applied to any appreciable extent, if at all, to telegrams between Great Britain and abroad.—*Reuter* (Paris).

Telephones for the Deaf.—An Amplifier.—A special receiver for those whose defective hearing precludes the use of the ordinary telephone is in use in the United States. The principal element is a thermionic valve, by means of which the deaf person can amplify the current in stages and so increase the sound reproduced by the diaphragm. The set has little or no special value for those whose hearing is normal.

The Telephone Service.—Development.—The Federation of British Industries has suggested to the Postmaster-General that extension and improvement schemes might, in view of the present state of unemployment, possibly be hurried. Expenditure is now about £1,000,000 per month, and the Postmaster-General has £36,000,000 for this purpose.

Underground Cables.—According to the *Evening News*, during the last six months 30 underground cables have been completed and brought into use. They extend, altogether, for more than 470 miles, and contain 70,400 miles of wire. In addition, the new main cable between London and Glasgow, 440 miles, has been laid. During the last financial year more than 1,000 miles of main cables was drawn into underground conduits. There are now in this country 4,000,000 miles of post office wire underground, and 1,000,000 miles overhead.

United States.—Selective Radio Transmission.—A demonstration of the simultaneous transmission of eight or more wireless messages from one transmitting valve on the same ten-metre wave-length, and their reception on a single instrument, was made three weeks ago by the inventor, Mr. J. H. Hammond, jun., before officials of the Navy Department, who have now permitted the announcement of a detailed account of this system of "selective secret radio transmission." Prime importance is attached to the utilisation of short wave-lengths in view of the fact that virtually all the available wave-lengths have already been allotted to broadcasting stations, says *The Times*, which explains that the general principle of the system is the projection of a short carrier wave at the rate of, say, 30,000,000 vibrations per second, on to which are impressed one or more modulatory waves at the rate of 27,000 vibrations per second and upwards, which produce periodic changes of intensity in the carrier wave. The Hammond receiver is designed to separate the frequencies of the complex incoming wave, having one circuit sensitive to the carrier wave and the other circuits sensitive to the frequencies of the modulatory waves. Only an operator knowing the frequencies which are being used can pick out incoming messages.

Radio Notes.

Continental Relays.—Another Experiment.—The first relay of Continental wireless programmes took place on October 15th, and was broadcast from the B.B.C. London station. The attempt, though not a complete success, served to show what could be done in re-broadcasting Continental stations. It was the first time that the Hayes receiving station of the B.B.C. had officially figured in the musical programmes, and it is understood that another attempt will be made on October 29th.

Sounds Competition.—Interesting Experiment.—The radio sounds competition which was broadcast from all the B.B.C. stations, except Belfast, on October 16th is welcomed as a technical experiment of considerable interest, for it is astonishing how difficult it may be to recognise the commonest of sounds by the ear alone without the aid of sight. The competition was organised by *Popular Wireless*; 20 familiar sounds were made in the London (2LO) studio for listeners to identify, prizes being offered for the most correct lists.

Wave-Lengths.—Recent Alterations.—The Geneva Wireless Bureau recently altered the wave-lengths of 25 Continental broadcasting stations in an endeavour to abate interference between stations. Last week the wave-lengths of six British stations were increased; for instance, 2LO has been raised from 357.7 metres to 364, but the official figure still continues to be published as 365.

Russia.—Radio Apparatus Production.—As a result of the ever-increasing demand in the Soviet Union for radio apparatus for amateurs, production at the works of the Elektrosviaz Trust is continually being extended. During September alone amateurs' radio apparatus to the value of half a million roubles was turned out.—*Reuter's Trade Service* (Moscow).

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Aldershot. — November 3rd. Electricity Department. 1,500 yd. paper-insulated lead-covered armoured l.p. cable. (See this issue.)

Australia.—Sydney.—November 30th. Public Works Department. Metering equipment for the Barren Jack hydro-electric development scheme and the Kiama-Nowra transmission line.*

December 16th. New South Wales Government Railways and Tramways. 10 single-phase, 1,800-kVA transformers.*

Melbourne.—December 14th. Electricity Commission of Victoria. 22,000-V insulators. (October 16th.)

Belfast. — November 2nd. Electricity Department. Motor-generator and transformer. (October 9th.)

Bo'ness.—Town Council. Electric lighting work in connection with the housing scheme. Director of Housing, Burgh Chambers, Bo'ness.

Dublin.—November 12th. Great Northern Railway (Ireland). Stores for six months (including electrical fittings, lamps, cable and wire, &c.). (See this issue.)

Egypt.—Cairo.—December 1st. Ministry of Public Works. Two pumping units and accessories for the Mex pumping station.*

Erith.—November 6th. Electricity Department. 100 house-service prepayment meters. (See this issue.)

London.—H.M. Office of Works.—November 3rd. Installation of cables, switchboards, &c., and wiring at the Ministry of Pensions Hospital, Orpington. (October 16th.)

November 4th. Electric wiring in conduit at Montagu House. (October 16th.)

Metropolitan Asylums Board. November 4th. Installation of two new hydro extractors at the Western Fever Hospital, Seagrave Road, S.W.; installation of hot-water heating apparatus at St. Anne's Home, Herne Bay; and installation of automatic telephones at the Downs Hospital for Children, Sutton, Surrey. (October 16th.)

Paddington.—November 3rd. Great Western Railway. Telegraph instruments, electrical apparatus, &c., telegraph ironwork and tools, telegraph drysalterers. November 20th. Electrical wires and cables. (October 16th.

London County Council. November 2nd. Wiring and fittings for electric lighting at the New Road elementary school, Clapham, S.W. (181 wiring points controlled by 168 switches). (See this issue.)

Manchester. — November 6th. Electricity Committee. One 500-kW fully automatic, motor or rotary converter, transformers and switchgear, &c. Three 500-kW fully automatic, motor or rotary converters or mercury-vapour rectifiers, transformers, switchgear, &c. (October 16th.)

New Zealand.—Hastings.—February 1st. Borough Council. Diesel engine and a.c. generator.*

Smethwick.—October 24th. Education Committee. Electric light installation at New Holly Lodge High School. Mr. A. H. Sears, Secretary for Education, Education Offices, 215, High Street, Smethwick.

Southampton.—November 2nd. Harbour Board. Alterations to the electrical equipment of 12 cranes, supply of cables, disconnecting boxes, switchgear. Specifications from Mr. W. G. Gubbins, clerk, Harbour Offices.

Uruguay.—Montevideo.—November 27th. State Electricity Supply Works. H. and l.p. cables and accessories.*

January 7th, 1926. 26,000 kilograms of copper wires and cables.*

January 5th. Bare copper wire, quicksilver.*

January 8th. Black and G.I. wire, &c.*

January 11th. 96,000 metres lead-covered wires and cables.*

January 12th. 44,500 metallic and carbon-filament lamps.*

Administration Nacional del Puerto de Montevideo. January 2nd. Machine tools and equipment.*

West Ham.—November 16th. Education Committee. Installation of electric lighting and central heating at the Cumberland Road new secondary school. (See this issue.)

York.—November 12th. Electricity Department. One 6,000-kW, 3-phase turbo-alternator, with condensing plant, pipework, &c.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Barnstaple.—Board of Guardians. Accepted:—
Installing electricity at the new casual wards.—Garnish & Lemon.

Bolton.—Tramways Committee. Accepted:—
Three top-covered single-truck tramcar bodies.—English Electric Co., Ltd.

Carlisle.—Electricity Committee. Accepted:—
Flange pipes (£165).—Aiton & Co., Ltd.
Circulating-water screens (£1,537).—F. W. Brackett & Co., Ltd.

Gravesend.—Electricity Committee. Recommended:—
Foundation steelwork for generator (£240).—Measures Bros. (1911), Ltd.

India.—Lightalloys, Ltd., has received the contract for the whole of the doors (sliding and hinged) required for the new electrified rolling stock being built by Messrs. Cammell, Laird & Co., Ltd., for the Bombay, Baroda and Central India Railway.

Irish Free State.—The following were among the contracts placed by the Controller of Stores, Department of Posts and Telegraphs, during September, 1925:—
Battery plates.—D. P. Battery Co., Ltd.
Electric light stores.—Falk, Stadelmann & Co., Ltd.
Switchboard jacks.—British L. M. Ericsson Mfg. Co., Ltd.
Switchboard frames.—T. R. Scott & Co., Ltd.
Telegraph accessories.—International Electric Co., Ltd.; Western Electric Co., Ltd.
Telephone cabinets.—Siemens Bros. & Co., Ltd.
Telephone lamps.—Phœnix Telephone & Electric Works, Ltd.

Leeds.—Tramways Committee. Accepted:—
25 sets of Ackley brakes (£381).—British Ackley Brake Co., Ltd.
Portable electric welding plant (£225).—Premier Electric Welding Co., Ltd.

Electricity Committee. Accepted:—
Cable.—Enfield Cable Works, Ltd. (£1,086); W. T. Henley's Telegraph Works Co., Ltd.(£1,400); Macintosh Cable Co., Ltd. (£768).
Poles and cables for overhead distribution at Thorpe sewage works (£824).—Wilson Hartnells Installations, Ltd.

Lepton.—Urban Council. Accepted:—
Installing electric light in 50 houses, six lights in each (£4 per house).—Yorkshire Electric Power Co.

London.—St. Pancras.—Electricity and Public Lighting Committee. Recommended:—
Two 1,000-kW motor-converters working at 750 revolutions per minute (£8,212).—British Thomson-Houston Co., Ltd.
One 1,000-kW motor-converter working at 500 revolutions per minute (£4,731).—General Electric Co., Ltd.

London County Council.—Stores and Contracts Committee. Accepted:—
Electric fittings for 12 months.—Baxter & Caunter, Ltd.; British Central Electrical Co., Ltd.; British Electrical and Mfg. Co.; G. S. Peckham & Co., Ltd.; Juliux Sax & Co.; Tok Switches, Ltd.
Electrical insulating materials for 12 months.—L. Andrew & Co.; Attwater and Sons; British Insulated & Helsby Cables, Ltd.; British Central Electrical Co., Ltd.; J. Cookson, Ltd.; Hamnett & Andrew; L. P. S. Electrical Co., Ltd.; Pomona Rubber Co.; A. A. Sample; Siemens Bros. & Co., Ltd.; J. L. Scott & Co.

Hammersmith.—Electricity Committee. Recommended:—
32-300-amp. double-pole l.p. fuse units (£140).—W. Lucy & Co., Ltd.
Eight circuit-breakers (£80).—J. G. Statter & Co.
12 months' supply of coal for the electricity department: Digby ⅜ in. slack (approx. 19,000 tons), 15s. 7d. per ton for barge deliveries, 14s. 10d. per ton for rail deliveries; Gedling washed singles (approx. 10,300 tons), 22s. 4d. per ton (barge), 21s. 7d. per ton (rail).—Judd, Budd, Ltd.
Glen Rhodda Welsh thro' coal (2,700 tons), 30s. 9d. per ton (rail).—W. McElroy & Co.

Islington.—Lighting Committee. Recommended:—
Two inter-connector switches (£1,880) and two feeder switches (£1,370); rotor for alternator (£3,000).—Metropolitan-Vickers Electrical Co., Ltd.

Metropolitan Asylums Board.—Works Committee. Installation of fire alarm system, Tooting Bec Hospital:—

Cox-Walkers (Recommended.)	£277
Read & Partners, Ltd.	424
W. H. Agar	445
Smethurst & Co. (London), Ltd.	450
A. Hawkins & Sons	639

Installation of X-ray apparatus, Northern Hospital:—

Newton & Wright, Ltd. (Recommended.)	£286
A. E. Dean & Co.	325
Schall & Son, Ltd.	325
X-Rays, Ltd.	358
Watson & Sons (Electro-Medical), Ltd.	367
Medical Supply Association, Ltd.	373

Installation of electric bells, Lambeth Casual Ward :—

T. Clarke & Co., Ltd. (Recommended.)	**£150**
W. H. Agar	152
Toy & Winslow	163
Buchanan & Curwen	173
G. E. Taylor & Co.	181
Lund Bros. & Co.	194

ADMIRALTY.—Park Royal Engineering Co., Ltd., has received a contract from Messrs. Cammell, Laird & Co., Ltd., for a main switchboard for H.M.S. *Rodney*.

Portsmouth.—Tramways Committee. Recommended:—

Brake blocks.—Day, Wallis & Co.

Overhead line materials.—Brecknell, Munro & Rogers, Ltd.; A. and J. M. Anderson Mfg. Co.; Day, Wallis & Co.; R. Wood & Son; G. W. Allsop; Engineering & Lighting Equipment Co., Ltd.; R. Johnson & Nephew, Ltd.

Electric sign at tramway offices (£285).—General Electric Co., Ltd.

Sheffield.—Electricity Committee. Accepted:—

Additional transformers (£2,652).—British Electric Transformer Co., Ltd.

Shipley.—District Council.

Electric lighting at smallpox hospital (£179).—G. Binns.

Forthcoming Events.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, October 26th.—At the Institution, Victoria Embankment, W.C. Discussion on "How Can the Cost of Distribution be Cheapened?" to be opened by the president, Mr. R. A. Chattock.

(North-Eastern Centre).—Monday, October 26th. At Armstrong College, Newcastle-on-Tyne. At 7 p.m. Address by the chairman, Mr. R. W. Gregory.

Nottingham Society of Engineers.—Monday, October 26th. At the Victoria Station Hotel, Nottingham. At 7.30 p.m. Lecture on "The Evolution of Hand Tools," by Mr. A. S. Barnes.

Institution of Civil Engineers.—Thursday, October 29th. At the Institution, Great George Street, S.W. At 6 p.m. Joint meeting with the bodies which are co-operating in the work of the Special Committee on Tabulating the Results of Heat-engine Trials. Discussion on "Standard Codes for Tabulating the Results of Trials of Gas-engines and Gas Producers," to be opened by Mr. G. J. Wells.

Junior Institution of Engineers.—Friday, October 30th. At 39, Victoria Street, S.W. At 7.30 p.m. Kinematograph lecture, showing the construction and assembly of the 50,000-kW turbo-alternator plant for Chicago at the works of Messrs. C. A. Parsons & Co., Ltd.

Electrical Trades Commercial Travellers' Association.—Friday, October 30th. At Elma Rooms, 15, Savoy Street, W.C.2. At 7 p.m. Lecture on "Salesmanship," by Mr. V. Dale.

Notes.

Edinburgh Electrical Society.—The syllabus for the new session includes papers on automatic telephony, stationary batteries, radio telephony, maintenance, the influence of light in industry, cables, hydroelectric plant, organisation, the electrical equipment of a battleship, and country distribution—altogether a varied and interesting programme. On Wednesday last Prof. T. Hudson Beare was to deliver an address to the Society.

Victorian Electricity Commission Inquiry.—According to the *Melbourne Age*, the Government of Victoria has decided to appoint an independent engineer to investigate and report upon the working of the State Electricity Commission. It has taken this action in response to severe criticisms which have been made of the Commission's expenditure, particularly in connection with the Yallourn scheme, the cost of energy from which is stated to be much greater than that of electricity supplied by the State Railway power station.

Proposed Walmsley Memorial.—An appeal has been issued for donations toward a memorial fund of £2,000 which is being raised to perpetuate the memory of the close association of the late Dr. R. Mullineux Walmsley with the Northampton Polytechnic Institute. A committee has been formed representative of every phase of activity in the Institute. It is proposed to erect a tablet or other record of the late Principal in a suitable position in the Institute, and to endow a Walmsley Memorial Scholarship tenable in the Engineering Day College and available for all students of the Northampton Polytechnic Institute. We believe that there are a large number of our readers who owe much to the assistance received from Prof. Walmsley and his staff and we hope that the response will be ready and generous. Donations should be sent to Mr. W. K. Davis, the Hon. Treasurer, at the Institute, St. John's Street, E.C.1. Mr. J. Cameron Rennie is chairman of the committee and Mr. F. L. Best is acting as honorary secretary.

London Electrical Engineers.—27th A.A. Battalion R.E. (T.A.).—Honorary Colonel, Colonel R. E. B. Crompton, C.B.; Officer Commanding, Lieut.-Col. C. H. S. Evans, O.B.E.—The following orders have been issued for October and November :—

The Battalion will train during the ensuing year, 1925-26, as two Companies :—

305th Company (Major A. W. M. Mawby, O.B.E., A.M.I.E.E.).—Tuesdays, 7 p.m. to 9.30 p.m., commencing Tuesday, November 3rd, 1925.

306th Company (Major F. C. Clarke, A.M.I.E.E.).—Mondays, 7 p.m. to 9.30 p.m., commencing Monday, November 2nd, 1925.

Headquarters at 46, Regency Street, London, S.W.1, will be open until 8 p.m. on weekdays and 1 p.m. Saturdays.

Electricity in the Home.—At the autumn quarterly conference of the Leeds Labour Party Women's Central Committee, held last week, Miss Clara Adams, the secretary, read a paper on "Electricity in the Home," which had been prepared by Alderman D. B. Foster, who was unable to attend. The speaker said the old argument as to the cheeriness and comfort of the coal fire fell to the ground because the working woman had not time for sitting by the fire. Her time was largely taken up in doing unnecessary work which could be done more efficiently by means of electrical appliances. Reference was made to electricity as a means of eliminating the smoke nuisance and improving public health.

A Wheatstone Memorial.—On Monday last a memorial tablet to Sir Charles Wheatstone was unveiled at St. Michael's Church, Gloucester, by Sir Charles Sherrington, President of the Royal Society, the day being the 50th anniversary of Wheatstone's death.

Fatalities.—On October 15th, Alex. Robertson, employed as a coal cutter, lost his life as the result of an electric shock received while at work in the Bardykes Colliery, Cambuslang.

An inquest was held at Simonstone, last week, on James M'Kenna, electrical fitter, Radcliffe, who was killed at a substation belonging to the Lancashire Electric Power Company at Simonstone. Charles William Dyke, electrical fitter, said that he heard a crash and saw M'Kenna knocked backwards against the wall. Witness tried artificial respiration, but without success. Another witness said deceased must have touched a live wire. M'Kenna's head, he added, was within a few inches of the live conductor. The district engineer, Mr. T. Morphy, said he was not asked to isolate the sub-station, and he did not consider it necessary. The Coroner said that M'Kenna had not taken sufficient precaution, and he had paid the penalty. The jury returned a verdict of "Accidental death."

A New Railway Engine.—Representatives of the Canadian National Railways entered into a contract some time ago with Messrs. William Beardmore and Co., of Glasgow, for the development of an engine on the lines of that firm's new aero motor, but intended for the propulsion of short-distance rail cars. The Beardmore aero engine, while retaining the light weight and other essential characteristics of the usual engine of the kind, operates on the Diesel principle and burns crude oil of the cheapest varieties, the oil being injected into the cylinders at such a high pressure that it is automatically ignited without the use of sparking plugs or electrical apparatus. The smaller of the engines is a 4-cylinder one of 160 b.h.p., which has developed 250 b.h.p. on test. It weighs approximately 2,576 lb. The larger engine has 8 cylinders, is rated at 320 b.h.p., and has the same power-weight ratio. The engine is water-cooled, and employs forced lubrication at 60 lb. pressure per square inch, both oil and water being cooled in radiators usually situated on the roof of the car.

Two types of cars have been designed. The one in which the smaller engine is fitted has a body with an overall length of 60 ft. set on two four-wheel bogie trucks and includes an arrangement for the attachment of a trailer when desired. It carries 56 passengers, with space for luggage. The larger car is of the articulated type; it consists of two carriages, the outer ends of which are placed on four-wheel bogies, while the inner ends meet at the centre of a third four-wheel bogie. The total overall length of this car is 102 ft. It weighs 94 tons, and has a wheel base of 85 ft. 10 in. This car carries 126 passengers and luggage, and one half of it is a smoking compartment.

The electrical power is developed by a specially designed direct-current Westinghouse generator of 200 kW, 600 volts. The storage batteries are of the 272-ampere-hour, 300-volt iron-clad Exide type, carried beneath the car. There are four driving motors, each of 100 h.p., 600 volts, mounted two each on the front and rear trucks. The storage batteries are employed for lighting and other minor services throughout the car, and for starting the engine, which in turn charges them. It may be added that the engine can be run up to full speed immediately it starts to fire from dead cold.

The motorman's controls are similar to those of a street tramcar driver. The cars can be run either backwards or forwards, and are controlled from either end.

Trials of these cars took place recently in Canada, and the first two are now in service.

The larger car covered a distance of 117 miles in 2 hours 15 minutes' running time, an average of 52 m.p.h. The fuel consumption worked out at 3½ miles per imperial gallon.

Bristol Corporation Electricity Department. — CAPITAL STATION.—It is within the recollections of our readers that Bristol was concerned in the first inquiry held by the Electricity Commissioners, in connection with the setting-up of a Joint Electricity Authority for the Lower Severn Area. The proceedings came to a dead-lock, and the inquiry was adjourned *sine die*. In the meantime the Severn Barrage Scheme was under discussion and the Government appointed a Commission to report on the engineering merits of the scheme and the financial obligations consequent thereon. Whilst this investigation has been in progress, Bristol has been faced with an ever-increasing demand upon its generating resources. The Feeder Road power station, built in 1902, with five subsequent extensions, is found to be inadequate to meet the load of the immediate future. "Progress" has been the slogan of the Bristol Electricity Committee since its inception, and plans have already been approved for the construction of a generating station at Portishead Dock, at the mouth of the River Severn, with an ultimate capacity of 240,000 kW without overload. The proposal is to complete the station in five stages,

the initial instalment being 40,000 kW, and for a number of years this will run in parallel with the Feeder Road station. The main features of the first stage are the provision of two 20,000-kW, 11,000-volt, 50-period, turbo-generators, and five boilers, each rated at 80,000 lb. per hour at a pressure of 310 lb. per square inch and a temperature of 700 deg. F., complete with chain-grate stokers, mechanical-draught plant, economisers, &c. The generators will be connected solid to step-up transformers, and energy will be transmitted to sub-stations at a pressure of 33,000 volts between phases, all switching being carried out on the 33,000-volt side.

Subsequent stages will entail the installation of five sets, each of 40,000-kW capacity, and to meet the requirements for circulating water, Mr. H. Faraday Proctor, city electrical engineer, has decided to construct inlet and outlet culverts through solid rock for a distance of about 2,000 yards, each culvert being 12 feet inside diameter; the crown of the inlet tunnel will be at least 4 feet below the lowest recorded tide level.

The Electricity Commissioners have approved the details of this scheme, and it is expected that the station will be ready for commercial load in the autumn of 1927. The Corporation is prepared to consider tenders from contractors who are capable of carrying out the initial stage of the station in its entirety.

Appointment Vacant.—Electrical engineer for the Borough of Pudsey Electricity Department. (See our advertisement pages to-day.)

Electrical Trades Benevolent Institution.—Festival List.—The following is a preliminary list of donations to the Benevolent Fund recently received:—

	£	s.	d.
Babcock & Wilcox, Ltd.	10	10	0
Balfour, Beatty & Co., Ltd.	2	2	0
Barralet, E. S.	20	0	0
Bailey, G., Sons & Co., Ltd.	2	2	0
Berkeley, A. (Birmingham)	1	1	0
Budenberg Gauge Co., Ltd.	1	1	0
Bunting, John H.	1	1	0
Callender's Cable & Construction Co., Ltd.	25	0	0
Chattock, R. A.	3	3	0
Coaker, W. F.	1	1	0
Cory, W., & Son, Ltd.	5	5	0
Damard Lacquer Co., Ltd.	10	10	0
Dick, W. B., & Co., Ltd.	3	3	0
Equipment & Engineering Co.	1	1	0
Firth, Thos., & Sons, Ltd.	2	2	0
Foundation Co., Ltd.	10	10	0
Gillespie & Beales	2	2	0
Graham, Alfred, & Co.	5	5	0
Griffiths Bros.	5	5	0
Horsfield, R. L.	1	1	0
Hudson & Wright, Ltd.	3	3	0
Igranic Electric Co., Ltd.	2	2	0
Kryn & Lahy Metal Works, Ltd.	1	1	0
Lloyd, F. H., & Co., Ltd.	1	1	0
Macintosh Cable Co., Ltd.	10	0	0
Metropolitan-Vickers Electrical Co., Ltd.	25	0	0
Paltridge, R.	1	1	0
Pinchin, Johnson & Co., Ltd.	200	0	0
Potter, H. V.	2	2	0
Robson, Edward	5	5	0
Russell, G. Newton	0	10	6
Sheppard, H. J.	2	2	0
Smith, Frederick, & Co., Ltd.	2	2	0
Willmot, A. V., Sons & Phillips	2	2	0

Electricity Supply at Stoke-on-Trent.—Extensions at Hanley.—A large gathering assembled on Thursday last at the Central Power House, Hanley, for the opening ceremony of the big extension to the Stoke-on-Trent electricity works, just completed. Prior to the ceremony, Mr. A. Burton, city surveyor, gave a brief description of the buildings, and Mr. C. H. Yeaman, the electrical engineer, outlined the history of the undertaking. The Central Power House was opened in 1913, and since then there had been three extensions. He directed attention to an exhibition of electrical appliances, cookers, heaters, &c., which had been staged at the King's Hall. He said that if the plant could be kept running the full 24 hours they could supply energy at a halfpenny a unit, or even less. They were anxious to save coal, and this involved the utmost utilisation of the heat in the steam; the makers of the turbine—the Metropolitan-Vickers Company—were good enough to give the Corporation the better set of the two they submitted in their specifications, at the lower price. It was the first of its kind, and with it they hoped to achieve a world's record for output and low coal consumption for this size of set.

The door of the extension boiler house was unlocked by the Mayor (Alderman H. Leese), and the vice-chairman of the Committee (Councillor G. Hassall) started the fans and grates. In the engine room the Mayoress turned on the steam to No. 5 turbine, and simultaneously an electrical device at the end of the building—"City of Stoke, 1925"—flashed into life. Mrs. G. Hassall switched on the exciter of No. 5 alternator, and the Mayor subsequently closed the main switch.

After an inspection of the works, the party was conveyed to the King's Hall, where tea was provided. Alderman Sampson Walker, in proposing a vote of thanks to the Mayor and Mayoress for their hospitality, said that much of the success of the undertaking was due to Mr. Yeaman, the electrical engineer, who was held in very high esteem throughout the whole electrical world. Alderman Leese had held the chairmanship of the Electricity Committee from September, 1910, to the present time, and he was the right man in the right place.

The Mayor, replying, said the district was elongated, and it contained no big factories, so that the cost of distribution was high. The average price was about 1.58d. per unit. So far as generating costs were concerned, Stoke stood second on the list of 33 large towns in the Midlands.

A vote of thanks to the contractors was proposed by Mr. J. M. Travers, J.P., a member of the Electricity Committee.

Capt. R. S. Hilton (Metropolitan-Vickers Electrical Co., Ltd.), replying, said that some of the most highly developed countries in the world were those where the use of electricity per head of the population was greater than in other countries. It was a matter for regret that we in this country were still a long way from the top. When he was in Russia about six weeks ago he discovered to his astonishment that they were developing their sources of electricity supply in a most wonderful manner. Thirteen large power stations were being erected, and it seemed as if the scheme was to connect up from the Baltic to the Black Sea with a chain of electricity stations.

Mr. G. Summers (Stirling Boiler Co., Ltd.), and Mr. J. Meiklejohn (Messrs. Meiklejohn & Sons) also responded.

On behalf of the whole of the contractors, Capt. Hilton presented a silver tea and coffee service as a token of esteem and in recognition of 15 years' service rendered by the Mayor as chairman of the Electricity Supply Committee. Capt. Hilton also presented a smoker's outfit to Mr. G. Hassall, and a silver rose bowl to Mrs. Hassall.

Institution Notes.

Institution of Electrical Engineers. — North-Midland Centre.—The opening meeting and smoking concert are to be held at the Hotel Metropole, Leeds, on November 10th, at 7 p.m., when Mr. S. Derwen Jones will read his inaugural address as chairman.

Informal Meeting.—The first informal meeting of the session will be held on Monday next, when the president, Mr. R. A. Chattock, will open a discussion on cheapening the cost of distribution.

Institute of Physics.—The ninth lecture of the series, "Physics in Industry," will be delivered by Dr. B. A. Keen, assistant director of the Rothamsted Experimental Station, and will deal with "The Physicist in Agriculture, with Special Reference to Soil Problems." The lecture, which will be open to the public, will be given in the rooms of the Chemical Society, Burlington House, London, on Wednesday, November 25th, at 5.30 p.m., and the chair will be taken by Sir William Bragg, president of the Institute.

Junior Institution of Engineers.—Super-pressure Cable Dielectrics.—On Friday last Mr. A. J. Tracey, A.M.I.E.E., delivered a lecturette on this subject, and exhibited a large number of diagrams giving particulars of tests on high-voltage cables. He explained that the thickness of the dielectric was a most important figure to be mentioned in the results of tests, as the dielectric strength varied enormously with the thickness. Figures and diagrams were shown illustrating the effect of foreign matter and air pockets in dielectrics. Mr. Tracey said that an occluded air pocket was one of the worst things that could be found in a dielectric. It was worse than a piece of metal. It had frequently been discovered that impregnated paper-insulated cables which had been subjected to very high dielectric stresses for long periods exhibited charred spots which appeared to be incipient breakdowns and usually took a tree-like form. Mr. Tracey exhibited several reproductions of such tree forms.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

South Shields Corporation Electricity Committee recommends increasing the salary of Mr. James Edgar, the electrical engineer, from £700 to £800 a year.

Mr. A. Chew, of the Aldershot Corporation electrical works staff, who is leaving to become chief clerk in the electricity department at Welwyn Garden City, Herts., has been presented by his colleagues with a silver hunter watch.

Mr. G. W. Mayle, for some years with the Igranic Electric Co., Glasgow, is now with Messrs. J. J. Inglis & Co., engineers, of Glasgow.

A Sydney newspaper reports that radio men were present in large numbers at a luncheon of the Electrical Association, when occasion was taken to say farewell to Mr. O. F. Mingay, manager of the Burgin Electric Co. Mr. Mingay was about to leave for England for a couple of years to study radio conditions abroad.

Mr. H. C. Bradbrook, director of Waygood-Otis (Aust.) Proprietary, Ltd., before leaving for England was tendered a farewell dinner by the staff at the Hotel Sydney, and was presented with an Australian souvenir.

Mr. Charles A. Hopkins, chief assistant to the late Mr. W. M. Milnes, tramways manager, Wigan, has been appointed his successor. The position is a provisional one for twelve months, at a salary of £600 per annum. Mr. Hopkins went to Wigan in 1919. Previously he was with the Chatham and District Light Railways Co. and the Swindon Tramways and Electricity Department. There were 40 applications for the post.

Mr. F. G. H. Macrae has just returned from a five years' tour of India and is now assistant manager and advisory engi-

neer at the Stoll Picture Theatre (London Opera House), Kingsway, W.C.2.

The marriage took place on October 14th, at Preston, Faversham, of Mr. Thomas Pye, partner in the firm of H. S. Tett & Co., Ltd., electrical engineers, of Faversham and Sittingbourne, and Miss Winifred Mary Chambers, of Faversham.

Alderman P. W. Petter, J.P., of Messrs. Petters, Ltd., Yeovil, is Mayor-Elect of the borough.

Mr. A. H. Darker, A.M.I.M.E., A.M.I.E.E., chief electrical engineer of Messrs. J. Stone & Co., Ltd., London, is leaving England on October 23rd by the P. & O. steamer *Narkunda* on a business tour through Ceylon, India, Burma, Australia, New Zealand, and America.

We are informed that Mr. W. C. Davey, Senr., of Messrs. W. C. Davey & Co., telephone and electrical engineers, of 28 and 29, Mortimer Market, Tottenham Court Road, W.C.1, has retired after more than 50 years' activity in the electrical industry.

Mr. W. A. Benger has relinquished his position as chief designer to Messrs. F. & A. Parkinson, of Guiseley, Leeds, in order to commence business on his own account as a chartered electrical engineer at 102, Albion Street, Leeds.

Shoreditch Borough Council Lighting Committee recommends that Mr. C. Newton Russell be appointed consulting engineer at a fee of 300 guineas for one year, as from the date of his proposed retirement from the position of borough electrical engineer.

Mr. Francis Joseph Moffett, B.A., M.I.E.E., is the chairman of the South-Midland Centre of the Institution of Electrical Engineers. He delivered his address on Wednesday evening. Mr. Moffett was educated at the Yorkshire College of Science, Leeds, and at the University College of North Wales. On completion of his course at the latter college, he took his degree in arts at the London University. His theoretical electrical training was obtained at the School of Electrical Engineering, Hanover Square, London, W. After serving an apprenticeship in an engineering works, he served for some time as an engineer on the staff of the National Telephone Co. and subsequently joined the Woolwich District Electricity Supply Co. In 1897 he was appointed chief electrical engineer to the Colony of S. Nigeria and superintended the erection of the electric power station in Lagos. On retirement from the Colonial service, he entered the firm of Messrs. Preece & Cardew, consulting engineers, Westminster, and was occupied on various electric light and power work, including the electrical equipment of some of H.M. dockyards. In 1908 he commenced to practise in Birmingham as a consulting engineer, in partnership with Mr. N. B. Rosher, and since that time has been responsible for the design and supervision of various electrical schemes, as well as for the inspection and testing of plant for the Dominions, Crown

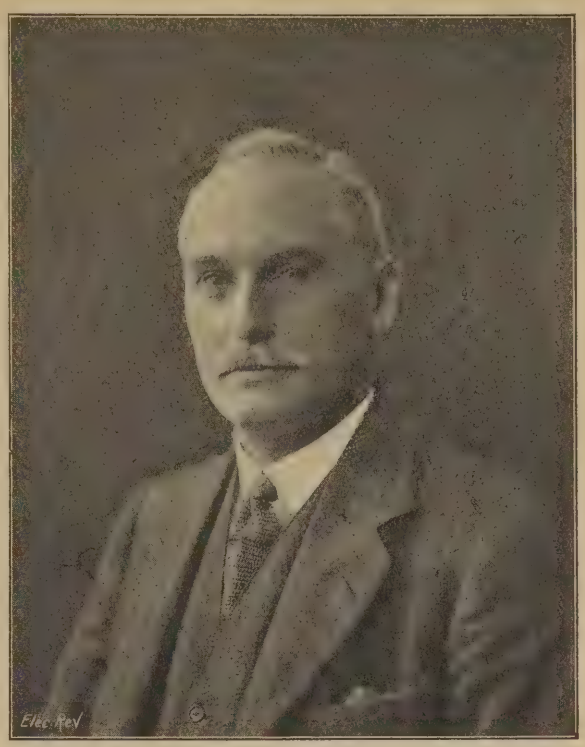


A. Clara Cooper] *[Edgbaston.*

Mr. F. J. Moffett.
Chairman of the South-Midland Centre of the Institution of Electrical Engineers.

Colonies, and foreign countries. In 1921, on the retirement of Mr. N. B. Rosher from the firm, he was joined by Mr. F. H. Mann, A.M.I.E.E. Several years ago he translated the work on "Alternating Currents," by MM. Loppé and Bouquet, and has recently written a book on "The Electric Furnace." Mr. Moffett is a member of the Association of Consulting Engineers.

Mr. J. S. Thomson, who delivered his address as chairman of the Dundee Sub-Centre of the Institution of Electrical Engineers last night, is manager of the Fife Electric Power Co., Dunfermline. He was educated at Montrose Academy and at the City of London School. He gained his early electrical experience in the Deptford station and Mains Department of the London Electric Supply Corporation. After



Mr. J. S. Thomson.
Chairman of the Dundee Sub-Centre of the Institution of Electrical Engineers.

holding various posts with the Wimbledon Urban District Council, the Corporation of Newport (Mon.) and the South Wales Electrical Power Distribution Co., he was appointed in 1905 to the position which he still holds with the Fife Electric Power Co. In Fife a supply is at present being given in over 30 towns and villages and to some 50 farms, in addition to power supplies to collieries and other works over an area of 25 miles from the power station. Some idea of the class of work may perhaps be gathered from the fact that on a system comprising some 125 miles of e.h.p. overhead lines and underground cables there are no fewer than 125 transforming points.

Mr. L. A. Coe, of Siemens & English Electric Lamp Co., Ltd., previously with Siemens Bros. Dynamo Works, Ltd., has been appointed manager of Messrs. Wm. Sanders & Co., switchgear manufacturers, Wednesbury, Staffs. He will take up his new duties on November 1st.

Obituary.—Mr. J. Angus.—We regret to record the death, which occurred several months ago at a Kenya nursing home, of Mr. James Angus, A.M.I.E.E. Mr. Angus, who was 48 years of age, was until a little before his death chief engineer and manager of the Nairobi Electric Lighting Co. He had occupied that position for 12 years, and was about to take a long trip home when he was taken ill.

Mr. A. T. Collier.—The death has taken place at his residence at St. Albans of Mr. Arthur Thomas Collier, the inventor of the Collier telephone receiver.

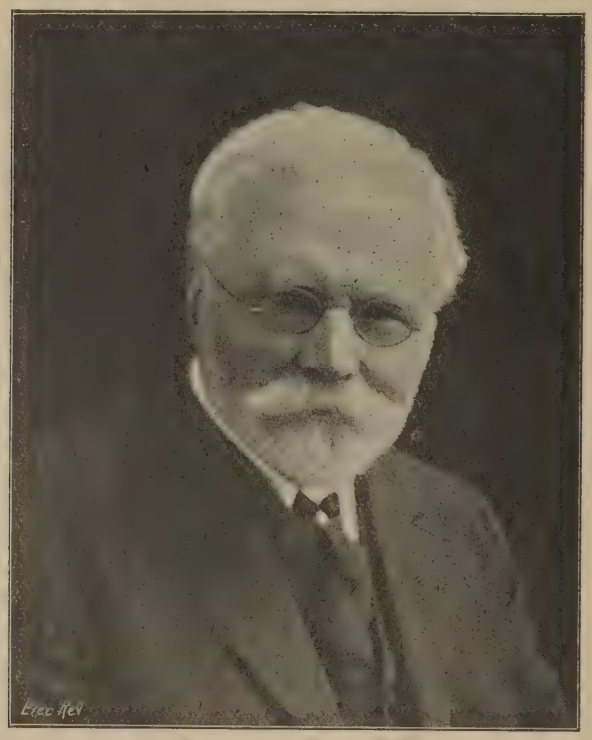
Mr. Sidney Morgan (25), an electrical engineer, of Kidderminster, employed by the Shropshire, Worcestershire and Staffordshire Electrical Power Company, died in the Bromsgrove Cottage Hospital on October 14th, as the result of injuries received while motor-cycling.

Ald. W. Bruce.—Striking tribute to the memory of the late Ald. Wm. Bruce, for many years chairman of the Sunderland Corporation Electricity Committee, has been paid by Sir John Snell, Chief Electrical Commissioner, in a letter to Sunderland Town Council, expressing his sympathy at the Council's loss. He wrote: "For 11 years he was Chairman of the Electricity Committee when I was the Electrical Engineer, and we lived a strenuous life in those days. Ald. Bruce was exemplary in his thoroughness, but it was a great education for me, and we worked in double harness for all those years with a growing respect for him on my side and, I believe, a faith in me on his. The borough owes much to him."

Mr. J. B. Duke.—The death occurred on October 12th of Mr. J. B. Duke, popularly known as the "Tobacco King" of the United States. Apart from his activities in the realm indicated, however, Mr. Duke was a leader in hydro-electric development in the North American Continent. He was the progenitor of the series of hydro-electric stations now grouped together under the control of the Southern Power Company and immediately prior to the war he financed the development of the Saguenay River, Quebec Province. This work was in-

terrupted by the war, but it was resumed two or three years ago and a plant with a capacity of 550,000 h.p. has been erected on the river, and a part of this is already in service. This development is considered to be one of the most important in Canada's industrial history and a number of important undertakings are being commenced in the district. One of the most prominent is that of the Aluminium Company of America, which has decided to erect a plant there.

Prof. Andrew Gray, F.R.S.—As was briefly mentioned in our last issue, Professor Andrew Gray, D.Sc., LL.D., F.R.S., Emeritus Professor of Natural Philosophy at the University of Glasgow, passed away on October 10th at the ripe age of 78 years. Dr. Gray was the eldest son of John Gray of Lochgelly, Fife. In 1875 he became secretary and assistant to Lord Kelvin (then William Thomson), who had already occupied the Chair of Natural Philosophy in the Glasgow University for thirty years. In 1876 he became Eglinton Fellow in Mathematics. He became Kelvin's official assistant in 1880 and four years later he took up the professorship of physics in the University College in North Wales, which he held until 1899, when he was recalled to Glasgow to succeed Lord Kelvin in the Chair of Natural Philosophy. He resigned the chair in 1923 and received the title Emeritus Professor. Prof. Gray was the author of numerous contributions to scientific literature, the first being his book on "Absolute Measurements in Electricity and Magnetism," which appeared in 1883. Other



Elliott & Fry [*London.*

The late Prof. Andrew Gray, F.R.S.

works on the same subject followed, and in this connection we may mention that when the Electrical Review celebrated its 25th birthday in 1897 one of the valued contributions to its Special Issue was a signed article by him on "Absolute Measurements." In that article he began by saying that the advances in practical electricity during the 25 years preceding 1897 had been "enormous" and that "it was not too much to say that that progress had been in no small degree due to the adoption of an absolute system of units for the measurement of electrical quantities." In 1888 Prof. Gray expanded his book under the title "Theory and Practice of Absolute Measurements in Electricity and Magnetism," Vol. I; the second volume was published in 1893, and a new edition in 1921. His bent was towards mathematical analysis, and he published an important work on "Magnetism and Electricity" in 1898, in the preface of which he recorded his deep appreciation of the value of Mr. Oliver Heaviside's work on electromagnetic theory—a far-sighted view which was fully justified many years later. Unfortunately, though Prof. Gray produced several works on dynamics and kindred subjects—including his classic "Treatise on Gyrostatics and Rotational Motion" in 1919—the second volume of "Magnetism and Electricity," we believe, was never published. In 1915, when he delivered the Kelvin lecture before the Institution of Electrical Engineers, he reviewed Lord Kelvin's contributions to the subject of gyrostatics, with demonstrations in which Kelvin's original apparatus, which he had helped to make, was employed. During the war Prof. Gray was a member of the Inventions Panel of the Ministry of Munitions, and in a notable address as president of the Mathematical and Physical Science Section of the British Association in 1919, he discussed some of the lessons taught by the war.

Wills.—The late Mr. E. B. Caird (of Caird & Rayner, engineers) left £41,552 gross and £41,224 net personalty.

The late Mr. Henry Bevis left £64,116 gross and £60,246 net personalty.

New Companies Registered.

J. S. A. Syndicate, Ltd. (208,894).—Private company. Registered October 8th. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, manufacturers of machinery and trade implements of all kinds, toolmakers, brassfounders, metal workers, manufacturers of and dealers in wireless apparatus, appliances and inventions, &c. The subscribers (each with one share) are:—T. S. Jones, 31, Belsize Square, Hampstead, N.W.3, chartered accountant; J. N. Baker, Broad Street House, Old Broad Street, E.C., accountant. The first directors are to be appointed by the subscribers. Qualification, £1. Remuneration, £25 each per annum. Solicitors: W. T. Hick & Co., Broad Street House, Old Broad Street, E.C.2.

L. Vincent Thomas & Co., Ltd. (209,041).—Private company. Registered October 16th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical, mechanical, and marine engineers and draughtsmen, &c. The subscribers (each with one share) are:—Mrs. Theresa Edith Thomas, 5, Richmond Terrace, Swansea; E. Ironside, Bishopston, Swansea, solicitor's managing clerk. Mrs. Theresa Edith Thomas is the first director and secretary (*pro tem.*). Solicitors: Gee & Edwards, Llanfair Buildings, St. Mary Street, Swansea. Registered office: 5, Richmond Terrace, Swansea.

Andy Gramophone Co., Ltd. (208,952).—Private company. Registered October 12th. Capital, £100 in £1 shares. Objects: To acquire lands, buildings and hereditaments in England for the erection and establishment of manufactories and workshops with suitable plant, engines and machinery with a view to manufacture, purchase, sell and deal in gramophones, phonographs, and all kinds of loud-speaking apparatus, and any other article adapted for sound reproduction, and amplifying apparatus and wireless or radio apparatus and accessories, either directly or indirectly through the medium of agents or otherwise, &c. The subscribers (each with one share) are:—W. O. Forder, 6, Grays Inn Square, W.C.1, solicitor's clerk; C. W. Hunter, 14, Gardenia Road, Enfield, accountant. The first directors are not named. Remuneration as fixed by the company. Solicitors: Braund and Hill, 6, Grays Inn Square, W.C.1. Registered office: 42, Upper George Street, Edgware Road, W.1.

Emerald Radio Co., Ltd. (208,933).—Private company. Registered October 10th. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with G. W. Parr, and to carry on the business of electrical, mechanical and general engineers and contractors, manufacturers and sellers of transformers, radiators, dynamos, motors and radio instruments of all kinds, &c. The first directors are:—A. E. Pater, 1, Arcade House, Finchley Road, N.W.11, builder; G. W. Parr, Loampit Hill House, Lewisham, S.E.13, engineer (chairman); E. J. Walker, 4, Francemary Road, Brockley, S.E.4, engineer (all permanent). Solicitors: Rundle and Hobrow, 9, Ironmonger Lane, E.C.2. Registered office: 10, Bush Lane, Cannon Street, E.C.4.

Izzard Brothers, Ltd. (208,939).—Private company. Registered October 10th. Capital, £1,000 in £1 shares. Objects: To acquire the business carried on by "Izzard Brothers" at 13, Upper Clapton Road, E.5, and to carry on the business of manufacturers of and dealers in electrical and mechanical appliances and scientific instruments, and all parts, fittings and accessories for these, particularly with regard to wireless telegraphy or telephony. The life governing directors are:—A. T. Izzard, 118, Evering Road, Stoke Newington, N.16, radio engineer; R. E. Izzard, 198, Lower Clapton Road, Clapton, E.5, radio engineer. No qualification required. Secretary: J. R. Homer, 198, Lower Clapton Road, E.5.

Union Welding Co., Ltd. (208,982).—Private company. Registered October 13th. Capital, £5,000 in £1 shares. Objects: To carry on the business of electric, acetylene, blow-pipe and other forms of welding and soldering, ship builders and repairers, boat, barge and motor and other launch builders, shipowners, wharfingers, timber merchants, metallurgists, electrical engineers and contractors, &c. The first directors are:—G. W. Roger, "Iona," 44, Dartmouth Row, Blackheath, S.E., naval architect (life director); W. Ellis, 23, Billiter Street, E.C.3, shipbroker; J. Caldwell, The White House of Speen, Princes Risborough, Bucks. Qualification, 100 shares. Remuneration, £50 each per annum. Secretary: G. H. Marshall. Solicitors: Stibbard, Gibson & Co., 21, Leadenhall Street, E.C.3. Registered office: 23, Leadenhall Street, E.C.3.

Forbes Brothers, Ltd. (13,829).—Private company. Registered in Edinburgh October 12th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of wireless apparatus and plant of all kinds, &c. The first directors are:—F. R. Forbes, 692, Cathcart Road, Glasgow, engineer; J. Forbes, 347, Cumberland Street, Glasgow, draper. Qualification, 100 shares. Registered office: 50, Sauchiehall Street, Glasgow.

A. G. Inrig & Co., Ltd. (209,015).—Private company. Registered October 15th. Capital, £750 in £1 shares. Objects: To adopt an agreement with G. Inrig, trading as "A. G. Inrig & Co.," Nicholas Lane, Laindon, to carry on the business of constructional and electrical engineers, as formerly carried on by A. G. Inrig & Co. The first directors are:—G. Inrig (permanent), Nicholas Lane, Laindon; L. Inrig, 15, Manor Road, Teddington. Qualification, £1. Secretary: G. Inrig. Registered office: 9 Weston Chambers, Weston Road, Southend.

Official Returns of Electrical Companies.

Kye, Ltd. (formerly Spencer's (Electrical), Ltd.).—Satisfaction in full on September 4th, 1925 (*a*) of debentures dated November 18th, 1924, securing £500, and (*b*) of debenture dated August 31st, 1923, securing £1,000.

Waverham Electricity Supply Co., Ltd.—H. L. Dale, incorporated accountant, of 4, Darwin Street, Northwich, ceased to act as receiver or manager on October 2nd, 1925.

R. M. P., Ltd. — Mortgage debenture dated September 17th, 1925, to secure £100, charged on the company's undertaking and property, present and future. Holder: G. P. Power, Adderley Road, Saltley, Birmingham.

Electron Co., Ltd. — Particulars filed of £2,000 debentures authorised September 22nd, 1925, charged on the company's undertaking and property, present and future, including uncalled capital (if any), the amount of the present issue being £600.

Houghton's Electrical Engineering Co., Ltd.—Debenture dated September 23rd, 1925, to secure £400, charged on the company's undertaking and property, present and future. Holder: R. H. King, M.D., 11, Egmont Road, Sutton, Surrey.

Central Electric and Radio Co., Ltd.—Particulars filed on October 8th of £750 debentures authorised June 17th, 1925, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £550.

Victoria Electric Plant Co., Ltd.—Particulars filed of £550 debentures, authorised September 30th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Oxford Electric Co., Ltd.—Issue on August 21st, 1925, of £10,000 6 per cent. debenture stock, part of a series already registered.

Ferranti, Ltd. (83,718).—Return dated September 25th, 1925. Capital, £300,000 in 100,000 6 per cent. preference, 100,000 7 per cent. second preference, and 100,000 ordinary shares of £1 each. 71,166 6 per cent. preference, 75,000 7 per cent. second preference, and 60,000 ordinary shares taken up. £206,166 considered as paid. Mortgages and charges, £45,834.

Marconi International Marine Communication Co., Ltd. (65,759).—Return dated August 7th, 1925. Capital, £1,500,000 in £1 shares. 1,192,726 shares taken up. £1,087,726 paid. £105,000 considered as paid. Mortgages and charges, £8,140.

W. Sisson & Co., Ltd. (82,295).—Return dated August 4th, 1925. Capital, £50,000 in 5,000 preference, 38,000 ordinary, and 7,000 deferred shares of £1 each. 4,375 preference, 31,711 ordinary, and 7,000 deferred shares taken up. £28,686 paid on 4,375 preference and 24,311 ordinary shares. £14,400 considered as paid on the remainder. Mortgages and charges, £3,949 6s. 1d., due to Lloyd's Bank, Ltd. (overdraft limit, £15,000).

Yorkshire (Woollen District) Electric Tramways, Ltd. (71,916).—Return dated June 23rd, 1925. Capital, £500,000 in 250,000 preference and 250,000 ordinary shares of £1 each. 220,000 ordinary shares taken up. £220,000 paid. Mortgages and charges, £34,800 (issued to bank as collateral security).

Foster & Pullen, Ltd. (108,579).—Return dated August 21st, 1925. Capital, £5,000 in £1 shares. 4,436 shares taken up. £2,436 paid. £2,000 considered as paid. Mortgages and charges, £500.

British Arc Welding Co., Ltd. (108,759).—Return dated August 21st, 1925. Capital, £50,000 in £10 shares. 1,474 shares taken up. £12,740 paid. £2,000 considered as paid. Mortgages and charges, nil.

Christy Brothers & Co., Ltd. (90,039).—Return dated September 4th, 1925. Capital, £40,000 in 32,000 ordinary, 3,000 deferred, and 5,000 preference shares of £1 each. 28,406 ordinary, 3,000 deferred, and 4,250 preference shares taken up. £25,856 paid. £9,800 considered as paid. Mortgages and charges, £5,600.

Tangent Tool Engineering Co., Ltd.—Debenture dated October 2nd, 1925, to secure £2,200, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: W. H. Welch, Redcliffe Street, Bristol.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Agricultural and General Engineers, Ltd.

In the course of his address at the annual meeting on October 16th, Mr. G. E. Rowland (chairman) said that, although it lay within their powers, they had decided not to ask any of their associated companies which had made profits to declare a dividend, as those profits were being employed in further profitable work. For the same reason no interest had been charged upon advances made to the associated companies. Although originally the manufactures of the group consisted of agricultural implements and general engineering products, at the present time the companies produced, apart from almost every implement used in farming, everything in the engineering line from a split pin to large boilers and power plants. In spite of the depression in industry and in the face of great difficulties, the group had increased its sales by 32 per cent. in two and a-half years. If the sales could be increased by 12½ per cent. the concern would become a consistent dividend-earning one. Among the new products which members of the group were turning out were trackless tram motors made by Bull Motors, Ltd., in addition to its range of industrial d.c. motors, and electric trolley 'buses by Messrs. Garretts, which were equipped with "Bull" traction motors. Special attention was being paid to foreign markets, especially those of Latin America, and an organisation had been set up in Argentina.

Prospectus.

Pettigrew & Merriman (1925), Ltd.—This company, the registration details of which were given in our "New Companies Registered" last week (p. 628), has been advertising inviting subscriptions for an issue of 125,000 7½ per cent. cum. preference shares of £1 each at par. The list was to close on or before October 21st. The company acquires as a going concern the business of Pettigrew & Merriman, Ltd. (incorporated in 1919), and all the issued capital of Pettigrew & Merriman (Continental), Ltd., together with the manufacturing business and undertaking of Brunet et Cie., of Paris, makers of the well-known "Brunet" headphones, transformers, and loud speakers. It is stated that the total net assets amount to £233,900, and that the present rate of profits covers the preference dividend six times over. It is stated by M. Paul Brunet that over 1,000,000 headphones have already been sold —350,000 in Great Britain, 250,000 in France, and so on.

Swiss Companies.

The report of the *Bank für Elektrische Unternehmungen*, of Zurich, for the year ended September last shows a net profit of 256,873 fr. A dividend of 8 per cent. is being paid on the "A" and "B" shares, as against 7 per cent. for the preceding year.

The *Motor Columbus Gesellschaft für Elektrische Unternehmungen*, of Baden, is paying a dividend of 9 per cent. for the last financial year, the same as for 1923-24.

The report of *Escher, Wyss & Co.*, of Zurich, for the year ended March 31st last states that the principal activities of the company during the year were in the hydraulic and steam turbine departments. Among the work turned out was a number of Francis turbines of from 10,000 to 15,000 h.p. for hydro-electric stations, ten steam turbines of between 10,000 and 15,000 h.p., at 3,000 r.p.m., and three 30,000-h.p. sets, 1,500 r.p.m., one of the last being for the central station of the Compania Hispano-America in Buenos Aires.

Belgian Company.

The report of the *Société des Constructions Electriques de Belgique*, of Liége, for the year ended June 30th last shows a net profit of 2,860 fr., which reduces the debit standing in the balance-sheet to 761,302 fr. The business is now being mainly carried on in new works at Herstal, which are fully engaged. The old works in Liége are being used for the manufacture of small motors and electrical apparatus. The report states that the arrangement entered into in 1920 whereby, in return for part of the profits being payable to the Société des Constructions Electriques de France, the Belgian company obtained the technical support of the French company and of the English Electric Co. has been modified. The Belgian company thus becomes an entirely free agent as regards export trade. The Ghent branch of the undertaking has also been formed into a separate company to be known as the Société des Anciens Ateliers van den Kerchove.

Argentine Light and Power Co., Ltd.

The annual meeting was held on October 16th. Mr. W. S. Poole, who presided in the absence of the chairman (Sir George Touche) through ill-health, said that, generally, the position of Argentina during the past year had improved, especially in the Province and City of Cordoba, in which the bulk of the company's business was carried on. The latest census showed a considerable increase in the population of Cordoba and Santa Fé. The gross receipts of the combined businesses in those two provinces for the year ended March 31st last were £529,148 and the net receipts £264,822. During the first six months of the current year substantial improvement had been shown, and present indications were that little, if any, steam operation would be necessary in Cordoba during the remainder of the year. They were able to declare a dividend of 2½ per cent. upon the ordinary shares.

International Light and Power Co., Ltd.

The income during the year ended June 30th last was £73,399, as compared with £70,612 in the preceding year, and after meeting expenses and crediting £30,433 brought forward, the available balance is £70,431. Of this, £2,500 is transferred to the contingencies reserve, the arrears of preference dividend are paid, and a balance of £14,382 is carried forward. It is stated that the business of the four subsidiary companies has been satisfactory and has expanded, although Mexican conditions have been very unsettled. This precludes the installation at present of the generating plant which is urgently needed. The company has acquired the share capital of the Southern Brazilian Railways Co. by means of a note issue of £128,000. A meeting of English shareholders is to be held on October 26th.

Montevideo Telephone Co., Ltd.—The report for the year ended July 31st, 1925, shows that after providing for all charges in Montevideo and London, and making provision for income tax and Corporation Profits tax, the net profit was £32,832. The available balance including the sum brought forward is £40,440. After transferring £15,000 to the reserve fund, a final dividend of 5 per cent. is recommended, making, with the interim dividend already paid, 7 per cent. for the year, less income tax, leaving £14,583 to be carried forward. The business of the company continues to make satisfactory progress. During the year the number of stations was increased by 839, making a total of 13,462 stations as at July 31st, 1925. Meeting: London, October 26th.

Stock Exchange Notices.—Application has been made to the Committee to allow the following to be officially quoted:—

American Telephone and Telegraph Co.—$4,904,400 capital stock.

Brisbane Tramway Trust.—Stock and partly-paid scrip for £500,000 5¼ per cent. Brisbane Tramway stock, 1944-1954.

Dealings in the following have been specially allowed by the Stock Exchange Committee under Rule 159:—

American Telephone and Telegraph.—$4,904,400 capital stock in shares of $100 each.

Newcastle-upon-Tyne Electric Supply.—32,250 5 per cent. preference shares of £1 each, fully paid, Nos. 1,499,768 to 1,532,017.

English Electric Co. of Australasia, Ltd.—The report for the year ended March 31st last records a net profit of £22,047, as compared with £37,501 in the preceding year. A dividend of 5 per cent. has been paid; in 1923-24 the rate was 10 per cent. The sum of £3,556 is transferred to the reserves, making these £41,589. Standard-Waygood, Ltd., the capital of which is held by the company, has declared a dividend of 15 per cent.

Stothert & Pitt, Ltd.—The report for the year ended June 30th last states that, although the depression in the engineering trade continued, there was a considerable improvement in the company's business. The profit for the year was only £191. To this was added £122 brought forward and £3,000 was taken from reserve, and after paying the preference dividend a balance of £196 is carried forward.

Brampton Bros., Ltd.—The report for the year shows a net profit of £15,029, and with the sum of £11,873 brought forward there is an available balance of £26,902. A dividend of 10 per cent. is declared on the ordinary shares, £2,000 is transferred to reserve, and £13,202 carried forward.

Erinoid, Ltd.—It is proposed to pay a final dividend of 7½ per cent. actual, less tax, making a total of 12½ per cent. less tax, for the year.

Brazilian Traction, Light and Power Co.—Quarterly dividend of 1 per cent. on the ordinary stock.

Electrolytic Zinc Co. of Australasia.—The gross profit for the year ended June 30th last was £510,073, and the net profit £375,380. To the latter amount was added £98,920 brought forward, making £474,301. The allocations include £40,000 to reserve, dividends £216,269, and £165,932 carried forward.

Callender's Cable and Construction Co., Ltd.—A dividend of 1s. per share actual, less tax, has been declared on the ordinary shares, as in 1924.

River Plate Electricity Co., Ltd.—An interim dividend of 3 per cent. has been declared on the ordinary stock.

Stocks and Shares.

Monday Evening.

Light depression has occurred amongst investment stocks in consequence of the stiffening of money market rates. This is regarded as a seasonal event, and it would attract no particular attention were it not that the Bank Rate had been unexpectedly lowered to 4 per cent. on the first day of the present month. While the gilt-edged issues are dull, however, the good-class industrials maintain their prices, and, in some cases, have improved upon their last week's quotations.

At a time when money is so much needed in this country for purposes of electrical expansion and extension, it is a little remarkable—not to say anomalous—to find that substantial amounts of British capital are being utilised in the purchase of American industrial stocks, shares and bonds. Several firms are placing considerable blocks of such issues over here. It is a fairly open secret that United States financiers have been on the alert for some time past to obtain a footing in this country's electrical enterprise. In the main, the overtures have met with an exceedingly chilly response, and, in default of acquiring a considerable interest in big British business, Americans are now offering utility securities, made across the Atlantic, upon terms that may appear attractive when compared with those obtainable from the home-grown stocks. Experience and caution hold out a warning, however, against temptations to invest money in issues that may prove to be of a different calibre from those of the British companies. Nor is it only safety of capital that dictates the desirability of retaining money for electrical purposes in this country. Employment and industry are both dependent to a large extent upon the provision of capital for electricity undertakings in Great Britain.

Cable and Telephone descriptions stand out with marked firmness in this week's lists. Indo-European shares are £2 higher at 44½ and are still wanted. The Eastern stock and shares retain their last week's gains. Anglo-American deferred has risen 10s. Amongst telephones, United River Plates are 3/16 higher at 7½ and the new shares have reached 40s. premium. Monte Video Telephones firmed up to 1½; the company has increased its dividend from 5 per cent. to 7 per cent. Jutland Telephone 5½ per cents. advanced to 101, and British Columbia Telephone Sixes at 102½ have put on 3 points. No changes took place in wireless, except for a few halfpence decline, to 6s. 9d. sellers, in Canadian Marconis.

Callender's Cable has declared the usual 5 per cent. interim dividend, and the price is unchanged at 3 3/16. India Rubbers are a little easier at 20s. 7½d. Metropolitan-Vickers ordinary picked up to 23s., and there is a good deal doing in the shares. Edisons reacted to 7s. 6d. A brisk rise lifted Johnson and Phillips to 50s. 9d., thus wiping out last week's loss. The engineering and allied shares keep hard, various rises being registered on the idea that the trades are to benefit from some possible extension of the Safeguarding of Industries Act.

In the London lighting group, County ordinary are on offer at 56s. 6d., and Citys at 47s. 6d., a thousand of each being obtainable at these prices. London Electrics can be bought at 34s. 6d., and Charing Cross at 2½. Metropolitan ordinary are quoted at 39s. 6d. middle, but 1,000 are available at 38s. 6d. Newcastle-on-Tyne have gone back 6d. to 22s. Amongst provincial ordinary shares now to be obtained are Folkestone at 39s. 6d. xd., Llanelly at 26s. 3d., Midlands at 22s. 9d., Shropshire "A" at 27s. 6d. and "B" at 25s. Egham and Staines new ordinary stand about 22s. 6d., Fife Trams at 24s., and Yorkshire Electric Power at 29s. 6d. There is a tolerable amount of stock on offer at the moment in the ordinary shares of electricity supply and traction companies.

Brazilian Tractions have been moving rapidly and irregularly. From 77 the price jumped to 82½, after which it fell back to 78½, leaving a net gain of 1½ on the week. The other foreign issues are unusually quiet, and the domestic stocks show no movements. Amongst Undergrounds, the only change is a point rise to 103 in Underground Electric 6 per cent. income debenture stock, which is not to be confused with the same company's 6 per cent. income debenture bonds, standing at 97.

The main feature in the industrial section continues to be the activity in rubber shares. Speculators were shaken out sharply last week, when a fall in the price of the product led to extensive selling of the shares. Both recovered without much difficulty. The wildness of the rush to buy rubber shares has given way to quieter conditions, but the fortnightly settlement, this week, is once more on a gigantic scale. The City lighting companies will gain more satisfaction than Stock Exchange staffs from the quantity of current required to illuminate work that will go on in many offices until midnight, at the earliest, every day (or night) in this week.

Share List of Electrical Companies

	Nom.	Dividend. 1923.	Dividend. 1924.	Price Oct. 19. 1925.	Rise or fall.	Yield p.c.
Home Electricity Companies.						
Bournemouth and Poole	£ 1	13	14	2 1/16	—	4 15 4
Brompton Ordinary	1	10	10	1½	—	*5 14 8
Charing Cross Ordinary	1	14½	15	£0/-	—	6 2 5
do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	1¼	—	6 8 0
City of London	1	15	15	47/-	—1/16	6 7 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	28/6	—	5 12 4
County of London	1	15	15	56/-	—1/-	5 7 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12⅝	—	5 16 8
Lancs. Light and Power	1	7½	7½	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 3
do. do. 6% Pref.	5	6	6	5½	—	5 7 10
Metropolitan	1	10	11	39/4	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	22/-	—6d.	6 7 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	24/-	—6d.	5 16 3
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—6d.	5 9 1
St. James' and Pall Mall	5	17½	17½	14⅝	—	5 17 8
South London	1	15	15	2 5/16	—	5 17 1
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/6	—	6 14 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6
Home Rails.						
Central London Ord. Assented	Stock	4	4	66	—	6 1 3
Metropolitan	,,	4	5	70½	+2	7 1 10
do. District	,,	3½	3½	44	— ½	7 19 1
Underground Electric Ordinary	10	Nil	Nil	2¼	—	Nil
do. do. "A"	1/-	Nil	Nil	6/6	—	Nil
do. do. Income	Bonds	6	6	97	—	*6 3 9
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
do. Def.	,,	1½	1½	24¼	+ ½	6 3 9
Automatic Telephone	1	3	6	47/6	—	2 10 7
Chili Telephone	5	6	5	5¾	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6¼	—	8 0 0
Eastern Extension	10	10	10	17½	—	*5 16 9
Eastern Tel. Ord.	Stock	10	10	170½	—	*5 17 4
Globe Tel. and T. Ord.	10	10	10	17⅝	—	*5 13 4
do. do. Pref.	10	6	6	10⅞	—	5 10 4
Great Northern Tel.	10	22	22	33½	—	6 12 3
Indo-European	25	7	8½	44½	+2	*4 15 6
Marconi	1	10	10	1 7/16	—	6 19 2
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord.	1	12	12	2 1/16	—	*5 16 4
United R. Plate Tel.	5	8	8	7¼	+3/16	5 10 3
Western Telegraph	10	10	10	16⅜	—	*6 4 0
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3⅜	—	8 3 0
do. do. 2nd Pref.	5	6	6	3⅜	—	8 17 10
do. do. 5% Deb.	Stock	5	5	77½	—	6 9 0
British Electric Traction Ord.	,,	6	6	121½	—	4 18 9
do. do. 6% Pref.	,,	6	6	107	—	5 12 2
Brazil Traction	100	4	4	78½	+1½	5 2 0
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	89½	—	5 11 9
do. do. Preferred	,,	96/-	96/-	92½	—	*5 3 0
do. do. Deferred	,,	129/5	129/5	112½	—	*5 15 4
do. do. Deb.	,,	4¼	4¼	77⅛	—	5 9 8
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	63½	—	7 17 6
Mexican Light Common	100	Nil	Nil	32	—	Nil
do. Pref.	100	Nil	Nil	62	—	Nil
do. 1st Bonds	—	5	5	69½	—	7 3 11
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8
Manufacturing Companies.						
Babcock & Wilcox	1	12	12	2⅜	—	*4 16 0
British Aluminium Ord.	1	5	10	33/9	—	5 19 5
British Elec. Transformer Pref.	1	Nil	7	⅛	—	...
British Insulated Ord.	1	15	15	3½	—	4 5 9
Brush Ord.	1	10	10	22/-	—	7 13 10
Callenders	1	15	15	3 3/16	—	4 14 1
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅜	—	...
Edison-Swan	£1	10	10	7/6	—6d.	5 6 8
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	30/-	—	6 13 4
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	17/3	—	5 15 3
do. do. Pref.	1	6	6	20/-	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	26/-	—	5 15 5
Henley	1	15	16	3½	—	4 18 0
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	1 5/16	—1/16	*4 16 10
Johnson & Phillips	1	10	10	50/9	+3/9	3 18 9
Met-Vickers, Ord.	1	8	8	23/-	+6d.	6 19 2
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	£1	—	7½	29/6	—	5 1 8
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Exports and Imports of Electrical Goods and Machinery in September, 1925.

The mere comparison of the total value of electrical goods and apparatus exported during September with the totals for August and September, 1924, gives the impression that satisfactory progress was made. Upon a more detailed examination, however, it is seen that had it not been for an abnormal increase under the heading "Submarine telegraph and telephone cable" (a violently-fluctuating factor), another fall would have been recorded amounting to about £115,000 in comparison with August, and to about £160,000 in comparison with the total for September, 1924. In making these two comparisons it will be observed that only five and four items respectively showed increases, all the remainder being lower—seriously lower in many cases. The figures show a healthy position so far as the cable industry is concerned, for apart from the submarine section, cables under two other heads ("Insulated wires and cables" and "Telegraph and telephone wires and cables by £44,576. The principal decreases occurred in the items "Electrical goods and apparatus (unenumerated)," £26,964, and meters and instruments, £80,613, as well as the decrease in the case of telegraph and telephone cables mentioned above.

In the import section the total indicated a slight increase as compared with the August total, while there was an increase of nearly £22,000 in comparison with the figure for September, 1924. Increases and decreases were about evenly divided, the former including £12,685 in the case of batteries and accumulators and £11,542 in connection with insulated wires and cables. The principal decrease was a fall of £13,050 in respect of glow lamps. The increase as compared with September, 1924, was very general, there being only three items which showed a decline. One of the latter—telegraph instruments and apparatus—provided the largest variation, a fall of £36,763; the greatest increase occurred under the heading "Batteries and accumulators" (£32,608).

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Sept., 1925.	Inc. or dec. as compared with Aug., 1925.	Inc. or dec. as compared with Sept., 1924.	Electrical imports for Sept., 1925.	Inc. or dec. as compared with Aug., 1925.	Inc. or dec. as compared with Sept., 1924.	Electrical re-exports for Sept., 1925.	Inc. or dec. as compared with Aug., 1925.	Inc. or dec. as compared with Sept., 1924
Electrical goods and apparatus (unenumerated)	£149,018	+ £8,897	− £22,501	£86,439	− £3,094	− £13,116	£5,962	+ £677	− £802
Insulated wires and cables ...	200,291	+ 44,470	− 23,045	51,220	+ 11,542	+ 7,530	967	+ 873	+ 961
Glow lamps	34,259	− 16,225	− 10,010	28,802	− 13,050	+ 7,036	273	− 460	22
Arc lamps and parts	1,152	+ 416	+ 833	2,006	+ 1,368	+ 1,205	90	+ 28	+ 73
Batteries and accumulators ...	64,396	− 19,588	− 12,406	69,637	+ 12,685	+ 32,608	359	− 158	+ 166
Meters and instruments ...	23,461	− 11,298	− 9,302	22,664	− 5,692	+ 3,394	591	− 114	− 1,029
Carbons	1,095	− 3,598	− 127	7,660	− 1,125	+ 115	192	+ 169	+ 146
Electrical Machinery—									
Electrical machinery (unenumerated)	175,346	− 78,230	− 55,244	97,202	− 8,930	+ 14,118	4,372	+ 169	+ 56
Railway and tramway motors	22,540	− 32,179	− 21,594	—	—	—	—	—	—
Other motors and generators ...	178,383	− 1,728	+ 30,475	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	5,319	− 614	− 5,578	27	+ 24	− 4	—	—	− 38
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	52,687	+ 11,700	− 43,692	18,234	+ 3,383	+ 5,611	574	+ 227	− 530
Submarine telegraph and telephone cable	424,913	+ 385,183	+ 421,363	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	203,383	− 17,133	+ 11,760	49,402	+ 5,778	− 36,763	2,416	− 664	− 3,418
Totals	£1,536,243	+ £270,073	+ £260,932	£433,293	+ £2,889	+ £21,814	£15,796	+ £727	− £4,437
Increases for the nine months ended September, 1925	Exports. + £2,288,468			Imports. + £867,353			Re-exports. + £38,260		

able, not submarine") showed satisfactory increases. The other two increases—"Electrical goods and apparatus (unenumerated)," and "Arc lamps and parts"—were not of important dimensions. The largest actual decrease occurred under the heading "Electrical machinery (unenumerated)," although proportionately the fall in the exports of railway and tramway motors was the most serious. The exports of meters and instruments, and glow lamps were halved, and large decreases were also recorded for batteries and accumulators, and telegraph and telephone instruments and apparatus. The export total for the three complete quarters of the current year shows a good increase as compared with the figure for the first nine months of last year, but it should be mentioned that more than half of this increase is due to a rise of £1,305,220 in the value of exported submarine telegraph and telephone cable. On the other hand, non-submarine telegraph and telephone cable decreased in value by £262,764. Electrical machinery exports increased in value by £550,460, telegraph and telephone instruments and apparatus by £392,996, batteries and accumulators by £238,673, electric lamps and parts by £128,388, and insulated

There is little of interest in the re-export section, with the possible exception of the decline of £4,437 in the total as compared with the September, 1924, figure.

The Irish Free State and Foreign Contracts.—Mr. Kevin O'Higgins, Minister for Justice, in the course of a recent speech, referred to what he described as a secret organisation in connection with the Shannon power scheme, the object of which was "to combat certain anti-British trade tendencies" which were supposed to be manifesting themselves within the Free State. "There are no anti-British trade tendencies here that I am aware of," declared Mr. O'Higgins. "You have an undeveloped country lacking in many respects that technical equipment which should enable its own citizens to take the initiative in schemes of improvement and development. Other countries have realised that and have been quick to make, either to the Government or to local authorities, proposals which seemed mutually advantageous. That is why there are Belgians in Carlow, Germans in Limerick, and Frenchmen about to install an improved cleansing system in Dublin. No rival proposal was forthcoming in these matters from British sources, and when British engineers or commercial men have the vision to see and the initiative to undertake and exploit the opportunity they will find the same readiness to do business with them."—*Daily Telegraph.*

Electrical Exhibitions and Showrooms.

Recent Developments in Local Undertakings.

Since the appearance of the article under this heading in our last issue, additional information has come to hand concerning several of the recently inaugurated showrooms, &c. The most interesting developments are the opening of the lighting service bureaux at Glasgow and Newcastle. These make three of their kind now in the United Kingdom. The addition of the two in the North will, we feel sure, greatly assist in and extend the good work which is being done by the parent institution in London.

The New Hackney Demonstration Halls.

Following the description of these halls in our last issue some additional photographs of the premises add considerably to its interest. The building, fig. 1, is of a simple yet pleasing and dignified design. The extending flat-roofed loggia forms a platform above, 65 ft. by 16 ft., suitable for

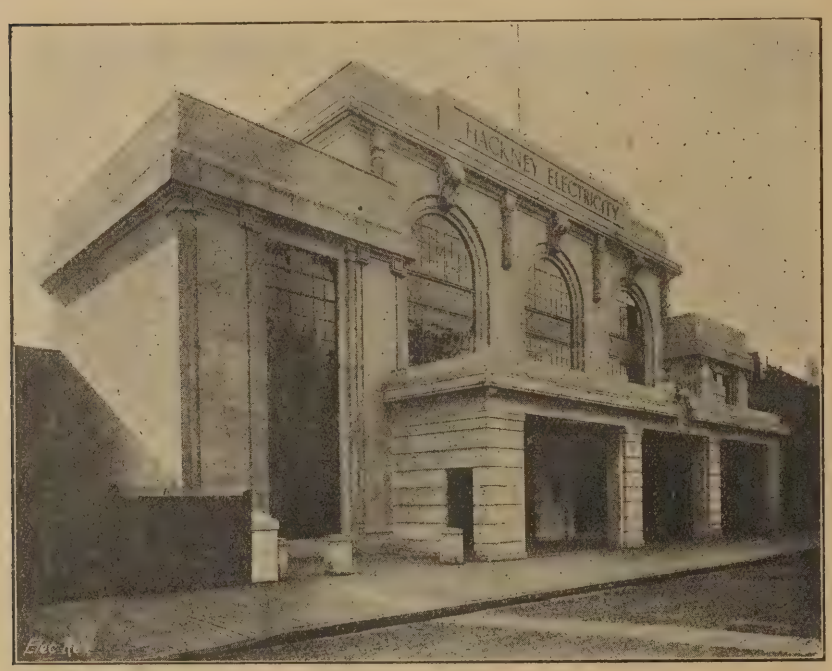


Fig. 1.—Hackney Showrooms.

advertising schemes, and at the same time effectively darkens the exterior of the main display windows. These windows are arranged to suggest in a theatrical manner what electricity can perform. A notable feature is that not a single light fitting can be seen by the onlooker on the front of the building,



Fig. 2.—Vestibule Hall.

the floodlights being effectively concealed. At either extremity of the vestibule hall, fig. 2, are arranged an inquiry and accountant's offices, each forming a wing at the frontage of the main building. On entering the lecture hall, fig. 3, from the vestibule, one might easily imagine himself in a theatre or similar place of entertainment, this being the atmosphere which it is desired to create. Fig. 4 shows the model bedroom.

In the spacious offices above the showrooms several new departures from the usual practice have been instituted. A special room has been set apart as a waiting room and library for the committee and staff, the main object being to establish a place in which the technical journals, &c., may be at all times available to the staff and others interested. A committee room is also provided, it being suggested that a suitable atmosphere is created for the committee when sitting if it is at the electricity headquarters proper.

A staff all-electric kitchen, where meals are prepared and cooked, is another interesting feature. It is intended to invite prospective consumers, when visiting the model kitchen on the ground floor, to see for themselves food being cooked in the normal routine.

The new showrooms mark the development of a very necessary line of thought in connection with the electricity supply industry—that of supplying service rather than a commodity. It is the intention of the Hackney undertaking to carry out an educational campaign on novel lines.

The Lighting Service Bureau at Glasgow.

We referred briefly to the inauguration of the Scottish Electric Lighting Service Bureau at Glasgow in our issue of last week. The Bureau is an organisation sponsored by the Glasgow Corporation Electricity Department, the Electrical Contractors' Association, the Electric Lamp Manufacturers' Association, the supply undertakings and other electrical interests in Scotland. Most of the large cities in Scotland are also co-operating in the scheme.

Its object is to further the cause of lighting by electricity through the agency of a lighting service bureau at 20, Trongate, Glasgow.

Lectures and demonstrations will there be given to those directly interested in lighting, and the demonstration rooms, fig. 6, will be open to all and any who wish to become acquainted with the latest practice in electric lighting for any application. Examples of the correct methods for industrial purposes, shop interiors, illuminated signs and posters, the flood lighting of buildings and street lighting, will all be shown and explained.

There is also a fine example of an illuminated shop window depicting the old and new methods of lighting and giving a practical illustration of what can be accomplished by the use of coloured light. Flood lights and spotlights are included in this model shop-window equipment, while the window, with its display dressing for a drapery shop, lends itself in a remarkable manner for this purpose.



Fig. 3.—Lecture Theatre.

Home lighting will be demonstrated on novel lines. An alcove has been arranged in order that good and bad lighting can be demonstrated in all the principal rooms in the

home by the quick interchange of furniture and lighting effects.

The committee of the Bureau, under the chairmanship of Mr. S. B. Langlands, manager of the Corporation Lighting



Fig. 4.—Model Bedroom, Hackney.

Department, has made use of the experience of the Lighting Service Bureau in London, 15, Savoy Street, Strand, and the new demonstration rooms are modelled somewhat on the lines followed there. There are, however, several things which have lent themselves to different treatment and the Scottish Bureau can claim to have excellent equipment in every way. There is every reason to expect that the hopes of those interested in bringing about "a brighter Scotland" will soon be on the way to fulfilment.

The fundamental principle of doing away with glare from the new gasfilled lamp will be stressed on all occasions, for it is felt that great harm has been done to the cause of electric lighting by ignorance in this matter, which has resulted in painfully wrong methods of installation.

The Bureau is a permanent establishment and will be in charge of Mr. Henry L. Hughes, in the capacity of district engineer, and its purpose is purely educational, all modern types of lighting apparatus being shown and their uses explained, leaving the existing selling agencies to deal with the commercial side.

At the opening ceremony on October 12th there was a large attendance of gentlemen interested in electric lighting in its many phases. The chair was occupied by Mr. S. B. Langlands, who introduced Lord Provost Montgomery, and in doing so expressed the hope that the movement they were inaugurating that day would soon spread all over Scotland and that "a brighter Glasgow" and "a brighter Scotland" would be the result.



Fig. 6.—Demonstration Room, Glasgow Bureau.

The Lord Provost, in opening the Bureau, said the movement for better lighting was one that deserved support. They might have a great quantity of light, but if that light was not properly diffused it might be very imperfect. The Bureau was set up for the purpose of informing the public as to the proper appliances to use and the correct methods on which to use them to get the very best results from the electrical energy they consumed. The Corporation began by giving them the electrical energy at a very modest rate. His Lordship's slogan had always been "Give us cheap light." They had very cheap electricity in Glasgow. They had an example in their rooms of what could be done in the way of shop window lighting, and it was up to the enterprising business man to see what could be done in that direction. In regard to workshops, too, too much importance could not be attached to the lighting, for a workman could not be expected to give his best results without good light. He remembered it was stated on one occasion by the Home Secretary that improved lighting in workshops resulted not only in the improved health of the workers, but also in increased output of work. He said he was glad the Corporation had gone in for the electric lighting of tenements, and in conclusion he wished the Bureau every success.

Dr. Dewar, convener of the Corporation Electricity Committee, presented the Lord Provost with an electric reading lamp in glass.

Mr. W. E. Bush, manager of the Lighting Service Bureau, London, also spoke, giving an interesting account of the objects of the movement, as well as a demonstration of lighting.

Mr. Sully, director of the E.L.M.A., also spoke.

On October 15th a meeting of the Glasgow shopkeepers was addressed by a representative of the Corporation Electricity Department, who emphasised the cordiality of his department towards the "Brighter Glasgow" movement, and explained the exceptionally favourable terms on which the Corporation was prepared to supply the energy for "after-hours" illumination and the very low hire rate of an automatic time switch for cutting off the supply at any given hour. A committee of leading shopkeepers was formed to carry out suggestions put before the meeting.



Fig. 5.—Metro-Vick Stand at Salford.

The North-East Coast Lighting Service Bureau.

The new Lighting Service Bureau for the North-East Coast was formally opened at Dial House, Northumberland Street,



Fig. 7.—Illuminated Tramcar, Leicester.

Newcastle-on-Tyne, on October 13th, by the Lord Mayor of the city (Ald. Walter Lee). Like the similar and new institution at Glasgow, it is another development of the Lighting Service

Bureau of London, making three of its kind in the kingdom. The value attached to the scheme, which aims at demonstrating the best mode of modern lighting, is indicated by the fact that the effort is being maintained by the following interests:—The Newcastle-upon-Tyne Electric Supply Co., Ltd.; the Newcastle and District Electric Lighting Co., Ltd.; the Tynemouth, South Shields, Sunderland, Darlington, Middlesbrough, Carlisle, Stockton and West Hartlepool Corporations; and the North-East Coast sections of the Electrical Wholesalers' Federation, the Electrical Contractors' Association, the Electrical Lamp Manufacturers' Association, and the Electrical Development Association.

The commodious premises are so arranged that they can represent a workshop with the lighting necessary for such an establishment installed, while modern methods of lighting shop interiors and shop windows can be shown with facility. One feature of interest to shopkeepers shows the bad effects of bare lamps hanging in the windows and how to eliminate the glare by the use of properly designed reflectors. The Bureau is in charge of a district engineer, and arrangements are being made to invite electrical contractors, engineering societies, technical schools, architectural associations, and similar bodies to demonstrations. The rooms are provided with equipment for dealing with the following fields of illumination:—Lighting of factories and workshops, street lighting, lighting of public buildings, flood lighting of buildings, electric signs, and domestic lighting.

Dr. W. M. Thornton, M.I.E.E., presided at the opening proceedings. He said that there was no need to dwell on the importance of utilising to the full the best methods of lighting which science and experience had developed in the last few years. It was not only a question of having a bright light, but one of having a right light. The influence of light on health had become known during the last ten years, and there were clinics in most large towns where children suffering from rickets and skin complaints could be treated by electric light. That was a great work, and might in time revolutionise life in densely populated quarters of towns. The Bureau, also, served as a kind of clinic, to which those who suffered from the wrong sort of lighting might take their complaints. It was established to show what was right and what was wrong in the methods of lighting the public used. The first bureau of the kind to be started was in New York, and he had the pleasure of visiting it sixteen years ago; all the great manufacturing firms pooled their information for the public good, and the work had spread all over the world since. There was an excellent bureau in London, and since Newcastle was the electrical centre of gravity of the British Isles it was right and proper that they should have one there.

The Lord Mayor, in declaring the Bureau open, said all sections of the community using electric light would appreciate the services to be rendered by the experts associated with that Bureau. He wished the undertaking all success. The objects of the Bureau were explained by Mr. W. E. Bush, of the Lighting Service Bureau, Savoy Street, London, and Mr. C. W. Sully, director of the Electric Lamp Manufacturers' Association.

The Salford Electrical Exhibition.

In connection with the opening of the new Agecroft electricity generating station at Salford on September 23rd, a description of which appeared in the Electrical Review on September 25th, the Salford Corporation held an electrical exhibition in the Pendleton Town Hall. The show proved of considerable interest and an excellent display of electrical apparatus of every description was given. A very comprehensive display of electrical domestic appliances was found at the stand of Metro-Vick Supplies, Ltd., fig. 5, the new "Cosmos" cooker of this firm, and its Harcourt fittings and wireless sets being the main features.

The Electrical Exhibition at Leicester.

In connection with the recent electrical exhibition held at Leicester, an account of which we included in a similar article in our issue of last week, it is interesting to learn that the Leicester Corporation Tramway Department rendered considerable assistance to the exhibition authorities in their efforts to bring success to the show. Fig. 7, p. 673, is a view of the illuminated tramcar which was attractively decorated to give publicity to the concern. During the period of the exhibition it was run over the chief routes of the city as a mark of the Corporation's high appreciation of the value of the exhibition to the city.

We understand that arrangements are being made to repeat the exhibition on a very large scale early in 1927.

Smoke Abatement.

A Conference at Buxton.

(*Concluded from page* 636.)

On the Saturday evening the annual dinner of the League was held with Sir Napier Shaw, F.R.S., Chairman of the Advisory Committee on atmospheric pollution, as President. Sir Napier proposed the health of the League, to which toast Mr. Melland and Mr. Elliott (hon. secretary) suitably replied. The meetings on the Sunday were divided into two sections. In the morning the question of domestic smoke abatement was dealt with and in the evening attention was directed to industrial smoke. Three papers were given in the morning session, one by Dr. Margaret Fishenden, of the Department of Scientific and Industrial Research, another by Mr. Thomson, F.R.I.B.A., who described the Logie housing scheme at Dundee, and the third by Ex-Bailie W. B. Smith, O.B.E., who dealt with the new smokeless fuel plant erected by the Glasgow Corporation at the Dalmarnock Gas Works.

Dr. Fishenden's address was chiefly devoted to an exposition of the possibilities of coke and the necessity of gaining the co-operation of architects, builders, grate manufacturers, & Dr. Thomson, the Dundee city architect, gave a most interesting account of the Logie scheme, an important feature of which is the central installation for the heating of the dwellings and supplying hot water for domestic purposes. He stated that the cost of the installation was more than saved by the economies effected in such things as grates, fenders, circulating tanks, &c. The calorifiers served a double purpose in that they supplied hot water for the baths and wash-houses which it was necessary to have for the houses in the neighbourhood which were not centrally supplied. He appraised the scheme on account of the labour saved, its cleanliness and its economy. The tenants were supplied with hot water at 160 degs. at any time of the night or day and each room had its separate radiator. A communal laundry had been built with the idea of dealing with the larger articles, and in the houses all the latest labour-saving devices were installed including rotary washers, electrically driven. Ex-Bailie W. B. Smith gave a brief description of the working of the smokeless fuel plant on the Maclaurin system erected at Dalmarnock. He stated that from one ton of coal they were extracting 8 therms of gas, 15 to 16 gallons of oil, and 11 cwt. of smokeless fuel. The fuel was being sold at 30s. per ton and it was hoped through the additional gas supply to be able to serve manufacturers at such a rate as would allow of the boilers being gas-fired, with the consequent reduction of the smoke nuisance. He stated that the plant only was responsible for the low capital and working costs and in every way it had been successful and an economic proposition. The meeting was then thrown open to discussion on the three papers which were taken in order. Some remarks were made in regard to ventilation arising out of Dr. Fishenden's paper, and one medical officer warned the Conference not to save fuel at the expense of health. He reminded those present of the dangers of going from a hot room into the cold air outside.

In regard to the Logie scheme, another medical officer raised the question of correct ventilation, saying that with central heating there was a down-draught on the heads of the persons occupying the room and this could be proved by the dirt marks upon the walls. Central heating induced a feeling of lassitude. It had been found necessary to revive the lagging energy of those subjected to radiator heating for long hours. He held strong views on solar radiation and central heating was the one way to eliminate this benefit; the coal fire and even the gas stove were much better. In the course of his reply, Mr. Thomson stated that during five years, there had been no complaints and so far as he was aware not the slightest ill-effect had been noticed.

On the Sunday evening Dr. R. Veitch Clark was in the chair, and in the course of his opening address alluded to the impracticable nature of the present methods of dealing with the smoke nuisance. Large smoke areas with one single controlling authority should be established, in his opinion, and it was necessary for all to co-operate. The country required new sources of power; electricity should be developed, as in this lay the secret of the industrial revival.

Mrs. Claudesley Brereton read a paper which was the result of a questionnaire with which she had approached a number of industrialists. One question was, would it immediately or ultimately increase your firm's costs to abolish smoke? Many firms answered in the negative: It would not in their opinion, be possible to scrap existing machinery but in the gradual development of industry the smoke nuisance would be gradually abated as the emission of smoke always meant the loss of valuable products.

Mechanical stoking was highly spoken of, and with regard to oil, gas and electricity, some useful data were obtained. Coal had only one really sound believer, gas was more fortunate and in regard to electricity, Messrs. Boot's replied: "The whole of our factory is driven electrically and supplied from our own central power house, where modern plant is installed which has reduced the smoke nuisance to a minimum."

Mrs. Brereton, in summing up her proposals, suggested that the Minister of Health should appoint permanent committees, each including a fuel expert, to advise him as to the minimum of smoke which it was practicable to emit; and that these committees should be invited to draw up instructions to show by what methods it was practicable to reduce smoke to the standards set up on their recommendation. Mrs. Brereton concluded by saying: "Effective legislation should be practical and not impose new burdens upon industry at this unfitting moment."

A short concluding meeting was then held at which the proceedings of the conference were summed up and an announcement was made that in all probability another conference would be held at Glasgow in the spring.

The British Empire Exhibition.—It is announced that as there is no intention of continuing the British Empire Exhibition after October 31st, liquidators are to be appointed as soon as possible to wind up affairs. It is thought probable that the recently-appointed Realisation Committee, under the chairmanship of Mr. J. H. Thomas, will be asked to undertake the duties

The Textile Machinery Exhibition, 1925.

A Review of the Electrical Features of the Manchester Show.

The many exhibits on view at the City Hall, Manchester, which housed the Textile Machinery and Accessories Exhibition from October 2nd to 17th, revealed the progress that is being made in the application of new ideas in many directions. Changes are being proposed which, in some cases, will involve a radical alteration of established principle, but, notwithstanding much misapprehension, it can safely be said that (except perhaps in the case of one or two European countries, and then only with regard to particular classes of machinery) there is no serious challenge to the supremacy of the British manufacturer. Whilst trade conditions in the textile industries have not been stabilised for the last four years, there are signs now of distinct improvement and the fact that another large cotton crop is more than likely this year will undoubtedly stimulate the trade, not only in this country, but throughout the world. The new machinery for the production of and subsequent processes connected with artificial silk, or, as it is better termed, "rayon," is being produced in large quantities by foreign firms, and in this particular connection British textile machinists will do well to lose no opportunity; in practically every other department there is no question as to the supremacy of Britain.

Nearly 15 per cent. of the exhibits were of foreign origin, but they were not to any great extent connected with the electrical industry. Every available space in the hall was booked, and many firms were refused space.

Lancashire Dynamo and Motor Co.

It is unfortunate that a.c. was not laid on to the exhibition hall, and the promoters (the *Textile Recorder*) had no alternative but to incur the expense of installing a motor-alternator of 00 volts, 60 kVA, 50 cycles, 3-phase, 1,500 r.p.m., and this supplied all the a.c. power used in the building; in addition, much d.c. was used. This machine formed part of the exhibit, which ncluded "Maxtorq" motors, of the Lancashire Dynamo nd Motor Co., and the company's motors were used also to drive machinery on other exhibitors' stands.

Carver Textile Patents, Ltd.

This stand was occupied by the Carver electro-mechanical oom, fig. 1. Dr. Carver's successful abolition of cards in the ordinary jacquard weaving, as demonstrated during years of nill practice, is now succeeded by the entire and absolute upersession of the ordinary jacquard machine, together with he long cords of jacquard harnesses usually required in damask weaving. Instead of jacquard machines of varied apacity with 400, 600, 800 and 1,200 hooks, of which two and hree separate machines are mounted high above the loom to ontrol the harness cords and warp threads for producing large esigns as seen in the best table covers, the new machine is f easy access to the operative from the floor. There are no ong harness cords, no wire hooks and needles, no pasteboard ards laced together in long continuous masses, as is the case n the system in common use. All this is done away with and here will therefore be no periodical renewal of harness, no pplication of the three coats of costly varnish with the necesary three periods of drying. The staff and department for his purpose in each damask factory will be done away with, vith consequent economy.

Dr. Carver's former achievement of weaving by electrical ontact with the photographed design is now replaced by an ntirely novel re-constitution of the mechanism, the pattern eing printed direct from a tracing of the design on to the etal plate with insulated and non-insulated surfaces.

As regards the cost of the former and the new method, the reliminary cost at present for a large table cover pattern would e about £160. The cost by the new system, including the rtist's original sketch, its photographing on a thin aluminium late, completely ready for use in the loom, is about £18—a aving of nearly 90 per cent. The saving in time is equally reat. Whereas from the selection of the artist's sketch, the ransfer of the sketch by the designer to his squared paper esign, the punching of the cards by the card cutter to the acing in a continuous chain of cards occupies frequently as ong as five weeks, all that is needed by the new system is he printing by photography of the sketch on the aluminium late, completed ready for the loom in three hours. There re no faults as regards insulation. No "touching up" of he photograph on the aluminium plate by a specialist is ecessary.

In weaving a long damask tablecloth certain repetitions of gured border and centre sometimes occur. Instead of arrangng for the insertion of several repeats of ordinary jacquard ards to effect this, a hand wheel is conveniently placed in ront of the loom for the weaver to turn quickly forward or ackward. The portion of pattern to be repeated can be rranged for simply and with complete efficiency. The weaver imply turns the small handle to an easily ascertained position nd restarts the loom. Further with regard to time saved, as here are no huge masses of cards to be taken out and relaced, including transport and storage thereof, the changing f the aluminium plates can be effected in a few minutes.

There will be no need for large storage space for cards temorarily out of use, and furthermore if it is necessary to repeat he cards for a successful pattern, to put into other looms, all that is needed by the new system is anotner printed plate, done in three hours at the cost of a few pence.

The shedding mechanism is also arranged to give double lift action. The movement is so easy that the strain on the warp threads is reduced to a minimum, and the loom may be run at a speed hitherto unattainable. A damask serviette pattern of the ordinary width can be woven at the rate of 200 picks per minute without jerk or strain on the warp and with perfect production of the design. There is no trace of vibration at this high speed.

There are none of the usual lingoes or weights attached to the ends of harness cords. Frames of 40 light springs in tubes are used, which, at high speeds secure absolute freedom from swing, with a perfectly steady vertical movement of the mails and warp threads. The new system embodies every known action for warp control and is complete in itself. For its installation nothing is required beyond its fixing on and attachment by bolts to the plain loom.

The shedding mechanism is divided into self-contained frames, each controlling 40 threads, and suspended immediately above the warp, and is adjustable so that the frames can be arranged at any spacing across the loom according to the "sett" of cloth to be woven. Each of the 40 actions in one frame controls each single thread as in "full harness" so that the woven pattern is free from defects such as "steppiness" of edges of figures, and turning points of the twills in

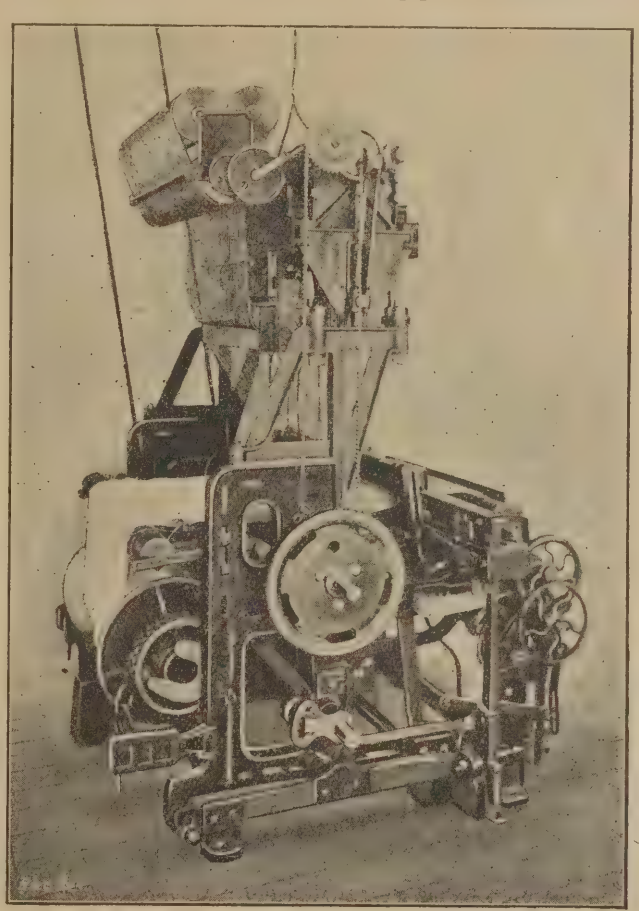


Fig. 1.—The Carver Electro-mechanical Loom.

which threads are frequently controlled in the ordinary way from the card in twos, threes and more.

The twilling is performed by cam-driven bars stretching from side to side of the loom, and the frames engage the bars in the same way, whatever the space may be. One set of twilling bars is provided and separately controlled for the figured pattern, and one other set for the ground cloth. Any twill can be independently woven in either set. For example, a 5-shaft twill can be given to the ground and a 5-shaft to the figure: or a 5-shaft ground with an 8-shaft figure, or *vice versa;* or an 8-shaft in the ground with a reversed 8-shaft in the figure; in fact, any twill or satin can be used for the pattern or ground that will divide into 40—that is 4, 5, 8 or 10.

This system of electrical reading from an aluminium plate has been brought to a high degree of perfection. The sheet metal pattern plate can be fed to the electrical reader at any desired speed in relation to that of the loom, so that when the number of picks per inch in the cloth is altered, the speed of the plate can be correspondingly changed to bring out the pattern in any desired relation of length to breadth. From the same pattern plates, therefore, cloths of varying picks per inch can be woven satisfactorily. The serviette loom shown above, fig. 1, is set for 125 threads per inch in the warp, but is easily adjustable to any required practical number of

threads. For wider looms the number of frames is correspondingly increased, but the height remains the same.

A minor but not an inconsiderable advantage secured is the freedom from oilstains on the cloth. With the ordinary jacquard system it is difficult to insulate all the lubricated parts in the overhead gear, and the black oil falling upon the yarn causes a stain which it is difficult to remove. In the new machine there is no part requiring lubrication in a position from which oil can fall upon the warp.

The fact that the new machines can be attached to plain looms enabling the finest damasks to be woven renders them of special interest to Lancashire manufacturers, as, owing to the shortage of flax during the war, cotton table damasks were largely woven by the best linen manufacturers, and they are found with the improved methods of finishing now in use to be strong competitors with the linen fabric.

British Northrop Loom Co.

This company displayed three automatic looms, one of which, the Northrop automatic four-box loom, has electrical control of the automatic weft supply. This machine is a natural sequence to the Northrop 1-shuttle automatic loom. The operation of the changing motion is as follows, see fig. 2:

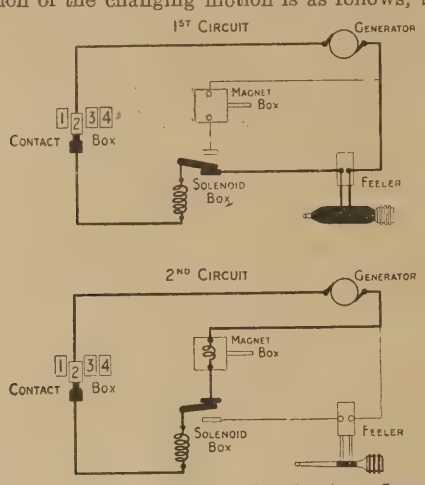


Fig. 2.—Electrical Control of Weft Supply to Loom.

When a pattern card presses back one of the needles of the box motion it puts into circuit the solenoid which controls the weft supply for that particular box. The weft pirns are each provided with a metal sleeve which comes into contact with an electric feeler at the battery side of the sley after all but two or three picks of weft have been withdrawn from the pirn. Electrical energy then causes the solenoid to depress a small trigger, and a contact arm which is operated by a spring changes position, and by its movement breaks the first circuit and completes a second circuit. The movement of this contact arm puts the feeler out of circuit for this particular shuttle and at the same time registers the need for a new supply of weft. After the need for a fresh weft pirn has been indicated or registered by the feeler, it is immaterial whether the nearly empty shuttle remains active, or is rendered inactive for some time by the control of the pattern cards. The voltage used is low and the electrical parts are mounted on the loom as a separate unit and can be readily removed for attention. It is astonishing how little alteration in the ordinary type of automatic loom has been found necessary in order to introduce this invention which overcomes the difficulties hitherto associated with drop-box motions, and as the colour selection is controlled from the box pattern card, the maximum possible time is allowed for the change of weft to take place, this being a factor of considerable importance.

British Thomson-Houston Co., Ltd.

This company had undoubtedly the most attractive stand in the entire exhibition. Electric motors of various types, together with control equipment, were shown, and attention should be particularly directed to the 9-h.p. motor adapted for driving ring spinning frames so as to maintain the maximum permissible speed of winding the cop. Apart from many classes of power equipment, lighting fittings were suitably displayed for the guidance of the textile trades. A very large field lies in this direction, and each of the electrical firms exhibiting utilised the limited means at their disposal to the best advantage. An example of oil-immersed circuit breakers suitable for use in the stator and rotor circuits of slip-ring induction motors is shown in fig. 4. For motors up to about 200 h.p. at 660 volts, this starter, type OHM, has a face-plate starting switch supported horizontally in a removal sheet-steel oil tank with the contacts face downwards at t bottom of the tank so that the circuit is broken in oil and sludge or deposits from the oil can lodge on the contact fac The resistance wire is wound on porcelain between the swit and the top of the starter, and is so arranged that the uni longest in circuit are at the bottom and therefore in the coole part of the oil. The contact segments are reversible and renew able, and pivoted controller-type contact fingers (wi renewable tips) are fitted to the switch arm. The combinati of a "dead man's" handle and a step-by-step slow-moti device ensures a pause on each contact and a quick moveme between each; interlocking features are included.

For smaller slip-ring motors, up to about 200 h.p. at fro 400 to 600 volts, drum-type starting pillars, as exemplified the type ATP, fig. 5, meet requirements in many instanc for the driving of textile machinery. A feature is that t contactors cannot be held closed when passing from the "run to the "off" position. Terminals provide for remote pu buttons to be fitted for stopping as well as for "inching purposes. "Inching" by means of the push button can on

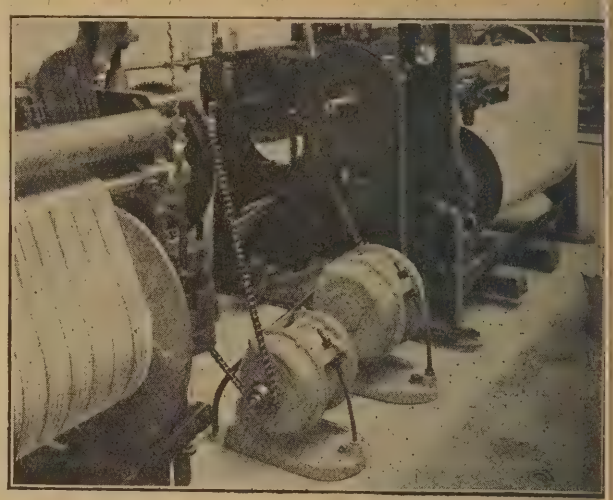
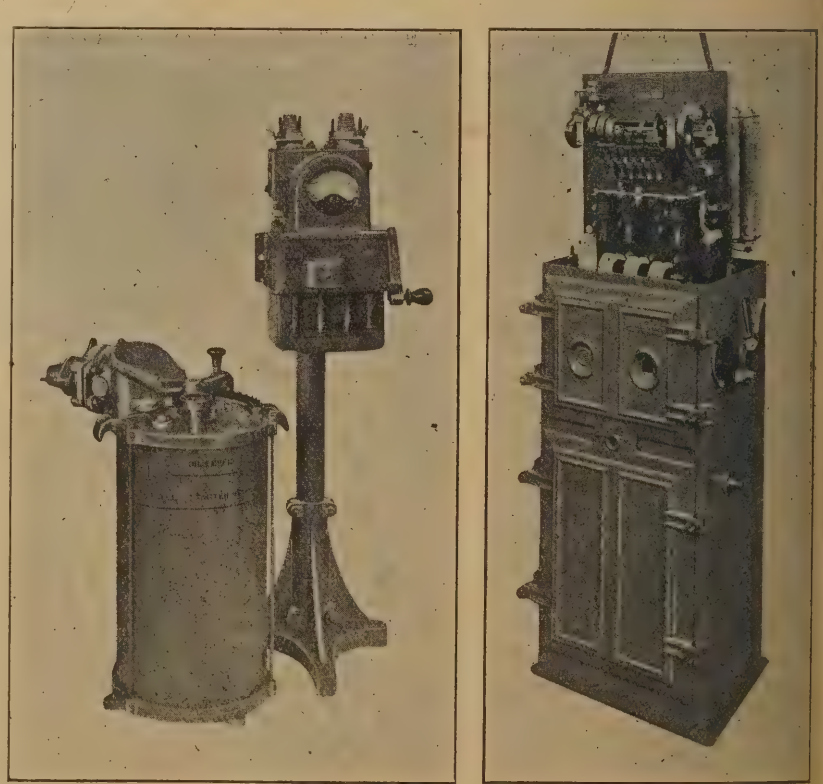


Fig. 3.—Renold Loom Chain Drives.

be carried out when the handle is in the "start" positio and, alternatively, "inching" can be done by alternatel gripping and releasing the starting handle.

Hans Renold, Ltd.

On a very large stand the following were exhibited: On 420-h.p. drive arranged with three strands of chain 7.1 in. wid on wheels of 17 and 68 teeth respectively, the larger running at 12.75 r.p.m. The drive was driven from a 3-h.p. motor running at 1,225 r.p.m. by a chain 1.2 in. wide on wheels of 1 and 114, the two reductions being made on wheels of 19 and 76. The small motor drive by segmental bush chain was enclosed in a gear-case fitted with a pump and sump.



Figs. 4 and 5.—B.T.-H. Oil-immersed Rotor Starter and Pedestal Oil-switch (left) and Drum-type Starter (right).

In addition, two complete individual loom drives were shown fitted with the Renold slipping device, which absorbs the shocks due to "bangs off," and improves the quality of the weave. The illustration, fig. 3, is of individual loom drives by Renold bush roller chains at a motor speed of 960 r.p.m. and a loom-shaft speed of 150 r.p.m.

Another feature was two complete sets of standard drives, 1 to 5 h.p. and 5 to 10 h.p. These drives are designed to cover a wide range of horse-powers at various speed ratios and can be delivered immediately from stock. Several other interesting exhibits included a spinning-frame end drive as well as a complete range of chains.

English Electric Co., Ltd.

A good show of motors of various types and outputs depicted those generally used for electrically driving textile mills. Special attention was directed to a ½-h.p. motor with 86 per cent. efficiency which can be arranged for either belt, gear, or chain drive. The ventilation of the machines is on a positive system by definite air paths arranged so as to give each part its requisite amount of cooling, with a fan system incorporated. The loom motors were all of the totally-enclosed type with squirrel-cage rotors, designed for individual drive where



Fig. 6.—English Electric Co.'s Stand.

the starting torque should be sufficiently great to ensure quick acceleration of the loom from rest up to full speed. An effort was made to display reflectors, &c., to demonstrate the varying forms of lighting adapted to textile mills. The company has been doing a considerable amount of textile work recently, and amongst the completed contracts mention should be made of Coddington's at Blackburn and the Black Pits Mill at Rochdale. It has also recently installed two turbine sets and alternators at Maynard's Mill premises in Preston.

(To be continued.)

The Motor-Car Exhibition.

Comments and Suggestions.

The 19th International Motor Exhibition, organised by the Society of Motor Manufacturers and Traders, Ltd., in connection with the Royal Automobile Club, and housed at Olympia from October 8th to 17th, was the most important of the series, for there has been no Paris *Salon* this autumn, as in previous seasons, and looked at from the electrical point of view, interest was confined to the accessories, although the Magnetic Car Co., Ltd., had a 22/70-h.p., six-cylinder chassis on view which was provided with a "magnetic" transmission between the engine and the road wheels. No gears or clutch are needed, and the arrangement affords a large range of variable speeds; the engine is fitted with magneto ignition, but the electric lighting and starting are effected through the transmission system. In the components section such accessory equipment as electric lighting dynamos, lamps, horns, engine-starting devices, magnetos and coil ignition outfits, sparking plugs, &c., was displayed in abundance, but, except in the case of non-essential items, no really new apparatus was noticed. Mention should be made, however, of the "Heliroid" silent starter driving gear which was seen on the stand of Messrs. C. A. Vandervell & Co., Ltd.; the model is a compromise that was made to fit on a six-cylinder Belsize engine. It is arranged to be inserted between the dynamo and the timing gear case; therefore, the dynamo is driven through it with a magneto in tandem, which only necessitates one drive for the three units. One of the most suitable positions for this new drive would be off the lay shaft of the gear box. The design is extremely neat and compact, and the device should be quite silent in operation, as it eliminates the teeth on the flywheel and avoids shocks. Another item of recent design is an electric foot warmer for motor cars which consumes no more energy than one head lamp.

Accumulators are, of course, indispensable to the modern car, but no novelties were noticed, not even on the "Exide" stand; as was pointed out, however, at the re-union luncheon of the Chloride Electrical Storage Co., Ltd., the need for standardising battery crates and fittings has long been urgent, and the S.M.M. & T., recognising this, formed a committee to consider the matter, consisting of representatives of the leading battery makers. Agreement was finally reached, and it is hoped that car manufacturers will adopt the standards which battery makers will be ready to supply as from January 1st, 1926. Acceptance will enable them to fit any reputable make of battery without alteration to the cable connectors or space to be allocated for the battery by the chassis constructor. "Service" agents and battery repairers will also share in the advantages of standardisation, because their stocks of spare parts will be greatly reduced.

Mr. D. P. Dunn again invited serious attention to what he referred to as the short-sighted policy of the British car manufacturer in continuing the practice of purchasing his electrical equipment as a whole, instead of utilising the experience of specialist manufacturers and buying his lamps from a lamp maker, his starter-motor from a manufacturer of those articles, and his battery from a battery maker. The result would be, eventually, greater economy and, immediately, greater efficiency. An examination of the lists of 1926 cars shows that 88 per cent. of the British cars on the market follow the line of least resistance, and fit complete electrical equipment made by one manufacturer, whilst only 12 per cent. discriminate as to the various items and get each from specialists in that particular line. On foreign cars, notably American, the reverse is the case.

The result is that the average British car often has to be cranked by hand when cold, whereas on the average American car the starting handle is rarely, if ever, used. The generally-accepted reason for hand cranking is to spare the strain on the battery, but the battery is, for the most part, quite capable of doing its work, as is evidenced by the fact that the battery on the average American car is smaller, lighter, and cheaper, than that fitted on many British cars of much smaller horse-power.

After all, if the car buyer pays for an electric starter, he ought to get one that will start the car to which it is fitted, always and under all conditions; it is the starter which is the real bottle-neck, for the battery can only deliver as much current as the starter can utilise, and if the starter be underpowered a bigger battery will not provide the remedy.

On the stand of the British Thomson-Houston Co., Ltd., amongst magnetos, lighting generators, and ignition sets, an interesting form of automatic ignition-advancing mechanism was exhibited; it is designed to operate on the rotating shaft, and advances the ignition automatically in accordance with the speed, by actually advancing the rotation of the magneto shaft. In this manner the maximum sparking efficiency is maintained throughout a very wide range, and the timing may be governed in accordance with the requirements of any make of engine. It should be noted that, in addition to the action of this automatic feature, the ordinary hand-controlled timing lever is operative, and thus the range of advance and retard is further increased.

In the rubber tire section Pirelli, St. Helens, and Henley's products were on view, whilst the undermentioned firms also had stands on the gallery: A.C. Sphinx Sparking Plug Co., Ltd., Allen-Liversidge, Ltd., British Lighting & Ignition Co., Ltd., W. Canning & Co., Ltd., Delco-Remy & Hyatt, Ltd., Fuller's United Electric Works, Ltd., Hart Accumulator Co., Ltd., Klaxon, Ltd., Lodge Plugs, Ltd., Lucas Electrical Co., Ltd., Marelli Magnetos (England), Ltd., Midgley Car Lighting Co., Ltd., M.L. Magneto Syndicate, Ltd., North & Sons, Ltd., Peto & Radford, A. Picard, Powell & Hanmer, Ltd., Ripaults, Ltd., Robinhood Engineering Works, Ltd., Rotax (Motor Accessories), Ltd., Rotherham & Sons, Ltd., Scintilla, Ltd., and Simms Motor Units (1920), Ltd.

British motor cars have always been good, but with regard to price, ability to deliver in large numbers, and the equipment provided, there have been times when the position of the British manufacturer would not bear discussion. However, the position has changed, gradually, but surely; the demand for light cars is increasing on the Continent and in the Dominions, although in the medium-powered car market foreign rivalry is much keener, but there can be no doubt about which country leads in the production of the expensive high-powered motor car.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Rural Electricity Supply.

This subject seems to be a further step onwards towards clarification, judging from the information disclosed by the recent correspondence in your columns, coupled with the latter part of the article entitled "Electricity in Agriculture" which appeared on page 607 of the Electrical Review. Hence if some more of your readers would give of their experience, it would further help.

As regards wayleaves, it is not generally appreciated that a rental of one shilling for a ten-inch diameter pole, represents about £1,000 per acre; hence those landowners who are obtaining 2s., 4s., and 8s. per double pole (as stated in the above-mentioned article) are doing pretty well—to put the matter mildly—for the land would not be worth more than £25 per acre for agricultural purposes. In France they would get two-pence-halfpenny, and in Germany nothing, per pole. By the way, it is difficult to get more than one shilling per pole, even in towns, from the Post Office Telephone Department. This is a case where experience over a long period assists considerably.

It does not seem to occur to everyone that the presence of an electricity supply line adds to the value of the land, so the owner ought really to pay a premium to the enterprising erectors of the electrical installation. I recently came across a case—in Scotland, too—where the landowner bargained as a part of the wayleave which he granted that he should be supplied with electricity at one penny per unit. He does not, however, use the current because he thinks it is too dear! If only he had been educated as to what electricity would do for him, instead of being fed upon hypothetical arguments about costs per unit, the case might have been different. In France, the writer met a farmer who rejoiced because two 30,000-volt lines crossed his land at right angles. The reason was that he could plough all his land without erecting any lines of his own. For the electricity supply authorities were actually so pleased to sell lots of energy, that they did not mind hanging up three simple hooks on their lines, wherever the farmer wanted to work his electric plough. Truly the attitude to matters electrical differs greatly in different countries.

One would think that the majority of electricity supply undertakings in this country did not really want to sell electricity, or at any rate to go outside their existing customers. Lately I have had the opportunity of reading a number of letters from different central station engineers, explaining why they did not want to develop their business—one would hardly think that such letters could or would be written in this day and generation. It will be corroborated by anyone who is in close touch with the industry. What is evidently wanted is education—and then more education. There are, of course, many bright spots, *e.g.*, South Wales, Chester, Hackney, and others, but, alas, they are too few as yet.

Difficulties are made to be overcome, so I trust others of your readers will help in the solution of the problem, how best to reduce the cost of overhead construction in this country. It is no use slanging Electricity Commissioners or telephone engineers, but rather, as Mr. Fennell has done, draw attention to definite points that require modification or suggest how they can be countered, there being more ways of killing a cat than by hanging it.

R. Borlase Matthews.

Greater Felcourt, East Grinstead, *October* 17*th*, 1925.

Mr. Fennell's characteristic reply in your issue of October 16th to my letter in that of the 9th idem calls for a rejoinder.

It is generally recognised that it is only a big man who will readily acknowledge mistakes, and I was hoping that Mr. Fennell would do what was right and admit that he had overstepped the mark when he accused engineers in another public service of devising excuses to save themselves trouble in carrying out work, the actual sentence to which I took exception being: "Their talk of efficiency limits is a device to save themselves trouble." I confined myself entirely to that point in my letter, and showed that in quite 75 per cent. of the crossings of high- and extra-high-pressure circuits the Post Office placed its lines underground. Mr. Fennell himself agrees that in a recent case the Post Office offered to put its lines underground at 23 points, and the fact that they were local circuits and not junction circuits has no bearing, as there is as much "trouble" in placing one type of circuit underground as the other. The Post Office official who has the work to do in these cases, is the Sectional Engineer whose merits Mr. Fennell now extols.

As stated in my last communication, when projected high- and extra-high-pressure overhead lines will cross P.O. overhead lines, first consideration is given as to whether the P.O. lines can be placed underground without undue degradation. This, in effect, means that all subscribers' circuits are so dealt with, the doubtful cases being junction circuits and short trunk circuits. The junction circuits are of great importance, and to refer to them as "paltry interconnecting circuits" shows a want of appreciation of the telephone system layout. "Paltry" is defined as "worthless, petty, contemptible," and is quite a wrong adjective to associate with these important links in the chain of telephone communication.

On the other hand, I am afraid Mr. Fennell has been misinformed if he was told that the Post Office rule is to refuse to put underground any but subscribers' connections. This is not correct. The transmission efficiency of each junction circuit concerned in a crossing is considered in every case and if the circumstances are favourable, an offer is made to the power undertaker to place the route underground. The placing of junction circuits underground is not uncommon. I do not think it necessary to supply actual details of cases, and Mr. Fennell must accept my word as to the procedure and the results.

I am not quite clear as to the positions of the "higher officials" in Mr. Fenell's letter. One of his sentences might be read to include me in that galaxy, and I had a correspondingly thrill when I read it. Whoever is intended, however, I can assure him that only engineers deal with the question whether a line shall or shall not be placed underground at a power crossing, and they are to blame if blame there be.

As regards the technical aspects of telephone transmission by overhead and underground lines, Mr. Fennell can find this explained in "Telephone Transmission," by J. G. Hill, published by Longmans, and the application in Post Office Technical Instruction No. XXI, which can be purchased from H.M. Stationery Office.

I do not wish to pursue this correspondence. I only entered upon it to protest against a flagrant reflection on colleagues, and incidentally myself. I should like to say in conclusion that the St. George and Dragon attitude is quite out of place. Anyone reading some of the statements commonly made would imagine that the Post Office was deliberately engaged in thwarting the efforts of the Electricity Supply Authorities from malice prepense. I think those best able to judge, and possessing a sense of proportion, will not agree with these extravagant criticisms. Differences of opinion on technical matters are understandable, but they can surely be expressed in measured language.

S. C. Bartholomew.

G.P.O., London, *October* 17*th*, 1925.

With reference to your leading article in this week's Review on the above, is not the whole industry suffering from rules and regulations?

In quite recent years the arbitrary rules of 1,000 amps. to the square inch was absolutely compulsory; although we knew that an 18's wire would carry 10 amps. we were not allowed to let it carry more than 1.8 amps., and we have had to replace an 18's wire with 3/20's when the load was 2½ amps.

Here in Manchester in the early days the contractor's life was made a burden by the utter absurdity of the whole book of rules; every single item comprising an installation had to be approved by the chief, who kept a museum, and if the ceiling rose or switch, &c., did not appeal to him, there was no alternative but to scrap it and install other approved patterns.

In later years, this gentleman, we believe, was one of those responsible for the present I.E.E. Rules, when if a lampholder is within reach of a stone floor, it must be shrouded in an ugly black covering, while the switch must be all porcelain, which is mechanically weak and a constant source of trouble and expense to the user.

We have fixed many thousands of ordinary tumbler brass covered switches which are still in operation, and so far as we know, no one has been killed by a shock received from one of them, and flush switches rarely have the cover plates earthed.

Then there is the everlasting question of "earthing." If a radiator should be earthed, why not an iron or a vacuum cleaner? and how must an iron be earthed? We have sold many thousands of plug adaptors to fit an ordinary lamp holder, and we should imagine that a good proportion are used in a kitchen with a stone floor—but we have yet to hear of a fatality through an electric iron.

On the other hand, most of the much-advertised cleaners are not only not earthed, but they are used in ninety-nine cases out of a hundred on a power plug which is fused to blow at 20/25 amps., and this on a piece of apparatus which has a cord subject to rapid wear and which only requires, at the most, 200 watts. Yet this goes on year in, year out, all hopelessly wrong, yet we never hear of a fatality through using domestic apparatus.

If figures could be obtained showing the numbers of deaths from electric shocks and from gas poisoning or explosion, the proportion would be found to be all in favour of electricity yet so far as we know, there are no restrictions on how gas must be installed. The gasfitter does not have a fifty-page book of rules, yet he is dealing with a far more deadly thing than the electrician, and if he installs a gas radiator, he uses an ordinary gas tap, whereas the electrician has to use a plug which makes a very big hole in a pound before the wiring is started, making a costly job of an electric heating installation.

We have hundreds of the old 2-pin heating plugs on our jobs which up to now have not, to our knowledge, caused any serious accident.

With electricity coming on as it is now, it is our duty to make its installation as simple a matter as possible, instead of hedging it round with restrictions—a lot of which are totally unnecessary.

The following is an example of how awkward a supply authority actually can be:—

We applied for a supply for an hotel to replace a small plant in Cheadle, and told them the average maximum demand was 1 kW and that this would total 2 kW when we had their supply.

The supply people would not take this and flatly refused to consider our application until we had told them the candle-power of every lamp installed—the joke being that nearly every lamp was changed to twice its candle-power when the supply was installed.

Again, nearly every supply authority has different rules and regulations, and what will pass in Manchester will not pass at, say, St. Annes, Liverpool, &c.

The plumber is in a very much happier position than the contractor; he is registered, the public cannot get discounts off plumbers' material, he is not up against the insane competition of the wireman doing odd jobs in his spare time from a private house—possibly with material he has stolen from his employer.

But we suppose all this is due to electricity being still in its infancy (*sic*)!

E. O. Walker.

Manchester, *October 14th*, 1925.

Mr. W. Fennell's excellent letter in your issue of September 25th will no doubt be readily endorsed by all engineers who have the problems of supplying large rural areas, and erecting overhead transmission lines, before them, although with regard to the "Post Office" his remarks seem a bit too strong. While appreciating the annoyance caused by the strict enforcement of out-of-date regulations, one must also admit that, on the whole, the Post Office engineers will stretch a point in order to meet the supply engineer's requirements, and I am only too glad to state that this has been my experience on many occasions. Of course, the supply company when second comers must pay for any alterations, &c., to the Post Office plant that their lines necessitate, but it does seem unfair that where the Post Office are second comers, and guarding, &c., becomes necessary, they will only agree to "consider as a concession" bearing half the cost thereof.

As far as low-pressure lines are concerned, the use of "P.B.J." cable by either party will overcome most difficulties to-day.

Another point which I have not yet noticed raised in your columns is the very widespread prejudice against overhead lines that one is constantly up against from local authorities and residents in the country generally. They are "dangerous," "unsightly," "spoil the amenities," and so on, and of course opposition of this sort is frequently fostered by the local gas company. Much delay and expense is often involved in overcoming it, and one can only liken it to the short-sighted prejudice and obstruction experienced by the railway companies nearly a century ago. The clauses of the Acts which are eagerly seized upon for this kind of opposition need re-drafting, and as has been already suggested in your columns, suggestions for the revision of existing regulations should be made to the Electricity Commissioners.

How differently these things appear to be done in other countries! Areas in Belgium which were utterly desolate a few short years ago are to-day entirely rebuilt and cultivated, and everywhere, stalking across the country, one sees the concrete poles and overhead lines connecting up villages, the names of which are burned for ever in our memories. Even in Ypres, with its brand new and ugly buildings, the supply is carried down many streets on brackets fixed to the fronts of the houses. The mere suggestion of this over here would almost cause a riot as things are at present. However, from the publicity you are now giving the matter, let us hope that easier conditions will soon prevail.

A. Adrian Hunt.
The Hayward's Heath & District Electric Supply Company, Ltd., and The Burgess Hill & District Electric Supply Company, Ltd.

Burgess Hill, *October 13th*, 1925.

A More Comprehensive Wireless Exhibition.

I shall be glad of an opportunity of inviting the attention of your readers interested in radio to the following points:—

During the last three years the National Association of Radio Manufacturers has organised a "Wireless Exhibition," and whilst this has been thoroughly well arranged, there can be no doubt that it would be more appropriate to call the outcome of its efforts an "Exhibition of Popular Wireless Receivers and Accessories," since the apparatus shown is restricted to the kind which is of interest solely to those known, for want of a better name, as "Broadcast Listeners."

Exhibitions of the kind referred to, do, of course, provide an opportunity for any manufacturer to see the products of certain competitors, but on the other hand, the constitution of the organisers precludes many other manufacturers from exhibiting, and therefore the exhibition cannot be regarded as completely representative, even of British manufacturers of broadcast receivers.

I would like to suggest to all parties concerned that it might be advantageous on some future occasion to organise a true "Wireless Exhibition," open not only to manufacturers of receiving sets and accessories, but what is equally important, to the manufacturers of the plant and instruments required on the engineering or transmitting side of radio-telephony and telegraphy.

It is generally admitted that the technical quality of radio-telephony broadcast in this country is of a very high order, in consequence of which manufacturers of transmitting, as well as receiving, apparatus have received many inquiries from abroad, from which fact we can assume with reasonable safety that an exhibition covering every application of wireless-telephony and telegraphy, both from the transmitting and the receiving side, would attract the attention, not only of the public and the manufacturers, but also of prospective buyers from abroad.

An exhibition on these lines, therefore, would be certain of success and might confer great advantages on this branch of the British engineering industry.

Incidentally, such an exhibition might help everyone concerned to realise that the prosperity and employment resulting from the extensive sale of receivers, accessories, and journals depends in the ultimate sense on the engineers who design the transmitting equipment, and when the complexity of the radio engineers' work is appreciated, it will be seen that these men need the widest possible training and experience.

L. F. Fogarty.

Ruislip, *October 14th*, 1925.

Is the Contracting Business Degenerating?

"Polyphase," in his letter of the 3rd inst., propounds rather a difficult problem for those ignorant of the local circumstances. Assuming rigid specifications, the possible solutions are:—

1. The plumbers who beat his price may have gambled on getting both electrical and plumbing work on this installation, and by co-operation in both branches foresaw a certain time economy, to be achieved in "lifting and laying" work, &c.
2. The work was in an outlying district. The plumbers may have calculated on employing a man (or men) resident near the installation without paying country allowance and/or travelling expenses, or their business may have been situated more advantageously to the site of the work than was that of "Polyphase." This would have a considerable bearing on the wages charge, which appears abnormally high (see 3).
3. These following assumptions are based on the information given by "Polyphase."
   Saving effected by *cheap* material—selling price £8
   Assume prime cost saving to be £7
   Therefore *total* cost of *quality* material equals, say £21, which, with total prime cost of whole job at £80, using quality material, leaves a prime wage charge of £59.
   The wage charge on contracting work is one on which the greatest variation will occur, provided the material specification is fairly "watertight." Even with all other things equal, a discrepancy of 33⅓ per cent. is by no means unusual, and in this case would assist to explain the difference in estimated prices. If the prime cost of materials is much greater than I have shown, I would assume a greater prime cost saving than £7 by the inclusion of Continental and other rubbish.

Of course, there are 15 other possible solutions to this question, any one or all of which may be duly unearthed by the Official Receiver, or gentlemen of that ilk.

Q. O. C. H.

October 12th, 1925.

I agree with "Polyphase" that the contracting business is degenerating, and will continue to, until some sort of elementary examination is at least made by employers to find out whether they are employing men with some little electrical knowledge.

At the present time all one need have is a full benefit trade union card to command full union rate, irrespective of one's abilities, or knowledge.

Ninety per cent. of men holding such cards could not pass a first-year wireman's examination of the City and Guilds, and a great number do not even know Ohm's Law. Until we have some system of examination for wiremen as in New Zealand and Canada, and supply companies and fire insurance offices refuse to pass work not up to I.E.E. standards, the business seems hopeless. Take, for instance, the work being passed at the present time on many of the electric signs. Would some of the contractors care for, say, an inspection to be made of the work by a consulting electrical engineer?

Contractor.

October 19th, 1925.

We feel it incumbent upon us to reply to the blatant comments on the above question appearing in your columns, above the *nom-de-plume* "Hard Working Ex-Service Electrical Contractor."

First, when his business expands (as we think it must do, bearing in mind the figure quoted per point), he will probably discover that his "evenings" on the books will, of necessity, have to be extended into the small hours of the morning.

So he engages a clerk, and *then* an extra electrician or so (to cope with all the contracts he cannot do himself), and presently finds that after he has interviewed prospective customers and travellers, measured one or two jobs up and prepared the estimates therefor, and trotted round at the week-ends to collect a "few" cheques and promises, he wants a portable electrical installation, to "see" to earn his 25s. per day. So it goes on, until he degenerates, from a "producer" to a "non-producer"; and a very hard-working one at that. About this time, he makes the astounding discovery that he is no longer able to execute work at 10s. 6d. per point, and make a profit. But (and here's the rub) a new "spark" arises in the elec-

trical firmament (10s. 6d. per point and fully guaranteed), and when it transpires that it is the man he sacked last week, "Hard Working Ex-Service Electrical Contractor" gasps; possibly puts all his small change in the "swear box," rushes into print, and joins the ranks of "Polyphase" and——

Another Hard Working Ex-Service Electrical Contractor.

Birmingham, *October 16th*, 1925.

The above question has apparently nettled your correspondent, the reason being obvious, as he gives it himself. "H.W.E.S.C." is one of the type of individuals who are lowering the status of the electrical contracting business. If I am endeavouring to uphold the status I cannot be deteriorating. Your correspondent's letter contains foolish assumptions and sarcasm and it would make comical reading were it not so pathetically stupid. I have no desire to write a page of my history, but for your ultra-clever correspondent's information I would inform him that I have had 20 years' experience as an electrical engineer (not a wireman), 14 of those years having been spent in hard work (on the tools). My present business is conducted from an office (not a dwelling house), no showroom, little girl keeping books and office, writer on the road from 7.30 a.m. till 8 or 9 p.m. I am indeed sorry that there are individuals like "Hard Working Ex-Service Contractor" (if he is a contractor).

Polyphase.

October 17th, 1925.

The letter on "Electric Wiring" in this week's issue, signed by "Polyphase," touches a matter that has long been—may I say?—a cloud upon the "electrical horizon."

We are periodically treated to outbursts upon "popularising electricity" by various bodies, but nothing much appears to be done about that abomination, the "jerry-wireman."

Admittedly it is a bit of a problem, but I certainly think it time that steps were taken to see that only competent men undertook the work of wiring. May I here make the suggestion that—dare I breathe it?—the Institution of Electrical Engineers might make a start by holding, periodically, examinations on electrical wiring; and included in this examination should be a test of the candidate's knowledge of the I.E.E. wiring rules. A certificate should be issued to the successful candidates, and one might hope that, in the course of time, no one, without this qualification would be allowed to practice wiring.

When I say examination, I don't mean a highly technical examination, such as the Institution conducts at present, but a simplified one, that would test a candidate's fitness for the "job of wiring."

I fully realise that the wireman is not always to blame; a help in this direction would be weekly wages and an annual holiday—for if the manager needs a holiday, so does the man whose duty it is to keep the station clean; do we not *all* need a change now and again?

We have an excellent set of rules for our guidance, anent wiring, but I wonder how many undertakings can legally enforce these?

Under the circumstances what better body than the Institution of Electrical Engineers could conduct an examination for "proficiency in wiring"?

I think I am correct when I say that the British Horological Institute issues "Repairers' Certificates" to watch and clock repairers who pass its examination; and I also believe that it conducts classes for preparing candidates for this examination. I may be asked: What has this to do with electric wiring?

I have only cited the above with a view to showing that what one institution can do, another can.

I certainly think that something should be done; for the ignorance of some so-called wiremen anent matters electrical is startling.

Ghost.

October 17th, 1925.

The Manufacture of Alternating-current Motors.

In his letter published in your issue of October 9th, Mr. Shaw declines our invitation to arrange a meeting so that we could supply him with the facts he asked for, and in addition he proceeds to introduce irrelevant topics.

We can only conclude that Mr. Shaw was not serious in expressing a doubt as to the accuracy of our statement, but that this correspondence was started for another purpose altogether. We must, therefore, decline to continue the correspondence.

We believe that the Crypto Electrical Company, Ltd., manufactures chiefly small-size machines. Our statement refers specifically to a.c. industrial power motors, and this term is generally understood to mean motors ranging from 1 to 250 b.h.p. Fractional h.p. and small special machines are obviously outside the class of machine referred to by us, therefore Mr. Shaw's reference in his letter to his company's *sales* for July is entirely beside the point. We also specifically mentioned output not sales, because monthly sales fluctuate between wide limits, whereas output represents productive capacity and is much more steady and reliable as a basis for comparison. Our July sales figure would surprise Mr. Shaw, but this is so obviously an unfair basis for comparison that we would not quote such a figure.

Mr. Shaw rather unkindly suggests that our information regarding competitors' output has been obtained surreptitiously. It is probably true in respect of the smaller manufacturers that they do not exchange such confidences, and Mr. Shaw will, therefore, no doubt be surprised to know that more than one large manufacturer of a.c. motors in this country has been pleased to exchange with us, in confidence, output figures. If Mr. Shaw cannot comprehend that facts supplied to us in this way cannot be published we are unable to help him. We know our announcement to be true and probably in time Mr. Shaw will realise this fact.

In conclusion, may we add that we are in agreement with a recent correspondent in your columns respecting a series of advertisements of a company of which Mr. Shaw is a director. That correspondence emphasised the fact that engineering products do not lend themselves to the same treatment from a publicity point of view as patent medicines.

F. & A. Parkinson, Ltd.

F. Parkinson, *Director.*

Guiseley, *October 15th*, 1925.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

6,983. "Manufacture of rubber-insulated electric wires and cables." J. C. Bongrand. March 19th, 1923. (213,258.)

7,261. "Wireless valves." S. L. Price. March 21st, 1924. (239,980.)

7,607. "Thermionic valve holder or adaptor for use in wireless work." A. T. Philbrook and H. R. J. Sawyer. March 25th, 1924. (240,194.)

10,109. "Electric multiple circuit selector systems." A. Woosnam (L. Ederer). April 23rd, 1924. (240,198.)

10,187. "Manufacture of sintered tungsten and filaments made therefrom." British Thomson-Houston Co., Ltd. May 1st, 1923. (215,347.)

12,262. "Telegraphic printing apparatus." Creed & Co., Ltd., and F. G. Creed. May 19th, 1924. (240,200.)

13,123. "Electric signalling systems for indicating and/or recording distant movements." G. Kent, Ltd., and A. H. Avery. May 28th, 1924. (240,205.)

14,851. "Transformers for telephony and wireless signalling and the method of constructing the same." M. Cooper. June 19th, 1924. (240,212.)

14,926. "Thermionic valves." A. C. Hyde. June 20th, 1924. (240,213.)

15,088. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd. June 25th, 1923. (218,287.)

15,159. "Method of establishing a system of aerials with directional radiation." Soc. Française Radio-Electrique. June 23rd, 1923. (217,933.)

15,213. "Selecting mechanism for electrical signalling apparatus." Relay Automatic Telephone Co., Ltd., F. M. Ward, and W. T. Finlay. June 24th, 1924. (240,217.)

15,257. "Rectification of alternating current." E. Y. Robinson and Metropolitan-Vickers Electrical Co., Ltd. June 24th, 1924. (240,222.)

15,402. "Alternating-current systems." W. J. Mellersh-Jackson (G. A. Startweather). June 26th, 1924. (240,238.)

15,640. "Electrical time switches." M. J. Railing, H. C. Turner, and A. Sherwin. June 30th, 1924. (240,243.)

16,274. "Cathodes for vacuum electric devices." A. S. Cachemaille (Westinghouse Lamp Co.). July 7th, 1924. (240,252.)

16,979. "Electric switches for elevator controller circuits." Elevator Supplies Co., Inc. August 8th, 1923. (220,286.)

18,613. "Combined vase or bowl and wireless loud speaker." Howes and Burley, Ltd., and A. J. Curnow. August 5th, 1924. (240,269.)

18,945. "Devices for grinding the curved contact surface of brushes of electric machines." J. H. Bennison and F. Pape. August 9th, 1924. (240,271.)

20,899. "Holders for electric lamps." G. E. Tate and F. O. Monkhouse. September 4th, 1924. (240,282.)

21,122. "Inductance coils as used in wireless apparatus and the like." L. H. Paddle and J. A. Crisp. September 8th, 1924. (Cognate application 24,807/24.) (240,283.)

22,876. "Headlights of motor-cars and other vehicles." J. A. Hardie. September 29th, 1924. (240,296.)

22,941. "Glass to metal seals, particularly for vacuum tube devices." Metropolitan-Vickers Electrical Co., Ltd. September 28th, 1923. (222,510.)

24,251. "Electron discharge devices." Metropolitan-Vickers Electrical Co., Ltd. October 15th, 1923. (223,562.)

25,576. "Electric power condensers and cooling means therefor." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (H. R. van Deventer). October 27th, 1924. (240,310.)

25,875. "Electric motor control." English Electric Co., Ltd., and F. Morris. October 30th, 1924. (240,312.)

26,188. "Batteries suitable for use in conjunction with wireless apparatus or the like purposes." C. E. Clominson. November 3rd, 1924. (240,314.)

27,023. "Automatic and semi-automatic telephone systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. November 12th, 1924. (Addition to 205 651.) (240,320.)

28,585. "Cord grip for electric lampholders." M. J. Railing and F. G. Quance. November 28th, 1924. (240,327.)

29,198. "Bow current-collectors for electric vehicles." J. Fischer de Tovaros. December 5th, 1924. (240,328.)

29,590. "Electric relays." Western Electric Co., Ltd. (Western Electric Co. Inc.). December 9th, 1924. (240,330.)

29,943. "Junction boxes for high-tension cables." Siemens-Schuckertwerke Ges. December 15th, 1923. (226,222.)

30,766. "Sound reflective or directive devices particularly applicable for use as horn devices with telephonic loud speakers." Neufeldt & Kühnke. May 30th, 1924. (234,773.)

30,856. "Electrically-operated controlling and distributing device for liquids under pressure." G. Gourdon. September 23rd, 1924. (240,338.)

1925.

381. "Dirigible headlights." C. W. Perry. January 6th, 1925. (240,341.)

807. "Support for an electromagnetic sound-reproducer and method of making the same." D. H. Moss. February 9th, 1924. (228,868.)

1,866. "Electrical condensers." G. H. Cooke. January 21st, 1925. (240,346.)

1,973. "Child's electric cooking stove." W. Schwarzenhauer and Bingwerke Vorm. Geb. Bing Akt. Ges. January 22nd, 1925. (240,347.)

2,260. "Screens for reducing secondary radiation from X-rays." H. S. Sawford. January 26th, 1924. (228,533.)

3,622. "Electromagnetic devices." British Thomson-Houston Co., Ltd. February 9th, 1924. (228,947.)

5,436. "Speedometers of the eddy-current type." Deuta-Werke Vorm. Deutsche Tachometerwerke Ges. March 29th, 1924. (231,442.)

7,323. "Electric oil switches." International General Electric Co. Inc. March 19th, 1924. (231,169.)

The

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Electrical Manufacturing in Russia.

WITH the opening of the new financial year in Soviet Russia particular attention was devoted, in all branches of the State monopolised industries, to the programmes which have been prepared for developments in 1925-26, and even in the next five years, for which plans have in some cases been drawn up.

In these deliberations the electrical manufacturing industry, as well as the supply branch, has occupied a prominent position. Judging from the information available from Soviet sources, and recorded from time to time in the columns of this journal, and from the fact that orders are known to have been placed for electrical machinery and plant both in this and other countries during the past two years or so, it is certain that progress is being made in the supply industry and in the manufacturing branches, even if many statements emanating from Soviet circles have to be accepted with some reserve.

The Board of Trade recently issued a report from the British Commercial Mission in Moscow giving a survey of the coal mining industry in Soviet Russia, which has been accepted as an authoritative document. Yet the only information available to the British Mission, as well as to the other trading missions in Russia, is that which is furnished by the Soviet Government and published in the official newspapers, and from this point of view the commercial missions in Russia could just as well fulfil their duties in London and other European cities in this respect, without the large expenditure necessary for the maintenance of these organisations abroad, and that, too, with a greater measure of personal convenience and comfort. Little information or statistics can be obtained from private sources, and the convictions and punishments occasionally meted out to Russians found guilty of what is termed "commercial espionage," as, for instance, those which recently took place at Kharkoff in the matter of the coal and iron and steel industries, are sufficient to prevent any repetition of these cases which, after all, only amounted to the giving to former foreign owners of a little information, in return for the payment of a few roubles, respecting the condition of mines and iron works.

Though little information is, as we say, available from Russian sources, British electrical concerns which are finding ways of doing business with Russia have first-hand proofs of the electrical progress that is actually taking place. The Metropolitan-Vickers Co. and associated concerns have long been in actual touch with the market, as our pages have shown, and it was Sir Philip Nash who, eighteen months ago, advocated an extended and particular application of Export Trade Facilities Act accommodation for concerns which found the risks too heavy to carry unsupported. It was with great pleasure that we reported in our last issue that Captain R. S. Hilton, of the same company, referred to a recent visit that he had paid to Russia (six weeks previously, as a matter of fact) when he discovered, to his astonishment notwithstanding all that has been reported in these pages, that they were developing their sources of electricity supply in a most wonderful manner.

The Russian electrical industry is confronted with three distinct problems. In the first place, the Central Electrical Trust and the Leningrad Electrical Machine Trust, which, as mentioned previously, were to be consolidated, have now actually been amalgamated as from October 1st under the title of the Get or State Electrical Trust. In this connection Mr. H. N. Milshtein, one of the directors of the enlarged trust, is reported to have stated at the beginning of this month that the union of the two heavy electrical engineering trusts coincided with the time of increasing the load on the works embodied in this trust to the limits of their technical possibility. The second problem relates to the proposed great extension of the manufacturing industry, and the third concerns the utilisation of foreign experience in the promotion of the scheme of expansion. Mention has previously been made of the intention of Russian electrical engineers to seek the aid of foreign works, and in this respect they have already availed themselves, to some extent, of the services of Swedish firms.

Apparently the turn of the Germans has now arrived, as was briefly mentioned in our "Business Notices" a fortnight ago. According to statements emanating from Berlin, negotiations have been proceeding for some weeks past between representatives of the Russian electrical trust and the Berlin A.E.G., and these are said to have resulted in the reaching of an agreement in principle. Under the agreement—which seems to resemble those between the German company and the General Electric Co. of New York of the pre-war period, renewed in the post-war period—it is proposed to place at the disposition of the Russian trust the technical experience and patents of the A.E.G., and it is said that the General Electric Co. of New York will probably participate in the arrangement. The Russians also intend to enter into an agreement with the International Glow Lamp Trust, for which negotiations are now proceeding. Besides the technical agreement, the Russians desire to conclude one in regard to the deliveries of machinery by the Germans of the value of £2,000,000, but some difficulty is being experienced in the matter owing to a credit of several years being asked for by the Soviet interests. It is stated that in A.E.G. circles confirmation is forthcoming of the conclusion of the technical agreement, although the signatures of the representatives of the Russian Government have yet to be appended to the documents.

Coming now to the electrical engineering industry, which has been investigated by the electrotechnical section of the special conference in Moscow, the section has made it quite clear that the absorbing capacity of the market in the next five years will grow to four times the pre-war capacity. At the end of that period the home production is expected to be covered to the measure of 80 per cent., so that it will be necessary to increase the producing capability of the works from the rate of 100,000,000 roubles, which was the annual rate on July 1st, 1925, to 320,000,000 roubles (£32,000,000) per annum in 1930. The only manner in which this development can take place is by the construction of new works and the undertaking of bulk production, especially of machines. In view of this fact, a beginning has already been made by the extension of the "Dynamo" works, which is specialising in tramway and crane motors. At Kharkoff the former Gerlyach Pulst Works is being united with the former Vek Works, and the construction of standard machines will be organised there, while at the same time the foundry is to be enlarged and all the extensions finished in two years. The production of transformers is to be concentrated at the Provodnik Works in Moscow, and the output from other works will be discontinued.

A big programme of construction is to be carried out in the low-pressure industry in Leningrad and Moscow in 1925-26. Besides these, almost all the other producing works will be considerably extended as, for instance, the Electric Carbon Works, which will then also turn out carbon brushes, and the Svetlana lamp factory. In 1926-27 the second stage is intended to be embarked upon, when works will be established in Leningrad for the production of materials, works for the manufacture of high-pressure insulators in Moscow in substitution for the old Isolator Works, and a factory for the manufacture of carbon electrodes. The capital expenditure on the extensions contemplated in 1925-26 will have the effect of increasing the productive capacity of the works under the control of the General Electric Commission from 86,000,000 roubles to 141,000,000 roubles per annum. The capital outlay proposed in 1925-26 amounts to 21,600,000 roubles.

Of course, the execution of the programme for the year depends upon whether the money required is or is not placed at the disposal of the industry.

The I.E.E. Presidential Address.

The address with which Mr. R. A. Chattock read himself into the presidential chair at the meeting of the Institution of Electrical Engineers last week was one of the shortest that we have heard, and one of the most spirited. As he has plainly shown during the past twelve months, he has no liking for the proposals which, it is believed, are to be brought forward by the Government next month, and he took the opportunity offered by his inaugural address to give reasons for the opinions which he holds. The principal items in his speech were the advantages of pulverised fuel, the necessity of improving the load factor on electricity supply undertakings, the interconnection of power stations, the standardisation of frequency, and the training of electrical engineers. On almost all of these points we are glad to find ourselves in full agreement with Mr. Chattock.

Almost exactly a year ago, commenting on a proposal of Mr. J. H. Ellis, chairman of the Plymouth Gas Co., that electricity works should go hand-in-hand with gas works, with the conservation of coal as their common aim, we pointed out that the increasing use of pulverised fuel was a long step in that direction, and that the solution of the problem might involve the carbonisation of coal at a lower temperature than was customary. A similar proposal by a gas engineer, Mr. R. Gray, of Hamilton, is reported elsewhere in this issue. On various occasions we have returned to this subject, and it is interesting to find that Mr. Chattock, who has adopted pulverised fuel for recent boiler extensions, is emphatically in favour of its use on the grounds of economy in capital cost and operation, and of the possibility it presents of utilising the refuse heaps of collieries; like Mr. W. B. Woodhouse, in his presidential address last year, he has given serious attention to the question of coal distillation and by-product recovery, and whilst he repeats his predecessor's warning regarding the market price of by-products, he is attracted by the system of carbonisation of pulverised coal, yielding fuel in powdered form ready for combustion in boiler furnaces, which we recently described—subject to its proving satisfactory.

With regard to load factor, Mr. Chattock points out the necessity, which we have frequently emphasised, of improving the load factor by the adoption of a two-part tariff to encourage domestic uses, by railway electrification, and by securing other long-hour loads. But he agrees with our contention that no improvement in

load factor is likely to result from the interconnection of distant power stations, which usually possess load curves of similar configuration, and he cites American experience in support of this view.

The subject of interconnection Mr. Chattock treats as inseparable from that of standardisation of frequency, which is an almost indispensable preliminary condition, and, we take it, would not be pressed if the question of interconnection did not arise. Mr. Woodhouse last year pointed out the disadvantages of interconnecting distant stations; Mr. Chattock goes further, reminding his audience that local generating stations are now highly economical, and to derive any large proportion of the supply from a distant station would entail heavy capital cost without increased economy. As we have previously pointed out, the concentration of plant involves increased outlay and loss of energy in mains, and where the load curves are similar, the interconnecting mains merely take the place of stand-by plant, which can be more economically provided where it is wanted. Moreover, it is impracticable to tap such mains without the use of very costly switchgear and regulating apparatus; an interconnecting main is a feeder, and cannot at the same time be a bus-bar. These facts were emphasised by Mr. Chattock. The interlinking of adjoining stations is a different matter; as we have stated, it involves no great outlay, whilst its advantages are unquestionable, and Mr. Chattock fully approves of this.

With regard to the standardisation of frequency, we have propounded the view that this would be desirable, though not essential except for the purpose of interconnection; it would reduce the cost of a.c. apparatus, and do away with the flicker that occurs in lamps fed from a 25-cycle supply. Mr. Chattock may well be excused for minimising the importance of these questions, in view of the fact that the huge Birmingham undertaking is mainly dependent on a 25-cycle system, and that to convert it to 50 cycles would involve an immense upheaval; and he gives figures indicating that the cost for Birmingham alone would be nearly seven millions sterling, and for the whole country the colossal figure of 27 millions. Whilst we adhere to the opinion that a uniform frequency of 50 cycles for public supply would be decidedly advantageous, we feel that if his estimates are correct the outlay is out of all proportion to the benefits that would accrue from it.

Finally, we welcome Mr. Chattock's comments on the training of electrical engineers, which are in close accord with the advice that we have given from time to time to the many parents who appeal to us for guidance.

The British Industries Fair.

Manufacturers may perhaps be pardoned if they complain that they have had more than their fill of exhibitions, for it must be admitted that this somewhat expensive form of publicity has been heavily run on during the past year or two. There are many reasons why firms of a certain standing must often participate in these displays, but it is certainly a fact that results are not always satisfactory, although it is practically impossible to make an accurate appraisal of the results of an exhibition, some of them being of a very indirect nature.

We would, however, once again draw our readers' notice to an exhibition which is very different from the majority, namely, the British Industries Fair. As the principal aim of this Fair, which is of an official character, is to bring large buyers into direct contact with manufacturers, the results are more tangible, although it also brings in its train orders which cannot definitely be linked up with it. It may be said that practically every visitor to the Fair is a potential buyer; whereas at an ordinary exhibition mere sightseers are in the majority, often to the detriment of business.

There is no doubt that this is realised by many important firms which are to be seen year by year at their stands in the Castle Bromwich Aerodrome, Birmingham, or the White City, London. It may be taken as certain that these firms do not take space so regularly from pure altruism. They evidently derive some advantage from their participation, and this would appear to indicate that other firms stand a good chance of securing business in the same way.

Hitherto the electrical manufacturing industry has not been represented at Birmingham upon the scale which its importance justifies. The Fair has given an opportunity to many of the local firms to display their wares, and upon the whole these firms have seized it in a commendable manner—no doubt with corresponding benefit to their business. But while expressing our appreciation of the efforts of these firms, we feel bound to say that the electrical industry of this country should be more thoroughly represented at the Fair, and we urge manufacturers to study the matter and, if possible, to take a hand in this important means of fostering our export trade.

In any consideration the encouragement given by the Government should be borne in mind. A sum of £25,000 is being utilised for the sole purpose of propaganda for the Fair, and 75 per cent. of this will be spent on advertising the Fair abroad. Potential buyers from overseas are aided in a number of ways—another excellent feature of the organisation—and the whole of the commercial, diplomatic and consular service assists to make the Fair and its objects known in all parts of the world.

It is satisfactory to learn that applications for space are being received at a rapid rate; we advise British electrical manufacturers to apply in good time.

The Society of Technical Engineers.

The formation of a Staff Benefit Society under the ægis of the Engineering and Allied Employers' National Federation has had an unfortunate result as regards the "Third Party in industry." It appears that the rules of the new Society include a condition that none of its members shall belong to any professional protective association, which would, of course, exclude the members of the Society of Technical Engineers from participation, and a protest addressed by the secretary of the S.T.E. to the Federation, pointing out that this provision was in effect an official ban on membership of his Society, met with a cold reception. Consequently the Executive Council of the S.T.E., on Saturday last, unanimously adopted the resolution which is recorded amongst our "Notes" to-day (p. 708). A second resolution was adopted as a rejoinder to an attack made by the Trade Union Congress last month upon the "Third Party" movement.

It is true that staff organisations exist which have joined hands with the manual trade unions, but this does not apply to the Society of Technical Engineers, which has explicitly forsworn the use of the strike as a weapon, has kept outside the Labour movement, and has pledged itself always to promote the interests of industry in general—"to seek peace and ensue it." This policy apparently appeals neither to the employers nor to the Trade Unions, doubtless on the principle that he who is not for us is against us; the S.T.E. refuses to ally itself with either side, and consequently both sides regard it askance.

We believe, however, that they are both mistaken, and that the Society of Technical Engineers will prove to be sincere in its desire to work for peace in industry. Occupying, as its members undoubtedly do, an intermediate position between the employers and the manual workers, they are admirably situated to mediate between them, to convey to each a lucid and impartial presentation of the other's case, and in some measure to mitigate the disadvantages suffered by the engineering industries through the want of a Whitley scheme—all this, of course, apart from the services rendered by the Society to its own members. We sincerely hope that the Engineering Employers' Federation will not assume a hostile attitude towards the S.T.E., which would not only be, we think, unjust, but also ill-advised.

Electrical Developments in Finland.

The Inimitable Imatra.

By THEODORE STEVENS, M.I.E.E.

"The most beautiful waterfall in Europe" is in the hands of the engineer, but lovers of Nature's beauties are not to be deprived of their enjoyment of Imatra for



Fig. 1.—The Rapids of Imatra, Half a Mile in Length.

many years, because the volume of water is so great that the whole plant that is to be installed (construction will occupy two years more) could be run at full load



Fig. 2.—The Wallinkoski Rapids.

during minimum flow with a surplus in the narrow river bed of two hundred tons per second. The drainage area is 23,000 square miles, and the run-off, equivalent in a

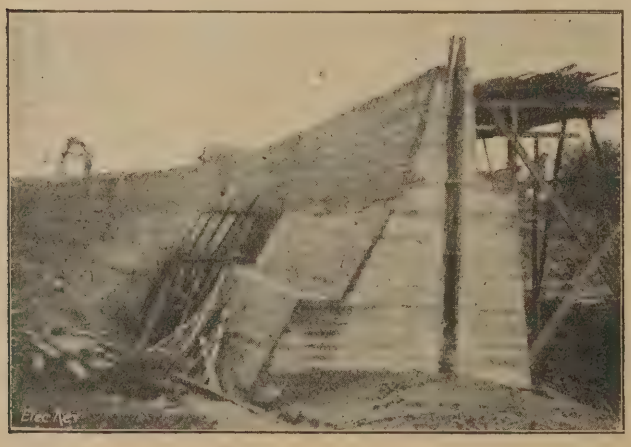


Fig. 3.—Incomplete West Wall of Head-race.

year to less than 12 inches of rainfall, does not vary more than 20 per cent. from the average of 20,000 cubic feet per second.

The River Wuoksi has ten consecutive rapids between Lake Saima and Lake Ladoga. Of three relatively small water-powers in existence, two will disappear when the level of the head-race water is raised.

If the time ever arrives when the whole flow is diverted from Imatra rapids, Wallinkoski, the next rapids south of Imatra, will be "the most beautiful in Europe."

To appreciate the reason for this moderate interference with scenic beauty, which Finlanders and everyone who visits it appreciate, the power situation throughout the country must be examined. In Finland there are hundreds of small water-power plants (30,000 h.p. total

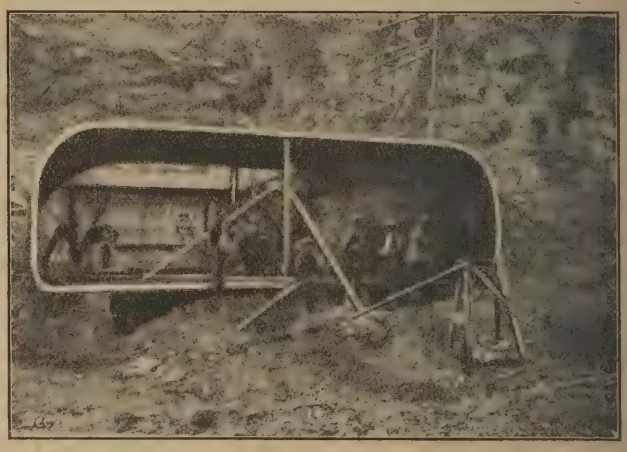


Fig. 4.—Discharge Outlet of First Set in place, Aug. 21st, 1925.

of less than 50 h.p. each), and 200,000 horse-power total in 165 plants, of over 50 h.p. and up to 16,000 kVA. In addition, there is a quarter million horse-power in various types of heat engines.

Many networks of transmission lines at voltages up to 70,000 V connect some of these 165 plants into groups, one having twelve plants interconnected. A careful examination of a large-scale map of these transmissions,



Fig. 5.—Excavation for Tail-race.

totalling 4,600 miles, reveals no point on any network more distant than 26 miles from a generating station.

A quarter of the area of Finland is comprised in four districts (*viz.*, Viborg, Nyland, Abo, and Tavastehus), where 60 per cent. of the total population live and where 90 (of the 165) plants are situated. From Imatra in the east to Abo on the west coast power from Imatra will be transmitted 240 miles at 110,000/120,000 volts and suitably interconnected with most of the existing networks in those four districts, supplementing their power. When this is complete, no plant on the network will be more than 30 miles from a generating station.

Finland's area is nearly 150,000 sq. miles; of this 17,000 sq. miles is covered by inland waters; 100,000 sq. miles by forests; 7,200 sq. miles are arable land (1910 census); and 3,700 sq. miles are under pasture. The population is nearly 3,500,000, and 224 kelvins are consumed per annum per head of population. Nearly

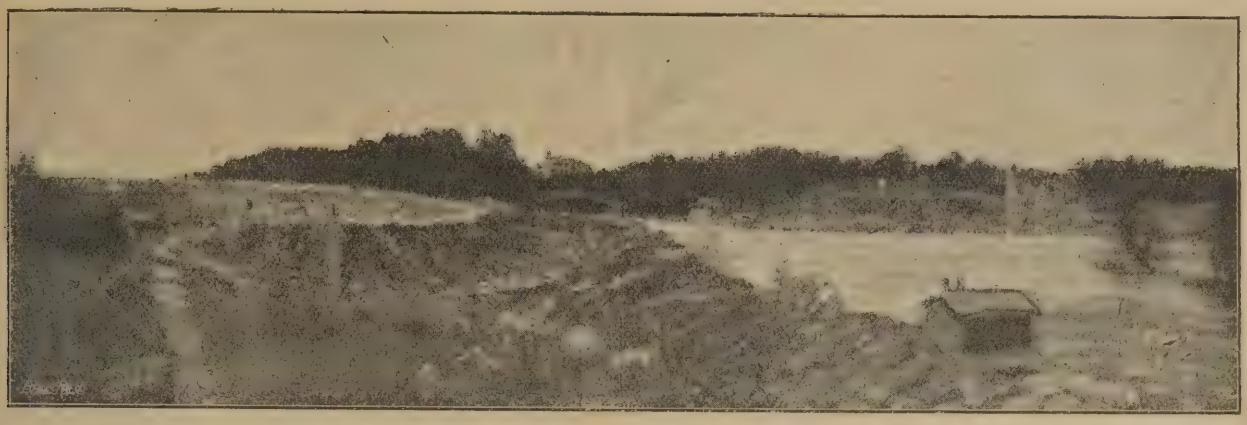


Fig. 6.—Wuoksi River at Normal Level; Head-race on Left, Showing Raised Level.

3,000 miles of railway and 20,000 miles of high road provide means of transport.

For comparison, the British Isles, with fourteen times the population on 81 per cent. of the (Finland's) area, consume 66 per cent. of the kelvins per annum per head that Finland consumes.

The Government decided in 1921 to develop part of the power of the Imatra rapids and to interconnect the new station with existing stations in the south of Finland. The diversion works at Imatra are straight in plan, nearly 300 ft. wide and 2,400 ft. long; 80 ft. head will be utilised. 800,000 cubic yards of earth and 300,000 cubic yards of rock must be moved. The works are estimated to cost £10 per installed horse-power at the present extraordinary rate of exchange of 193 marks to £1 (25 was the normal value). Sluice gate works are under construction, and when these are completed the river water will be passed through them whilst revolving gates are built over the present river bed. The power-house site is visible in fig. 5, and fig. 4 shows the outlet end of the first 27,000-h.p. set in its final position. Three sets of this size will be installed by 1928. The ultimate capacity of the site, which lends itself to storage, is about 250,000 h.p.

The existing low-head water-power plant at Linnankoski (fig. 7) will be submerged when the Imatra plant is completed, since it stands below the contemplated level in the new head race.

The following works of reference may be useful to the interested reader:—

Helsingfors: "Finland's Water Power and Electric Transmissions." Georg Christiernin. "Some Aspects of the Geography of Finland." Dr. Ragnar Numelin. "Water Power Resources of Finland." Dr. Edv. Blomqvist.



Fig. 7.—Linnankoski Power House, which will be Submerged.

London: "Lectures on Finland." Mrs. Aino Malmberg.

Electro-Farming.

Intensive Illumination on a Market Garden.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

Artificial lighting has been employed to hasten the growth of plants by different experimenters at intervals from the year 1775. At the Paris Exhibition of 1900 the writer had the opportunity of inspecting the effects of electric lighting on plants through glass of various colours and again in 1906 he was privileged to observe the experiments at Schenectady carried out by the late Dr. Steinmetz with mercury-vapour lamps. Until the last few years all work in connection with the artificial illumination of plants has been carried out with light of ordinary intensity. However, during the latter period, a considerable amount of research has been conducted in America with very intense illumination; in particular some very interesting work has been carried out by Dr. R. B. Harvey, of Minnesota, on the growth of plants entirely in artificial light. Many plants were grown from seed to seed, in the continuous light obtained from 200-watt and 1,000-watt nitrogen-filled Mazda lamps, used, of course, in conjunction with suitable reflectors. The same system has been applied more recently to the growing of grass on golf greens, which received world-wide publicity in the newspaper Press. As the results of these recent experiments seemed to show a great deal more promise than those performed with ordinary illumination in earlier days, the writer decided to carry out some work in this connection at East Grinstead, and obtained some very interesting results. 1,000-watt Mazda lamps and suitable reflectors, two feet in diameter, were used for this purpose. The lamps were placed three feet above the level of the tops of the pots which contained the plants under treatment. The tests were carried out on the ordinary plants which are usually to be found in greenhouses associated with a garden of fair size. In every case the progress of the plants was most remarkable. Daffodils and Lent lilies, when placed under the light for six hours a night, flowered in four days, growing about three-quarters of an inch a day. Narcissi flowered in seven days. In

each case, the plants were placed under the light when the buds were just beginning to form. The control plants placed away from the light took four weeks to flower. These experiments were carried out in rather an empirical manner, as the chief object was to obtain a general idea as to the value or otherwise of intensive illumination. From a scientific point of view they were entirely satisfactory, but the work would have been costly from the point of view of electricity consumption, if it had not been for the fact that the electricity supply on the writer's farm is generated by water power. By means of a self-winding automatic time switch, the lamps were switched on at midnight and off at six a.m., *i.e.*, the current was used for lighting the plants when not required for any other purpose. Further, the use of the time switch made certain as to the exact period during which the light was on.

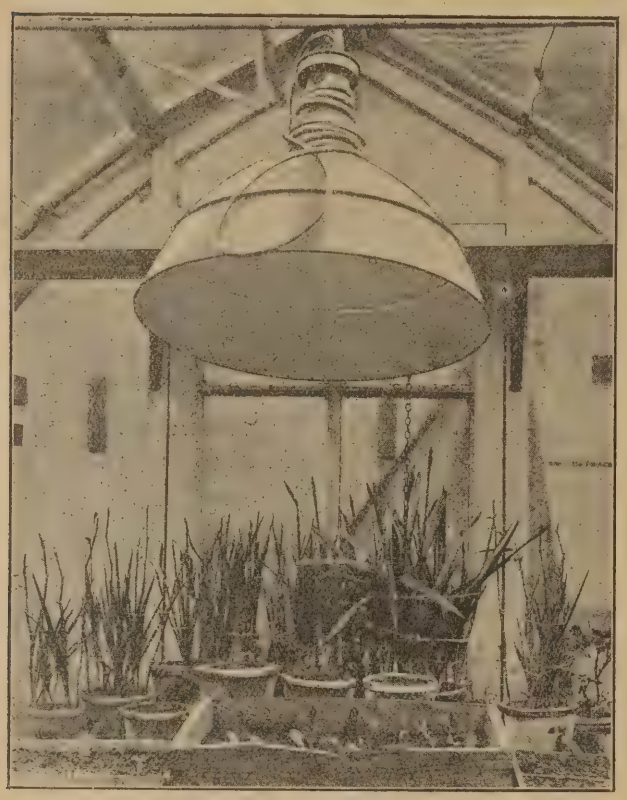


Fig. 1.—Reflector used for Illuminating Plants.



Fig. 2.—Four Days later—the effect of Artificial Illumination.

Since to obtain this very intensive illumination the lamps have to be placed so close to the plants, the number of plants that can be lighted at a time is necessarily very limited, which means that the cost per plant, even at one penny per unit, is very high, in fact, too high, except under special circumstances such as to enable a market gardener to get some plants forward for Christmas or Easter or other times when the public are prepared to pay extraordinarily high prices for them. For certain scientific purposes, such as seed breeding, cost is of small importance. In America, by this means, it has been possible to obtain four crops of wheat in one year and thus in that period it has been possible to establish the fixedness or otherwise of a new breed of seed, instead of having to wait four or five years. As is well known, in the breeding of new seeds, only time will prove whether a new variety will remain true to type or not; many excellent samples of seed revert to an inferior ancestral stock in the course of several generations, hence the very great importance of knowing whether the new variety is really a stable form.

In casting round to ascertain whether there might not possibly be some commercial advantages in electric lighting for market gardeners, other than for a special seasonal trade, the discovery was made by the writer that if the plants in greenhouses are given, in turn, one night's treatment, they make remarkable progress. In point of fact this progress is very much greater than the average per day if the plant were illuminated for a number of days. As one night's treatment improves the plants so much, it is well worth the while of an enterprising market gardener to treat all his plants in turn in this way. The practical method for carrying this out would be to suspend the lamps from an overhead runway of galvanised wire, so that each lamp can easily be moved into a fresh position for each night's treatment, as this would involve less labour than moving the plants to positions under fixed lamps.

The next commercial application discovered was in connection with the pricking out or transplanting of seedlings. Every gardener, amateur or otherwise, is fully aware how, on the day after the transplanting of seedlings, most of them fall over and wilt. Now it is well known that any check in the growth of either a plant or an animal when young has its effect ever after. The discovery was made, however, that when such seedlings were exposed to intensive illumination for one night, not only did they not wilt, but with one night's treatment they appeared to have put on a week's growth and to be exceptionally strong and healthy.

The illustrations, figs. 1 and 2, give an idea as to the type of reflector employed and its location in relation to the plants. It must be admitted by everyone that the two illustrations show a very striking difference as the result of four days' lighting.

In recommending this mode of lighting to market gardeners, the obvious course is to advise its application in conjunction with automatic time switches and the use of the light between midnight and six a.m.—at which time, undoubtedly, most of the electricity supply undertakings would be prepared to grant special rates. It is a matter of great interest to all associated with the electrical engineering and market gardening industries to find that there are excellent possibilities of commercially applying what has hitherto only been a scientific feat. True, the scientific work, so far, is still in its early stages and cannot by any means as yet be described as an exact science. To begin with, different varieties of plants seem to grow better under different intensities of illumination, thus there is scope for considerable economy in the application of the light. For the time being 1,000-watt gasfilled lamps, placed three feet above the plants, will give satisfactory results, but in many cases undoubtedly more light is being supplied than is necessary, yet, on the other hand, it is only just sufficient for many plants. Environment must always play its part, and the gardener must always be a man who is skilled in the culture of plants. For one thing, if care is not taken, some plants will become

too "leggy," *i.e.*, lengthen out too much, or else show effects of forcing.

In 1918 Dr. Steinmetz, in conjunction with Mr. J. L. R. Hayden, grew beans under five 500-watt, gas-filled lamps, placed three feet above the ground, and giving an intensity of illumination over the plants of 700 lumens per square foot of ground. The power consumption over the bed in the 44 days, during which these lamps were kept burning day and night, was 55 watts per square foot. They found that the rate of growth and development was nearly double that of a control plot which received only daylight.



Fig. 3.—Electrically-lighted Glass-houses.

Plants may be roughly classified from a light point of view as (*a*) those which respond to long days and therefore bloom in the summer time, and (*b*) plants which require only a short day (less than 12 hours) and therefore bloom early in the spring or late in the autumn. There is still another class (*c*) to which the length of day seems immaterial, and which therefore bloom all the year round.

It has always been assumed that ultra-violet rays were a most important factor in plant growth, hence many experimenters have employed mercury-vapour arc lamps. However, it is of interest to realise that the half-watt lamp, when used intensively, can produce better results, because, after all, a half-watt lamp is an article which can easily be obtained commercially on the market and is actually in stock in every town of any size. On the other hand, mercury-vapour lamps are very much more difficult to obtain and require greater care in handling. Further, it is doubtful whether many electrical contractors would even know where to place an order for one. Still the ultra-violet ray lamp may yet be found to have a field of its own.

There is quite an extensive bibliography on the treatment of plants by artificial light. Arrangements have been made to insert a list, in due course, in the new journal *Electro-Farming*. Hence much valuable information on the artificial illumination of plants is already available for those who desire to follow up the practical applications.

Another commercial use of electric light by the market gardener is for the prosaic task of cutting and picking blooms at the last minutes before dispatch, which often means after sunset. Fig. 3 shows a range of glass-houses which are so lighted. Incidentally, they are wired with Kaleeko, the junction boxes being made moisture-proof with the aid of Kalaloid composition. Damp, of course, is the bugbear of greenhouse wiring.

Electric heating does not at present seem to come within the range of practical politics for greenhouse work. It has, however, been used successfully under conditions where power can be obtained very cheaply. The writer recently had an opportunity of inspecting some greenhouses heated in this way. One of the very great difficulties that has to be contended with is the moistness of the atmosphere and considerable trouble is experienced with switches; in fact, it is wise to employ a totally-enclosed iron-clad switch for this purpose. One successful method of arranging the heating is to employ bare wires run around the greenhouses, so as to get an effective distribution. These heating wires are protected by galvanised sheds or inverted guttering, from the drops of water falling from the plants overhead.

When electric light is installed on a market garden other applications of electricity will naturally follow. The four most important uses will be (*a*) for the pumping of water to tanks for use in watering cans; (*b*) for automatic watering devices; (*c*) for distributing liquid manure; and (*d*) for spraying insecticides in powder and liquid forms. Then the electric vehicle for the transport of the crops to the railway station or wholesale market must not be overlooked. Many market gardeners have developed so far to-day that they already employ six-ton vehicles.

Another Wireless Exhibition.

A Review of the Novelties at the Horticultural Hall.

(*Concluded from page* 646.)

Amongst the loud-speakers displayed, the Western Electric "Kone" was demonstrated in the main hall with the aid of the "public address" system. It is a fine instrument, though the best results are obtained only when real power valves are used. A novel, if somewhat expensive, instrument is the "Statophone," which was shown by Messrs. C. F. Elwell, Ltd.

A New Loud-speaker.

Its action is described as electrostatic, the conventional magnetic system with its diaphragm or reed having given place to a very light metallised membrane; in fact, the speaker consists essentially of a condenser, one plate of which is a heavy casting, whilst the other is flexible and constitutes the diaphragm of the instrument. A varying potential applied across the plates sets up corresponding mechanical forces, causing the flexible plate to move. In practice, the diaphragm consists of a single lamina of mica of the order of 1 mil thickness and approximately 12 in. diameter, silvered on one side to render it conducting and clamped round its circumference between two heavy metal rings. The fixed plate is insulated from the clamping rings by ebonite insets, and is machined so as to approach the diaphragm to within a few mils. The associated receiving equipment consists of a detector followed by a resistance-capacity coupled amplifier terminating in a filter circuit which applies the signal potentials to the loud speaker. A constant potential is also applied directly across the loud-speaker plates by means of a high resistance connected between the constant potential side of the filter and the valve filaments. Tonal purity rather than noisy volume has been sought, and the "Statophone" speaker with its special receiver are mounted together in a cabinet measuring 20¼ by 15¾ by 8¾ in. One model employs a crystal detector and a 3-stage resistance amplifier, and the other is a 4-valve set with reaction in the aerial circuit.

Thermionic Valves.

The number of different types of thermionic valve suitable for reception purposes now obtainable in the British market is at least 90; the selection of the best for any one particular function is accordingly of considerable importance, and it might almost be said difficulty too. Much depends on the interpretation of the varied characteristics of the several types, the choice being limited by conclusions reached regarding cost,

battery power needed, and, as a rule, what may be considered undesirable mechanical or constructional features.

Amongst those seen at the show, the Fellows Magneto Co.'s "Louden" valves are remarkable for their low price; the bright emitters take 0.4 A at 4.5 V, and the dull emitters need only 0.1 A at from 4 to 6 V according to type, the anode voltage being from 40 to 80 in both cases. The valves exhibited by Cleartron Radio, Ltd., are of American design, but are now being made in a Birmingham factory. The "multi" valves shown by the Nelson Electric Co., Ltd., are interesting in that each has three filaments which can be brought into use one or two at a time as desired by a simple switch device incorporated in the cap, as indicated in fig. 5. The switch consists of two arms pivoted scissors-like on one of the valve legs. When one filament is desired, the arms should be brought together with the tips in contact with one of the three studs in the cap base. When it is to be used as a power valve and two filaments are required, the arms should be opened in the opposite direction, so that the tips come in contact with any two of the studs, thus paralleling two filaments. Two new types were recently introduced; one operates at 1.8 V and 0.35 A, and the other at 3 V and 0.06 A.



Fig. 5.—A 3-filament Valve.

The Stethophone.

Of the various sounds produced within the heart or lungs, the actual intensity is not in itself of fundamental significance; for example, certain serious organic lesions may make themselves evident only by faint murmurs. Hence it is of pathological importance that means should be available of hearing the



Fig. 6.—The "Stethophone."

slightest sounds above the more general noises, and the "Stethophone," which was demonstrated by the Western Electric Co., Ltd., is a precision apparatus designed to amplify just those faint murmurs which are of such vital importance. It consists of the following elements:—An electromagnetic transmitter, a three-stage amplifier with potentiometer control, a selected group of electrical filters, and a multiplicity of receivers for observers, of which, perhaps, the filters are the most interesting. Normally there are five; a high-pass 130-cycle filter, a low-pass 130-cycle, a low-pass 400-cycle, a low-pass 650-cycle, and a low-pass 1,100-cycle filter. The first two eliminate interfering noises, including sounds of the human voice. The 400-cycle filter is useful for observing presystolic and low-pitched systolic and diastolic murmurs. The 650-cycle is valuable for high-pitched murmurs and low-pitched rales, whilst the 1,100-cycle passes only the very high-pitched murmurs and rales. The valve amplifier is distortionless between the limits of observation, and of course the degree of magnification can be increased to any desired extent. The apparatus, which is shown in use in fig. 6, requires 6-volt and 130-volt batteries for its operation, and when mounted for use in hospitals resembles a tea-wagon in appearance. There are many applications for this remarkable instrument; for example, by the addition of a recording galvanometer, photographic reproductions of heart and chest sounds can be made and retained as permanent records.

The Audiometer.

Another exhibit of the Western Electric Co., Ltd., was a portable instrument suitable for use in delicate functional and diagnostic examinations by otologists; it may also be used to apply standard hearing tests for physical examination purposes, and measurements sufficient to form a picture accurately indicating the character and deficiencies of acuity can rapidly be taken. Such readings, when plotted with the zero line representing normal hearing, is called an "Audiograph."

The audiometer, fig. 7, is acoustically a generator of pure tones which may be varied both in pitch and intensity at the will of the operator. The oscillator has

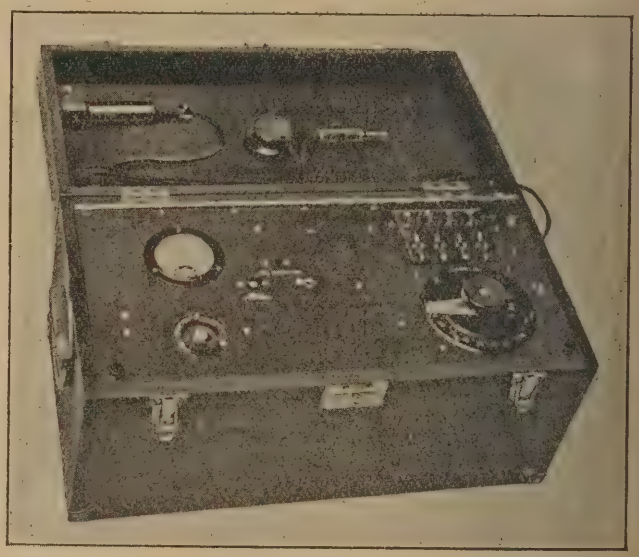


Fig. 7.—The Audiometer.

a frequency range which extends from 64 to 8,192 double vibrations or cycles per second. This range is divided into eight steps of frequency, 64, 128, 256, 512, 1,024, 2,048, 4,096, 8,192 cycles per second, and the desired steps are selected by the operator with keys that control the oscillator coils and condensers, and the circuits are arranged so that if two keys are thrown at one time, no oscillation is produced, thus preventing incorrect results. A "Wecovalve" is used in the oscillating circuit, while a volt-milliameter is provided to measure the filament current and the plate voltage, so that the power supply to the valve may be maintained at the proper value. The source of power for both the filament and plate of the valve is dry batteries. The attenuation potentiometer, which forms part of the audiometer, consists of a resistance network connected to a 24-point intensity control which serves to vary the output of the oscillator. The movement of the switch from one point to the next causes a change of five sensation units in the output; the sensation unit being approximately the smallest change in intensity perceptible to a person of normal hearing.

The Metering of Three-Phase Power.

The Effect of Abnormal Conditions on Single-phase and Polyphase Meters.

By GEORGE D. MALCOLM.

When considering the question of metering a three-phase power supply, it is always safe to assume that at some time or other conditions will arise which will destroy equality between the phases, even when an initial test proves the load to be perfectly balanced. One phase may become open-circuited due to a fuse blowing or to a faulty winding, and the motor may still continue to function on light loads, either with or without the knowledge of the consumer. I have known of three-phase motors running for quite long periods with one line fuse "blown," starting being effected by manual "assistance" at the belt. The fault would probably be rectified before the date of the next meter reading, but it is the consumption during the faulty period that has to be dealt with, and unless suitable means of integrating are provided, it is extremely difficult to compute this correctly. It is imperative, therefore, if accurate registration is desired, that equipment be installed capable of coping with abnormal conditions.

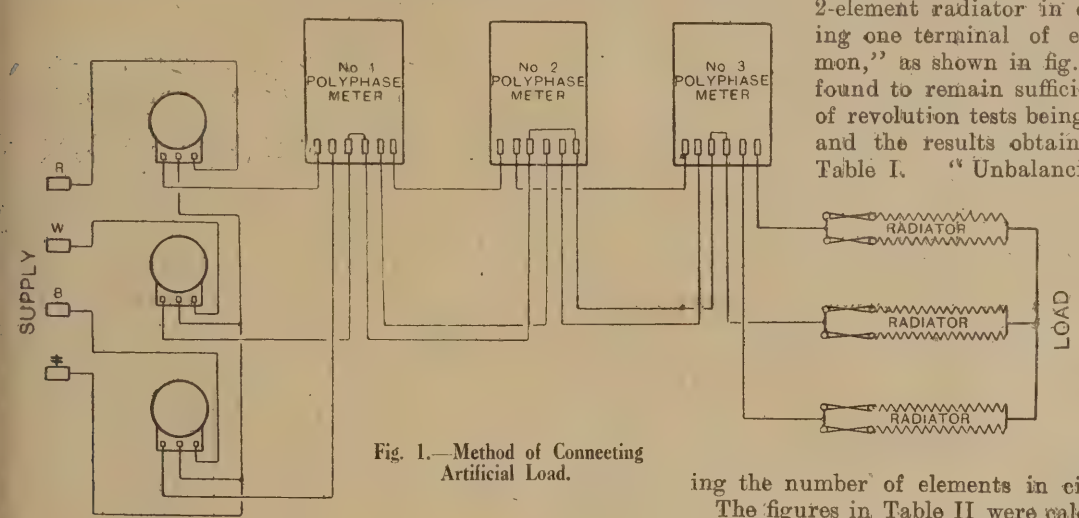


Fig. 1.—Method of Connecting Artificial Load.

With a view to acquiring data on this subject, experiments were made to ascertain what discrepancies could be expected under the following four systems of metering on a three-phase, 4-wire network:—

System No. 1.—One single-phase 240-V meter. Registration multiplied by 3.

System No. 2.—Two single-phase 240-V meters. Registrations added and result multiplied by 1.5.

System No. 3.—Three single-phase 240-V meters. Registrations added.

System No. 4.—One three-phase 3-wire 415-V meter. Direct reading.

The first series of tests was carried out for the purpose of demonstrating the relative performances of single-phase and polyphase meters on a star-connected, non-inductive, three-phase load under various conditions. An easily controlled and practically non-inductive artificial load was obtained by connecting one 2-element radiator in each phase and making one terminal of each radiator "common," as shown in fig. 1. The current was found to remain sufficiently steady to allow of revolution tests being taken on all meters, and the results obtained are tabulated in Table I. "Unbalancing" was effected by manipulation of the radiator switches, there being one switch per element. The precise condition under which each test was made can be gauged from column 2 (Table I), the figures indicating the number of elements in circuit on each phase.

The figures in Table II were calculated from Table I, and show clearly the difference in the number of units chargeable under the four systems. It will be readily seen that systems Nos. 1 and 2 are far from satisfactory under the extraordinary circumstances which sometimes arise. The red phase meter represented the service meter in system No. 1, and the red and blue phase meters provided the figures for system No. 2.

In the second series of tests the three radiators were substituted by a 2-h.p. three-phase motor, and, as this was running light, a highly inductive load was the result, especially when the unbalanced conditions were created. The load, however, was too unsteady to allow for revolution tests to be made, so dial tests were taken over a period of days, and the results obtained are set out in Table No. 3.

It will be noticed that under certain conditions one single-phase meter reverses, whilst another is speeded up, the total power being the algebraical sum of the three. Assuming that the meters register correctly in either direction, this does not matter much in the laboratory, but from a practical meter-reading point of view it is very unsatisfactory, as it is sometimes difficult to ascertain whether the difference in the readings is due to external influence, or to a defective meter. In any case, careful investigation *in situ* is called for, with the attendant loss of time and delay in the issue

TABLE I.

Relative Performances of Single and Polyphase Meters on a Star-connected Non-inductive Load.

Condition of load.	Radiator elements in circuit.			Load in watts.				Calculated meter watts.					
								Single phase.				Polyphase.	
	B	W	R	Blue.	White.	Red.	Total.	Blue.	White.	Red.	Total.	No. 1.	No. 2.
Balanced—full load	2	2	2	1,700	1,700	1,700	5,100	1,730	1,710	1,725	5,165	5,150	5,120
,, half load	1	1	1	860	860	850	2,570	866	866	864	2,596	2,580	2,640
Unbalanced—Red phase light	2	2	1	1,440	1,440	1,220	4,100	1,615	1,615	1,080	4,310	4,250	4,280
,, White ,, ,,	2	1	2	1,420	1,220	1,430	4,070	1,618	1,058	1,622	4,298	4,280	4,300
,, Blue ,, ,,	1	2	2	1,200	1,440	1,400	4,040	1,058	1,585	1,585	4,228	4,230	4,270
,, Red ,, heavy	1	1	2	1,100	1,100	940	3,140	994	978	1,300	3,262	3,320	3,270
,, White ,, ,,	1	2	1	1,100	960	1,110	3,170	968	1,300	982	3,250	3,210	3,210
,, Blue ,, ,,	2	1	1	940	1,140	1,120	3,200	1,300	955	968	3,223	3,250	3,200
Blue phase fuse drawn	—	2	2	—	1,260	1,250	2,510	—	1,285	1,300	2,585	2,520	2,570
White ,, ,, ,,	2	—	2	1,240	—	1,300	2,540	1,320	—	1,320	2,640	2,620	2,500
Red ,, ,, ,,	2	2	—	1,260	1,300	—	2,560	1,340	1,342	—	2,682	2,600	2,600
Blue phase winding open-circuited	—	2	2	—	1,260	1,260	2,520	—	1,340	1,365	2,705	2,475	2,540
White ,, ,, ,, ,,	2	—	2	1,240	—	1,280	2,520	1,340	—	1,342	2,682	2,580	2,560
Red ,, ,, ,, ,,	2	2	—	1,260	1,300	—	2,560	1,335	1,345	—	2,680	2,600	2,618

of accounts. If the duration and cause of the trouble cannot be found, the resultant estimated consumption is a matter for compromise between the undertaker and the consumer.

Table II.

Units chargeable to consumer in respect of three-phase supply to a non-inductive load under four systems of metering. Calculated from data in Table I and reduced to a percentage basis to facilitate comparison.

Condition of load.	True units.	System No.			
		1	2	3	4
Balanced—Full load	100	101	101	101	101
„ Half load	„	101	101	101	102
Unbalanced—Red phase light ...	„	79	99	105	104
„ White „ „ ...	„	120	120	106	105
„ Blue „ „ ...	„	118	98	105	105
„ Red „ heavy ...	„	128	113	107	108
„ White „ „ ...	„	93	93	103	102
„ Blue „ „ ...	„	91	106	101	101
Blue phase fuse drawn	„	156	78	103	102
White „ „	„	156	156	104	101
Red „ „	„	0	78	105	102
Blue phase winding open circuited	„	162	81	107	99
White „ „ „	„	159	159	106	102
Red „ „ „	„	0	78	104	102

they do, however, represent what occasionally occurs in practice, and one must be prepared to meet them.

It would appear, from the results obtained, that the only satisfactory means of doing so, as far as three-phase industrial power metering is concerned, is by the use of suitable three-phase, unbalanced load meters.

The question of capital outlay is often an important factor when deciding on the method of metering to be employed, and a comparison of the relative costs of instruments for the four systems under consideration may be interesting. Taking present-day "ring" prices for meters of 10-ampere capacity, and assuming the price of one single-phase meter to be unity, the comparative costs are as follows:—

System No. 1 ...	1
„ No. 2 ...	2
„ No. 3 ...	3
„ No. 4 ...	2.47

Having regard to the inaccuracies which may occur under systems 1 and 2, I think we may safely rule them out, and this leaves the choice between systems Nos. 3 and 4. Here the advantage lies with the latter, both as regards price and performance, as has been shown. The fact that there is only one reading dial on the polyphase meter is also a point much appreciated by consumers, and incidentally by the departments dealing with meter readings and accounts.

TABLE III.—Relative Performances of Single and Polyphase Meters on Inductive Power Load, 2-h.p. Motor Running Light.

Condition of load.	Units registered.							
	Single-phase meters.				Polyphase meters.			
	Blue.	White.	Red.	Total.	No. 1.	No. 2.	No. 3.	Average.
Unbalanced.—Blue phase light	8·4	− 9·4	16·6	15·6	15·8	16·6	13·7	15·4
„ White phase light	9·9	5·8	− 6·3	9·4	9·7	10·4	9·8	9·9
„ Red phase light	− 7·1	10·3	6	9·2	8·9	10·8	9·2	9·6
Blue phase fuse drawn	0	− 5·1	10	4·9	5·2	5·3	4·3	4·9
White phase fuse drawn	7·9	0	− 3·7	4·2	4·5	4·4	4·3	4·4
Red phase fuse drawn...	− 5·4	10·8	0	5·4	4·6	5·9	5·5	5·3

Table IV.

Units chargeable to consumer in respect of a three-phase power supply (inductive) under four systems of metering as in Table II.

Calculated from data in Table III and reduced to a percentage basis, assuming average of polyphase meters to be correct.

Condition of load.	System No.			
	1	2	3	4
Unbalanced.—Blue phase light ...	324	244	101	00
„ White „ ...	−191	55	95	100
„ Red „ ...	188	−17	96	100
Blue phase fuse drawn	610	310	100	100
White „ „	−250	143	95	100
Red „ „	0	− 53	102	100

Table IV is similar to Table II, but owing to the inductive nature of the load and the complications caused thereby, the differences are greater than in the case of the non-inductive load.

Many of the conditions produced were extreme, but

I have not included the use of two separate single-phase meters operating on the 2-wattmeter method, for here again arise the complications due to the reversal of one meter during periods of low power factor, and the uncertainty as to whether the difference between the readings of the two meters is due to this cause or to a defect in one of the meters. From the cost point of view there is little to be gained, as, owing to the shunt coils having to be wound for phase voltage instead of for the voltage between phase and neutral, the price per meter is higher. Using the same constant as before, the cost factor for two 10-ampere single-phase meters would be 2.46. When one considers the time spent in investigating the cause of unequal readings, in additional meter reading, additional records, and the like, the slightly higher cost of the polyphase meter is amply justified.

The writer desires to express his thanks to Mr. W. C. P. Tapper for his courtesy in permitting the publication of the test figures.

Electricity Supply in Great Britain.—IV.

Surrey and Sussex.

In the notes which accompanied the map of Kent and the map of Herts. it was pointed out that most of the *unshaded* area in those two counties was covered by the Acts of certain undertakers, but it should be noted that such is not the case in the map of Surrey and Sussex, which we reproduce this week. So far as we have been able to ascertain, no statutory powers for the supply of electricity are held, nor have any yet been applied for, in respect of the areas which are not hatched on the map on the opposite page.

In the list of undertakers concerned in the supply of electricity in Surrey and Sussex, given on p. 692, it is interesting to note that, including the Metropolitan Electric Supply Co., Ltd. (which has bulk supply powers in the Urban Districts of Egham and Chertsey and the Parish of Thorpe), there are 20 undertakers, marked by an asterisk, whose areas of supply are wholly or partly included in the London and Home Counties Electricity District.



Electricity Supply in the Counties of Surrey and Sussex.

Local Authorities.

*Barnes Urban District Council.
Bexhill Corporation.
Brighton Corporation.
Chichester Corporation.
*Croydon Corporation.
Eastbourne Corporation.
East Grinstead Urban District Council.
*Epsom Urban District Council.
*Guildford Corporation.
Hastings Corporation.
Horsham Urban District Council.
Hove Corporation.
*Kingston-upon-Thames Corporation.
Portsmouth Corporation.
*Reigate Corporation.
*Wimbledon Corporation.
Worthing Corporation.

Companies.

Aldershot Gas, Water & District Lighting Co.
*Ascot District Gas & Electricity Co.
Bognor Gas Light & Coke Co.
Burgess Hill & District Electric Supply Co., Ltd.
*Callender's Cable & Construction Co., Ltd.
*County of London Electric Supply Co., Ltd.
Crowborough District Gas & Electricity Co.
*Edmundson's Electricity Corporation, Ltd.
*Egham & Staines Electricity Co., Ltd.
Farnham Gas and Electricity Co.
Hayward's Heath & District Electric Supply Co., Ltd.
Hindhead & District Electric Light Co., Ltd.
*Leatherhead & District Electricity Co., Ltd.
Lewes & District Electric Supply Co., Ltd.
*Richmond (Surrey) Electric Light & Power Co., Ltd.
*Sevenoaks & District Electricity Co., Ltd.
Shoreham & District Electric Light & Power Co., Ltd.
*South Met. Electric Tramways & Lighting Co., Ltd.
Steyning Electric Light Co., Ltd.
Sussex Electricity Supply Co., Ltd.
*Twickenham & Teddington Electric Supply Co., Ltd.
Uckfield Gas & Electricity Co.
*Urban Electric Supply Co., Ltd.
Weald Electric Supply Co., Ltd.
*Woking Electric Supply Co., Ltd.
York Town & Blackwater Gas Co.

The following figures for the Administrative Counties of East Sussex, West Sussex, and Surrey, with the associated County Boroughs, have been obtained from the 1921 Census :—

Acres.	Persons.	Resident families.	Buildings not containing dwellings.
1,394,304	1,658,083	376,337	19,953

The map itself has been prepared by using the 1917 Boundary Commission maps (by permission of the Controller of H.M. Stationery Office). Since 1917 the following alterations have been made :—

(1) Part of the Parish of Trotton has been transferred to the Parish of Iping.

(2) The Borough and Parish of Guildford has been enlarged by the inclusion of part of the Parish of Artington.

(3) The County Borough of Brighton has been extended so as to include part of the Parish of Patcham, the added part being transferred to the Parish of Preston in Brighton County Borough.

(4) Part of the Parish of Farnham Rural has been transferred to the Urban District and Parish of Farnham.

(5) The boundary line between Croydon County Borough and Mitcham Urban District has been slightly amended.

(6) The Parish of Hollington Saint John has been merged into the Parish of Hastings, which is now coextensive with the County Borough of Hastings.

The Institution of Electrical Engineers.

Inaugural Address by R. A. CHATTOCK, President I.E.E. ***(Abstract).***

It is an illuminating fact that two chief engineers of large electricity supply undertakings have been selected during the past session and the present session to this high office, and I cannot help thinking that the intention underlying this was largely influenced by the fact that at the present time His Majesty's Government is interesting itself in the present position and the future of this particular section of the industry, and in consequence the subject is becoming one of great public interest.

The report of the Electricity Commission, embodying as it does such a vast amount of statistical matter in connection with the generation and supply of electrical energy in this country, is, in my opinion, a most valuable book of reference for supply engineers.

The general review embodied in the report is particularly valuable, including as it does average figures for the whole country. It is gratifying to know that the cost of production is coming down, and the cost to the consumer is being lessened. It is, I think, obvious that the improvement year by year has been materially assisted by the general policy of the Commissioners. The task that they are carrying out can only be regarded as colossal. One hears complaints that things are not moving fast enough, and that after six years only one Joint Authority has so far come into existence. In my opinion, far better and more lasting progress can be made by going slowly and thoroughly considering each step. I should like to suggest to the Commissioners in a spirit of friendly criticism that, when far-reaching and costly changes are contemplated, a free and frank discussion with the interests involved would be of far greater value to the commercial community than the production of a cut-and-dried proposal that has to stand antagonistic criticism, which might quite easily have been disarmed by reasonable compromise.

It seems to me that to compare the performance of steam-operated stations on a "pounds of coal per unit generated" basis only is rather misleading. What we are all aiming at is to produce and distribute electricity as cheaply as possible.

A station using fuel of a very poor calorific value at a low price per ton can produce electricity quite as cheaply as a station using high-priced fuel of high calorific value, although the fuel consumption per unit and the thermal efficiency of such a station may compare unfavourably with those of the station using the expensive fuel.

Again, if the distillation of coal proves to be a commercial possibility, from 30 to 70 per cent. more weight of coal will have to be handled to produce a given quantity of electricity, and whilst it may pay handsomely to adopt this process, the number of pounds of coal used per unit will of course compare very unfavourably with the figures obtained in a station burning coal to destruction.

I think, therefore, that a better method of comparison would be the cost, rather than the weight, of the fuel per unit generated, and this cost would have to take into account the sale of any by-products obtained in any process of distillation.

The selling price of these products depends on world-wide competition with products obtained from sources other than coal. It also depends on the demand for these products in the available markets. The gas industry at the present time is suffering very severely from its inability to dispose of the by-products at a remunerative figure. It is therefore very desirable to realise that if processes of this kind are adopted, a serious commercial risk will be run which may have an adverse effect on the selling price of electricity.

Boiler-house efficiencies of 90 per cent. can now be obtained, compared with 80 per cent. a few years ago. The difficulty of obtaining, for lining the furnaces, a refractory material that will stand up to the high temperatures without undue maintenance cost, has been solved by screening the furnace walls with water tubes which are coupled up to and form part of the boiler itself. The circulating system through these tubes is kept distinct from the main circulation through the boiler, and very high rates of evaporation—in some cases as much as 50 lb. per square foot of heating surface—are obtained from these tubes, apparently without any consequent disadvantages.

There are five great advantages in the use of pulverised fuel, as compared with boiler-house practice up to the present. These are :—

(1) Greater efficiency in operation.

(2) Greater capacity of individual boiler units—it being possible to install boilers each having a capacity of 300,000 lb. of steam per hour, with single combustion chambers.

(3) Greater reliability of the pulverised-fuel furnace, whilst the regulation of the temperature can be controlled with wonderful accuracy and consistency.

(4) The reduction in the cost of labour in operating such boilers is nothing less than extraordinary. One attendant can control the operation of a battery of boilers having a combined capacity of 1 million lb. of steam per hour.

(5) The efficient use of all classes of fuel. It is possible to use efficiently the poorest classes of fuel, which have hitherto been looked upon as refuse and cannot be burnt on mechanical stokers. Such a development will be of national importance, as it will make available for service the refuse heaps of old colliery workings which have been accumulating for many years.

It is evident that considerable economy, both in capital cost and in operation, can be looked for in the future.

We are now told that pulverisation has to be combined with low-temperature carbonisation in order to obtain a still further reduction in the cost of production. The proposal sounds more attractive than the ordinary low-temperature carbonisation process, as the resultant fuel is obtained in a pulverised form and can be sent direct to the boiler furnaces. The process, however, has yet to be demonstrated and proved before it can be accepted for general use.

In this country the load factor obtained in the majority of the undertakings is between 15 and 30 per cent. Those undertakings which have a higher load factor have the benefit of long-hour demand, such as is created by railway traction, colliery pumping, and similar loads. Experience in America also goes to show that a load factor of 45 to 50 per cent. can be obtained where these long-hour loads are available.

The statistics issued by the Electricity Commission show that only six undertakings in this country obtain a load factor exceeding 45 per cent. The combined load factor for the whole of Great Britain was of the order of 28 per cent. in 1922-23.

The reduction in load factor that has occurred during recent years has been due to three causes:—

(1) The bad condition of most manufacturing industries.
(2) The reduction in working hours.
(3) The phenomenal increase in the lighting connections in residential districts.

The reduction in working hours in factories has had the greatest effect in reducing the load factor, and if this is felt so severely on the capital charges of the supply undertakings, how much more must it be felt on the capital outlay of factories. One can only hope that, when trade does revive, it will be possible to run two or three shifts of men in the factories and so improve the serious position in which we are all placed at present.

The load factor of a residential lighting supply is approximately 10 per cent. It is obvious, therefore, that if this supply is increased to a relatively much greater extent than the power supply, it will have the effect of reducing the average load factor and increasing the cost of production. It is therefore incumbent upon supply engineers to do their utmost to foster the use of electricity for cooking and heating. The most telling way is to arrange an attractive tariff, and the one that seems to find most favour with the average householder is that under which the consumer pays per quarter a fixed sum, and a low charge per unit for every unit used in the house—whether for lighting, cooking or heating.

The suggestion that has been made in certain quarters, that the general load factor throughout the country can be improved by linking-up all the big centres of supply and by taking advantage of the better diversity factor so created, is in my opinion outside the realms of possibility. This proposal has been tried to a certain extent in America, and experience has shown that the peak load rises as fast as the output. The expansion of these large systems by means of heavy trunk lines running long distances has not had the effect of improving the load factor on the system; on the contrary, it is tending to decrease this as the area of supply grows larger.

In this country there is no evidence that the habits of the population vary as between one large industrial centre and another. The hours of work in the factories are approximately the same, and there is no reason for believing that the peak load in one district would occur at a substantially different time from that in another.

It does not therefore appear, from the point of view of improving the load factor, that there is any justification for incurring the enormous expenditure that would be necessary to link up all the big centres in the country with trunk mains of sufficient capacity to enable their effect to be felt in the operation of the generating stations.

(To be concluded.)

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The Western Electric's New Name.—The Western Electric Co., Ltd., of London, will from October 31st, 1925, be known as "Standard Telephones and Cables, Limited." The registered and executive office will remain at Connaught House, Aldwych, W.C.2. We have already published some particulars respecting the sale to the International Telephone and Telegraph Corporation of the International Western Electric Company, by the Western Electric Company Incorporated. Under this new ownership, the International Western Electric Company will in future be known as the International Standard Electric Corporation, and will continue to hold exclusive licences under the foreign patents of the Western Electric Company Incorporated in the telephone and telegraph field, and will also continue to act as the exclusive distributors outside of the United States, Canada, and Newfoundland, for all Western Electric manufactures. The change in ownership of the International Western Electric Company, with which the Western Electric Co., Ltd., of London, has been affiliated, will not involve any material changes in the organisation or in the broad policy that has always been followed by the latter company, unless such changes are of a progressive nature.

E.D.A. Activities.—The most recent publication of the British Electrical Development Association is an illustrated folder (E.D.A. No. 582) entitled "People Buy where the Light is Bright." This, as its title indicates, deals with shop lighting, and it contains a list of retail trade journals covering many industries in which a series of E.D.A. advertisements (reproduced in the pamphlet) will appear during the next few weeks. Among the various conferences, &c., for which the British Electrical Development Association and its staff will be responsible during the coming month is an event at Leighton Buzzard on November 24th. A town's meeting is being organised by the Leighton Buzzard Traders' Association, at which Mr. V. W. Dale will deal with "The Use of Electricity in the Home."

Patents in Turkey and Latvia.—The *Board of Trade Journal* reports that Turkey and Latvia have acceded to the Industrial Property Convention, and the provisions of Section 1 of the Patents and Designs Act, 1907, as amended by the Acts of 1914 and 1919 are accordingly in force as from August 10th last in the case of Latvia, and as from October 10th last in the case of Turkey.

A Radio Campaign.—In order to popularise "Sterling" and "Marconi" radio products, the Marconiphone Co., Ltd., are supplying to dealers a set of effective showcards, &c. "Marconi" valves are represented by a showcard, a lampshade, and a circular mirror. The Sterling "Mellovox" loud speaker is advertised by a stand-up cardboard cut-out of a lady conducting an orchestra, and other "Sterling" radio apparatus provides a subject for another ingenious cut-out.

Slide Rule for Wire Rope.—Messrs. Bruntons, of Musselburgh, have sent us a sample of an ingenious slide rule, which gives the essential particulars of the four types of steel wire rope that are most widely used; for each of these one setting of the slide gives the diameter and circumference, weight per yard, and guaranteed actual breaking strain of five qualities of wire. It is not a slide rule in the ordinary sense, having no logarithmic scales; the slide carries tabulated data, of which the appropriate items appear simultaneously at four windows in the cover—one set for each of the four types. The price is 2s. 6d.

Lamp Publicity.—Philips Lamps, Ltd., has produced a number of showcards and devices advertising its lamps, and is inserting advertisements in the leading newspapers and magazines. The company also offers to specially dress the shop windows of any members of the trade who request it to do so.

The Shannon Scheme.—It is reported that as the result of conferences between the Irish Free State Government and the National Executive of the Irish Labour Party a basis of negotiation has been found which should result in a satisfactory settlement of the dispute which is holding up the Shannon power scheme. The contractors for the scheme, Messrs. Siemens-Schuckert & Co., require 20,000 tons of coal, and have announced their intention of purchasing this in the best market—not necessarily Germany. They state that they have already placed large contracts with Irish firms, including orders for cement and other materials.

Merchandise Marks.—The Federation of British Industries has drawn the attention of the President of the Board of Trade to the increased importance of the matter of marking imported goods with their country of origin, in view of the support which members of the Government have given to the proposal that the British public should be encouraged to purchase British-made goods. It is considered that regulations can be devised which will be effective in providing means for the buyer to distinguish foreign from British goods, at the same time protecting all legitimate interests, such as the *entrepôt* trade.

The King's Roll.—Sir A. Steel-Maitland, the Minister of Labour, stated last week that it was the intention of the Government to pass a resolution through Parliament definitely instructing Government departments to place contracts only with firms whose names were on the King's Roll (for the employment of disabled ex-service men), in all but exceptional cases. Hitherto this principle has been informally adopted, but the Government's action will place the matter on a more definite basis.

Dublin Radio Exhibition.—An exhibition of radio apparatus, in which a number of the leading British firms are participating, is to be held in the Mansion House, Dublin, from November 11th to 14th.

Contractors Visit Cosmos Works.—On October 14th, a party of electrical contractors from the London area visited the Cosmos Lamp Works, Brimsdown, Middlesex, in connection with the "Cosmos" Lamp Campaign. After luncheon at Odone's Restaurant, Victoria, S.W.1, the party proceeded by char-a-banc to the lamp works of the Metropolitan-Vickers Electrical Co., Ltd., at Brimsdown, a very interesting tour of inspection of the lamp-making department, the heating and cooking department, and the radio valve department, being made. The return journey was broken in order to permit members of the party to see the company's London showrooms in High Holborn.

Trade Announcements.—New showroom premises at 37, Monson Road, Tunbridge Wells, have been opened by the County Wireless Services, Ltd.

Mr. J. Carman, electrical engineer and wireless expert, of Ramsgate, has opened a branch business at 4, Carlton Parade, Broadstairs.

The Marconiphone Co., Ltd., has opened a branch depôt at 16, Water Street, Liverpool, for the supply of wireless stores to West Lancashire, Cheshire and North Wales.

Mr. D. M. Mason, A.M.I.E.E., late chief assistant engineer at the factories of the Gramophone Company at Hayes, and for a number of years electrical superintendent at Croydon electricity works, has commenced business on his own account at Grafton House, Golden Square, London, W.1, as an electrical engineer and contractor specialising in industrial power plant and factory equipment.

Catalogues and Lists.—The Suffolk Iron Foundry (1920), Ltd., Gipping Works, Stowmarket.—A booklet dealing with oxy-acetylene welding with "super-silicon" rods.

The Siemens & English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, E.C.4.—An illustrated pamphlet containing details and prices of "Siemens-Xcel" domestic electrical appliances, including fires, cookers, vacuum cleaners, &c. Also a showcard in colours effectively advertising "Siemens-Xcel" electric fires.

The Engineering & Lighting Equipment Co., Ltd., Sphere Works, St. Albans, Herts.—Folders Nos. P1227 and 1228, dealing respectively with side-street lighting fittings and standard industrial reflectors.

The Wainwright Manufacturing Co., Ltd., 531, Forest Road, Walthamstow, E.17.—An illustrated and priced catalogue of radio components, including condensers, coil holders, crystal detectors, &c.

Messrs. Wootton & Co., Ltd., High Street, Ponder's End, Middlesex.—A mailing card giving dimensions and prices of wooden backboards and fittings.

Messrs. Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.1.—List No. P1061, containing particulars and prices of "Sunstar" shop-window lighting reflectors and fittings. Also Catalogue No. 559, containing full particulars of "Efescaphone" receiving sets and "Efesca" components. Illustrated and priced.

The Dominion Rubber Co., Ltd., 47-48, Farringdon Street, E.C.4.—A leaflet illustrating a "Matchless" conveyor belt 3,000 ft. in length and 36 in. wide.

The Sloan Electrical Co., Ltd., 8, 10, and 12, Golden Lane, E.C.1.—An illustrated price list of white porcelain insulators and ironwork, and a catalogue of electrical accessories, wires and cables.

The British Thomson-Houston Co., Ltd., Rugby.—Lists A.G. 188, describing "Fabroil A" gears; 4591-A, containing illustrated details of instrument transformers (up to 11,000 V); 5120-B, dealing with field rheostats for generators and motors; and 5,130, describing field discharge resistances.

Drake & Gorham Wholesale, Ltd., 67, Long Acre, W.C.2.—A very comprehensive catalogue (84 pp.) of radio apparatus of all makes, including complete sets, components, and accessories. Each item is illustrated and priced. Also a leaflet (No. 421), dealing with "A.D." Leclanché cells for radio purposes.

Industrial Combustion Engineers, Ltd., Astor House, Aldwych, W.C.2.—Catalogue Nos. 1 to 4, dealing with "Bailey" boiler meters of various patterns. These meters are installed at Manchester (Barton), Birmingham, the L.C.C. Tramways power station, and other important supply undertakings.

The Mullard Wireless Service Co., Ltd., Nightingale Lane, Balham, S.W.12.—A coloured showcard depicting a number of musical fairies and advertising "Mullard" radio valves.

Messrs. W. E. Beardsall & Co., Ltd., 5, Victoria Bridge, Manchester.—A folder illustrating "Winter" interlocking switch plugs. Priced.

The Carpax Co., Ltd., 312, Deansgate, Manchester.—A leaflet describing the "Jasper" screw-on connector for small wires, together with a sample of the device.

Messrs. Clough, Smith & Co., Ltd., 36, Victoria Street, S.W.1.—A well-illustrated brochure, describing the "Straker-Clough" trolley omnibus as supplied to home and foreign tramway authorities.

Brittain's Electric Motor Co., 110, Cannon Street, E.C.4.—A detailed catalogue of the company's a.c. motors of various types and ratings. Illustrated and priced.

Messrs. W. H. Willcox & Co., Ltd., 38, Southwark Street, S.E.1.—Booklets containing particulars of the company's motor lubricants and oils and greases.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A well-illustrated brochure describing the "Gecoray" system of shop-window lighting; a number of examples are depicted.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester.—Special Publication No. 7130/1, a price list of "M.-V." shop-window lighting equipment, including real silver reflectors.

The Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—A series of pamphlets giving details, illustrations, and prices of various "Igranic" radio components and accessories, including coils, transformers, rheostats, condensers, valve-holders, &c.

The Rockwood Co., Ltd., 147, Queen Victoria Street, E.C.4.—A priced folder, illustrating and describing a number of small tools for radio construction—reamers, panel cutters, pliers, wrenches, &c.

Messrs. E. P. Allam & Co., 107-109, Gray's Inn Road, W.C.1.—October stock list of d.c. motors ranging from 1 to 38 h.p.

The Midland Electric Manufacturing Co., Ltd., Barford Street, Birmingham.—A booklet entitled "Switches and Standards," showing new designs of "M.E.M." switches which conform to the requirements of the I.E.E. Rules and Home Office and the Board of Trade regulations, and are made in accordance with the conditions laid down by the British Engineering Standards Association.

Messrs. Ferranti, Ltd., Hollinwood, Lancs.—Pamphlet Ta 710, describing a short-circuit test on a 1,200-kVA, 5,500/440-V standard core-type, three-phase transformer.

Philips Lamps, Ltd., 60, Wilson Street, Finsbury Square, E.C.2.—A pamphlet advertising the "Philips" Christmas tree lighting outfits.

Bankruptcy Proceedings.—H. A. Van Os and M. H. Van Os, trading as Van Os & Company, merchants, 56, Holborn Viaduct, E.C.—These bankrupts applied on October 20th to Mr. Registrar Mellor, at the London Bankruptcy Court for an order of discharge from bankruptcy proceedings instituted last February. Mr. V. Armstrong, Official Receiver, reported that the ranking liabilities amounted to £4,798 and the assets had only realised £2, but a further small sum was anticipated from book debts. The bankrupts took over a business previously carried on by their father. They attributed their failure to depreciation in the value of stock, liability for differences owing to accounts being closed against them, and lack of capital. In November, 1923, they registered a company with a capital of £500 to carry on business as general merchants and manufacturers of electrical lamps and accessories; they became directors of the company; H. A. Van Os was allotted 300 shares and M. H. Van Os 187 shares, but they were subsequently transferred to another person, and the bankrupts held only the qualifying shares. They were in receipt of remuneration at the rate of £125 per annum each, and a commission of 1½ per cent. on the total sales of the company. The discharge was opposed by the Official Receiver on the grounds of (1) insufficiency of assets to equal 10s. in the £ on the amount of the liabilities; and (2) trading with knowledge of insolvency. His Honour granted a discharge subject to judgment for £100, to be satisfied by an immediate cash payment.

A. A. Carr and G. S. Childe, dealers in radio accessories, 38, Park Row, Leeds, and 38, Victoria Road, Scarborough.—The public examination of these debtors was held at the London Bankruptcy Court on October 21st, before Mr. Registrar Hope. The failure occurred last February with liabilities of £555, against assets valued at £51. Replying to Mr. Walter Boyle, Senior Official Receiver, the debtor Carr stated that prior to 1922 he carried on business at Leeds as a stockbroker, but closed down in that year and commenced as an agent for the sale of radio accessories. In 1923 he was joined in partnership by Childe, who paid £750 for a half-share in the business, and subsequently provided a further £250. In November, 1923, they sold their business to Carr & Childe, Ltd., each of them receiving 250 fully-paid £1 shares, and they acted as directors until May, 1924. The failure was attributed to the commission earned having been insufficient to meet overhead expenses, lack of capital, and loss of business in consequence of the non-delivery of goods ordered from manufacturers. The debtor Childe confirmed the evidence given by his partner. The examination was concluded.

W. C. Rhodes, trading as L. J. Palmer & Co., 141, Newspaper House, Corporation Street, Birmingham, electrical engineer and contractor.—The first meeting of creditors was held on October 19th at the Official Receiver's office, Birmingham. The statement of affairs showed a deficiency of £621. Debtor attributed his failure to bad trade and liability in respect of the debts of a partnership. In May, 1923, he entered into partnership with another as electrical engineers, the joint capital amounting to £130, of which one-half represented the value of the stock and trade effects of the partner; the balance was cash contributed by the debtor, while they each provided a further £50. In 1923 the business was removed to Corporation Street, and a year later the partnership was dissolved. A balance sheet then prepared showed a deficiency of nearly £278, and debtor agreed to take over the business, and discharge the liabilities with the exception of a debt of £50 due to his partner's mother. The case being a summary one was left with the Official Receiver as trustee of the estate.

W. K. M. Wilson, 1, Mount Street, Heanor, Derbyshire, electrician and radio apparatus dealer.—The adjourned public examination of this debtor was held recently at the Court House, Derby. It appeared that the debtor commenced business in February, 1922, with £100 borrowed capital. This

business only lasted about a month. He then commenced at his residence, 1, Mount Street, Heanor. Debtor was supplied with faulty goods by manufacturers, and in consequence of this and of competition trade fell off. His liabilities were £373 against assets of £17. Debtor admitted that he kept no books of account. The examination was closed.

S. Purcell, electrical contractor, The Arcade, Goole.—Receiving order made October 20th on debtor's own petition.

J. Kingston (Cromwell Engineering Works), electrical and general engineer, 176, Romsey Road, Shirley, Southampton.—First and final dividend of 3s. 8¾d. in the £, payable at the Official Receiver's office, Midland Bank Chambers, High Street, Southampton.

B. Uttley, electrician, Tower Street, Bacup.—Receiving order made October 14th, on debtor's own petition.

W. R. Squire, electrical engineer, 11, Steward Street, Spring Hill, Birmingham.—First meeting October 29th, at the Official Receiver's offices, 191, Corporation Street, Birmingham. Public examination, December 2nd, at the Court House, Birmingham.

S. B. Weston (Westforrest Radio Co.), wireless apparatus manufacturer, Playhouse Arcade, High Street, Guildford.—Trustee, Mr. T. Gourlay, Official Receiver, 29, Russell Square, W.C., released October 7th.

Company Liquidations.—H. W. Smith & Co., Ltd., electrical wire and cable manufacturers, Lydbrook, Gloucestershire.—The statutory first meetings of the creditors and shareholders of this company were held on October 19th at Carey Street, W.C. Mr. J. Barwick Thompson, Official Receiver, reported that the winding-up order was made on April 7th last upon the petition of the Attorney-General, acting on behalf of the Board of Inland Revenue, creditors claiming £47,978. The company was registered in 1912, as a private company, with a nominal capital of 5,000 ordinary shares of £1 each, and was formed to acquire as a going concern the business of electrical wire and cable manufacturers, previously carried on by H. W. Smith and F. W. T. Brain, since 1906. The vendors were the promoters and acted as first directors. Mr. Brain resigned office in March, 1913, and was succeeded in the following August by Mrs. Smith. Under the purchase agreement, the company acquired the goodwill and the assets (with the exception of book debts) for a consideration of £2,530, payable as to £2,000 in shares and £530 in cash, and in addition undertook to discharge the business liabilities, which amounted to £1,137. Mr. H. W. Smith was appointed managing director and secretary at a salary of £250 per annum, plus a bonus on the annual profits; his salary was afterwards increased to £1,000 and later to £2,000 per annum, but no record of any such increase was to be found in the minute book of the company. The issued capital was £3,200, of which £2,000 was allotted to the vendors as fully paid and £1,200 was subscribed by them for cash. During the war the company carried on a very substantial and profitable business. Small losses were made in the first three years, but the subsequent accounts showed profits of £1,494 in 1915, £32,290 in 1916, £33,979 in 1917, and £36,334 in 1918. No proper accounts were kept for 1919, but a draft account showed a loss of £5,063. The company had secured contracts to supply wire and cables to various Governments during the war, and that explained the large profits made in those years; those profits were apparently used to extend the business by providing special plant and machinery and to enlarge the factory. After the war a number of the contracts were cancelled and the business came practically to a standstill. Early in 1920 arrangements were made for a reconstruction of the company and for the provision of finance for the purpose of resuscitating the business during the post-war period. That was to be carried out with the assistance of S. Smith & Sons (Motor Accessories), Ltd. Arrangements were made for the registration of a new company entitled W. H. Smith & Company (1920), Ltd., and for this company to go into voluntary liquidation. Leave was given to register a company with the new title on condition that the old company should go into voluntary liquidation, but apparently no steps had been taken to carry this into effect. The new company was registered on June 10th, 1920, and its original capital of £60,000 was subsequently increased to £75,000. It undertook to acquire the old company's business as from January 1st, 1920, for a consideration of £25,000, payable in 20,000 10 per cent. cumulative preference and 5,000 ordinary shares of £1 each. The book debts of the old company were not taken over but were to be collected by the new company and the proceeds applied to payment of the liabilities of the old company, the new company also undertaking to pay any balances remaining on the old debts. Mr. H. W. Smith was appointed managing director of the new company for five years at a salary running from £1,000 to £1,250 per annum. S. Smith & Sons (Motor Accessories), Ltd., subscribed cash for 25,000 shares and arranged to finance the company by means of a bank overdraft to the extent of £50,000. It was intended that the Smith's Motor Accessories Company should take a considerable quantity of the new company's output, and for a time it did so, but owing to the depression in the motor trade during 1920-21, it experienced trade difficulties itself, and had to reduce its requirements accordingly. The new company appeared to have experienced difficulties from the commencement owing to trade depression and the business was carried on at a loss. In February, 1921, debentures for £50,000 were issued to the bankers to secure the overdraft, and in the following September a Receiver was appointed who took possession of the assets and had since carried on the business. At the date of the transfer to the new company the old company was stated to be liable to the Inland Revenue as follows: Income tax, £6,662; Excess Profits Duty, £39,594; and interest thereon £1,722, a total of £47,978. The company was dissolved on February 9th, 1923, by notice in the *London Gazette*, and was struck off the Register of Joint Stock Companies. In the following December, however, it was restored to the Register on the petition of the Board of Inland Revenue, and that body, through the Attorney-General, presented the petition upon which the order to wind up the company was made last April. The accounts filed under the liquidation showed unsecured creditors for £36,662 and preferential claims of £9,049, whilst the only assets disclosed were £20,000 preference and £5,000 ordinary shares of H. W. Smith & Co. (1920), Ltd., together with a claim against that company for damages for breach of contract in failing to discharge the liabilities of the old company. The Receiver of the 1920 company had informed the Official Receiver that he was about to effect a sale of its assets at a sum which would be insufficient to discharge the debenture issue. It followed that no value whatever could be placed on the shares in the new company or the claim against that body, and there was no prospect whatever of any dividend being paid to either the creditors or shareholders of this company. The failure was attributed by Mr. H. W. Smith to the inability of the 1920 company to discharge the liabilities of the old company owing to general trade depression and heavy depreciation in the value of the stock. Mr. H. T. Marsh, who was appointed secretary on August 23rd, 1920, for the purpose of protecting the interests of S. Smith & Sons (Motor Accessories), Ltd., had expressed the opinion that the company spent much in excess of the large profits earned during the war period, in adding to the buildings, plant and machinery; that expenditure left no funds available with which to secure trade to remuneratively employ the plant and machinery. In the absence of a quorum the meetings were formally adjourned for a week, and the chairman intimated that the liquidation would then doubtless be left in the hands of the Official Receiver.

Morch Bros., Ltd., manufacturers of radio sets and accessories, 35, Tresham Avenue, Clapton, E.5.—The first meetings of the creditors and shareholders were held on October 22nd, at Carey Street, W.C. The winding up order was made last June upon a creditor's petition, and accounts have been submitted showing a total indebtedness of £1,323 and assets valued at £532, leaving a deficiency of £1,790 with regard to contributories, the issued capital being £1,000. Mr. E. T. A. Phillips, Official Receiver, reported that the company was promoted as a private company in December, 1924, with a nominal capital of £1,000, the promoter being Mr. J. J. Morch, who was appointed managing director at a salary of £400 per annum. The promoter and his brother had carried on business as motor engineers, and in the autumn of 1923 they commenced to manufacture wireless sets and accessories, for which purpose they installed the necessary plant. They were handicapped by lack of capital, and borrowed £350 on the understanding that a company should be formed and debentures created to secure the advances. The purchase consideration for the business was agreed at £2,525, payable as to £156 in cash, £1,000 in shares, and the balance by discharging the existing liabilities. The debentures, however, were not issued until March 9th, 1925, which date was within three months of the commencement of the liquidation, and as they were for a past consideration, the bonds were invalid. The chief business of the company was the manufacture of wireless sets and accessories for wholesalers and retailers; a contract was obtained for the supply of about £800 worth of such goods, but after about £300 worth had been supplied, the buyers refused to take delivery of the remainder and that caused a loss to the company. Execution having been levied in May, 1925, in respect of rates, the debenture holders appointed Mr. C. T. Payne as receiver on their behalf and liquidation proceedings followed. The failure was attributed by the company's officials to trade depression, and the illness of the managing director, but, in the opinion of the Official Receiver, the failure was due to the lack of working capital. Upon the making of the winding up order, the Official Receiver, on giving an undertaking to satisfy the execution debt, took possession of the assets and disposed of them by public auction, the sale realising £244 gross. The creditors passed a resolution for Mr. C. Latham, 70, New Oxford Street, W., to act as liquidator, but the shareholders declared in favour of the Official Receiver remaining in office and the chairman announced that the appointment would be made by the Registrar in due course.

Carter & Mitchell, Ltd., wholesale electrical and wireless suppliers, 24, Allsop Street, Upper Baker Street, N.W.—A meeting of creditors was held on October 22nd, at the offices of Mr. C. Latham, accountant to the Wireless & Radio Trades Guardian Association, 78, New Oxford Street, W. The chair was occupied by Mr. Latham, who said that when the creditors previously met it was reported that the liabilities were £1,236 against net assets of £406, leaving a deficiency of £829. The company was formed in July, 1923, with a nominal capital of £2,000, of which £1,000 had been issued. The creditors decided that Mr. Latham should be appointed as joint liquidator, and the shareholders had since passed a resolution appointing him to act as sole liquidator, as the gentleman originally appointed intimated that he wished to retire. Mr. Latham stated that there was a balance at the bank of only 3s., whilst the fixtures and fittings were estimated to realise £5. There were also book debts valued at £60; doubtful and bad debts, £25; and stock £5. The total assets were £95, from which had to be deducted £74. The Chairman added that there were cer-

tain other assets which were claimed by third persons, but their claims had not been admitted by him. With regard to the liabilities, the amount due to the trade was £816, and in addition there was a contingent liability for alleged breach of contract with a German company. That contingent liability was put down at £7,647. Unless anything unforeseen happened it was unlikely that the creditors would receive any dividend. The voluntary liquidation of the company is to be continued.

International Wireless Manufacturers, Ltd.—A petition for the winding up of this company has been presented to the High Court by Marconi's Wireless Telegraph Co., Ltd., of Marconi House, Strand, W.C., creditors, and will be heard in London on November 3rd.

Union Electric Welding Co., Ltd.—Winding up voluntarily. Meeting of creditors November 2nd, at 9, Billiter Square, E.C. Particulars of claims to the Liquidator, Mr. L. O. Huggins, 81, Cannon Street, E.C., by November 23rd.

Tredegars, Ltd. (old company).—A meeting of members is called for November 24th at the offices of Messrs. Tansley Witt and Co., 5, Chancery Lane, W.C., to hear an account of the winding up from the joint Liquidators, Messrs. N. Bell and B. B. McCallum.

Dissolutions of Partnership.—Midland Electric Co., electrical factors, 1, Charles Street, Leicester.—Mrs. J. A. Young, and Mr. F. A. Dunmore have dissolved partnership. Mrs. Young will attend to debts.

Hall & Heptonstall, motor and electrical engineers, Somerset Hotel Yard, and 13, Station Parade, Harrogate.—Mr. W. T. Heptonstall and Mr. W. R. Smith have dissolved partnership. Mr. Heptonstall will attend to debts and continue the business under the same style.

Onslow Engineering Co. (Williams & Robertson), mechanical and electrical engineers, 177, Fulham Road, South Kensington, S.W.—Mr. A. W. Williams and Mr. D. W. Robertson have dissolved partnership. Mr. Williams will attend to debts and continue the business under the style of Onslow Engineering Co. (A. W. Williams).

Empire Goods Propaganda by Tramcar.—During the recent Shopping Week at Walsall, the Corporation Tramway Department fitted up one of its cars to encourage the inhabi-



An Illuminated Tramcar at Walsall.

tants to buy Empire products. This car was particularly attractive at night, as the accompanying illustration shows.

Licensing Indian Electrical Contractors.—An amendment to the rules promulgated by the Government of Bombay for the licensing of wiremen and electrical contractors provides that a register of all electrical contractors and wiremen shall be maintained by the Electrical Engineer to the Government. The licences and certificates shall be renewable annually, failure to renew them will render them liable to cancellation, and the full fee for a fresh licence or certificate will be charged. The fee for such renewals shall be: Licence as electrical contractor, Rs. 10 per annum; Class I certificate of competency, Rs. 5 per annum; and Class II certificate of competency, Re. 1 per annum.

Licensing Contractors in New South Wales.—The *Sydney Evening News* reported recently that regulations for the licensing of electrical contractors as redrafted, had been forwarded to the Government. The proposal was that licences should be issued as from October 1st, and should remain in force for 12 months. On and after November 1st it will be illegal for any person to undertake electrical installation unless he is the holder of a licence or is employed by the holder of a licence who has contracted to carry out the work. Provided no further delay occurs on the part of the Government in gazetting the regulations, the Act should be in complete operation by November 1st.

Polish Contract for Czecho-Slovakia. — The Ceskomoravska-Kolben Co., of Prague, has recently secured a contract for the establishment of an electric power station in the town of Przemysl.

Swedish Apparatus Exports.—The *Swedish Economic Review* states that the exports of telegraph and telephone apparatus from Sweden during the period January-August, 1925, were valued at 4,475,000 kr., as compared with 4,809,000 kr. in the equivalent period of 1924.

Book Notices.—"The Confessions of a Capitalist," by Sir E. J. P. Benn, Bart. London: Hutchinson & Co. 18s. net. —We confess to a difficulty in writing about this book for there are so many things that we might say, if we had the space to spare, concerning both the author himself and what he says about himself. We began by wondering why it was written and what justification there could be for a comparatively young man in the midst of life's activities sitting down to write about so many trifles connected with his own unbringing, his schemes, failures, and successes. One recovers from this as one passes on through its very easily read chapters and gets accustomed to the free use of the first person singular. Really it is the kind of story that ten thousand other business men might have written about the difficulties of doing business nowadays, for we have all been in the same boat since the war. Those most likely to be interested in the parts of the book dealing with his business in trade journals, his few successes and his many losses, are trade journalists and newspaper proprietors who have walked contemporaneously with the author, since his father (upon whom the baronetcy was conferred toward the end of his life, for much public service), initiated him into this department of activity. How far the general reader is interested in such matters we do not pretend to know, but there is much that is entertaining and informative relating to the science and conduct of business and to the way in which private enterprise is penalised and throttled and trade and employment are hampered by the conditions which prevail to-day. That part of the story, and especially the account of some of the disastrous effects of heavy taxation, is well told and should be widely read. It tells of many things that the great majority of the people know nothing about, and it tells them in a straightforward and interesting way. But many of those who ought to read these things cannot afford the price of the book—not being capitalists themselves. Editors are sometimes asked to advise their readers candidly whether a certain book is one to buy or one to borrow. Those who are in a position to borrow will not need any guidance; others will probably buy it and then pass it on, pleasing the author by giving the widest circulation possible to his story.

The Autumn List of books published by Sir Isaac Pitman and Sons, Ltd., contains many titles, with brief descriptions, of books dealing with a wide variety of electrical subjects.

"The Activities of Vickers, Ltd.," is the title of a brochure published by the company named to inform the public of its many important works. Among the activities dealt with are the production of ordnance, the building of battleships and aeroplanes, the construction of motor bodies, gas engines, condensers, &c. The illustrations are numerous and effective.

"Tables and Graphs for Facilitating the Computation of Spectral Energy Distribution by Planck's Formula" (seven sheets, five charts).—Bureau of Standards. Washington: Government Printing Office. 35 cents.

"Science Abstracts A and B." Vol. XXVIII. Part 10. October 25th, 1925.—London: E. & F. N. Spon, Ltd. Price 3s. each.

German Radio Enterprise in Turkey.—The *Financial News* reports the formation of the Elektro-Radio Société Anonyme Turque in Constantinople, with a capital of £T300,000, to undertake the manufacture of electrical instruments, &c., and to carry on broadcasting and radio-telegraphy. German capital and enterprise have taken a large participation in the new concern, among the firms represented being the Siemens-Schuckertwerke, Siemens & Halske, the Telefunken Co., and the Dr. Eric F. Huth Gesellschaft.

New German Customs Tariff.—With the issue of the *Board of Trade Journal* dated October 15th was published a complete translation of the new German Customs tariff which was put into force on October 1st. The publication can be obtained from the Stationery Office at 6d. net.

New Australian Company.—Among the recently-formed Australian companies is Condor Lamp (Australasia), Ltd., with a capital of £25,000.

Hungarian Electrical Exports. — During the second quarter of the current year 8,224 quintals of electrical goods and apparatus was exported from Hungary. The principal customers were Italy (1,490 quintals) and Jugo-Slavia (1,152 quintals); the British share was too small for separate classification. Over half of the total was represented by machinery (generators, transformers, &c.).

Norwegian Transformers for Australia.—According to *Commerce Reports* the Norwegian A/S National Industri recently secured a contract for the supply of approximately 300,000 crowns' worth of transformers to Australia.

The Finnish Electrical Market.—*Commerce Reports* says that, generally speaking, Finland holds considerable promise of future development as a market for electrical wiring material, but its growth will necessarily be slow. The price factor in a country where money is comparatively scarce and the market limited is usually the deciding one. The material at present employed is predominantly of German make or at least of German design.

British Tenders for Budapest Scheme.—According to the Budapest newspapers, tenders for the supply of electric power for the city of Budapest have been received, not only from the Dutch-American group, but also from the Armstrong and Vickers groups. All these groups, it is added, declare their readiness to take over the foreign debts of the city of Budapest and promise reductions in the charges for the supply of power varying from 20 to 40 per cent. of the present rates.—*Reuter* (Budapest).

Proposed Russian Purchases Abroad.—The Supreme Council of National Economy of the United Soviet Socialist Republics announces that it is sending abroad, especially to Germany, France, England, and America, twelve commissions, representing various branches of industry, such as the electro-technical, oil and metal sections, invested with extensive powers to purchase equipment for the industries concerned, to a total amount of 270,000,000 roubles, subject to credit being granted up to three years.—*Reuter* (Moscow).

New Western Electric Showroom.—The Western Electric Co., Ltd., has recently opened a new showroom at Livery Street, Birmingham. The accompanying reproductions of photographs show the room to be well laid out, and the exhibits to be very representative of the company's products. Fig. 1 is a view of the section devoted to domestic electrical equipment, the principal objects being a vacuum cleaner, a washing machine, and an ironer, while a number of table

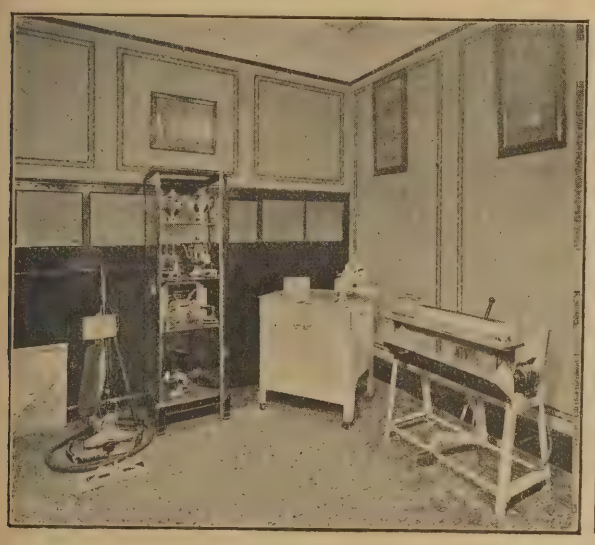


Fig. 1.—The Domestic Section.

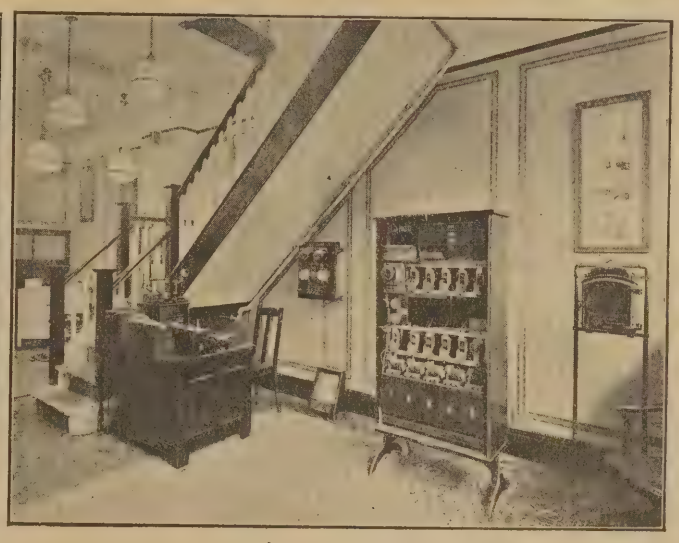


Fig. 2.—The Telephone Section.

Western Electric Showroom at Birmingham.

appliances and other electrical devices are housed in a show-case. The other view (fig. 2) is of the telephone section. This contains a great deal of intercommunication equipment, as well as radio-telephone sets and accessories, including "Igranic" devices. The new showroom is under the control of Mr. J. Entwistle, the company's Birmingham manager.

Argentine Crane Contract.—A contract for 129 electric cranes for the new harbour in Buenos Aires is reported to have been secured by a German firm at a price which was lower than the offers made by other German firms, and from 10 to 15 per cent. lower than the tender prices of English and American competitors.

Belgian Enterprise in Turkey. — Under the title of the Société Turque de Gaz et d'Electricité à Constantinople, a company has been formed in Brussels under the auspices of the Empain group to resume the gas concession in Stamboul and the gas and electricity concessions on the Asiatic side of Constantinople, as well as to undertake the establishment and working of other industrial undertakings in Turkey. The company whose statutes have been approved by presidential decree of the Government of Turkey, has an initial capital of £T1,000,000. Belgian electrical and financial companies are among the chief subscribers of the capital.

American General Electric Progress.—The president of the General Electric Co. (United States) recently announced that the value of the orders received by his company during the third quarter of the current year was $73,561,483—an increase of 26 per cent. when compared with the September quarter of 1924. For the first nine months of the year the total value of orders has been $223,876,711—an increase of 10 per cent. over the figure for January-September, 1924.

French Lamp Propaganda.—Ten French manufacturers of electric lamps have recently embarked on a joint publicity campaign urging the French public to "support French industry by buying only electric lamps which are really French."

New French Companies.—A new company has lately been formed at Wolfisheim, Lower Rhine Province, with a capital of 1,200,000 fr., and the title Le Société "Meti," Fabrique de Matériel Electrique, Téléphonique et Industriel.

La Société de Distribution Rurale d'Energie Electrique is the name of a new company which has lately been organised at Ruffec (Charente) with a capital of 350,000 fr.

The Embargo on Foreign Loans.—The Federation of British Industries has made representations to the Governor of the Court of the Bank of England urging upon him some relaxation in the present attitude of the Bank with regard to foreign loans issued in this country. At the present moment the policy of the Bank is said to constitute a virtual embargo upon such loans and to have a consequent adverse effect upon our export trade. In the past the large annual investment of British capital in oversea countries has played an important part in supporting and developing export trade. It is suggested that if the Bank of England cannot completely abandon the present embargo it should at least permit a partial relaxation in respect of loans of such a character that their proceeds would largely or wholly be expended immediately in this country in the purchase of British goods.

Unemployment.—There was a further decrease of 20,925 in the total of registered unemployed during the week ended October 19th, the number at that date being 1,237,900. This compares with about 1,204,000 at the equivalent period of last year.

Employment During September.—The October *Ministry of Labour Gazette* states that employment in the engineering industry during September continued bad on the whole, the general figure of unemployment being 11.6 per cent., a decrease of 0.2 per cent. as compared with August and 1.9 per cent. in comparison with September, 1924. In the electrical branch employment remained fairly good, the unemployment percentage being 5.7, a decrease of 0.2 per cent. as compared with August, although it was higher by 0.5 per cent. than in September, 1924. There were also slight decreases in unemployment in the electrical wiring and contracting industry and in electrical cable, wire and lamp manufacture.

New Municipal Showrooms and Offices.—The new Southport electricity showrooms at the Glaciarium, Lord Street, were recently opened. The administrative offices and showrooms are on the street frontage; the first and second floors are occupied entirely by offices for the technical and clerical staffs and a large room which is to be used as a lecture hall for the demonstration of electric cooking, washing, ironing and vacuum cleaning. This room is fitted with a large platform at one end, and is set out as a model kitchen. The body of the lecture hill is fitted with tip-up seats for about 50 persons, although the room will comfortably accommodate 100 persons at any one time. As in the showrooms, the whole of the ceiling is fitted with special adaptors for the easy fixing of all classes of lighting fittings. The skirting boards round the room have been fitted with numerous sockets for supplying current to all classes of electric appliances which are exhibited and demonstrated in this room. Appliances bought from the showrooms and valued at £3 or over can be obtained on the hire-purchase system. In the windows the latest systems of concealed lighting are employed. The showrooms include a model electrically-equipped house. The kitchen contains electric ovens, complete with grills and boiling plates. There is also a thermostatically controlled heating cistern over the sink. In the dining room there is a "Magicoal" electrical fire. In this room are displayed the latest styles of illumination, toasters, plate warmers and tea infusers.

The Electricity Committee of the Paisley Town Council is to erect buildings in Moss Street at a cost of £5,500 for electricity offices, a showroom, and meter shop.

New Belgian Company.—La Société d'Electricité de la Région de Malmedy is the name of a new company which has lately been formed in Brussels with a capital of 40 million francs.

New Swiss Company.—A new company has lately been formed at Lessoc, Canton of Fribourg, with the title Le Société Electro-Métallurgique Procédés R. Neveu, to acquire and exploit the Neveu electro-metallurgical patents.

For Sale.—By direction of the Air Ministry, Messrs. Horne & Co. will sell by auction on November 9th and the following days, at the Air Ministry Works and Buildings Stores Depôt, Watford, machinery, machine tools, generating and wireless plant and stores. Rawtenstall Corporation electricity department has for disposal surplus generating plant, &c. (See our advertisement pages to-day.)

Local Exhibitions.—An exhibition promoted by Paisley Corporation Electricity Department, in conjunction with local electrical contractors, was formally opened at the Town Hall, Paisley, on October 20th. This was the third venture of its kind to be held in the town. The Electricity Committee organised the display, and the following companies exhibited: The General Electric Co., Ltd.; Metro-Vick Supplies, Ltd.; Messrs. Kennedy, Stark & Co.; and Messrs. J. Kilpatrick and Son, Ltd.

Leeds.—A "Better Homes" Exhibition, organised by the *Leeds Mercury*, was held last week at the Fenton Street Drill Hall, Leeds. It included electric labour-saving appliances for domestic use. The exhibition was opened by the Lord Mayor and Lady Mayoress of Leeds, and there were some 60 exhibitors.

Wakefield.—Under the auspices of the Wakefield Corporation Electricity Department, an all-electrical exhibition, open to the public free, was held at the Bank Street Drill Hall, from October 19th to 24th. The exhibition was opened by the Mayor, and included the most modern applications of electricity for heating and cooking, with working examples of domestic appliances, especially washing, ironing and sewing machines. Electric cooking demonstrations were given daily, and for the benefit of local textile traders an electrically-driven "Dobcross" loom was running. The exhibitors were the Wakefield Corporation; the British Electric Transformer Co., Ltd.; the English Electric Co., Ltd.; Credenda Conduits, Ltd.; J. E. Fowler, Wakefield; the Hotpoint Electrical Appliances Co., Ltd.; the Hurley Machine Co.; Hutchinson, Hollingworth & Co., Ltd.; the Jackson Electric Stove Co., Ltd.; Walter Robb, Ltd., Wakefield; the Siemens & English Electric Lamp Co., Ltd.; and Singer's Sewing Machine Co., Ltd. Loan apparatus on the Corporation stand included appliances from W. E. Beardsall & Co., Ltd., Berry's Electric, Ltd., the Electrical Apparatus Co., Ltd., the English Electric Co., Ltd., Geo. Nobbs, Ltd., the Morgan Crucible Co., Ltd., Premier Electric Heaters, Ltd., and Young, Osmond & Young, Ltd.

New Austrian Company.—It is reported from Vienna that a new company is being organised under the name of the British-Austrian Metal Corporation, Ltd., to supply an Austrian syndicate with copper and to engage in the sale of cables, copper wire, &c.

German Foreign Electrical Loan.—The Berlin Stadtische Elekrizitatswerke Gesellschaft is reported to have arranged a 7 per cent. loan of £1,200,000 with a Swiss-Dutch syndicate to enable it to carry out further extensions. The interest on the loan, which is to run for a period of fifteen years, is being guaranteed by the Berlin Municipal Council.

Radio Transformer Price Reduction.—The Marconiphone Co., Ltd., informs us that it intends to reduce the prices of its "Ideal" radio transformers on November 1st.

The German Porcelain Insulator Industry.—According to a report just to hand, German manufacturers of porcelain for high-pressure insulation purposes are at present busily employed both on home and foreign orders. It is stated that several concerns now require long periods for delivery, while prices are stated to be satisfactory. On the other hand, makers of similar material for low-pressure insulation purposes are suffering from severe price competition. This is due partly to Czecho-Slovakian competition and partly to the fact that during the period of money inflation, the productive capacity was increased to an abnormal extent.

Lighting and Power Notes.

Aberdeen.—Year's Working.—The report on the working of the City Council's electricity undertaking (engineer: Mr. J. A. Bell) for the year ended July 31st last records a total income of £198,502, as compared with £187,874 in the preceding year. Operating expenses increased from £95,048 to £106,005, leaving a gross profit of £92,497 (£92,826). After deducting capital charges there remained a net surplus of £23,357, as against a surplus of £19,225 in 1923-24. The amount spent on capital account during the year amounted to £103,726, the chief items being £44,866 for machinery and £43,823 for mains and services. The electrical energy sold increased from 24,019,143 to 26,458,959 kWh. A 10,000-kW turbo-generator was put into commission during the year, and sanction was received to the installation of an additional set of a similar capacity. The number of heating and cooking appliances let out on hire increased by 666, making a total of 5,163.

Ashton-under-Lyne.—Extension of Supply.—The extension of the Corporation's electricity supply to the Hurst and Limehurst area was recently formally inaugurated. Electricity is transmitted from the generating station to a sub-station in Mossley Road at a pressure of 6,000 V a.c., where it is reduced to 3,000 V for distribution to various transformer pillars, which again reduce it to 240 V for lighting and 480 V for power.

Australia.—Sydney.—*Year's Working.*—The report on the working of the City Council's electricity undertaking (engineer: Mr. H. R. Forbes Mackay) for the year 1924 shows a total income of £1,611,767, as compared with £1,352,819 in the preceding year. Working expenses were £841,828, as against £740,893, leaving a gross profit of £769,939 (£611,926). Capital and other charges increased from £518,164 to £562,668, and there was a net surplus of £207,271, as compared with £93,762 in 1923. The capital expenditure during the year amounted to £739,730, and included £219,680 for machinery and plant at the power station, £90,311 for sub-station plant, and £244,077 for underground and overhead mains. The electrical energy generated amounted to 199,645,000 kWh, and 21,865,418 kWh was purchased from the Railway and Tramways Department. The sales of electrical energy amounted to 188,425,931 kWh, an increase of 30,729,175, or 19.49 per cent., and the average price obtained increased from 1.929d. to 1.946d. The maximum supply demanded rose from 51,290 to 60,080 kW. The new generating plant added during the year comprised two turbo-alternators, one of 17,500 kW, and one of 12,000 kW, bringing the capacity of the plant at the Pyrmont station up to 75,000 kW. Two new boiler houses were completed and three additional boilers, together with coal and ash handling plant, were put into operation. Totals of 23 miles of feeder cables, 168 miles of l.p. mains, and 55 miles of street lighting mains were put into service during the year.

Barnsley.—Loan.—The Town Council has received sanction to a loan of £5,230 for mains in the added areas of supply.

Bedford.—Loans.—The Corporation has received sanction to loans of £5,000 for sub-station equipment; £4,000 for buildings; £12,000 for plant at the generating station; and £15,000 for mains, transformers, and switchgear. Application is being made for sanction to the borrowing of £1,000 for a water purifier, £5,000 for meters, and £3,000 for domestic apparatus to be let out on hire.

Brandon (Co. Durham).—Loan.—The Urban District Council has decided to install prepayment meters in the Council houses at an estimated cost of £1,137, and is applying for sanction to the borrowing of this amount.

Calne.—Electricity Supply.—At the October meeting of the Town Council, the Gas Committee reported having considered the question of an electricity supply, and stated that the business streets of the town had been canvassed with encouraging results, and that that portion of the scheme could be carried out at a capital cost of from £2,500 to £3,000. The Council decided to invite tenders for the work.

Canada.—Hydro-Electric Development.—The North Shore Power Company, a subsidiary of the Shawinigan Water and Power Company, is now completing the harnessing of 20,000 h.p. at the Cheminée Falls, on the Batiscan River. This power will be available very shortly, and is derived from waterfalls which were leased from the Quebec Government.

The additions to the plant of the British Columbia Electric Railway Company at Stave Lake, which have been in hand for the past two years, have been completed. The power now available from that source amounts to 87,500 h.p. The additions have cost approximately $3,720,000. Announcement has recently been made by the president of the company that plans are completed to start immediate development of a power scheme on Bridge River, 135 miles north of Vancouver, on the Pacific Great Eastern Railway. The installation of the first sets, to cost $13,000,000 and to provide 60,000 h.p., will be started at once and should be completed in five years. Later the plant will be increased by an additional 70,000 h.p., at an expenditure of $30,000,000, the work to be spread over 15 years.

Continental. — Belgium. — Seventeen electricity supply undertakings are now associated with the Société de l'Union des Centrales Electriques, the object of which is to link up the various power stations in Belgium. The total power of the 21 power plants now interlinked is 112,500 kW. A considerable amount of the energy is generated by means of internal-combustion engines run by the waste gases from the blast furnaces in the district, and it is estimated that by this means a saving of 53,000 tons of coal was effected during the past year.

France. — A concession has lately been secured by the Société des Forces Electriques de la Vallée de Gavarnie to establishe a plant to utilise certain falls on the River Gavarnie, near Luz, in the Upper Pyrenees, for the generating of electricity. It is estimated that 34,500 kW is available.

Dunfermline.—Electricity in Small Houses.—The Corporation Housing Committee, having considered the respective costs of gas and electricity for lighting in connection with its housing scheme, has recommended the installation of electric lighting, and at the last meeting of the Town Council the recommendation was agreed to.

Eston.—Loan.—The Urban District Council is applying for sanction to a loan of £14,000 for electricity extensions.

Garw.—Inauguration of Supply.—The Urban District Council's electricity supply was recently formally inaugurated. Electricity is obtained in bulk from the South Wales Power Co., at a pressure of 11,000 V.

India.—Poona.—In order to meet the demand for additional electricity supplies in its area, the Poona Electric Supply Co. is to install two 600-b.h.p. Tosi engines direct-coupled to 400-kW generators. A new power house to accommodate the additional plant is nearing completion.—*Indian Textile Journal.*

Keighley.—Extension of Supply.—The Town Council is to apply for authority to supply electricity in the districts of Silsden, Cowling, Farnhill, Glusburn and Kildwick. Application is also being made for sanction to a loan of £50,000 for mains and services. The application of the Electrical Distribution of Yorkshire, Ltd., for a Special Order to supply in the districts above named is to be opposed.

Liverpool.—"All-Electric" Houses.—The Corporation Housing Committee is erecting 250 "all-electric" houses.

London.—Hammersmith.—*Year's Working.*—The accounts of the Borough Council's electricity undertaking (engineer: Mr. F. Hill) for the year ended March 31st last show a revenue of £193,726, as compared with £179,135 in 1923-24. Working expenses amounted to £112,984, as against £99,640, leaving a gross profit of £80,741 (£79,494), to which was added income from other sources making a total of £81,843. Capital and other charges absorbed £65,584, and there was a net surplus of £16,258, as compared with £15,434 in the preceding year. Out of the accumulated profits a contribution of £15,080 was made to the borough fund. The capital expenditure during the year amounted to £23,444, of which £17,091 was spent on mains' extensions, services, meters, and transformers. The sales of electrical energy increased from 20,126,879 to 24,485,903 kWh, and the average price obtained fell from 2.136d. to 1.898d. The maximum load rose from 12,440 to 13,200 kVA.

Stoke Newington.—The Electricity Committee has recommended to the Borough Council that the following revised terms for a bulk supply of electricity from the North Metropolitan Electric Power Supply Co. be accepted:—£5 per kW per annum, with a "unit" charge of ½d. for the first 250,000 kWh, and .4d. for all energy in excess of this amount.

Hornsey.—The Borough Council has received sanction to a loan of £23,850 for the installation of a 3,000-kW set.

Lowestoft.—Loan Sanctioned.—The Electricity Committee has obtained sanction to borrow £3,300 for the provision of a new feeder cable to Oulton Broad.

Luton.—Loans.—The Corporation is applying for sanction to loans of £10,000 for mains and £300 for switchgear. Sanction has been received to the borrowing of £2,000 for the provision of automatic stokers.

Newhaven.—Special Order.—The Brighton Town Council is applying for a Special Order to supply electricity to Telscombe Cliffs, in the area of the Rural District Council. The main is to be extended from the Rottingdean boundary to the main sewer outfall at Portobello, for the purpose of supplying electricity for operating pumping plant which is to be put down there. A sub-station is to be erected, and provision made for supplying electricity to premises when the Telscombe Cliffe Estate is developed. The maximum charges proposed are 9d. per kWh for lighting and 3d. per kWh for power.

Northern Ireland.—Whitehead (Co. Antrim).—A Lighting Committee has recently been formed to consider a proposal to introduce electricity for public lighting.

Londonderry.—In order to utilise the spare generating plant and electricity supply available owing to the closing down of the local shipyard, the city electrical engineer proposes the adoption of a combined (alternative) lighting, heating, and cooking rate for private houses. In this way it is hoped to secure a substantial increase of revenue without involving any additional expenditure for services or meters.

Preesall.—Loan.—At a recent meeting of the Town Council a communication was received from the Electricity Commissioners regarding the Council's application for sanction to borrow £14,000. The application was granted in respect of mains, but further information was required regarding services and transformers.

Portsmouth.—Loan Sanctioned.—The Town Council has received sanction to a loan of £11,000 for the erection and equipment of a sub-station at Fratton in connection with the supply of electricity to the tramway.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Buxton.—Lighting: Flat rate—Varying from 6½d. to 5d. per kWh, according to the quantity consumed. Two part tariff—From dusk to midnight, rates as above; remainder of the day 3½d. per kWh. Heating and cooking: Varying from 2d. to 1½d. per kWh according to quantity consumed. All charges subject to a discount of 2½ per cent. for prompt payment.

South Shields.—Rateable value system: For the winter quarters, 6d. per kWh for 3 kWh per £ of rateable value, and for the summer quarters, 6d. per kWh for one kWh per £ of rateable value. All energy in excess of these amounts 1d. per kWh.

Sheffield.—Loans Sanctioned.—The Electricity Committee has sanctioned loans of £1,403 for sub-stations in Cavendish Avenue, Rashley Road, and Mickley Lane, and £13,162 for the extension of mains to the Manor Housing Estate.

Seaham Harbour.—Proposed Electricity Scheme.—The Urban District Council has received a report from its consulting engineer on the proposed electricity scheme for the district. It is proposed to take a supply from the County of Durham Electric Supply Co., which has a 20,000-V supply at Stoney Cut sub-station, near Seaham Harbour. The cost of the scheme would be £16,600, and the estimated charge to consumers 7d. per kWh for lighting and 3d. and 3½d. for power. The Council is applying for a Special Order authorising it to distribute electricity in its area.

Skegness.—Proposed Electricity Scheme.—At the next meeting of the Town Council the question of installing electricity generating plant is to be considered.

Southport.—Purchase of Domestic Appliances.—The Corporation is applying for sanction to a loan of £5,000 for the purchase of electrical domestic appliances to be let out on hire.

South Warwickshire.—Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Leamington & Warwick Electrical Co., Ltd., to supply electricity in the rural districts of Southam, Stratford-on-Avon, and Warwick.

United States.—Hydro-Electric Development.—According to *Power*, the Mt. Shasta Power Corporation has applied for a licence covering Pit No. 4 site on Pit River, near Reading, California. The power is to be sold to the Pacific Gas and Electric Co. The development will make available 56,880 h.p. primarily. It is proposed to install three 40,000-h.p. generators.

A water-power enterprise is contemplated in two applications filed in Oklahoma City for permits to dam the Grand River in eastern Oklahoma. They are the Oklahoma Hydraulic Co. and the People's Public Service Corporation. Plans call for the erection of three dams. One below Miami would be 155 ft. high. It is stated that 275,000 h.p. would be developed.

The Carolina Power Co., of Sanford, N.C., is to erect a hydro-electric plant of about 40,000 h.p. Construction will start within the next few months.

Walsall.—Loan.—The Electric Supply Committee has decided to apply to the Electricity Commissioners for sanction to borrow £30,000 for extensions of electricity mains.

Tramway and Railway Notes.

Aberdeen.—Tramway Extensions.—The Corporation is to borrow £125,000 for tramway extensions. £2,500 is required for the electrical equipment of depôts.

Blackpool.—Year's Working.—The report of the manager of the Corporation tramway undertaking (Mr. C. Furness) for the year ended March 31st last shows a revenue of £272,420, and a working expenditure of £196,162, leaving a gross profit of £76,258. The figures for the previous year were: Revenue, £273,657; working expenses, £184,021; gross profit, £89,636. A deficiency of £165 on the motor-omnibus service was deducted from the surplus, and to it was added bank interest of £3,663 and a contribution of £83 from Lytham-St. Annes Corporation in respect of capital outlay at Adelaide Place terminus, making a total of £79,839 available. Capital charges, &c., absorbed £38,018, and the result was thus a net surplus of £41,820, as compared with £53,093 in 1923-24. This was added to a balance of £43,621 from the previous year, making £85,442. Sinking fund contributions amounted to £21,590, £15,000 was devoted to the borough fund, £25,621 transferred to renewal and reserve funds, and a balance of £23,230 was carried forward. The capital expenditure, which included £41,602 for permanent way, amounted to £52,419. The car-mileage increased from 2,605,269 to 2,691,698, and the passengers carried from 37,981,507 to 40,943,713.

Glasgow.—New Route.—The Tramways Committee has approved proposals for laying a tramway track on the Anniesland-Duntocher road.

Leeds.—New Route.—It was reported at a recent meeting of the Tramways Commitee that the new tramway to Middleton is nearly complete, and is expected to be available for service before the end of November.

Depot Extension.—The committee has decided to enlarge the central tramway depôt in Swinegate. The present accommodation is for 55 cars, and it is proposed to extend it to accommodate 200 cars.

London.—Old Street Station.—Escalators having been put into commission at Old Street underground station, the work on the dismantling of the lifts and the construction of

the new booking hall is to be commenced. The hall will have a circulating area of 2,050 sq. ft., and the work is expected to be finished early next year.

Through-Running.—The Highways Committee of the London County Council has recommended that an agreement be entered into with the Walthamstow Urban District Council for the through-running of tramcars between Liverpool Street and Chingford Mount.

Tramway Extension.—In connection with the extension of the tramway from Southend Village to Grove Park, the L.C.C. Highways Committee has recommended the expenditure of £33,875 for the extension of the tramway track from Bromley Road to connect with the portion at Downham, and £30,095 for the provision of electrical equipment, feeder pillars, duct-work, &c.

Newcastle-on-Tyne.—Purchase of Undertaking.—The Corporation Transport and Electricity Committee is considering the question of purchasing the undertaking of the Tyneside Tramways and Tramroads Co., with a view to amalgamating it with the city system. If agreement is is reached between the Corporation and the company, it is expected that Parliamentary powers will be sought in the Bill which is at present being promoted.

Sheffield.—New Cars.—The Corporation Tramways Committee is to introduce fifty new tramcars on its system.

Stockton-on-Tees.—Tramway Improvements.—The Joint Tramways Committee has instructed the tramways manager, in conjunction with the borough engineer of Thornaby, to prepare for submission to the next meeting of the committee an estimate of the cost of the proposed doubling of the tramway track in Middlesbrough Road.

Swansea.—Transport Scheme.—The Corporation Tramways Committee has considered three schemes, submitted by the borough electrical engineer, for carrying passengers to the Townhill estate, together with approximate estimates of costs, as folows:—A double track of tramways at a cost, exclusive of cars, of £27,000; cable tramway consisting of two cars driven by an electric motor on the top of the hill at a cost including cars of £24,000; a "Never-Stop" railway at a cost of £20,000. The committee has recommended the installation of a funicular railway, and has asked the borough engineer and the electrical engineer to prepare an estimate of the cost.

York.—"One-Man" Cars.—The Corporation Tramways Committee is experimenting with a "one-man" tramcar designed the city tramway engineer, Mr. J. A. Bromley, in collaboration with the English Electric Co., Ltd. The car is of the single-deck type, carrying 24 passengers, and if proved successful others of the same design are to be constructed.

Telegraph and Telephone Notes.

Canada.—Telephone Service.—It is stated that Canada has 1,009,203 telephones, or 11 for each 100 of her population.

Germany.—Electrophone Service.—The electrophone service which enables ordinary telephone subscribers to listen in their homes to operatic performances has recently experienced considerable technical improvement by the introduction of more efficient microphones in several towns. Hitherto the microphones used for this purpose were of the carbon granule type, and the new microphones with permanent magnets not only transmit with a high degree of purity and uniformity, but considerably reduce the number which it is necessary to use. The new microphones are only hand-size, and their application at the Frankfort Opera House has led, says *The Times*, to satisfactory results. The best results have been obtained by placing one microphone to the right and one to the left of the footlights, two more being placed to the right and left of the conductor. The performances are transmitted over the telephone wires to the Central Telephone Office, which passes them on to the telephone subscribers after amplification.

Railway Telephones.—Automatic System.—The new telephone exchange installed in the Southern Railway's general offices at Waterloo Station is now ready, and from Sunday department will speak to department and station to station by automatic telephony. The automatic system will enable an official at his desk at Waterloo to get 805 London depôts, stations, offices, or outposts without the intervention of any operator. The total cost of the inner London telephone scheme just carried out to the designs of the company's signal and telegraph superintendent, Mr. W. J. Thorrowgood, is £40,000.

Jutland.—Telephone Loan.—The Jutland Telephone Co. has accepted Hambros Bank's offer of a loan of £20,000 sterling at 5½ per cent., guaranteed by the Danish State.

Ships' Radio.—New Installations.—Six vessels owned by the Companhia Nacional de Navegacao Costeira, of Rio de Janeiro, are to be equipped by the Marconi International Marine Communication Co., Ltd., with wireless installations. The equipment for each ship will comprise a 1½-kW quenched-spark transmitter, a 1½-kW continuous-wave valve transmitter, valve receivers for spark and continuous-wave reception, a direction finder, and a broadcast receiver of the marine V4 type designed especially for ships. Loud-speakers operated by the broadcast receiver are to be installed in the music and smoking rooms of each ship. The receiving apparatus includes a four-electrode valve amplifier, and covers the wave-lengths of all the transmitting stations in commercial use. The direction-finding installations will use the new fixed-frame aerial, which obviates the use of posts or jumper stays, and effects a great saving both in space occupied and in cost. In addition to the five broadcast receivers mentioned above, the Companhia Nacional de Navegacao Costeira has purchased from the Marconi International Marine Communication Co., Ltd., twelve more such sets for installation on other ships of its fleet. Orders have also been received from Messrs. Elders and Fyffes, Ltd., for six new vessels to be installed with Marconi 1½-kW installations and fixed-frame direction finders.

Telegraph Conference.—Changes in Rates.—The plenary meeting of the International Telegraph Conference adopted, on October 24th, the increases in telegraph charges recommended by its Tariffs Committee. While the maximum terminal and transit rates chargeable are thus increased to keep pace with the increased working costs, no country is obliged to raise its rates; in practice, rates generally will not be raised except probably in the case of Germany, whose State telegraph systems are working at a loss. Great Britain has come to an arrangement with all European countries that there shall be no increase in the rates to and from Great Britain, except in traffic with France and Germany and in the case of these countries it is not certain that the increases will fall entirely on the public. The foregoing only refers to Intra-European traffic. As regards extra-European traffic, a slight increase in the maximum terminal charges at the European end is authorised, but the rates payable by the public will not be increased, the increases, if imposed by the Governments, being absorbed by the cable companies. The intra-European increases will come into force on April 1st, 1926.—*Reuter* (Paris).

Codes.—The plenary meeting of the International Telegraph Conference on October 21st decided to make no changes at present in the code language, but appointed a committee to report on the subject by next October. This means that the present rules as regards code cipher will remain in force until the next International Telegraph Conference some three years hence.—*Reuter* (Paris).

Telephony in Europe.—Projected New Main Cables.—It is stated that Mr. Jeremiah Smith, League of Nations Commissioner-General for Hungary, has given his consent to the construction of the Hungarian section of the long-distance telephone cable between Budapest and Vienna which the Austrian and Hungarian Governments recently agreed to lay down. The cable will contain 96 wires, as compared with the seven overhead telephone wires at present available, and will give Hungary direct telephone communication with the Western countries of Europe. The work is to be completed by the middle of 1927. The Government has also entered into communication with the Czecho-Slovakian and Yugo-Slav Governments with a view to getting Prague connected up with this great trunk line by a branch through Pressburg (Bratislava) and Belgrade by a branch to be extended eventually to Constantinople.—*Reuter* (Budapest).

Radio Notes.

Daventry.—A Mishap.—The cause of the 12 minutes' interruption in the operation of the B.B. Co.'s high-power station (5 XX) on the 23rd inst. was the presence of an infant mouse between the plates of one of the main condensers.

Experimental Transmission. — Cessation. — The experimental transmission which the B.B.C. has been in the habit of carrying out from one or other of its stations at night after the remainder of the stations have closed down, in order to allow those listeners who wished to do so to hear a distant station without any possibility of interference by near-by stations, was carried out for the last time on October 26th from the Bournemouth station. Such transmission from the "short-wave" stations has been abandoned for the present.

Egypt.—Radio Union.—It is reported that a Union has been formed of Greek enthusiasts with the object, amongst others, of establishing a low-power radio-telephone broadcasting station at Alexandria. Government permission will have to be obtained before the installation can be carried out.

Irish Free State.—Dublin Station.—The first radio broadcasting station in the Free State, which it is hoped will be in operation within the next two months, will be on the outskirts of Dublin. The International Wireless Bureau at Geneva has not yet fixed the wave-length to be used, but its power will be 1½ kW. A second station will be built later at Cork, the main function of which will be the relaying on low-power of the Dublin programmes, although there will be a small studio at Cork also; a landline is being laid between the two stations. The service will be controlled by the Post Office and financed by licence fees; in fact, as the *Evening News* points out, for the past three years owners of receiving sets in the Irish Free State have paid one guinea a year for the privilege of hearing Belfast and other B.B.C. stations. About £10,000 has been collected thus each year, all of which has been absorbed by the post and telegraph department of the Free State Government.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Aldershot. — November 3rd. Electricity Department. 1,500 yd. paper-insulated, lead-covered armoured l.p. cable. (October 23rd.)

Australia.—Sydney.—November 30th. Public Works Department. Metering equipment for the Barren Jack hydro-electric development scheme and the Kiama-Nowra transmission line.*

Melbourne.—December 14th. Electricity Commission of Victoria. 22,000-V insulators. (October 16th.)

Barking.—January 1st. County of London Electric Supply Co., Ltd. Water-tube boilers with mechanical stokers or water-tube boilers with powdered fuel equipment; steam turbo-alternators, condensing plant, and auxiliary apparatus for the Barking power station. (See this issue.)

Belgium.—November 4th. Belgian State Railway authorities (Office de l'Electricité), 25, Rue de la Charité, Brussels. Supply and laying of three lots of underground cables at respectively Bruges, Ypres, and Meirelbeke. Particulars (Cahier des Charges, Special No. 4-536) for 11 fr. 20 c.

November 4th. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Supply and laying of telegraph-telephone or loaded telephone cables between (1) Brussels and Lille, (2) Brussels and La Panne, (3) Brussels and Roosendael, and (4) Brussels and the German frontier at Hergenrath. Particulars (Cahier des Charges Special No. 3-144) for 9½ fr.

Bradford.—November 14th. Tramways Committee. General stores required during year commencing January 1st, 1926. Particulars from Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

Carlisle.—November 19th. Electricity Department. L.p. cast-iron piping for condensing water system. (See this issue.)

Dublin.—November 12th. Great Northern Railway (Ireland). Stores for six months (including electrical fittings, lamps, cable, and wire, &c.). (October 23rd.)

Erith.—November 6th. Electricity Department. 100 house-service prepayment meters. (October 23rd.)

Huddersfield.—Electric lighting installation at new premises at 74, Trinity Street. Particulars from Dr. Heanratty, 32, New North Road.

India.—Bombay.—November 11th. Bombay, Baroda and Central India Railway. D.c. motors and starting pillars. (See this issue.)

Kingston-upon-Hull.—November 16th. Electricity Department. Two natural draught cooling towers. (See this issue.)

London.—H.M. Office of Works.—November 3rd. Installation of cables, switchboards, &c., and wiring at the Ministry of Pensions Hospital, Orpington. (October 16th.)

November 4th. Electric wiring in conduit at Montagu House. (October 16th.)

Metropolitan Asylums Board. November 4th. Installation of two new hydro extractors at the Western Fever Hospital, Seagrave Road, S.W.; installation of hot-water heating apparatus at St. Anne's Home, Herne Bay; and installation of automatic telephones at the Downs Hospital for Children, Sutton, Surrey. (October 16th.)

Paddington.—November 3rd. Great Western Railway. Telegraph instruments, electrical apparatus, &c., telegraph ironwork and tools, telegraph drysalterers. November 20th. Electrical wires and cables. (October 16th.)

London County Council.—November 2nd. Wiring and fittings for electric lighting at the New Road elementary school, Clapham, S.W. (181 wiring points controlled by 168 switches). (October 23rd.)

November 16th. Reconstruction of electrical switchgear at Shoreditch sub-station. (See this issue.)

Shoreditch.—The Borough Council Electricity Committee will shortly invite tenders for a 10,000-kW turbo-alternator and 50,000-lb. boiler.

Manchester.—November 6th. Electricity Committee. One 500-kW fully automatic motor or rotary converter, transformers, switchgear, &c. Three 500-kW fully automatic motor or rotary converters or mercury-vapour rectifiers, transformers, switchgear, &c. (October 16th.)

New Zealand.—Hastings.—February 1st. Borough Council. Diesel engine and a.c. generator.*

Wellington.—December 15th. Post Office Stores Department. Key switches.*

Oldham.—November 21st. Electricity Department. Three 12,500-kW turbo-generators and auxiliary plant. (See this issue.)

Southampton.—November 2nd. Harbour Board. Alterations to the electrical equipment of 12 cranes, supply of cables, disconnecting boxes, and switchgear. Specifications from Mr. W. G. Gubbins, clerk, Harbour Offices.

Uruguay.—Montevideo.—January 7th, 1926. State Electricity Supply Works. 26,000 kilograms of copper wires and cables.*

January 5th. Bare copper wire, quicksilver.*
January 8th. Black and G.I. wire, &c.*
January 11th. 96,000 metres lead-covered wires and cables.*
January 12th. 44,500 metallic and carbon-filament lamps.*
Administration Nacional del Puerto de Montevideo. January 2nd. Machine tools and equipment.*

West Ham.—November 16th. Education Committee. Installation of electric lighting and central heating at the Cumberland Road new secondary school. (October 23rd.)

York.—November 12th. Electricity Department. One 6,000-kW, 3-phase turbo-alternator, with condensing plant, pipework, &c. (October 23rd.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Aylesbury.—Town Council. Accepted:—
400-kW rotary converter.—Crompton & Co., Ltd.

Bedford.—Town Council. Accepted:—
Alterations to the two existing 1,500-kW turbo-alternators (conversion from 60-cycle, single phase to 50-cycle, three-phase machines) (£700 and £1,200 respectively).—British Thomson-Houston Co., Ltd., and C. A. Parsons & Co., Ltd.

Belgium.—International competition was again experienced last week for a contract for the supply of 2,000 metres of cable to the municipal authorities of Schaerbeek, Brussels, tenders being received from one British (Callender's Cable and Construction Co., Ltd.), one Danish, one Dutch, two French, four German, and four Belgian concerns. The prices ranged from 85,100 to 146,500 fr., the lowest being that of the Nederlandsch Kabelfabriek Maatschappij, of Delft, Holland.

Bournemouth.—Tramway Committee. Accepted:—
Overhead tank for the generating station (£232).—Barrowfield Ironworks, Ltd.

Dorchester.—Lighting Committee. Recommended:—
Bridge-megger testing set (£53).—Evershed & Vignoles, Ltd.

Glasgow.—Corporation. Accepted:—
Electric lighting work at the Elder Park Clinic (£98).—Johnstone, Park and Co.

Government Contracts.—The following Government contracts were placed during September, 1925:—

Admiralty (Contract and Purchase Department).

Battery spares.—Hart Accumulator Co., Ltd.
W./t. boxes.—Player & Mitchell.
Cells.—Fuller's United Electric Works, Ltd.; D.P. Battery Co., Ltd.; Chloride Electrical Storage Co., Ltd.
Electric stationary crane.—T. Smith & Sons (Rodley), Ltd.
80-ton electric crane.—Stothert & Pitt, Ltd.
Electric travelling cranes.—T. Smith & Sons (Rodley), Ltd.; Cowans Sheldon & Co., Ltd.
Electrodes.—Quasi Arc Co., Ltd.
Fuse holders.—Pinnacle Switchgear, Ltd.
Lampholders.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.; Rainsford & Lynes, Ltd.; Sperryn & Co.
Electric incandescent lamps.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.
W./t. note magnifiers and w./t. transmitters.—Gambrell Bros., Ltd.
W./t. panels.—H. W. Sullivan, Ltd.; Park Royal Engineering Co., Ltd.
Rotary converter transformer.—Ferranti, Ltd.
Transformers.—Johnson & Phillips, Ltd.
W./t. valveholders.—H. W. Sullivan, Ltd.
20 special switchboards, 130 voltmeters.—Park Royal Engineering Co., Ltd.

War Office.

Submarine cable.—Siemens Bros. & Co., Ltd.
Distribution boards and couplings.—Simmonds & Stokes, Ltd.
Electric cords.—Callender's Cable & Construction Co., Ltd.
Switches.—General Electric Co., Ltd.
Switchboard panels.—Johnson & Phillips, Ltd.

Air Ministry.

Copper wire (Iraq).—General Electric Co., Ltd.
Internal wiring (Catterick).—T. Clarke & Co., Ltd.
Dynamometer.—Crompton & Co., Ltd.

Post Office.

Repairing batteries.—Portsmouth telephone exchange: D.P. Battery Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Chichester-Junction for Worthing: Johnson & Phillips, Ltd. Dorking-Worthing—mechanical tandem junction (Scheme II): W. T. Henley's Telegraph Works Co., Ltd. Holborn-Park, Western-Sloane, Hop-Battersea, Holborn-Western, Primrose Hill-Hampstead Junction and Primrose Hill Junction—mechanical tandem junction (Section II): Western Electric Co., Ltd. Canterbury-Dumpton Gap (Kent)—mechanical tandem junction (Section II): Siemens Bros. & Co., Ltd. Brentwood-Marks Tey: Pirelli-General Cable Works, Ltd.
Manufacture, supply, laying and jointing, &c., submarine cable—Anglo-Belgian (1926).—Siemens Bros. & Co., Ltd.
Cabling and wiring for lifts, conveyers, &c., Mount Pleasant new letter-sorting office.—Pinching & Walton.
Conveyors: Mount Pleasant sorting office.—H. Simon, Ltd.
E.h.p. switchgear: Mount Pleasant sub-station.—British Thomson-Houston Co., Ltd.
Private branch exchange equipment.—Vulcan Foundry, Ltd. (Newton-le-Willows); Jarrett, Rainsford & Laughton, Ltd. (Birmingham); Bilsland Bros., Ltd. (Glasgow); Taylor's Drug Co., Ltd. (Leeds); Bank of London & South America, Ltd. (E.C.2): Relay Automatic Telephone Co., Ltd.
Telephone exchange equipment.—Popesgrove (Twickenham): Siemens Bros. & Co., Ltd. Hampstead and York: Automatic Telephone Manufacturing Co., Ltd.
Telephone repeater station equipment.—Glasgow, Gloucester, Newport (Mon.), Marks Tey: General Electric Co., Ltd.
Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; British L.M. Ericsson Manufacturing Co., Ltd.; General Electric Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. and Co., Ltd.; Sterling Telephone & Electric Co., Ltd.; Telegraph Condenser Co., Ltd.; Western Electric.

Battery parts.—Alton Battery Co., Ltd.; D.P. Battery Co., Ltd.; Tudor Accumulator Co., Ltd.
Battery boxes.—W. & T. Lock.
Telephone cabinets.—Siemens Bros. & Co., Ltd.; W. Duncan, Tucker and Co., Ltd.
Cable.—B.I. & H. Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Hackbridge Cable Co., Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Joint box castings.—J. Williamson & Co., Ltd.
Porous cells.—General Electric Co., Ltd.
Telephone cords.—B.I. & H. Cables, Ltd.; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.
Loading coils.—General Electric Co., Ltd.; Western Electric Co., Ltd.
Cable drums.—B.I. & H. Cables, Ltd.; Eames Bros.; Siemens Bros. and Co., Ltd.
Ducts.—Albion Clay Co., Ltd.; Donington Sanitary Pipe & Fire Brick Co., Ltd.; Hepworth Iron Co., Ltd.; H. R. Mansfield, Ltd.; J. Oakes and Co. (Reddings Collieries, Ltd.); Oates & Green, Ltd.; Stanley Bros., Ltd.
Ear pieces.—North British Rubber Co., Ltd.
Electric light fittings.—Cable Accessories Co., Ltd.; W. White & Co.
Electric lamps.—B.I. & H. Cables, Ltd.; British Thomson-Houston Co., Ltd.; Cryselco, Ltd; Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Metro-Vick Supplies, Ltd.; Siemens & English Electric Lamp Co., Ltd.
Distribution cable plugs.—Siemens Bros. & Co., Ltd.
Electric trucks.—W. Goodyear & Sons, Ltd.
Wood troughing.—Calders, Ltd.
Bronze and copper wire.—Elliott's Metal Co., Ltd.
G.I. stranded wire.—Dorman, Long & Co., Ltd.; F. Smith & Co. (Wire Manufacturers), Ltd.
Zinc rods.—Eyre Smelting Co., Ltd.; Locke, Lancaster & W. W. & R. Johnson, Ltd.

H.M. OFFICE OF WORKS.

Wiring Royal Courts of Justice, Strand, W.C.—Electrical Installations, Ltd.

CROWN AGENTS FOR THE COLONIES.

Lux cells.—Chloride Electric Storage Co., Ltd.
Electric walking crane.—Ransomes & Rapier, Ltd.
Electric cable.—B.I. & H. Cables, Ltd.
Electric generating plant.—Lancashire Dynamo & Motor Co., Ltd.
Electric switchgear.—Metropolitan-Vickers Electrical Export Co., Ltd.
Electrical materials.—Siemens Bros. & Co., Ltd.
Ceiling fans.—Veritys, Ltd.
Porcelain insulators.—Taylor, Tunnicliffe & Co., Ltd.
Train lighting equipment.—J. Stone & Co., Ltd.
Telegraph ironwork.—Bullers, Ltd.
Telephones.—British L.M. Ericsson Manufacturing Co., Ltd.
Static transformers.—English Electric Co., Ltd.
Copper line wire.—Shropshire Iron Co., Ltd.

Hornsey.—Electricity Committee. Recommended:—
Circuit breakers (£240).—Park Royal Engineering Co., Ltd.

Liverpool.—Health Committee. Recommended:—
Two complete electrically-driven crude sewage pumping sets at the West Derby sewage farm (£1,374).—Drysdale & Co., Ltd.

Tramways Committee. Accepted:—
Structural steel and iron works for the new tramway works and car depôt.—Lambourne & Co., Ltd.

Lowestoft.—Electricity Committee. Accepted:—
2,300 yd. feeder cable (£2,348); 2,300 yd. pilot cable (£245).—Callender's Cable & Construction Co., Ltd.

Lewes.—Board of Guardians. Accepted:—
Extending electric light to all parts of the Institution.—E. L. Tappin and Son.

London.—LONDON COUNTY COUNCIL.—Highways Committee. Accepted:—
1,000-kW rotary-converter, with switchgear and cables, for the Hammersmith sub-station.—British Thomson-Houston Co., Ltd.
Battery for electrically-driven tower wagon (£893).—Edison Accumulators, Ltd.
Works transformer for Greenwich power station (£7,550).—C. A. Parsons and Co., Ltd.

SOUTHWARK.—Electricity Committee. Recommended:—
Cable.—Macintosh Cable Co., Ltd., and British Insulated & Helsby Cables, Ltd.
2,000 ft. copper bar (11½d. per lb.).—British Insulated & Helsby Cables, Ltd.
Feeder pillar (£80).—J. S. Plumtree.

POPLAR.—Electricity Committee. Recommended:—
Instrument equipment and steam flow meters for boilers and turbines (£1,175).—Electro-Flow Meter Co., Ltd.
Steam feed-water and drain systems for the generating station (£7,500).—International Combustion, Ltd.
Temperature indicator (£167).—Cambridge & Paul Instrument Co., Ltd.

Salford.—Electricity Committee. Accepted:—
Cable.—W. T. Glover & Co., Ltd. (£2,621); Western Electric Co., Ltd. (£850).
100 large electric cookers (£1,360).—General Electric Co., Ltd.
150 "Falco" small electric cookers (£1,912).—Hotpoint Electric Appliance Co., Ltd.

Forthcoming Events.

Commercial Motor Transport Exhibition.—October 29th to November 7th. At Olympia, London, W.

Electrical Trades Commercial Travellers' Association.—Friday, October 30th. At Elma Rooms, 15, Savoy Street, W.C.2. At 7 p.m. Lecture on "The Human Aspect of Salesmanship," by Mr. V. W. Dale.

Glasgow Corporation Electricity Department Engineering Society.—Monday, November 2nd. At the Welfare Hall, St. Andrew's Cross Works. At 7.45 p.m. Paper on "Protective Gear," by Mr. R. W. Biles.

Institute of Transport.—Monday, November 2nd. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 5.30 p.m. Annual general meeting. Paper on "One Hundred Years of Railway Development," by Mr. R. Bell.

Society of Engineers.—Monday, November 2nd. At Burlington House, Piccadilly, W. At 5.30 p.m. Paper on "The Influence of Aggregates on the Strength and Properties of Concrete," by Mr. G. O. Case.

Institution of the Rubber Industry.—Monday, November 2nd. At the Engineers' Club, Coventry Street, W. At 8 p.m. Paper on "The Plasticity of Unvulcanised Rubber," by Mr. R. W. Griffiths.

Roentgen Society.—Tuesday, November 3rd. At 32, Welbeck Street, W. At 8.15 p.m. Presidential address, "Atoms and X-rays," by Mr. F. W. Aston, F.R.S.

Electrical Society of Glasgow.—Tuesday, November 3rd. At Glasgow Lecture on "The Impetus of Electrical Marketing," by Mr. V. W. Dale

Institution of Civil Engineers.—Tuesday, November 3rd. At the Institution, Great George Street, S.W. At 6 p.m. Presidential address by Sir W. H. Ellis, and presentation of medals awarded by the Council.

National Association of Supervising Electricians.—Tuesday, November 3rd. At 39, Victoria Street, S.W. At 7.15 p.m. Lecture on "Automatic Telephones," by Mr. H. H. Harrison.

Electrical Trades Benevolent Institution.—Wednesday, November 4th. At the Trocadero Restaurant. At 7.30 p.m. Annual festival.

Royal Society of Arts.—Wednesday, November 4th. At John Street, Adelphi, W.C. At 8.30 p.m. Inaugural address by the Chairman of the Council, Sir H. Holland, F.R.S., on "The Organisation of Scientific Research Throughout the Empire."

Edinburgh Electrical Society.—Wednesday, November 4th. At the Royal Society of Arts, 117, George Street. At 8 p.m. Paper on "Automatic Telephony," by Mr. W. J. H. Piper.

Institution of Mining Engineers.—Wednesday, November 4th. At the Institution of Mechanical Engineers, Storey's Gate, S.W. At 11 a.m. Annual general meeting.

Institution of Heating and Ventilating Engineers.—Wednesday, November 4th. At Caxton Hall, Westminster, S.W. At 7 p.m. Paper on "The Modern Development of Combustion Recording," by Mr. J. J. Lassen.

Institution of Electrical Engineers.—Thursday, November 5th. At the Institution, Victoria Embankment, W.C. At 6 p.m. Paper on "Dielectric Problems in High-Voltage Cables," by Mr. P. Dunsheath.

(Wireless Section).—Wednesday, November 4th. At the Institution, Victoria Embankment, W.C. At 6 p.m. Inaugural address by the Chairman, Major B. Binyon.

(Mersey and North Wales (Liverpool) Centre).—Monday, November 2nd. At the University, Liverpool. At 7 p.m. Address by the Chairman, Mr. A. E. Malpas.

(North-Western Centre).—Tuesday, November 3rd. At the Engineers' Club, Manchester. At 7 p.m. Address by the Chairman, Mr. A. G. Ellis.

(Western Centre).—Monday, November 2nd. At the Museum Lecture Theatre, Bristol. At 6 p.m. Lecture on "Domestic Electrification," by Mr. J. W. Beauchamp.

Electrical Power Engineers' Association.—Friday, November 6th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 3 p.m. Lecture on "Electrical Faults in Power Plant and their Location," by Mr. G. M. S. Sichel.

Institution of Mechanical Engineers.—Friday, November 6th. At the Institution, Storey's Gate, S.W. At 6 p.m. Thomas Hawksley Lecture "Some Railway Notes, Old and New," by Sir John A. F. Aspinall.

Junior Institution of Engineers.—Friday, November 6th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "Flow Meters," by Mr. W. H. Simmons.

Faraday House Old Students' Association.—Friday, November 6th. At the Piccadilly Hotel. Annual dinner.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

BELATA small single pole switches.
FLODEN electric curling tongs.

Notes.

The Electrical Trades Benevolent Institution.—ANNUAL FESTIVAL DINNER.—On Wednesday next, November 4th, the Festival Dinner of the E.T.B.I. will be held at the Trocadero, London. There is still time to obtain tickets for this function, and thereby to benefit not only oneself, but also the protégés of the admirable Institution by which it is organised. We hope that our readers will take advantage of the opportunity to give it practical support—or, if they cannot attend in person, that they will demonstrate their sympathy with its objects in the usual manner observed among men of goodwill.

The Rt. Hon. F. G. Kellaway will be the principal guest. Tickets can be obtained from Mr. F. B. O. Hawes, 98, Grosvenor Road, S.W.

Late Legal.—BRITISH INSULATED & HELSBY CABLES, LTD., PENSION FUND.—Arguments were heard recently in the House of Lords by the Lord Chancellor, and Lords Atkinson, Buckmaster, Carson and Blanesburgh, in the case British Insulated and Helsby Cables, Ltd., *v.* J. Atherton (Inspector of Taxes), raising a novel income tax point. For the year ended April, 1918, the company was assessed to income tax in the sum of £250,000, against which it appealed on the ground that there should be a deduction of £31,784, in respect of a contribution to a pension fund for the benefit of its clerical and technical staff. The appeal was allowed by the Special Commissioners, and the assessment reduced to that extent, but a Special Case was stated and Mr. Justice Rowlatt upheld the decision. The Court of Appeal, however, reversed the finding and the company appealed to the House of Lords. Sir John Simon, K.C., speaking on behalf of the company, said that the absence of a pension fund had resulted in the company's losing some of its best men, and it was a matter of business that it should provide such a fund in order to keep its men. The sum was, in consequence, money wholly and exclusively expended for the purpose of its trade and the deduction was admissible. Addressing the House on behalf of the Crown, Sir Douglas Hogg, K.C. (the Attorney-General) maintained that as the sum was a lump one and not spread over years, the deduction was not admissible. Their Lordships reserved judgment.

Workmen's Compensation Award.—An electrician, James Henry Cook, of Wilson Street, Thornaby, applied at the Stockton County Court on October 20th for compensation in respect of injuries received while working for Messrs. Thomas Allen and Co., Bon Lea Foundry, Thornaby.

Mr. T. Richardson, for plaintiff, explained that in July his client was working on a crane, when the ladder on which he stood slipped, and in endeavouring to save himself Cook came into contact with a live electric wire. He held this wire until a man, hearing his cries, switched off the current. Applicant fell from the wire to the ground, a distance of 18 ft., and as a result of the mishap two fingers of the left hand had to be amputated. His ankle and shoulder were injured by the fall, his shoulder permanently. Applicant earned £3 a week, and he claimed 30s. a week compensation. Plaintiff admitted in cross-examination that it was his duty to cut off the current before he did any such work, but on this occasion he forgot to do so.

Medical evidence was given to the effect that applicant's shoulder was permanently disabled.

For the defence it was contended that applicant had infringed the regulations in failing to cut off the current, but Judge Moore held that respondents had not established serious and wilful misconduct; the applicant had merely been guilty of inadvertence. He awarded the applicant 30s. a week from the date of the accident.

Engineers' Club Dinner.—The second annual banquet of the Engineers' Club (London) was held at the Savoy Hotel on October 23rd, the president, Sir J. W. Isherwood, Bt., being in the chair. It was a largely attended and very successful function; amongst the many distinguished guests was the Chancellor of the Exchequer, who was the guest of the evening, and whose speech was broadcast from Daventry.

Following the loyal toast, that of "Our Guests" was proposed by the president, and in responding Mr. Winston S. Churchill, P.C., M.P., said that they would be wise in revolting against the prevailing weak, foolish and injurious mood of panic-stricken pessimism. Things were not getting worse and there was even a probability that they might get better. The British share of the oversea trade of the world had not diminished since the war. It was true that there was a reduced amount of world oversea trade, but of that reduced trade this country possessed a slightly larger proportion than it did before the war. In 450 typical businesses there had been an improvement of 11 per cent. in profit-making this year as compared with 1923. There had been a considerable diminution in the cost of living, and the yield of revenue fully bore out the expectations upon which the Budget had been framed. The consuming power of the people had not only been maintained, but in the case of many commodities it had been increased. The savings of the people in National Saving Certificates had increased by £7,000,000 in the present year. The latest estimate which had been laid before him showed that so far from getting poorer, or living on our capital, we were saving capital by hundreds of millions a year. Far fewer days had been lost by strikes this year than last year. Leaving out the exceptional conditions of the coal trade, employment in the general trade of the country had increased by 150,000. It was true that the population was increasing. The number of people who had reached the employable age last year was 700,000. Still there were 250,000 more people at work in the general trade of the country than there were a year ago.

The remission of taxation which was given by the Budget would cost more in the second year than in the first. In consequence it would be necessary either to reduce expenditure, or that there should be some quite exceptional trade expansion, if the Budget of 1926 was to be accurately and honestly balanced. As they could not count on an exceptional trade expansion, let them make sure of a reduction in expenditure, for which conditions were favourable.

Proposing "Success to British Engineering," Sir Philip M. M. Nash remarked, *inter alia*, that they could not live on tradition alone. If they faced the facts, they would find that conditions were not becoming worse; they should dwell on the future, not the past. British engineers wanted opportunities, and the one which showed most promise was the development of the Empire. They should make more use of the brains and achievements of pure science workers. Regarding national development of electricity, it was insufficient to know that the Government was considering the subject; what was required was a pronouncement or guidance as to policy, and now was the time for it.

Sir T. Harris Spencer and Air Chief Marshal Sir Hugh M. Trenchard responded, after which "The Engineers' Club" was toasted by Mr. Winston Churchill, the president replying. A selection of music by the band of H.M. Scots Guards added to the enjoyment of the evening.

London Traffic Inquiry. — An inquiry was opened last week at the Guildhall, Westminster, by a sub-committee of the London and Home Counties Advisory Council, into the traffic facilities in North London. The inquiry was adjourned until November 2nd.

Local Societies.—There was a record attendance of members at a meeting of the Glasgow Corporation Electricity Department Engineering Society held recently to hear the address of the President, Mr. R. B. Mitchell, at the opening of the session, 1925-1926. The President reviewed the work of the department during the past year and outlined the prospects for the current year and for future years. The society is in a flourishing condition and an interesting syllabus of meetings has been arranged for the current session, including a visit to the hydro-electric works at Stonebyres, Falls of Clyde. At the next meeting on November 2nd, a paper on "Protective Gear" is to be delivered by Mr. R. W. Biles, D.F.H., of Messrs. A. Reyrolle & Co., Ltd.

Nottingham Society of Engineers.—The annual general meeting was held on October 12th, under the presidency of Prof. Bulleid, O.B.E., at the Victoria Station Hotel. Mr. E. G. Phillips was elected president for the ensuing year, and addressed the members on the subject: "What is an Engineer?" He quoted, as exactly expressing all that he believed to be essential to an engineer, the qualities specified by Mr. W. Roland Needham in his article on "The Designer and Initiative" (Electrical Review, October 2nd, 1925, p. 532), and pointed out that the engineer had played an important part in developing life as now enjoyed, and was probably the greatest civilising force in existence.

The *Proceedings* of the Society are now printed, through the generous assistance of Ald. Sir John Turney, J.P.

Fatalities.—James Carter, labourer, of Oak Street, Oswaldtwistle, was killed recently at the Broad Oak Print Works, Accrington. An inquest was held on October 23rd, at Accrington. William Nuttall, an electrician employed at the works, stated that on October 19th they were brazing a portable electric light standard in a hot-air chamber in the cleaning department of the works. Carter was his labourer. The light stand was made of half-inch steel tubing and was 10 ft. high, through which ran two electric lighting wires carrying 250-volt alternating current, which lit five electric lamps attached to the tubing and 2 ft. apart. That job was completed, but two days later they were engaged connecting ten electric lighting mains in the distribution box in the cleaning department. Carter was labouring for witness, and he sent him into a room to put the fuses into the main feeder box in order to put the supply on at the place where they were working. Witness went away, and, when he returned ten minutes later, he noticed that the lights in the cleaning department and the hot-air chamber were on. He also noticed that the portable light stand in the hot air chamber was moving. He opened the chamber door, and found Carter lying on the ground, with his neck against the bottom of the light stand. He then ran to the distribution box and withdrew the fuses. Artificial respiration was tried for a quarter of an hour. A medical witness said that the cause of death was suffocation, but he could not say whether it was caused by electric shock, but it probably was. Mr. Topham said that he made tests in company with the electrical engineer, and found conditions which justified him in thinking that Carter might have had an electric shock. The jury found that Carter had died from an "electric shock, or accidental death."

A verdict of "Death due to electrocution," was returned on October 23rd at an inquest on Fred Ackroyd (36), of Oldham, labourer at Asa Lees & Co., textile machinists. After starting an electric motor he received a shock and died immediately. This, it was stated, was the first accident that had occurred at the works, where there were nearly 100 similar motors. It is presumed that the man's clothes acted as a conductor, as he had been out in the rain.

The Proposed Institute of Wireless Engineers.—The meeting in connection with the proposed Institute will be held at the Hotel Russell, Russell Square, London, to-morrow, October 31st. The chair is to be taken at 2.30 p.m. Tea will be served at 5 p.m., and the meeting will be continued till 7 p.m. if necessary. All interested persons are invited to be present.

Mining Electrical Engineers.—Scotland Branch.—Mr. D. Landale Frew, in his presidential address to the West of Scotland Branch of the Association of Mining Electrical Engineers at Glasgow, dealt with the developments in the use of machinery and electricity in coal mining in Scotland. He believed there was still much for the Association to do in the matter of the practical training of the men who handled the machines. The Government had an opportunity of forming training centres for such men, which would be much to the advantage of the coal industry, both to masters and men, in maintaining output and minimising breakdowns. The Association had for many years been considering the matter, but had been up against the difficulty of providing funds for equipping and running such centres.

Appointments Vacant.—Assistant telegraph engineers (probationary), for the Government of the Federated Malay States; switchboard attendant, for the Nuneaton Corporation electricity works; junior charge engineer, for the Derby County Borough electricity department; scientific instrument maker, for the Battersea Polytechnic; cable jointer, for the Middleton Corporation electricity department; combustion engineer, for the Southampton County Borough electricity works; plumber-jointer, for the Southend-on-Sea electricity department; meter repairer, for the Lancaster Corporation electricity works. (See our advertisement pages to-day.)

Finsbury Technical College.—The fourteenth annual dinner of the Old Students' Association of the College will be held at the Engineers' Club, Coventry Street, London, on Saturday, November 14th, at 7 p.m. Ladies are invited. Tickets are 6s. 6d. each, exclusive of wines, and may be obtained from Mr. R. O. Grant, hon. secretary, 70a, Basinghall Street, E.C.2.

The Batti-Wallahs' Society.—On Wednesday last week, the Batti-Wallahs held a re-union luncheon, at which Col. R. E. Crompton, C.B., was the principal guest. Mr. Pooley, presiding, read a letter from Sir Hugo Hirst, regretting his inability to be present owing to indisposition.

Col. Crompton, invited by the president to address the gathering, recalled his first acquaintance with batti-wallahs when he was on the staff of the Commander-in-chief in India, and, after other intimate reminiscences, extolled the merits of men who were always trying to make others happy—a quality which in his long experience he had found more fully developed amongst electrical engineers than in any other class. He expressed a strong desire that electrical men should become better friends with those concerned in the gas industry.

Proposing a vote of thanks to Col. Crompton, Mr. J. W. Beauchamp said that as time went on they would find some means of co-operating with the gas people, but he would regard with distrust any attempt to fix a line of demarcation between their respective spheres. Electricity and gas had both benefited enormously by active competition, to the advantage of the public.

At the suggestion of the president, Mr. E. S. Barralet made a brief appeal for support to the Electrical Trades Benevolent Institution, and a collection realised over £7.

Institution Notes.

Institution of Electrical Engineers.—The arrangements for the first part of the session 1925-26 include the following items:—

Ordinary Meetings of the Institution.

November 5th.—Mr. P. Dunsheath, O.B.E., M.A., B.Sc. "Dielectric Problems in High-Voltage Cables."
November 19th.—Mr. T. Carter. "The Engineer: His Due and His Duty in Life."
December 3rd.—Prof. S. P. Smith, D.Sc. "An All-Electric House."
December 17th.—Mr. C. E. Webb, B.Sc.(Eng.). "The Power Losses in Magnetic Sheet Material at High Flux Densities."
January 7th, 1926.—Capt. P. P. Eckersley. "Past, Present, and Future Developments in Wireless Telephony."
February 11th.—Annual dinner.

Wireless Section Meetings.

November 4th.—Major B. Binyon, O.B.E., M.A. (chairman of the Wireless Section). Inaugural address.
December 2nd.—Mr. H. A. Thomas, M.Sc. "The Performance of Amplifiers."
January 6th, 1926.—Lt.-Col. K. E. Edgeworth, D.S.O., M.C. "Frequency Variations in Thermionic Generators."

Informal Meetings.

November 9th.—Discussion on "Modern Developments of Telephone Cables." (Opened by Mr. E. S. Ritter.)
November 23rd.—Discussion on "The Testing of Large Electric Plant." (Opened by Mr. E. E. Tasker.)
December 7th.—Discussion on "Design and Performance of Protective Relays." (Opened by Mr. C. L. Lipman.)
December 11th, 1926.—Discussion on "The Electrical Installation in the Rockefeller Building, University College." (Opened by Mr. W. C. Clinton, B.Sc.).

Opening Meeting.—At the first meeting of the 1925-26 session on October 22nd, Mr. W. B. Woodhouse, retiring president, presented the premiums awarded by the Council for papers read last session before the Institution and its Wireless Section. After the presentation of the scholarships awarded by the Institution, Mr. R. A. Chattock, the new president, took the chair, and called upon Mr. Roger T. Smith to propose a vote of thanks to the retiring president; it was seconded by Dr. A. Russell and passed with enthusiasm. The president then delivered his inaugural address, an abstract of which is commenced elsewhere in this issue, and, following a vote of thanks proposed by Mr. S. P. Sparks and seconded by Dr. W. Thornton, the meeting, which was well attended, terminated at 7 o'clock.

Royal Society of Arts.—The 172nd session will be opened on Wednesday, November 4th, at 8.30 p.m., when the inaugural address will be delivered by Sir Thomas H. Holland, K.C.S.I., K.C.I.E., F.R.S., chairman of the Council, on "The Organisation of Scientific Research Throughout the Empire." A course of three lectures under the Cantor Trust will be delivered during the session by Dr. R. Lessing on "Coal Ash and Clean Coal." At the meetings after Christmas papers will be read, including "The Propagation of Electric Waves," by Mr. J. E. Taylor; "Problems in Paint and Varnish Technology," by Dr. H. Houlston Morgan; and "Domestic Heating," by Dr. Mary Fishenden. Courses of lectures will also be delivered by Dr. G. W. C. Kaye on "The Production and Measurement of High Vacua," and by Mr. W. F. Higgins on "Thermometry."

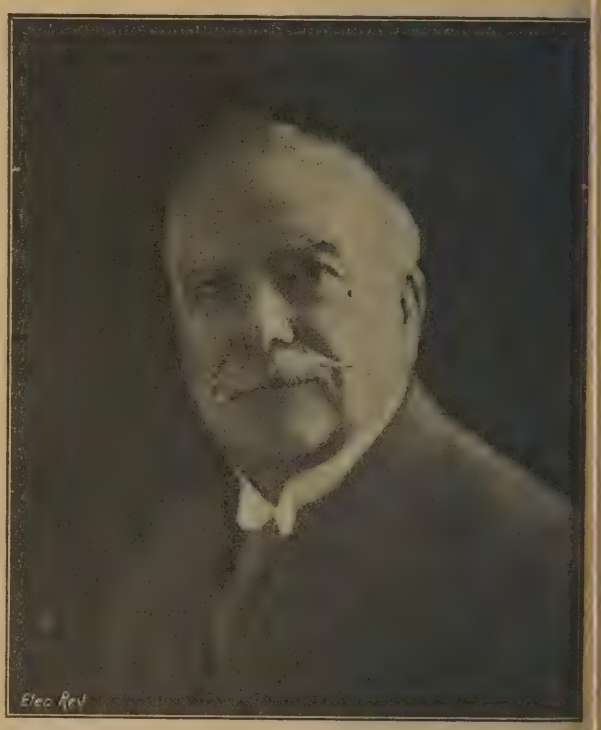
Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Mr. Charles V. Watson has left the service of the Walsall Corporation Electric Supply Department, to take up an appointment as junior mains assistant with the Yarmouth Corporation Electricity Department. Mr. Watson received several presents from his Walsall colleagues.

Last week the Glasgow Corporation approved the appointment by the Superintendent of Lighting, of Mr. Edward Stewart, head of his technical staff, to be assistant inspector in the place of Mr. Milner, who served the municipality for half a century. Mr. Stewart graduated M.A. and B.Sc. at Glasgow University, and before entering the Lighting Department was science master at Airdrie Academy.

Mr. C. Newton Russell, Assoc.M.I.C.E., M.I.E.E., w is shortly retiring from the service of the Shoreditch Boro Council, has served with that body as electrical engineer nearly 29 years. He served his apprenticeship at Stockt on-Tees, afterwards taking up the study of electricity visiting electrical works in the United States. He was some time a student in the School of Telegraphy and E trical Engineering, Hanover Square. In 1882 he joined firm of W. T. Goolden & Co., and had charge of their sect of the lighting of the Inventions and other exhibitions South Kensington, also the carrying out of a large amo of important work on warships for the British Admiralty a the Indian Government. In 1887 he was appointed engin to the Acton Hill Electrical Works, and five years later beca manager to the London and Lancashire Electrical Co., D ston. In 1896 he was appointed chief electrical engineer the Vestry of St. Leonard's, Shoreditch (now the Met politan Borough of Shoreditch), his present position. Newton Russell has contributed several papers to vari engineering societies on the subject of steam-raising by mea of the burning of town's refuse, and he was awarded Telford Premium by the Institution of Civil Engineers. Wh acting as electrical engineer to the Borough of Shoredit Mr. Newton Russell has been responsible for carrying extensions of plant and mains to the value of over half million sterling. A further extension of the Whiston Str electric power station has recently been sanctioned by t Electricity Commissioners, comprising the installation of



Navana, Ltd. [*Londo*

Mr. C. Newton Russell.

10,000-kW turbo-alternator, boiler, switchgear, &c., at an est mated cost of £70,000. For some years Mr. Newton Russell ha acted as one of the representatives of the Incorporated Munic pal Electrical Association on the British Engineering Standard Association. During the war he took an active part in co nection with the inception of the Metropolitan Munition Committee, of which he was one of the earliest member and was appointed by that body to act as district manage for the greater part of the eastern area of London; he serve throughout the war in that capacity. Although Mr. Russe is retiring from an active part in the management of th Shoreditch undertaking, his services are being retained b the Council as consulting engineer in an advisory capacit for a period of one year, as stated in these pages last week Mr. Newton Russell's successor is Mr. William Weekes A.M.I.E.E., who has been chief assistant at Shoreditch fo many years, and has been in the employ of the Council fo about 28 years. Mr. Weekes has a thorough knowledge o the undertaking, and we wish him success in his new position

Mr. Dean K. Chadbourne has been appointed genera manager of the Westinghouse Electric International Com pany to succeed Mr. E. D. Kilburn, who was recently elected vice-president of the Westinghouse Electric & Manufacturing Company.

Mr. Leonard Johnson, traffic superintendent of the Bir mingham Tramways, is in hospital suffering from a bullet wound received on Saturday morning. A tramway inspector named John Henry Cuttler has been arrested in connection with the affair.

Mr. C. L. Holman, manager since 1919 of the Stamford Elec tricity Works, has been appointed to a similar position at Frome, Somerset, where he will commence his duties next month

Mr. R. W. Gregory, the new chairman of the North-astern Centre of the Institution of Electrical Engineers, whose ortrait accompanies this note, is the head of Messrs. Merz id McLellan's electrical department. Mr. Gregory was born North Cadbury, Somerset, in 1882, and was educated at exey's School, Bruton, and Finsbury Technical College. In 01 he joined the Newcastle-upon-Tyne Electric Supply Com-iny, and, under Mr. H. L. Risley, obtained experience on ie construction and operation of the Neptune Bank and arville power stations. Mr. Gregory joined the staff of essrs. Merz & McLellan at the end of 1903, and, under Mr.



Bacon & Sons] *[Newcastle-on-Tyne.*

Mr. R. W. Gregory.

Chairman of the North-Eastern Centre of the I.E.E.

ernard Price, worked on the North-Eastern Railway electrifi-ation scheme, the construction of the Dunston power station, nd the development of the 20,000-V distribution system on the orth-East Coast. Later he became chief electrical draughts-an and switchgear engineer for his firm. During his long ssociation with Messrs. Merz & McLellan, Mr. Gregory has orked on many important schemes, among them being ailway electrifications in Argentina, Australia, South Africa, nd India; the Barking power station of the County of ondon company; the Mersey Power Company's develop-nents; and the electricity supply system of the North-East oast Power Companies. Mr. Gregory has served on the ritish Engineering Standards Association sub-committee on il break switches and switchgear, and the British Electrical nd Allied Industries Research Association sub-committee on il circuit breakers. His paper on "Sub-station Design with articular reference to Metal-Clad Switchgear" was read n Paris this summer at the International Conference on Extra-High-Pressure Systems. Mr. Gregory delivered his naugural address on Monday last.

At a meeting of the Fleetwood District Council, on October 21st, a motion to rescind a resolution to raise the salary of he Council's electrical engineer in accordance with the recog-nised scale was defeated.

The Highways Committee of the London County Council ecommends that Mr. T. E. Thomas, development superinten-lent, be promoted to the position of traffic manager in the raffic branch of the tramways department, at a salary of £1,200, rising to £1,500 a year (based on pre-war conditions); hat Mr. F. Scothorne, traffic statistics assistant, be pro-noted to the position of development superintendent in the raffic branch of the tramways department at a salary of £500, rising to £800 a year (based on pre-war conditions); that Mr. E. A. Wood, assistant superintendent of the central repair lepôt, be promoted to the position of superintendent of the entral repair depôt in the rolling stock branch of the tram-ways department, at a salary of £500, rising to £650 a year based on pre-war conditions); that Mr. R. E. S. Macintyre, echnical assistant (Grade 2) be promoted to the position of permanent-way engineer in the tramways department at a alary of £500, rising to £600 a year (based on pre-war con-litions).

The silver wedding was celebrated on October 14th of Mr. nd Mrs. L. B. Cantwell. Mr. Cantwell is head of the firm of Messrs. Cantwell & Hedger, electrical engineers, of High Street, Broadstairs.

M. Minieur, director of the Tunis Electricity & Gas Co., has lately been appointed a Chevalier of the Légion d'Honneur.

We reproduce herewith a portrait of Mr. A. E. Malpas, the new chairman of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers, who is to deliver his address on Monday next. Mr. Malpas was born in London in 1871. From 1885 to 1891 he was an apprentice in marine engineering at the Portsmouth Dockyard, where he gained experience in the various departments. While an apprentice he gained a Whitworth Exhibition and proceeded to Victoria University, Manchester. In 1892 he gained a National Scholarship, which took him to the Royal College of Science, London. Mr. Malpas gained a Whitworth Scholarship in 1893, which enabled him to attend lectures in electrical engineering under Prof. Ayrton, at the Central Technical College. Upon leaving college in 1894 he joined Messrs. Willans & Robinson, Ltd., as assistant in their Contract and Estimating Department. From 1897 to 1899 Mr. Malpas served as chief engineer and manager to Messrs. Calvert and Co., Manchester, and while with them carried out power and lighting installations in various parts of the country. His next post was with Messrs. Arthur Guinness, Sons and Co., Ltd., Dublin, who were spending over £100,000 on extensions to buildings and plant for the generating station. Having completed this work, Mr. Malpas went to the United Alkali Co., Ltd., as chief assistant to the superintending engineer, and in this capacity erected the first Kestner evaporator in England, for the concentration of caustic liquors in connection with a waste heat recovery scheme. He was also responsible for the construction and erecting of a battery of electric furnaces operated by gas-driven sets, aggregating 500 h.p. In 1903 he went to Spain as engineer to the Sociedad de Gasificacion Industrial, to take charge of the building and operation of a 12,000-h.p. gas producer plant erected in Madrid for the public supply of electricity. This company subsequently undertook a hydro-electric development upon the river Tagus, installing turbines with a capacity of 15,000 kVA. While in Spain, Mr. Malpas rendered assistance to the Electrolytic Chemical Co., of Aboño, Asturias, and he was subsequently with other chemical companies in Spain. He was recalled from Spain in 1915 to take up the position of manager of the Ammonia Soda Co., Ltd., with which he had previously served. When these works were taken over by Messrs. Brunner, Mond & Co., Ltd., Mr. Malpas transferred to the United Alkali Co., Ltd., as manager of the Perchlorate Works, Flint, and in 1919 he was appointed chief engineer to the company. After about six years in this position he commenced to practise as a consulting engineer in Liverpool, remaining consulting engineer to the United Alkali Co. Mr. Malpas is a member of the Institutions of Electrical, Mechanical and Chemical Engineers.



Lafayette] *[Manchester.*

Mr. A. E. Malpas.

Chairman of the Mersey and North Wales (Liverpool) Centre of the I.E.E.

We are asked to state that Mr. E. H. Woodhall has resigned from the board of directors of Messrs. Woodhall and Partners, Ltd., Swansea, and is not now connected with the company.

Mr. Harold C. Rogers, who for many years represented the British Thomson-Houston Co., Ltd., on the South Coast, will represent the Stearn Electric Co., Ltd., in that district from November 1st.

Mr. R. C. Bullough, who was manager and engineer of the Colchester Corporation Tramways from their inception 21 years ago until his retirement recently, has been presented by the employés of the department with a gold albert.

Mr. William A. McGilvray has joined the staff of the British Ebonite Co., Ltd., and will represent it in the North of England.

Mr. H. J. Nisbett, who has been manager of the Torquay Tramways Company for many years, is retiring from that post in order to devote his whole attention to public work. He is at present engaged in a municipal contest in the Babbacombe ward.

Obituary.—Mr. J. Malone.—The death took place on October 16th of Mr. James Malone, of Barnstaple, where he had carried on business as an electrician for 20 years. He was 70 years of age.

Herr F. T. Horn.—The death recently occurred, at the age of 71 years, of Herr Friedrich T. Horn, founder of the Horn Tachometer and Electric Measuring Instrument Works, of Grosszschocher, Leipzig.

Herr M. Hahn.—The death is reported from Vienna of Herr Max Hahn, general director of the Austrian Berliner Telephone Works, of that city.

Wills.—The late Mr. A. E. Mills, M.A., M.I.E.E., Fellow of the Physical Society, of North Finchley, consulting engineer, left £10,767 gross and £7,692 net personalty.

The late Mr. E. P. Simpson, a director of Worthington Simpson, Ltd., left £20,579 gross and £17,769 net personalty.

New Companies Registered.

British Rolled Steel Pole Co., Ltd. (209,065).—Private company. Registered October 17th. Capital, £10,000 in £1 shares (6,000 8 per cent. preferred ordinary and 4,000 deferred ordinary). Objects: To acquire a certain patent relating to improvements in the construction of telegraph, telephone and electrical service poles and masts and for other purposes. The first directors are:—F. L. Baldwin, Bentley Lodge, Banstead, Surrey; F. L. Broughton, Fieldhead, Hempstead, Gloucester; J. Payton, The Grange, Warwick Road, Solihull, Warwickshire; H. Kershaw Walker, Sandringham House, Sutton, Surrey. Qualification, 100 preferred ordinary shares. Remuneration (except managing director, if any) as fixed by the company. Secretary: A. F. Smith. Solicitors: Markby, Stewart & Wadesons, 5, Bishopsgate, E.C.2. Registered office: 3, Throgmorton Avenue, E.C.2.

Valco, Ltd. (209,073).—Private company. Registered October 17th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical, mechanical, wireless and general engineers, inventors, designers, manufacturers and repairers of, agents for, and dealers in lamps, valves, batteries, accumulators, receivers, amplifiers, and other electrical goods, accessories and materials, &c. The subscribers (each with one share) are:—P. V. Castell-Evans, Carn Dochun, Elthorne Heights, W.7, engineer; J. E. Oliver, 18, Milner Road, Merton Park, S.W.19, sales manager. The first directors are to be appointed by the subscribers. Secretary: J. E. Oliver.

Barclay, Young & Co., Ltd. (209,088).—Private company. Registered October 19th. Capital, £250 in 225 5 per cent. non-cumulative preference shares of £1 and 1,000 deferred shares of 6d. each. Objects: To carry on the business of electrical engineers and contractors; to promote companies for the purchase of rubber, oil and timber properties, mineral concessions or other properties; to carry on newspapers, to act as financiers, manufacturers, shipowners, carriers by land or sea; to construct and maintain roads, works, buildings and conveniences, &c. The subscribers (each with one preference share) are:—A. M. Kinnear, 65, Dalmeny Avenue, Norbury, S.W.16, engineer; W. R. Patterson, 12, Meyrick Road, Clapham Junction, S.W., clerk. The first directors are to be appointed by the subscribers. Secretary: S. E. Young. Registered office: 115, Hammersmith Road, W.14.

A. E. Pierson & Son, Ltd. (209,052).—Private company. Registered October 17th. Capital, £2,000 in £1 shares. Objects: To acquire the business of a lamp shade manufacturer and ornamental wire worker carried on by A. E. Pierson at 414, Edgware Road, W., as "A. E. Pierson and Son." The first directors are:—A. E. Pierson, Sun Villa, Northolt Junction, lamp shade manufacturer (permanent governing director); Harriet L. Pierson, Sun Villa, Northolt Junction. Qualification, 1 share. Solicitors: Greville and Averill, 35, Baker Street, Portman Square, W. Registered office: 414, Edgware Road, W.

Hygienic Telephone Attachment Co., Ltd. (209,148).—Private company. Registered October 21st. Capital, £2,400 in £1 shares. Objects: To adopt an agreement with E. A. Jones and to carry on business as manufacturers and traders of the Jones hygienic telephone attachment, &c. In a winding-up the patent rights shall revert to E. A. Jones except in such countries where such rights have been disposed of. The directors are:—E. A. Hosband, 52, Rupert Street, W.1; W. D'Oyley Rochfort, 52, Rupert Street, W.1; L. R. Warrens, 12, St. Simon's Avenue, Putney, S.W.15; and E. A. Jones, 50, West End Lane, Hampstead, N.W. Registered office: 52, Rupert Street, W.1.

Truescrews, Ltd. (209,134).—Private company. Registered October 20th. Capital, £500 in £1 shares. Objects: To carry on the business of factors, manufacturers, wholesalers, importers and exporters of and dealers in metal screws, nuts, bolts, washers, terminals and the like, and all kinds of goods appertaining to the wireless, electrical and engineering trades and industries, &c. The first directors are:—H. F. Maslin, 1, St. Andrew's Road, Stamford Hill, N.16, sales manager; E. R. Gilbert, The Cottage, Greenford Station, South Harrow, advertising agent. No qualification required. Solicitors: Denton, Hall and Burgin, 3, Gray's Inn Place, W.C.1. Registered office: 58, Ludgate Hill, E.C.4.

Rectalogy, Ltd. (209,129).—Private company. Registered October 20th. Capital, £500 in £1 shares. Objects: To carry on the business of dealers in and importers and exporters of all kinds of metals and alloys, manufacturers of and dealers in accessories and fittings of every description, and all kinds of goods in connection with wireless, electrical and engineering trades and industries, &c. The first directors are:—W. S. Worthington, Little Pipers, Clay Hill, Enfield, manufacturer (chairman and managing director); E. R. Gilbert, The Cottage, Greenford Station, Middlesex, advertising agent. No qualification required. Solicitors: Denton, Hall and Burgin, 3, Gray's Inn Place, W.C.1. Registered office: 58, Ludgate Hill, E.C.4.

T. D. Morison, Ltd. (209,132).—Private company. Registered October 20th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, toolmakers, metal workers, smiths, woodworkers, metallurgists, and chemists, manufacturers and repairers of and dealers in motor cars, motor cycles and other vehicl manufacturers and treaters of and dealers in textile fabrics, leather goo drugs, chemicals, &c. The subscribers (each with one share) are:—F. Winterbotham and H. K. Lee, both of 10 and 12, Bishopsgate, E.C.2. T. Morison is the first director. Solicitors: Waterhouse & Co., 10 and Bishopsgate, E.C.2.

Industrial Gases, Ltd. (209,175).—Private compan Registered October 22nd. Capital, £10,000 in £1 shares. Objects:— acquire the benefit of existing agreements, patents, and rights in the Briti Empire or elsewhere in respect of industrial gases, electro-chemical, a other electrical products or apparatus therefor, to carry on the business manufacturers and sellers and buyers of industrial gases, carbide of calciu and other similar products or products arising therefrom, electro-chemic products and apparatus, electrical and other plant, &c. The first directo are:—C. H. Bingham, 2, Kingswood Road, S.E.19; C. H. Bingham, Jun 2, Kingswood Road, S.E.19 (directors of Abercar, Ltd., Acetaar, Ltd., Allian Calcar Co., Ltd., Bristol Carbide Co., Ltd., Newcastle Carbide Co., Ltd Newcalcar, Ltd., Chas. Bingham & Co., Ltd., Alliance Carbide Co Ltd., and Albion Products (1921), Ltd.). No qualification required for t first directors. Remuneration as fixed by the company. Secretary: A. Bake Registered office: 34, Victoria Street, S.W.1.

Electricity Distribution of North Wales and District, Ltd (209,196).—Registered as a "public" company on October 23rd, with nominal capital of £205,500 in 200,000 preference shares of £1 and 110,0 ordinary shares of 1s. each. The preference shares are entitled to cumulative preferential dividend of 6 per cent. and the right in eac year to the extent of, but not more than, a further 4 per cent. per annu to share equally with the ordinary shares in the profits of the company afte paying the holders the said preferential dividend. The objects are:—To carry o in England and elsewhere the business of an electric light and power compan in all its branches, and for that purpose to apply to and obtain from Parliamen or the Board of Trade or any other governing or competent authority an Acts of Parliament of the United Kingdom, or Special or Provisiona Orders, to purchase or otherwise acquire, or to enter into and carry int effect any agreements for working and carrying on any undertaking author ised by any Act of Parliament or Provisional Order obtained by any loca authority, company, body, or person, and to construct, lay down, establish fix, and carry out all necessary stations for generating electrical energy works, plant, machinery, and sub-stations, cables, wires, lines, pipes, mains accumulators, lamps, and apparatus for the distribution and supply of elec tricity for all purposes, to apply for and obtain from Parliament, the Boar of Trade, Minister of Transport, and the Light Railway Commissioners o other Government authority any Act of Parliament of the United Kingdom Tramway Order or Light Railway Order, and to carry the same into effect to carry on the business of engineers, manufacturers of and dealers in apparatus, contractors for the construction and equipment of any works authorised by any Provisional Tramway or Light Railway Orders, whether electrical or other mechanical power, &c. The subscribers (each with one share) are:—H. Braten, 88, Dollis Hill Lane, Cricklewood, N.W.2, clerk; C. Osborne, 36, Beeklands Road, Streatham, S.W.17, clerk; and five other clerks. The minimum cash subscription is 7 shares. The directors may raise a loan not exceeding £100,000, being the loan which it is intended should be guaranteed by His Majesty's Treasury in pursuance of the Trade Facilities Acts, 1921-25. The directors may also from time to time raise or borrow any moneys for the purposes of the company within specified limitations.

The Treasury shall be represented on the board by one director, who shall not be removable without the sanction of the Treasury during the currency of the above loan nor prior to the raising thereof. The Investment Registry, Ltd., the Power Development Co., Ltd., and the Gwynedd Trust, Ltd., may each appoint one director, whose remuneration shall not be less than the highest remuneration paid to any other director other than the Treasury director, or chairman, and no director appointed by those companies shall be subject to retirement nor be required to hold any qualification. The first directors are not named. Qualification of other directors, £100. Remuneration (except Treasury director, chairman, and managing directors), £150 each per annum, free of income tax. Solicitors: Last, Riches and Fitton, 17, Sackville Street, W.1.

Measurement (Australia), Ltd. (209,228).—Private company. Registered October 24th. Capital, £25,000 in £1 shares. Objects:— To acquire from Measurement, Ltd., the Australian branch of the business, and to carry on in Australia or elsewhere the business of manufacturers, vendors and licensees of meters, machinery, and other apparatus for measuring, indicating, and recording the volume or flow of water and other liquids and electricity, or the strength and amount thereof, &c. The directors are:—Sir Henry Cowan (chairman), address not stated; F. R. Smith, "The Garth," Limpsfield Common, Surrey, gas engineer; F. Thorp, address not stated; and E. A. MacLeod, 16a, Carlton Road, Putney, S.W., engineer So long as Measurement, Ltd., or its nominees hold a majority of the total issued share capital, the directors shall be nominated by it. Solicitors: Rutherford & Co., 48, Cannon Street, E.C.

Official Returns of Electrical Companies.

A. O. Reflector Co., Ltd.—T. A. Evans, of 2 and 3, Salisbury Court, Fleet Street, E.C.4, C.A., was appointed receiver on October 8th, under powers contained in instrument dated January 16th, 1925.

Radio (Hove), Ltd.—Debenture dated October 2nd, 1925, to secure £200 constituting a floating charge on the company's undertaking and property, including uncalled capital and specific charge on lathes, drills, electric motor, &c. Holder: A. A. Gibson, 23/5, Billiter Street, E.C.

Halifax and Bermudas Cable Co., Ltd. (28,972).—Return dated October 8th, 1925. Capital, £50,000 in £5 shares. All shares taken up. £50,000 considered as paid. Mortgages and charges, nil.

Torquay Tramways Co., Ltd.—Satisfaction to the extent of £1,300 on September 30th, 1925, of charge dated March 8th, 1911, securing £60,000.

Musselburgh and District Electric Light and Traction Co., Ltd.—Satisfaction to the extent of £1,500 on September 30th, 1925, of charges dated November 13th, 1905, and May 11th, 1909, securing £90,000.

Norwood Wholesale Fittings Supply Co., Ltd.—C. Austin, of 29, Brunswick Mansions, Aldgate, E.C., ceased to act as receiver or manager on March 31st, 1925. (Notice filed October 17th.)

Adams Brothers (Longton, 1925), Ltd.—R. E. Clark, of 17, Albion Street, Hanley, was appointed receiver and manager on October 13th, under powers contained in debenture dated May 5th, 1925.

Buss, Webb & Son, Ltd.—Mortgage on land with messuages thereon in Foxhall Road, Ipswich, dated September 30th, 1925, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £2,500.

Eclat Electric Manufacturing Co., Ltd.—W. W. B. Jackson, of 65-66, Chancery Lane, W.C.2, ceased to act as receiver or manager on April 6th, 1925. (Notice filed October 16th.)

Todman, Ryall & Co., Ltd.—Issue on October 7th, 1925, of £3,000 debentures, part of a series already registered.

City Notes.

eports and Meetings of Electrical Companies; Dividend Results, &c.

isbon Electric ramways, Ltd. The directors' report for the year ended December 31st, 1924, states that there was a net profit of £80,397 after deducting interest and amortisation on the debentures the Cia. Carris de Ferro de Lisboa, and on the company's vn debentures, and the payment of London expenses. To is sum is added £25,066 brought forward, making £105,463. this amount £32,000 is transferred to depreciation account, 33,833 is set aside for the payment of arrears of preference vidends, and the balance (£9,630) is carried forward. There as a fall in the number of passengers carried during the year om 89,566,215 to 83,782,431. Higher wages increased the ex-nses, but this rise was more than met by the improvement the traffic revenue. The payment of the cumulative prefer-ice dividend has been brought up to December 31st, 1919.

Italian Companies. The *Società Piedmontese di Elettriche*, of Turin, is increasing its capital to 200 million lire with the object of acquiring a 70 per cent. interest in the Società Telefonica terregionale Piedmontese. The title of the first-named con-rn is also being altered to the Società Industrie Elettro-tele-niche "S.I.E.T."

The *Società Italiana dei Servizi Radio-telegraphici e Radio-lefonici*, of Rome, has lately changed its title to the *Società aliana Marconi*.

French Companies. The report of the *Société de la Maison Breguet*, of Paris, shows a net profit of 1,971,932 fr. for the financial year 1924-25, as compared with 2,172,453 fr. in the preding year. The dividend on the old shares is being reduced om 60 to 50 fr.

Herbert Morris, Ltd.—The profit for the past year, after lowing for income tax, was £71,150. To this are added 30,224 brought forward and £8,936 from investments, &c., aking £110,310. It is proposed to pay a further dividend on e ordinary shares, making 10 per cent., free of tax, for the ar, to capitalise £6,225, to transfer £10,000 to reserve, and carry forward £33,141. The meeting is to be held to-day riday) at Loughborough.

North Wales Power Co., Ltd.—The report for 1924 re-rds a profit of £40,477, and the available balance, after ducting debenture interest, &c., and adding £2,686 brought rward, is £20,205. A dividend of 8 per cent., less tax, is commended on the cumulative participating preference ares, leaving £3,219 to be carried forward.

Electrical Distribution of Yorkshire, Ltd.—The company s posted letters offering 250,000 ordinary shares to the share-lders at 26s. per share. The system of the company has been eatly extended, as a statement printed in our advertise-ent pages to-day indicates. At a meeting held a short time o it was resolved to increase the capital of the company from 50,000 to £500,000 by the creation of 250,000 new shares.

S. Smith & Sons (Motor Accessories), Ltd.—A meeting as called for yesterday of the holders of the company's 8½ per nt. first mortgage debentures. A resolution was to be sub-itted providing for a further postponement of the commence-ent of drawings and contributions to the sinking fund until tober, 1926, and January, 1927, and to postpone the ultimate demption date to 1938.

Western Union Telegraph Co. (Inc.).—A report cover-g the period from January to September (nine months) ows that the gross revenues amounted to $94,141,130, as mpared with $84,861,418 in the equivalent period of last year. he total expenses increased from $73,615,988 to $80,843,586, d the net income from $9,511,355 to $11,545,490.

Stock Exchange Notice.—Dealings in the following have en specially allowed by the Committee under Rule 159:—
Shropshire, Worcestershire, and Staffordshire Electric Power Co.—14,145 per cent. cumulative preference shares of £1 each, fully paid, Nos. 45,856 to 1,160,000.

Lancashire Electric Light and Power Co.—A meeting of e shareholders was to be held yesterday (Thursday) to nction the creation of 250,000 new £1 shares, increasing the dinary capital to £1,000,000. It is proposed to issue these rtly, and present shareholders will be given preference.

Dumbarton Burgh and County Tramways Co., Ltd.—he report for the year ended July 31st shows an available llance of £2,781, as compared with £3,079 in 1924. Of this nount £2,781 has been set aside for debenture stock redemp-on, and the balance (£202) is carried forward.

Montreal Light, Heat and Power Consolidated.—A divi-nd of $2 per share has been declared on the common and eferred shares in respect of the quarter ending October 31st.

Glenfield & Kennedy, Ltd.—An interim dividend of 4 per nt. has been declared on the ordinary shares, as compared ith 2½ per cent. in 1924.

United River Plate Telephone Co., Ltd.—The directors opose to pay an interim dividend of 3 per cent., free of x, on the ordinary shares, as in 1924.

Stanton Ironworks Co.—An interim dividend of 4 per nt., free of tax, has been declared on the ordinary shares, in 1924.

Calcutta Tramways Co., Ltd.—An interim dividend of per cent. (actual), free of tax, has been declared on the dinary shares.

Stocks and Shares.

Monday Evening.

Stock Exchange markets—or, to be more accurate, some of the Stock Exchange markets—are extremely busy. In illustration it may be mentioned that the price of Stock Exchange shares has risen from 116 a month ago, to 130, ex 48s. dividend, to-day. A "nominational," without the acquisition of which no candidate can obtain membership, changed hands at £80 five weeks ago, but the price is now nearer £500. Cable manufacturing shares, and electrical equipment issues, are remarkably better on the week. New stocks and shares find a welcome ready-made if they offer any reasonable temptation to the investor and the speculator.

Advances have occurred in British Aluminium, Brush, Callenders, Edisons, English Electrics, Generals, Johnson and Phillips, Henleys, Siemens, and others. References to our price lists will show the unusual strength displayed by this department. Moreover, the seller will find it much easier to deal at middle prices than the buyer. The supply of shares is extremely limited. In a few cases the dealers prefer not to sell at all, because they do not know where to go to replace what they part with; in other cases buyers are told that they may have to wait some considerable time, if they insist upon dealing, before delivery is likely to be effected.

Iron, steel, and engineering shares have advanced materially. Babcock, ex 1s. dividend, are 3s. 6d. up to 2⅝. It is said that a campaign has been quietly organised, in high official quarters, to preach "prosperity" to the nation, and that this has started the rise in "heavy" shares, in shipping and in railway stocks. Central London Assented ordinary, Metropolitan Consolidated, Districts and Undergrounds are all higher, and the market for steam stocks is as good as that for what are called the Tube issues.

Colonial and foreign traction descriptions follow the same upward path. Anglo-Argentine Tramways firsts are 1/16th lower, but the British Columbia, Brazil Tractions, Rio Tramways seconds, Mexican Light and Power preferred are amongst those which have gained on the week. British Columbia stocks, in particular, are a strong market.

One of the new company registrations is Electricity Distribution of North Wales and District, formed with a capital of 200,000 preference shares of £1 each and 110,000 ordinary shares of 1s. each.

Cable and telephone stocks are not behind the general list in the firmness of their market. Chili Telephones have put on 11s. 3d. to 6 5/16ths, owing to the permission for an increase in the company's scale of rates. United River Plates continue their steady rise, and are ⅛ better at 7⅜. The new shares stand at 2½ premium over the issue price. Indo-Europeans have gained 35s. The Eastern stocks and shares are strong. Anglo-American preferred is 1 higher at 102 ex dividend. In the wireless division, Canadian Marconis have been up to 7s. 6d., but relapsed a few pence. Marconis remain at 28s. 9d., and Marines can be bought at 17s. 7½d. Burndept preferred and deferred found strong support from United States buyers.

Details given here last week (Electrical Review, p. 670) of the offering of American Utility issues on this side have aroused attention, and some inquiry as to what companies are concerned. There are several. One that may serve as an illustration is the Central Illinois Public Service Company. This undertaking, according to particulars in London circulation, furnishes electric light and power directly to 194 communities in Illinois. It sells electrical energy at wholesale (*sic*) to 26 other public utility communities; serves eight communities with gas, 11 with water, five with heat, and five with electric railway service, and electric intersuburban railways are operated. It further operates 11 ice plants. The registrars and the transfer office are in Chicago.

These, and other similar American utility companies may be—and doubtless are—excellent institutions, but, without expressing any opinion upon the security offered by their shares, the opinion may be reiterated that British capital can find employment to equal advantage in British companies. The latter require money for development that can give employment to large bodies of British workmen, and the extension of the electrical field in this country will help to remove the reproach, so often heard from Americans, that Great Britain lags behind in the provision of the facilities to all kinds of industry that electricity alone can afford.

London supply shares are quiet. County ordinary have regained 1s., and the new preference can be sold at 21s. 1½d. premium. Urban preference at 18s. 9d. ex dividend pay £6 8s. per cent. on the money, and look a reasonable speculative investment at that level. Some of the provincial companies' shares have eased off a trifle. Clyde Valleys are 1s. lower at 27s. 6d.; falls of 6d. apiece have left Lancashires at 25s. 6d. and Midland Counties at 22s. 3d. Geographically, the electricity supply market is located in the Stock Exchange cheek-by-jowl with the rubber share department, in which business is still upon an enormous scale, dwarfing interest in some of the more humdrum markets where price fluctuations occur more calmly and less frequently. Confidence in continuance of strength in rubber shares remains unabated.

Share List of Electrical Companies

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Oct. 26. 1925.	Rise or fall.	Yield p.c.
Home Electricity Companies						
Bournemouth and Poole	1	13	14	2 1/16	—	4 15 4
Brompton Ordinary	1	10	10	1 3/4	—	*5 14 3
Charing Cross Ordinary	1	14 1/2	15	27/-	—	6 2 5
do. do. 4½ Pref.	1	4 1/2	4 1/2	17/6	—	5 2 10
Chelsea	1	12	12	1 1/8	—	6 8 0
City of London	1	15	15	47/-	—	6 7 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	27/6	—1/-	5 16 4
County of London	1	15	15	57/-	+1/-	5 5 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12 7/8	—	5 16 8
Lancs. Light and Power	1	7 1/2	7 1/2	25/6	—6d.	5 17 8
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5 1/2	—	5 7 10
Metropolitan	1	10	11	38/3	- 2/-	5 14 4
do. 4½% Pref.	1	4 1/2	4 1/2	17/6	—	5 2 10
Midland Counties	1	5 1/2	6	22/3	—6d.	5 7 10
Newcastle-on-Tyne Ordinary	1	6	7	22/-	—	6 7 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	9 1/2	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17 1/2	17 1/2	14 7/8	—	5 17 8
South London	1	15	15	2 5/16	—	5 17 1
South Metropolitan Pref.	1	7	7	1 1/4	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	18/9xd	—	6 8 1
Westminster Ordinary	1	15	15	44/6	—	6 14 10
Whitehall Elec. Invst. 7½% Pref.	1	7 1/2	7 1/2	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6
Home Rails.						
Central London Ord. Assented Stock	4	4		67	+1	5 19 5
Metropolitan	4	5		71	+ 1/2	7 0 10
do. District	3 1/2	3 1/2		47	+3	7 9 1
Underground Electric Ordinary	10	Nil	Nil	2 3/8	+ 1/8	Nil
do. do. "A"	1/-	Nil	Nil	7/-	+6d.	Nil
do. do. Income Bonds	6	6		97	—	*6 3 9
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref. Stock	6	6		102xd	+1	5 17 8
do. Def.	1 1/2	1 1/2		24 1/4	—	6 3 9
Automatic Telephone	1	3	6	47/6	—	2 10 7
Chili Telephone	5	6	5	6 1/16	+ 3/16	*4 7 0
Cuba Sub. Ord.	10	5	5	6 3/4	+1/2	7 8 2
Eastern Extension	10	10	10	17 1/2	+ 3/8	*5 14 3
Eastern Tel. Ord.	Stock	10	10	174 1/2	+4	*5 14 7
Globe Tel. and T. Ord.	10	10	10	17 3/4	+ 1/8	*5 12 8
do. do. Pref.	10	6	6	11	+ 1/8	5 8 1
Great Northern Tel.	10	22	22	35	+1 3/4	6 5 9
Indo-European	25	7	8 1/2	44 1/2xd	+ 1/2	*4 15 6
Marconi	1	10	10	1 1/16	—	6 19 2
Marconi Marine	1	10	7 1/2	7/8	—	8 11 6
Oriental Telephone Ord.	1	12	12	2 3/8xd	+2/-	*5 13 4
United R. Plate Tel.	5	8	8	7 7/8	+1/8	5 8 6
Western Telegraph	10	10	10	16 3/4	+ 3/8	*5 19 5
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5 1/2	5 1/2	3 5/16	— 1/16	8 6 0
do. do. 2nd Pref.	5	6	6	3 3/8	—	8 17 10
do. do. 5% Deb. Stock	5	5		77 1/2	—	6 9 0
British Electric Traction Ord.	6	6		122 1/2	+1	4 18 9
do. do. 6% Pref.	6	6		107	—	5 12 2
Brazil Traction	100	4	4	81	+2 1/2	4 18 9
Brit. Columbia Elec. Rly. Pce. Stock	5	5		89 1/2	—	5 11 9
do. do. Preferred	96/-	96/-		93 1/4	+1	*5 3 0
do. do. Deferred	129/5	129/5		114 1/2	+2	*5 13 4
do. do. Deb.	4 1/4	4 1/4		77 1/2	—	5 9 8
Lond. & Sub. Trac. 5% Pref.	1	2 1/2	Nil	4/6	—	Nil
London United Tram. Deb. Stock	4	4		42 1/2	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	63 1/2	—	7 17 6
Mexican Light Common	100	Nil	Nil	32	—	Nil
do. Pref.	100	Nil	Nil	63 1/2	+1 1/2	Nil
do. 1st Bonds	—	5	5	69 1/2	—	7 3 11
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8
Manufacturing Companies.						
Babcock & Wilcox	1	12	12	2 3/8xd	+3/6	*4 11 5
British Aluminium Ord.	1	5	10	1 7/8	+ 1/16	5 6 8
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3 3/4	+ 1/4	4 0 0
Brush Ord.	1	10	10	23/9	+1/9	8 8 5
Callenders	1	15	15	3 1/4xd	+2/3	4 12 4
do. 6½% Pref.	1	6 1/2	6 1/2	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	5/8	—	... ...
Edison-Swan	4/-	10	10	9/3	+1/9	5 6 8
do. 5% Deb. Stock	5	5		80 1/2	—	6 4 3
Electric Construction	1	10	10	1 3/8	+ 1/8	6 3 1
Enfield Cable, Pref.	1	7 1/2	7 1/2	1 1/2	—	6 0 0
English Electric	1	5	5	18/3	+1/-	5 9 7
do. do. Pref.	1	6	6	20/-	—	5 17 1
Gen. Elec. Pref.	1	6 1/2	6 1/2	23/9	—	5 9 5
do. Ord.	1	5	7 1/2	29/-	+3/-	5 3 5
Henley	1	15	16	3 1/16	+ 1/16	4 16 5
do. 4½% Pref.	5	4 1/2	4 1/2	4 1/2	—	5 6 0
India-Rubber	1	5	5	1 1/16	—1/32	*4 16 10
Johnson & Phillips	1	10	10	51/9	+4/-	3 13 0
Met-Vickers, Ord.	1	8	8	24/-	+1/6	6 10 8
do. Pref.	2	8	8	2 3/8	—	6 14 9
Siemens Ord.	1	—	7 1/2	32/-	+1/8	4 18 9
Telegraph Construction	12	20	20	26 1/2	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price October 27th.	Fortnight's Inc. or dec.
a Acid, Oxalic ... ... per lb.	5 3/4d.	
a Ammoniac, Sal ... ... per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£25	...
a Copper Sulphate ... ... ,,	£25 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4 1/2d.	...
a ,, Perchlorate ... ... ,,	5 1/2d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Commercial ... ... ,,	£8 10s.	1£s. inc
a ,, Roll ... ... ,,	£8 10s.	15s. inc.
a Soda, Chlorate ... ... per lb.	3 1/2d. to 3 3/4d.	...
a ,, Crystals ... ... per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
		...
		...
METALS, &c.		
b Aluminium, Ingots ... ... per ton	£120 to £125	
b ,, Wire ... ... per lb.	1/9 to 2/6*	
b ,, Sheet ... ... ,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		...
Grade I ... ... per ton net	£255	£6 inc.
Grade II ... ... ,, ,,	£182	£4 inc.
Grade III ... ... ,, ,,	£102	£1 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	10 1/4d.	...
c ,, Tubes (solid drawn) ... ,,	1/- to 1/0 1/2	...
c ,, Wire, basis ... ... ,,	10 3/4d.	...
c Copper Tubes (solid drawn) ... ,,	1/1 1/2	...
c ,, Bars (best selected) ... per ton	£92	£1 inc.
c ,, Sheet ... ... ,,	£92	£1 inc.
c ,, Rod ... ... ,,	£92	£1 inc.
d ,, (Electrolytic) Bars ... ,,	£68 10s.	10s. inc.
d ,, ,, Sheets ... ,,	£143 10s.	...
d ,, ,, Wire Rods ,,	£78 10s.	10s. inc.
d ,, ,, H.C. Wire per lb.	9 1/16d.	...
f Ebonite Rod ... ... ,,	2/3 to 2/8	...
f Sheet ... ... ,,	2/3to 2/6	...
n German Silver Wire ... ... ,,	2/8	...
h Gutta-percha, fine ... ... ,,	3/9	...
h India-rubber, Para fine ... ... ,,	3/9	7 1/2d. inc.
i Iron Pig (Cleveland Warrants) ... per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g Lead, English Pig ... ... ,,	£40 15s.	5s. inc.
g Mercury ... ... per bot.	£13 17s. 6d. to £14	7s. 6d. to 10s. inc.
e Mica (in original cases) small ... per lb.	3d. to 8/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/8 1/2	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/2 3/4	...
p ,, ,, wire ... ... ,,	1/3 3/4	...
o Platinum ... ... per oz.	£26	...
d Silicium Bronze Wire ... ... per lb.	1/0 1/2	...
r Steel, Magnet, in bars ... ... ,,	7 1/2d.	...
a Tin, Block (English) ... ... per ton.	£285 to £285 10s.	£7 15s. Inc.
n Wire, Nos. 1 to 16 ... ... per lb.	4/1	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

The Society of Technical Engineers.—At a full meeting held at its headquarters, London, on Saturday last, the Executive Council of the Society unanimously adopted the following resolutions:—

"That since a condition of membershiup of the new Staff Benefit Society being promoted by the Engineering and Allied Employers' National Federation is an undertaking not to belong to any professional protective organisation—all such organisations being covered by the ban against registered or unregistered Trade Unions—we call on all members of the engineering profession to refrain from joining this body, which deprives its members of their common rights of citizenship; further, that the action of the Employers' Federation would appear to be an affront to the engineering profession and an attack upon the peaceful policy of the third party in industry."

"That the Society of Technical Engineers would, however, welcome the participation of the Employers' Federation in promoting a staff benefit scheme without the obnoxious condition referred to above."

"That we have seen with sincere regret the resolution of the Trade Union Congress expressing disapproval of attempts "to foist upon industry third party ideas concerning the position of administrative staffs" and declaring that there can be no middle position between employers and labour; that this action of the Trade Union Congress is an unwarranted effort to coerce organisations of professional and administrative staff workers into the ranks of Labour and to dictate to them what their policy shall be; that in the face of this attack we reaffirm our adhesion to the third party position, in the confident belief that complete independence of control by the organisations of both the employers and the manual workers, such as the third party position secures, is the right policy for protective associations of professional and administrative staff workers."

The matter is referred to in our leading columns to-day.

Swedish Electrical Imports.

The following figures, showing the values of the imports of electrical and allied goods into Sweden in 1924 are taken from the recently-published official trade returns. For purposes of comparison the figures for 1923 are given and notes of increases or decreases are made.

	Kronor. 1923.	Kronor. 1924.	Kronor. Inc. or dec.
Accumulators and parts thereof—unmounted cells—			
Total	82,000	34,000	− 48,000
Denmark	12,000	—	− 12,000
Germany	68,000	18,000	− 50,000
United States	2,000	16,000	+ 14,000
Accumulator plates—			
Total	665,000	672,000	+ 7,000
Denmark	42,000	41,000	− 1,000
Germany	570,000	594,000	+ 24,000
Great Britain	27,000	13,000	− 14,000
U.S.A.	23,000	23,000	—
Cells and batteries, whole or part mounted—			
Total	404,000	641,000	+ 237,000
Denmark	140,000	110,000	− 30,000
Germany	158,000	306,000	+ 148,000
Great Britain	14,000	99,000	+ 85,000
U.S.A.	78,000	101,000	+ 23,000
Boards for electrical instruments and apparatus, fitted—			
Total	150,000	151,000	+ 1,000
Denmark	17,000	13,000	− 4,000
Germany	123,000	131,000	+ 8,000
Great Britain	4,000	1,000	− 3,000
Special apparatus for electrical purposes: Röntgen ray apparatus—			
Total	238,000	192,000	− 46,000
Germany	200,000	164,000	− 36,000
U.S.A.	21,000	9,000	− 12,000
Wireless telegraph and telephone apparatus—			
Total	1,963,000	2,993,000	+1,030,000
Germany	198,000	1,191,000	+ 993,000
Great Britain	70,000	549,000	+ 479,000
U.S.A.	1,586,000	408,000	−1,178,000
Other special apparatus for electrical purposes—			
Total	1,500,000	4,369,000	+2,869,000
Denmark	103,000	183,000	+ 80,000
Germany	949,000	1,399,000	+ 450,000
Great Britain	196,000	2,192,000	+1,996,000
Switzerland	25,000	26,000	+ 1,000
U.S.A.	180,000	269,000	+ 89,000
Galvanic cells—			
Total	1,223,000	1,305,000	+ 82,000
Denmark	431,000	455,000	+ 24,000
Germany	720,000	770,000	+ 50,000
Generators, motors, &c., weighing not more than 50 kilos each—			
Total	1,169,000	1,144,000	− 25,000
Denmark	213,000	110,000	− 103,000
Germany	635,000	562,000	− 73,000
Great Britain	127,000	83,000	− 44,000
U.S.A.	137,000	315,000	+ 178,000
Ditto, weighing more than 50 but less than 100 kilos—			
Total	184,000	135,000	− 49,000
Germany	130,000	83,000	− 47,000
U.S.A.	13,000	17,000	+ 4,000
Ditto, weighing more than 100 but less than 500 kilos—			
Total	381,000	300,000	− 81,000
Denmark	32,000	23,000	− 9,000
Germany	307,000	213,000	− 94,000
Ditto, weighing more than 500 but less than 3,000 kilos—			
Total	247,000	443,000	+ 196,000
Denmark	45,000	12,000	− 33,000
Germany	181,000	382,000	+ 201,000
Great Britain	19,000	39,000	+ 20,000
Ditto, weighing more than 3,000 kilos—			
Total	415,000	123,000	− 292,000
Denmark	11,000	12,000	+ 1,000
Germany	403,000	52,000	− 351,000
Transformers, 100 to 500 kg.—			
Total	69,000	61,000	− 8,000
Germany	54,000	51,000	− 3,000
U.S.A.	11,000	1,000	− 10,000
Transformers over 3,000 kg.—			
Total (all from Germany)	91,000	32,000	− 59,000
Metal filament lamps—			
Total	3,679,000	4,264,000	+ 585,000
Denmark	463,000	244,000	− 219,000
Germany	1,267,000	1,737,000	+ 470,000
Netherlands	1,420,000	1,940,000	+ 520,000
Belgium	132,000	65,000	− 67,000
Lamp sockets, with and without switches—			
Total	346,000	312,000	− 34,000
Germany	334,000	287,000	− 47,000
Insulating tubes, steel armoured—			
Total	59,000	29,000	− 30,000
Germany	56,000	29,000	− 27,000
Insulating tubes, other kinds—			
Total	344,000	267,000	− 77,000
Germany	310,000	261,000	− 49,000
Carbon, not specially mentioned, manufactured for electrical purposes, weighing 3 kilos or more—			
Total	654,000	744,000	+ 90,000
Germany	470,000	320,000	− 150,000
Carbon brushes—			
Total	73,000	75,000	+ 2,000
Germany	11,000	11,000	—
Great Britain	55,000	56,000	+ 1,000
Carbon: Other kinds—			
Total	639,000	707,000	+ 68,000
Germany	531,000	243,000	− 288,000
Starting, regulating, and reduction resistances, controls, and other electric regulators—			
Total	288,000	292,000	+ 4,000
Germany	236,000	216,000	− 20,000
Bases for incandescent lamps—			
Total	678,000	512,000	− 166,000
Germany	541,000	456,000	− 85,000
Netherlands	134,000	55,000	− 79,000
Stators, rotors, current collectors, magnet coils, &c., weighing not more than 50 kilos—			
Total	72,000	90,000	+ 18,000
Denmark	21,000	21,000	—
Germany	34,000	33,000	− 1,000
Current interrupters and reversers, oil brake switches, hand-operated—			
Total	37,000	67,000	+ 30,000
Germany	31,000	61,000	+ 30,000
Box switches—			
Total	498,000	419,000	− 79,000
Germany	463,000	384,000	− 79,000
Knife switches mounted on slate slabs—			
Total	208,000	129,000	− 79,000
Germany	124,000	82,000	− 42,000
Other kinds—			
Total	169,000	185,000	+ 16,000
Germany	141,000	146,000	+ 5,000
Safety appliances, not specified—			
Total	862,000	540,000	− 322,000
Germany	808,000	514,000	− 294,000
Electric stoves for household use—			
Total	232,000	255,000	+ 23,000
Denmark	31,000	22,000	− 9,000
Germany	178,000	178,000	—
Electricity meters—			
Total	1,446,000	1,127,000	− 319,000
Germany	1,360,000	1,088,000	− 272,000
Netherlands	27,000	—	− 27,000
Belgium	23,000	14,000	− 9,000
Other electrical measuring instruments—			
Total	395,000	349,000	− 46,000
Denmark	14,000	17,000	+ 3,000
Germany	326,000	250,000	− 76,000
Porcelain insulators, conduit pipes, &c.: White—			
Total	454,000	263,000	− 191,000
Denmark	15,000	11,000	− 4,000
Germany	428,000	246,000	− 182,000
Ditto, other kinds—			
Total	142,000	176,000	+ 34,000
Germany	47,000	157,000	+ 110,000
U.S.A.	79,000	10,000	− 69,000
Electric lighting fittings of brass, coated, varnished and lacquered—			
Total	151,000	100,000	− 51,000
Germany	126,000	74,000	− 52,000
Cables and cords with sheaths of lead or other metal; maximum diameter 25 mm.—			
Total	520,000	544,000	+ 24,000
Denmark	22000	23,000	+ 1,000
Germany	482,000	492,000	+ 10,000
Ditto, of greater diameter—			
Total	460,000	2,058,000	+1,598,000
Denmark	21,000	9,000	− 12,000
Germany	427,000	1,486,000	+1,059,000
Ditto, not specified—			
Total	769,000	843,000	+ 74,000
Denmark	57,000	40,000	− 17,000
Germany	563,000	657,000	+ 94,000
Netherlands	43,000	35,000	− 8,000
Belgium	43,000	25,000	− 18,000

(£1=about 17 kr.)

Russian Electrical Notes.

Production of Apparatus.—The equipment at the Electro-apparat works, which has been under care and maintenance, has now been restored and production was to be started again by the Leningrad Machine Trust at the beginning of October.

Credit Facilities.—In the interest of facilitating the securing of credit for electrical works, the directors of the Electrical Bank reduced on October 1st the rate of interest on long-term loans from 12 to 10 per cent. Moreover, the bank has put forward an application for permission to extend the period for long-term loans from 10 to 12 years.

Wireless Apparatus.—The Radio Transmission Company has just placed orders with the Leningrad Low-Pressure Trust for the delivery of wireless apparatus for the sum of 5,000,000 roubles. As the country's production is insufficient to satisfy the home demand, the company has made application for permission to purchase wireless apparatus abroad for the amount of 1,300,000 roubles.

The Schatur Station.—The first turbo-generator of 16,000 kW at the Schatur station was brought into regular operation at the end of September, the current being transmitted along an overhead line at 115,000 volts to Moscow. It is proposed to start the second machine of the same size in November when, besides supplying Moscow, current will be furnished to a number of industrial undertakings.

Rural Electrification.—The General Electrical Commission has forwarded to all organisations connected with works of rural electrification a request to prepare a definite number of standard types of installations, which are to be summarised and considered at a special conference. At the same time the Electric Planning Commission has decided that it is necessary for the assignments in the budget for 1925-26 for works of rural electrification to be increased from 10,000,000 to 15,000,000 roubles.

As a consequence of the absence of information concerning small installations in, and the actual application of electrical energy in the agricultural industry, the General Electrical Commission six months ago dispatched a representative to make an investigation of the question in the districts of Kostromsk, Yaroslav, and in various parts of the Ukraine (Kharkoff, Poltav, Kieff, Kherson, Pervomaisk, &c.). The inquiry has revealed the fact that small fuel stations and small hydro-electric stations predominate in the agricultural districts visited, these being of a capacity of only from 40 to 50 kW, and in a few cases of 150 kW. Most of the stations only serve for lighting, there being no power load, and they do not work all the year round. The information collected will be utilised in dealing with the question of loans for the electrification of agricultural districts.

Rural Supply Schemes.—The National Commissariat for Agriculture has opened an international competition for the submission of rural electrification schemes. Entries are said to have already been received from foreign firms, and American firms are stated to have asked for an extension of the time for the presentation of projects.

Foreign Turbo-Generators.—According to a report placed before the General Electrical Commission, turbo-generators of 5,000-kW capacity, the construction of which in Russia is still under contemplation, can be ordered abroad at prices which are considerably lower than those quoted by the electrical trusts. Also, the foreign sets are more economical in working and can be delivered in a shorter time than by the Soviet works. In view of these circumstances, the Commission has decided to ask the General Metal Commission and the General Electrical Trust to present a report concerning the prospects of the construction of turbo-generators in Russia and of the possibility in the next few years of reducing to a minimum the difference between home and foreign prices, quality, and time of construction.

A Large Generator from England.—The Electrotok, of Leningrad, is reported to have placed an order in England for the delivery of a generator of a size hitherto not used in Russia.

Turbo-Generator Performance.—The Leningrad Electric Machine Trust is reported to have received information from Rostoff that the 3,000-kW turbo-generator, which was the first of this size to be made in Russia, has just been put into operation. The results have been satisfactory and the steam consumption is claimed to be lower than in the case of foreign turbo-generators.

Large Steam Turbine.—The Leningrad Metallurgical Works has begun the assembly of a 10,000-kW steam turbine which was ordered by the Southern Steel Trust for the Briansk iron and steel works. This is the first machine of the size which has been constructed at the works.

New Manufacturing Works.—The General Electrical Commission has presented to the Supreme Council of National Economy a report on the proposed capital expenditure on the electrical manufacturing industry in the year 1925-26, which commenced on October 1st, 1925. Of the total, it is proposed to apportion 17,000,000 roubles to the heavy branches, 4,268,000 roubles to the Low-Pressure Trust, 230,800 roubles to the Accumulator Trust, and 150,000 roubles to the Karbolit works. New producing works are included in the total for the sum of 8,879,000 roubles; the provision of new equipment represents 8,182,000 roubles, and repair works 2,904,000 roubles. As to the necessity for the establishment of entirely new works it is mentioned that the firm orders on the books of the trusts at the present time already represent 65 per cent. of the productive programme of the General Trust (the amalgamated Central and the Leningrad Electrical Machine Trusts) for 1925-26, 65 per cent. in the case of the Low-Pressure Trust, and 55 per cent. in that of the Accumulator Trust. It is proposed to begin the construction of new works for the manufacture of standard sizes of machines, and to reconstruct the former Provodnik works for the turning out of small transformers, machines, and lamps. It is expected that the total capital outlay will have the effect of increasing by 63 per cent. the value of the total output of all the producing branches, while at the same time it is anticipated that the prime costs will be reduced by 14 per cent.

Ural Extensions.—It is reported from Sverdlovsk that the Ural District Council of National Economy has prepared a scheme for the extension of the Eropshin station in order to be able to supply energy to the Alapaeff works and asbestos mines. It is proposed to install two 3,500-kW turbo-generators and to transmit the power to the works and the mines by overhead lines. The initial extension of the station to 4,500 kW will involve an expenditure of 2,310,000 roubles, and the work is to be completed by next April.

A New Kaschir Station.—Preparatory works have begun in connection with the construction of a new Kaschir station, which will be equipped with two 20,000-kW turbo-generators. The existing Kaschir station, which can no longer satisfy the growing demand in Moscow, will be kept in reserve on the completion of the new works, one half of which is expected to be ready in the autumn of 1927.

A Large Combination.—The State Planning Commission has approved a scheme for the formation of a big union of interests by the amalgamation of the "Moges" (Moscow and district supply organisation), the Moscow tramway power station, the Electrical Transmission concern, and the Kaschir and Schatur regional stations, together with the sub-stations, peat-producing, and auxiliary undertakings. All these represent a total capital of 63,834,000 roubles, and the name "Moges" will be retained.

The Moscow Cable Network.—As a result of an investigation made by a committee of the Supreme Council of National Economy, it has been found that recent interruptions in the electricity supply in Moscow have been due to short circuits in parts of the cable network. The committee has decided that it is necessary to carry out the reconstruction of the network in the near future. The supply authority, known as the "Moges," intends to replace the existing oil-break switches and cut-outs at all important parts of the network.

Hydro-Electric Works.—A new hydro-electric works of 5,000 kilowatts is to be constructed to utilise the fall of the River Velikoi, about eight miles from Pskov. The preliminary works have been entrusted to the Electropomosh Company.

A New Accumulator.—Prof. A. F. Ioffe, of Leningrad, claims to have evolved a new accumulator which permits of the concentration of a large amount of energy within a small space. Work is now being carried out with a view to the application of the discovery to industrial purposes.

Manufacturing Profits.—The Electric Machine Trust, of Leningrad, which has now been amalgamated with the Central Electrical Trust, reports that the value of its turnover in the year ended September 30th last amounted to 30,000,000 roubles, as compared with 13,000,000 roubles in 1923-24. A profit of 2,000,000 roubles is claimed to have been made for 1924-25.

Mine Electrification.—It is reported from Ekaterinoslav that work is proceeding in connection with the electrification of the manganese and iron ore mines in the district of Krivoi Rog. An installation of 3,000 kW is to be started early in January at the October mine. A station of 30,000-kW capacity is shortly to be constructed in the iron ore district.

A New Peat Fuel Station.—It has been ascertained that the development of industries in Leningrad will create such a large demand for energy that even the Volkhoff hydro-electric works will be unable to satisfy it. In the circumstances the question has been raised of constructing a new station based on the use of peat from the marshes, and a committee of the State Planning Commission has paid a visit to the locality with a view to the selection of a suitable site for the station, which is to be completed in 1927. Moreover, the committee has decided that it is also necessary to enlarge the capacity of the existing stations, particularly the second station, which is situated in the centre of the industrial district of Leningrad.

The Volkhoff Station.—The State Planning Commission estimates that the expenditure on works at the Volkhoff station from April 1st, 1925, down to its completion will amount to 27,000,000 roubles, of which 21,500,000 roubles is to be provided in 1925-26.

The Textile Machinery Exhibition, 1925.

A Review of the Electrical Features of the Manchester Show.

(*Concluded from page* 677.)

T. Broadbent & Sons, Ltd.

Besides the well-known centrifugal clutch some hydro-extractors were on view, including one 48-in., directly-suspended, electrically-driven model. The motor revolves round the centre spindle and drives through a centrifugal clutch, thus being protected from damage, and resulting in a much reduced starting current being required.

Root Co.

This American firm showed counting devices for various purposes, particularly textile, the motors and control gear provided for them being of Metropolitan-Vickers manufacture.

Hindle, Son & Co., Ltd.

This company showed a 25-ton electric baling press with a d.c. reversing drive, series-wound, which automatically varies the speed according to the work being done. An overload circuit-breaker is provided in order that the motor may be stopped on maximum pressure being exerted, and it is also automatically brought to a standstill at the top and bottom limits of the travel. About 100 bales, it is claimed, can be pressed for one kWh of electricity. The presses are also supplied for a.c. circuits.

Roto-Sign Co.

On the stand of Messrs. J. H. Fenner & Co., Ltd., leather belting manufacturers, an electrically-operated moving sign supplied by the Roto-Sign Co. showed how this form of publicity may be used in an exhibition without any feeling of ostentation.

Metropolitan-Vickers Co., Ltd.

Of its two stands one was utilised as an office and the other for the display of a 680/1,000-b.h.p. turbine designed to run at 4,500 r.p.m. The low-speed shaft of the gears runs at 500 r.p.m., and the set was made for driving direct the main shaft of a mill in India. In addition, the firm had motors and control equipment running on many stands, including those of T. Broadbent & Sons (hydro-extractors), Universal Winding Co. (textile winders), Mellor, Bromley & Co. (hosiery machinery), Hoffmann Manufacturing Co., Carver Textile Patents, Ltd. (patent electromechanical loom, described last week), and Oscar Kohorn & Co. (artificial silk machinery).

Belliss & Morcom, Ltd.

A high-speed engine of the enclosed type was shown with the front doors removed so that the working parts could be seen. The engine was driven round slowly by a 2-h.p. "Lancashire" motor operating through Wallwork worm gear and a Hans Renold chain drive. The high- and low-pressure cylinders are 14½ in. and 21 in. diameter, respectively, with a piston stroke of 10 in., and exert 265 b.h.p. at normal full load and 330 b.h.p. overload, operating with steam at 150 lb. pressure and exhausting at 15 lb. back pressure to the heating system of the works in which it is to be installed. The engine runs at 425 r.p.m., and can be arranged to drive either an electric generator, or a pulley for rope transmission; it has been sold to the Calico Printers' Association.

Andrew Machine Construction Co., Ltd.

In addition to a working exhibit of patent humidifying plant, an electrically-driven air cleaning, purifying, and ventilating machine was shown which provides a method of disinfection and is easily portable.

Laminated Gears, Ltd.

A train of gears reducing, by means of five reductions, from a motor speed of 715 r.p.m. to 1½ r.p.m.; also a bedplate carrying ball-bearing motor and backshaft with laminated gears reducing from 705 r.p.m. to 143 r.p.m. There was also a speed-increasing set with the high-speed shaft running at 6,400 r.p.m.

Daniel Foxwell & Son.

The Kent patent electrical indicator, when fitted to an automatic cloth guider, enables one operative to mind more machines single-handed than at present on account of the fact that, should any fault occur in the selvedges of the cloth going to any machine, he will be immediately notified of it in an audible manner. If the selvedge of the cloth, or any portion of them, should for any reason travel beyond a predetermined distance away from their true line, the electric circuit is closed, thus causing the bell to be rung. A different tone for each machine enables the operative to know exactly where the trouble is.

Joseph Stubbs, Ltd.

These well-known textile machinists had a number of winders for textile use driven by electric motors supplied by Electromotors, Ltd. Each machine was driven by an individual motor either by chain drive or spur gearing.

Markt & Co. (London), Ltd.

This company showed for the first time in this country the new Veeder magnetic counter, fig. 7. This is operated by electromagnets, and with an 80-ampere-hour storage battery with the time of contact of the commutator adjusted to the minimum required to operate properly, the small U magnet counter should run to 5,000,000 and the large magnetic counter to 10,000,000 counts on one charge. The magnetic counter is essential under conditions where it is desirable that the counter be placed at some distance from the machine on which the count is to be taken. A number of counters can be grouped together in a central convenient place. It is also desirable where articles counted are very small, or thin, or light in weight, making it difficult to count them by mechanical means. Because no extra contact device need be provided, the magnetic counter is especially useful in conjunction with other devices already electrically operated, where it is desired to know the number of times these devices are started or stopped, such as lifts. In such cases, the counter could be connected in shunt or in series with the device in question.

The mechanism which moves the number wheels in counting has two motions: one, forward under the influence of the

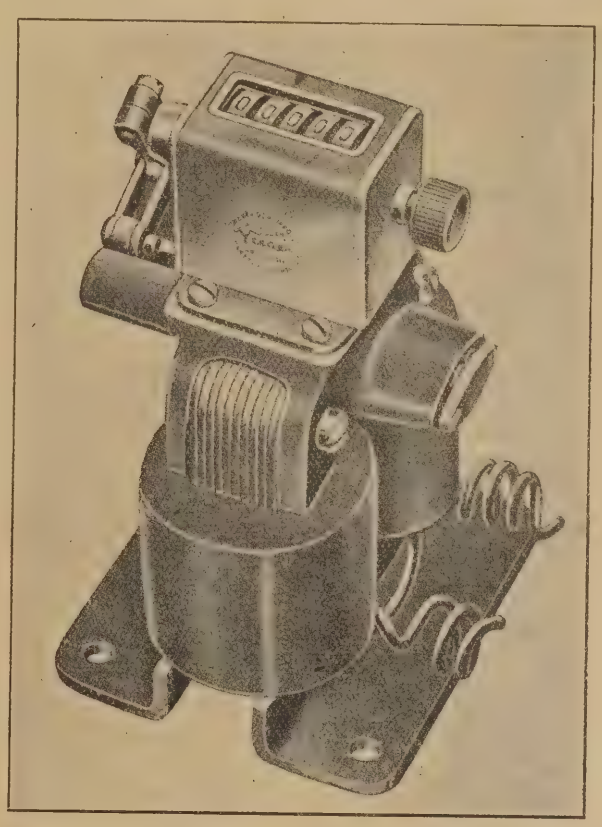


Fig. 7.—"Veeder" Magnetic Counter.

electro-magnets when the contact is made and which moves the counting wheel; and, secondly, the return movement under the influence of a spring which returns the mechanism and completes the cycle. Should the time of contact be too short, the first movement will not be completed, and if there is not sufficient time between breaks (when the current is off) the return movement will not be completed before again starting forward under the force of the magnets.

Although the counter may be placed in a detached position relative to the machine upon which the count is required, it is necessary to provide some mechanical device which will close and break the electrical circuit which operates the counter. The "wipe" style of contact can be used as a revolving, oscillating, or sliding member, and may be a simple contact of metal on the moving member coming in contact with a spring attached to a non-moving member. Another form would be a commutator of one bar on the circumference of a drum made of non-conducting material, with a brush of metal or carbon. The wipe contact has the advantage that, due to wear of the contact surfaces, ordinary material may be used, as any corrosion due to sparking tends to be worn away by the friction between the parts. The "touch" contact should be used where a very slight or short movement only is available; the contacts must be of suitable material, such as iridium, platinum, or tungsten, that will not corrode as a result of sparking on the break of contact. Care must be exercised to obviate double con-

tacts due to vibration or other causes, in which case the counter would register one count for each make and break, whether caused by intent or accident.

Singer Sewing Machine Co., Ltd.

This company had on view a single power bench fitted with a high-speed enclosed-type of electric transmitter to ensure the sewing machine being driven at maximum speed. Another interesting exhibit was the two-needle lock-stitch machine fitted on a special bench, complete with guide rail, clip, slide and weight, for automatically guiding the cloth to the needles. The machine makes the overlap, or imitation hand-pasted, seam now in use at bleach, dye, and print works, and is driven by a small electric motor.

Mr. George Ellison.

This display included a range of low-pressure ironclad air-break and oil-break control gear for industrial motors. Special attention was drawn to the new draw-out type switchboard for currents up to 1,200 amp. at 600 volts; also suitable for 3,000 volts and 200 amps. Some good contracts have been carried out in Lancashire lately, amongst which might be mentioned the Black Pits Mill at Rochdale, where the installation was erected jointly with the English Electric Co.; Thos. Warburton's Waste and Weaving Mill at Haslingden, where ironclad low-pressure switchgear has been installed in the new extensions, and also control gear for a 250-h.p. motor for the opening machinery and two 100-h.p. and 75-h.p. motors; also two 1,200-amp. incoming panels for the electricity department of the Accrington Corporation.

Henry Lowe & Sons, Ltd.

This firm exhibited an electric lift head gear. The winding gear is of the worm type and is self-sustaining; it comprises an electric motor, electro-mechanical brake, worm reduction gear and winding pulley, all mounted as a complete unit. On this stand was also shown by Mr. T. Simpson a patent smoke burner for fitting to boilers. No alteration is required in the fire bars, bridge work, or flues, and no drilling of holes in the boiler is required. The claims made are that no cold air is allowed to reach the fire and no black smoke is emitted.

Moore & Avery, Ltd.

This company, represented by Mr. James Witnell, exhibited a patent automatic warp thread reaching-in machine fitted with a small electric motor of about ¼ h.p., which can be driven from the electric light mains if desired.

W. H. Allen, Sons & Co., Ltd.

This was one of the most interesting stands in the whole exhibition; a great deal of machinery had been brought to the stand, and prominent amongst it were a 1,500-kW high-pressure steam turbine and a 1,000-kW geared steam turbine

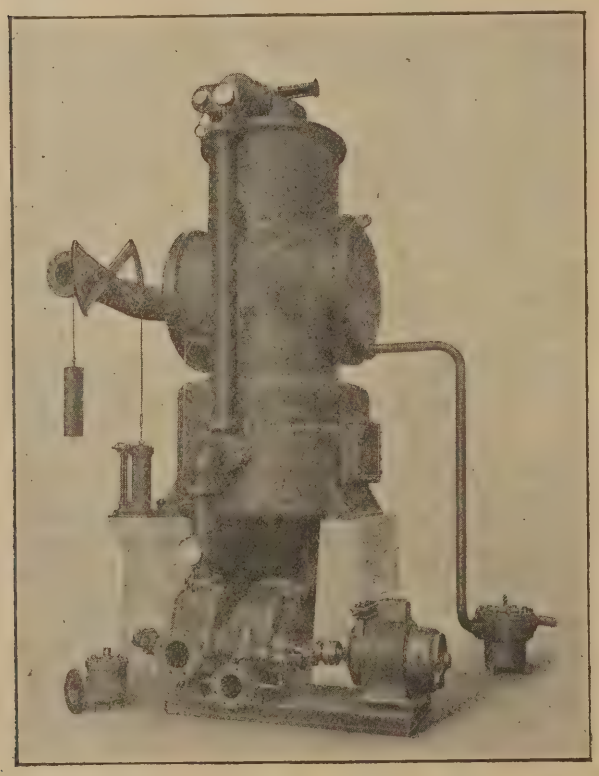
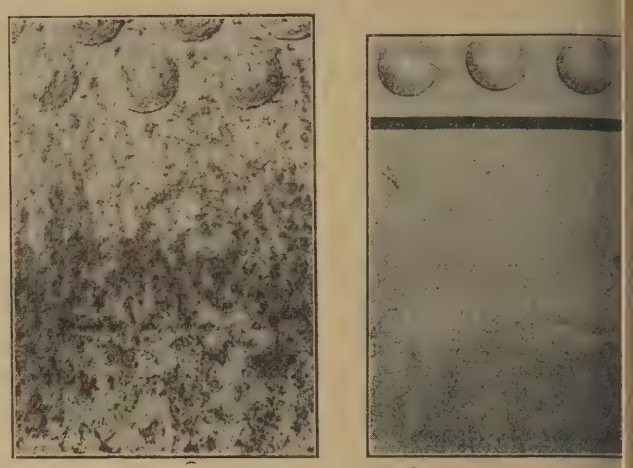


Fig. 8.—"Allen" Boiler Feed-water Deaerator.

for coupling direct to rope pulleys for driving textile mills. Apart from these, however, there were one or two matters of peculiar interest to electrical engineers. First, there was a model (one of four) of a surface condenser with 45,000 square feet of cooling surface for a power station in Japan. The advantage of the physical method of deaeration of the "Allen" deaerator (fig. 8), is that all gases in solution in the water are removed to the same extent in relation to their solubility, not oxygen only. In this plant violent ebullition and foaming ar created in the water by flashing; the water is shattered int minute particles, which allow of the complete liberation of th gases contained. The flashing is accomplished by heating th water under vacuum and flashing it on a surface of high tem perature. The apparatus is constructed in a self-contained un with which very high degrees of deaeration are being ob tained. The lower part contains a bank of steam-heated tube over which the water falls. Preliminary deaeration takes plac in the upper part, where the incoming water is heated to boi ing point by the vapour rising from the hot tubular surfac below. This hot surface acts like a pressure flash-boiler, an when the falling heated water comes in contact with it, it i



(A) Serious Pitting, without Deaeration. (B) No Pitting, with Deaeratio

Fig. 9.—Results of Deaeration.

repeatedly flashed as it falls from one tube to another on it way to the outlet, and the contained air thus liberated rise and is withdrawn at the top by a small steam-operated ejecto which maintains a vacuum in the deaerator corresponding t the temperature of the heated water. A float contained i the base of the deaerator controls the inlet of the water i accordance with the requirements of the boiler feed pump.

A large number of deaerators are said to have been manu factured and are now running in various power stations; i some plant the water entering them contains from 5 to 6 c.c of oxygen per litre, but the deaerators are claimed to be re moving 99 per cent. of that originally contained. Fig. 9A is view taken inside the top drum of a boiler which has bee run for ten months on undeaerated water. The serious pittin action that has taken place on the drum is clearly illustrated Fig. 9B is a view taken in a similar position on a similar boile in the same power station, but supplied for nine months wit deaerated water.

Universal Winding Co.

Whilst it might not be thought that the very large stan of this company would provide matter of especial interest t electricians, reference should be made to the coil winders pro duced by this firm. The "honeycomb coil," renowned i radio circles, was a product of this firm's No. 84 machine Another produces coils in "spool-wound form," each convolu tion of wire lying parallel and closely adjacent to the next on without any of the turns crossing. One of the latest machine winds the wire in the spool-wound form and at the completio of each layer injects a piece of prepared insulating paper be tween the finished and the new layers. This operation con sists of completely encircling the coil with the paper and cut ting it off in time for the next convolution of wire to wrap it i place. The machine winds coils from ½-in. inside diameter t 2-in. outside diameter on one type, or 9-in. diameter o another, and from ¼ in. to 2½ in. in length at a speed of from 200 to 1,200 r.p.m.

Samuel O'Neill & Sons, Ltd.

This exhibit consisted of paper tubes as used in the wireless electrical, and explosive trades, in addition to the wide rang of products for the textile industries.

General Electric Co., Ltd.

A comprehensive display of standard products as applied t textile drives included a 5-h.p., 400-volt, 950-r.p.m. self-con tained driving unit, star-delta starter, and motor fitted with centrifugal clutch, suitable for driving spinning, doublin frames, &c.; also a 15-h.p., 3-phase, 50-period, 400-volt, 960 r.p.m. motor with dustproof enclosed slip-rings, suitable fo line shaft drives, and a number of small loom motors. Th lighting was arranged in such a manner as to demonstrat the different kinds likely to be required in a textile mill, an there were also samples of cables, fittings, &c., suitable fo textile mills and dye-houses.

Amongst the recent contracts dealt with by this firm is th electric driving of the Osborne Spinning Mills at Oldham This is one of the oldest spinning mills and the installatio has effected considerable improvements in the lay-out of th premises. A new sub-station has been erected and supplie with 3-phase current at 6,600 volts, 50 cycles, which is trans formed to 400 volts. Three motors are installed in the tower of the Witton 200-h.p. slip-ring type. There are also tw 75-h.p. slip-ring motors in the blowing and card rooms

quipped with pipe ventilation on account of the dust in the mosphere. This installation is a good example of the manner i which the electrical drive can be put into premises con-ucted with very different intentions and shows the ease with vhich difficulties can be overcome.

Other Exhibits.

The whole of the machinery on the stand of Messrs. Asa, Jes & Co., was driven by electric motors with a centrifugal ɔtch on each shaft. The motor was coupled direct to the iving shaft of the ring spinning frame, the roving frame ɔd others being each driven through a pair of laminated ɡars. The motors were supplied by Messrs. Mather & Platt, ld., the control gear by George Ellison, the clutches by Thos. Joadbent & Sons, and the gears by Laminated Gears, Ltd. Messrs. Platt Bros. & Co., Ltd., exhibited amongst other pro-ɔcts a power loom, calico type, fitted with the Whittaker ɔtomatic weft replenishing attachment. The detector stop ɔtion was by Mather & Platt and the loom was driven by a ɔall independent motor lent by the English Electric Co., ɔrough a Renold chain and sprocket reducing gear. The "Wallace" centrifugal clutch manufactured by the Hele Shaw Jtent Clutch Co., was also demonstrated. Messrs. Geo. Int, Ltd., had a good display of their products, but the tests ɔ the new "Telerecorder" are not yet quite completed and ɔy were unable to show this new electrical steam-flow dis-ɔit recording instrument. Other textile machine makers em-ɔyed electrical power on their stands.

Conclusion.

Besides the English exhibitors, French, Swiss, Dutch, Spanish, Czecho-Slovakian, and German firms (including Siemens-Schuckert, Ltd.), displayed their wares. It is unlikely that any exhibition in the provinces could have been more successful than this one has been so far as one can judge at present. Not only have an immense number of inquiries been received, but actual orders have been booked on a substantial scale. The attraction of the ordinary public was very great and on the Saturdays the crowds were rendered a little unpleasant. On one day about 13,000 people came to the Hall. It might be thought that this was not in the best interests of business, but it must be borne in mind that a large number of these people were the operatives using the machines and as such were welcomed by the exhibitors. During the other days of the week the exhibition presented an animated appearance from morning until night and the many foreign and home buyers had ample opportunity to study the machinery displayed. All the electrical firms were enthusiastic as to results, and whilst it might appear in this survey that we have devoted too much space to matters other than purely electrical, we would say that in an exhibition such as this, one of the most prominent features is the plain fact that electricity is there to serve every requirement of the machinist. It is an integral part of textile machinery and a knowledge of the latter is absolutely essential to those hoping to extend the use of the former.

Scientific Shop-Window Illumination.

Commencement of the E.D.A. Conferences.

The 1925-26 series of conferences arranged by the British Electrical Development Association in the London district was ɔened on October 15th, in the Lighting Demonstration Jreau of the Electric Lamp Manufacturers' Association, at ɔvoy Hill, when Mr. W. E. Bush, of the E.L.M.A., read a per on "Selling Better Lighting to the Shopkeeper." His ,per was repeated at another meeting on the following even-ig. Special facilities exist at the Bureau for demonstration, l means of which Mr. Bush was able to illustrate the differ-ɔce between good, bad and indifferent lighting, with different ɨensities and lay-outs. Mr. C. W. Sully (Chairman of the JL.M.A.) presided.

Mr. Bush opened his lecture with a reference to a survey, ɔently undertaken by the E.L.M.A., of retail shops in the ɔuntry, which had provided valuable information as a basis f· a national sales campaign which was being conducted by tɜ E.L.M.A. One of the things indicated by that survey was tɑt two-thirds of the shop windows of this country were



Fig. 1.—A Typical Shop-window Reflector.

ɨing modern lamps with equipment designed a quarter of a ɔntury ago. Whereas shopkeepers were guided by skilled ɔsigners with regard to their fittings and furnishings, in the ɜatter of lighting they had been their own architects, and ld merely substituted new lamps for old. The result was ɜare, hard shadows, discomfort to purchasers, and other evils, ɑd considerable damage was being inflicted upon the elec-ɔical industry by exhibiting to millions of prospective con-ɔmers the crudest examples of electrical service. Judged by ɔod modern practice, only 17 per cent. of the shop windows ɔ the country were well lighted, and the position was little ɔtter in shop interiors. Mr. Bush deprecated the neglect of ɔod lighting on the score of cost, and emphasised the neces-ɔy for bringing home to the shopkeeper the fact that good ɔhting was good advertising at very low cost. To indicate e enormous market awaiting the industry in this connection, ɔ said that to raise the standard of shop lighting in this ɔuntry even to a conservative basis a minimum of five mil-ɔns sterling must be expended. The necessity for electrical ɔntractors to adopt good window lighting before they could ll it to others has often been raised at these conferences, and in this connection Mr. Bush said the survey mentioned showed that on an average contractors' shops and supply undertakings' showrooms were worse than retail shops. If an electrical showroom were not suitable for making a display, he suggested that the supply undertaking and the contractors jointly should make arrangements with a shopkeeper to light his window as a permanent exhibit during the winter months.

Appealing for simplicity in submitting specifications, he pointed out that the standardisation of equipment and lighting practice rendered it unnecessary to spend time in lengthy calculations to design good installations, or to trouble shopkeepers with engineering technicalities. He recommended the following specifications for first-class lighting:—*Window lighting.*—Specially designed shop-window reflectors fixed close to the ceiling, fitted with 100-W gasfilled lamps, spaced 1 ft. apart for windows in main thoroughfares, and 2 or 3 ft. apart in side streets. *Shop lighting.*—Totally-enclosed dust-proof fittings 10 ft. apart, fitted with 200-W gasfilled lamps.

In a reference to the value of lectures and demonstrations to trade organisations throughout the country, he referred to literature published by the E.L.M.A., which included a specially-prepared lecture entitled "Light and the Shop-

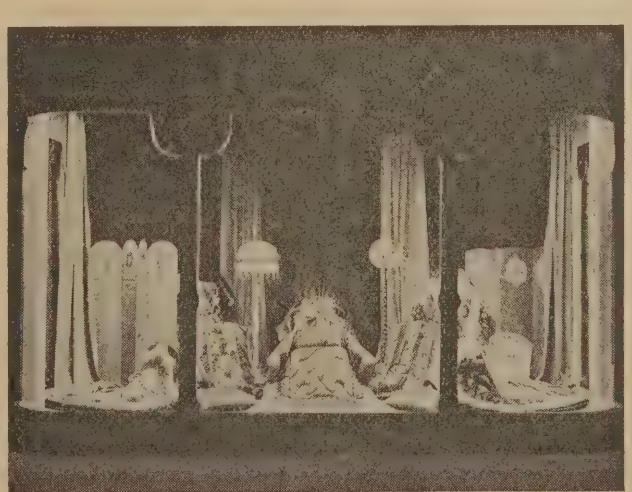


Fig. 2.—An Example of Good Shop-Window Lighting.

keeper," in booklet form. A model shop had also been prepared, by means of which every conceivable lighting system could be demonstrated in an appropriate setting. Mr. Bush appealed for co-operation between all sections of the industry, and for concentration on one aspect of electrical service at a time; the E.L.M.A had commenced by concentrating on shop lighting. There did not appear to be a saturation point until daylight levels were reached, and the 1925 standard would be far surpassed 10 years hence. He could foresee the time when super-lighting would be installed in the windows of all progressive stores in order to overcome daylight reflections.

Discussion.

In the ensuing discussion, Mr. James Edgar (South Shields) referred to lighting shop windows from outside, which, he considered, showed up the goods in the window less effectively than lamps installed inside. He also suggested that the E.D.A. and E.L.M.A. should impress upon the public the fact that supply authorities were anxious to advise them gratuitously with regard to their installations.

Mr. Blake urged greater confidence between the various sections of the industry in the work of raising lighting installations to a reasonable standard.

Mr. Herbert drew attention to the many small contractors in the country who had not sufficient knowledge to enable them to design an efficient installation, and who cut down specifications in order to reduce the price and secure an order; these contractors should be compelled to pass an examination to prove their ability.

Mr. R. C. Hawkins (E.L.M.A.) described some of his experiences as an investigator in connection with the E.L.M.A. survey. Most shopkeepers he had found to be sympathetic, but he agreed that many were afraid to ask the supply authority or a contractor for advice, for fear of being charged for it. They had been greatly impressed by demonstrations.

Mr. E. Boys (North Metropolitan E.P.S. Co.) asked for definite suggestions as to how to tackle the problem of shop lighting in bulk. He also referred to the case of a shopkeeper who, having been induced to display his goods in the North Metropolitan Co.'s showroom (the lighting being suitably arranged) had given an order to the value of £100 for the improvement of the lighting of his shop.

Mr. Abell referred to the difficulty of getting shopkeepers to dress their goods back from the glass of the window, and pointed out that in those cases outside lamps must be used. He asked whether the practice of using sprayed lamps without reflectors in windows had been successful.

Mr. Mason spoke of the importance of overcoming glare, and the consequent necessity for the salesman to have a scientific knowledge of illumination.

Mr. Houghton said it was valuable to establish one or two shops with properly lighted windows in a district, and to invite shopkeepers to inspect them.

Mr. Hayward considered that the cost of electricity should be reduced; some shopkeepers had reverted to the old standards on the score of cost.

Mr. A. Jones said that the cost of electric lighting was very small as compared with the other costs incurred by shopkeepers.

Mr. Bush, in reply, said he did not think outside lighting was good for the shopkeeper, or, ultimately, for the electrical industry. He would prefer that the electrical industry should go to the shopkeeper and offer advice. Though some existing installations could be improved by substituting sprayed lamps for those now used, he preferred the use of clear lamps in proper reflectors. There was no need to apologise for costs, but to justify them, because good lighting was positively business-building.

The Second Conference.

Mr. Bush's lecture was repeated on October 16th, when J. Y. Fletcher (G.E.C.) presided in the absence of Sir H Hirst, Bart., through indisposition.

The Chairman said that in addition to the lighting bure which had been established recently in Glasgow and Newca (Electrical Review, October 23rd, pp. 672-3), there w plans for opening a similar establishment in Manchester, it was hoped also to establish them in Leeds or Bradford Birmingham, and in Cardiff. For towns in which s bureaux could not be established, an attractive travell bureau was being developed.

Mr. C. Hayes advocated prepayment meters for electri consumers, as well as assisted wiring schemes.

Mr. Howard Smith agreed to the establishment of defer payment wiring schemes if the supply authorities gave work to the contractors and did not carry it out themsel He advocated the supply of electricity to shopkeepers a reduced rate.

Mr. H. F. Simon said that invention had gone ahead fas than the education of the public. He also mentioned the va of good lighting with regard to health and efficiency.

Mr. H. J. Adams said that very often owners of large bu ings which were leased as offices were opposed to impro lighting owing to the fact that they leased the offices a figure which was inclusive of lighting, and wished to k the cost down. An effort should be made to educate the own of such buildings.

Mr. L. E. Buckle said that competition between groups shopkeepers, rather than individuals, had proved valuable

Mr. J. C. Chaytor said that, in his experience, the pract of affording facilities to shopkeepers to display their goods electricity showrooms had proved valuable, and had convin them of the value of good lighting.

Mr. H. Marryat (Messrs. Marryat & Place) said it w important to standardise the position of the filament in a lan because otherwise, if it were fitted into a standard reflec the focal distribution was upset.

Mr. H. T. Young (Messrs. Troughton & Young) advoca the policy of giving a shopkeeper a good installation on proval if necessary, because of its advertising value to electrical industry. A shopkeeper generally kept such installation, and paid for it.

Mr. H. G. W. Haslett referred to the difficulty aris through trying to fit a standard lamp to a fitting which w not standard, and urged co-operation between lamp and fitti makers.

The Chairman, who was asked whether the low consum tion of lamps in this country as compared with others was result of British lamps having a longer life, said that British lamps were probably a little better than the best ma in other countries, but, in view of the interchange of techni experience throughout the world, there would not be a gr deal of difference in the future.

Mr. Bush, replying to the discussion, covered many of t points which he had dealt with in his reply on the previo evening. He agreed that development in the industry w going ahead faster than the education of the public, and su gested that the fault probably lay with the sales section of t industry.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A Portable Electric Saw.

We have received some particulars of a new portable electric saw, manufactured by the Electro-Magnetic Tool Co., of America. The "Speedway" saw, fig. 1, weighs only 15 lb. and is equipped with a universal motor suitable for operating on either a.c. or d.c. supplies. It is fitted with a flexible cable and standard adaptor. It is claimed that the saw is capable

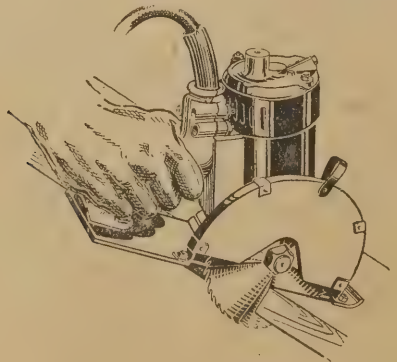


Fig. 1.—The "Speedway" Saw.

of being used for practically any work within the scope of a hand saw, and is equally effective in cutting bone, wall-board, plymetal, hard rubber, &c. A quick make-and-break trigger switch is located in the handle. The saw blade is adjustable by means of a single nut and is covered by a dust shield. The device is suitable for a 6-in. or 7-in. blade. Messrs. The B.E.M. Patents, Ltd., 100, Victoria Street, London, S.W.1, are the sole concessionnaires for the sale of this saw in Gre Britain.

"Star of Eve" Reflectors.

This is a new range of reflectors for various purposes pr duced by Mr. E. Rutherford Palmer, 40½, Bristol Street, B

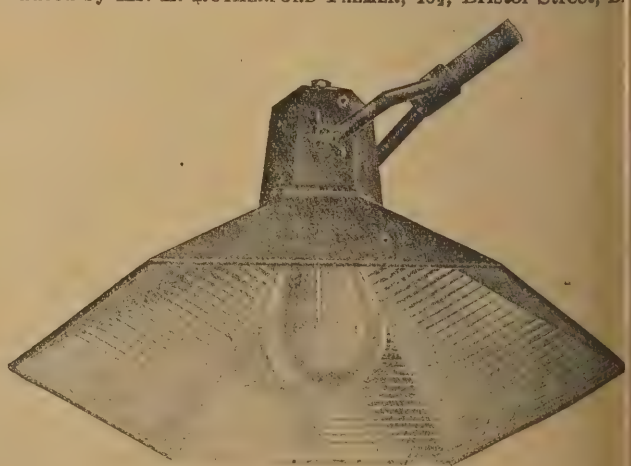


Fig. 2.—Exterior Lighting Fitting.

mingham. These reflectors consist of a body of heavy she metal lined inside with a fluted mirror split into sections give a correct distribution. By the use of a special enamel th mirrors are rendered impervious to fresh or salt water; and th

...ig is such that a broken mirror can easily be replaced. ...h galleries, in the case of reflectors for interior lighting, are ...ri..lated and made in two parts. This allows the body of ...reflector to be fixed when the holder has been wired. With



Fig. 3.—Interior Lighting Fitting.

...exterior lighting units a trunnion arm is supplied (fig. 2) ...iable the light to be directed as required. Fig. 3 illustrates ...nterior lighting reflector designed to take a 60-W lamp. ...standard finish is black enamel, but a number of art ...nel finishes are available.

An Improved Reducing Valve.

...ESSRS. THE STEAM FITTINGS CO., LTD., West Drayton, ...Illesex, have recently placed on the market an improved ...n pressure reducing valve known as the H.M. steam relay ... reducing valve, fig. 4, which is designed to reduce from ...able boiler pressure, independent of variations in steam con...ption, to a constant lower pressure. The valve has an adjust... operation which ensures a free and full lift. It is free, it ...aimed, from shock and hammer action, and works equally ... with saturated or superheated steam. It contains single ... main and auxiliary valve cones guided by means of a ...n. A balancing piston in a cylinder is placed above the ...s. A regulating and a safety valve are installed on the ...er cover of the device, and its lower cover is fitted with a ...-off hand spindle. The regulating valve is under the con... of a small diaphragm, the pressure on which is counter...d by a spring that is adjustable by a regulating screw ...n lock-nut. The high pressure steam reaches the chamber ...re the operating piston through the wall passage and the ...lating valve (left). The piston loading pressure in the ...mber, when the limit for which the spring pressure on the ...phragm is reached, lifts the diaphragm itself and the regu...ng valve so that, owing to the throttled admission, a con...t loading pressure is maintained in the chamber. The ...ing pressure holds the operating piston down and therefore ...h main and auxiliary valve cones open until a pressure is ...hed on the low pressure side of the valve and therefore in ...h chamber below the operating piston, which very slightly ...eds the loading pressure above the piston. In conse...nce of the small difference in pressure on the two operat...n piston surfaces, the piston itself is lifted and the valve cone ...es. The high pressure is thereby shut off from the cham...e above the valve cone, so that the pressure in it drops to ...s prevailing in the low pressure space of the valve (exit) ...ough the leakage space between the balancing piston and ...guide cylinder. The main and auxiliary valve cones are ...loaded by the high pressure from below and are moved in ...closing direction.

If the steam consumption should be interrupted the high pressure will hold the main and auxiliary valves tightly closed so that the pressure on the reduced pressure side cannot creep up. During operation the low pressure, in consequence of the steam consumption, has a tendency to drop. With constant consumption the pressures above and below the main piston (top) become equalised and the main valve cone remains stationary. It is claimed that this reducing valve is suitable for all steam pressure reduction down to 15 lb. per sq. in., whether the ratio of reduction is large or small.

A Device for Hand Pump Conversion.

It is often desired to have a ready means of converting the ordinary domestic hand pump into an electrically driven pump in country houses where an electricity supply is available. To meet this requirement Mr. A. W. REEVES, 3, Edmund Street, Birmingham, has produced the device illustrated in fig. 5. The pump rod is operated by a concentric gear worm driven by an electric motor.

The normal speed of the pump is 70 strokes per min. and the motor may be switched straight on to the main. The mechanical efficiency is claimed to be very high, owing to the device being fitted with ball bearings, and the worm and the worm-wheel being cut with great precision. The diameter of

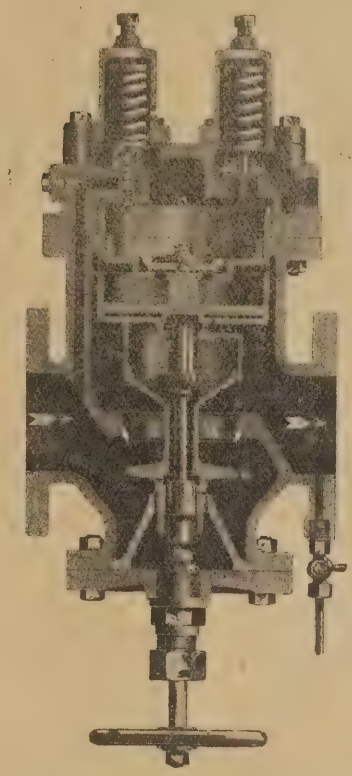




Fig. 4.—Relay Reducing Valve. Fig. 5.—Pump Conversion Device.

the base flange varies from 8 in. to 10 in. The method of attachment makes it possible to fix the device with its base flange at, or above the ground level, or in the event of the pump which it is desired to convert having an above ground delivery, the device can, of course, be fixed to suit this case.

In using the attachment the pump stroke is shortened by one half of that obtained when the pump is worked by hand, and the inertia forces become negligible. With an attachment 18 in. in height overall, it is claimed that 100 strokes per min. can be run with the stroke as short as 4 in.

Imagination in Engineering.

By FRANK J. MOFFETT.

(*Abstract of Chairman's Address;* SOUTH MIDLAND CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

...GINATION is commonly associated in the mind of the man in ...t street with those possessed of an artistic talent—poets, ...inters, dramatists and such like. The engineer is not as a ...e credited to the same extent with this power. He is con...ered to be a matter of fact, sensible sort of being with whom ...ts slightly absurd to associate any imaginative characteris...i.. I fancy that even engineers themselves are to a certain ...ent guilty of this attitude, and I trust that in the course of ...r remarks I may do something to modify it.

...n the most general acceptation of the term, imagination ...y be defined to be the power or process of producing mental ...ctures or ideas. When the train of ideas simply reproduces ...l image or picture of past experience, or phenomena without ...y material alteration, the process is called "reproductive ...agination". When by a process of selective combination of ...as a new picture is produced we have creative imagination. ...eative imagination is accompanied by many emotions—...asure or pain, hope or depression. Anyone who has made ...n a minor discovery knows the fine glow of satisfaction ...ich results from it, the joy of success or perhaps the dejec...n of failure. It is a well-known fact that many inventors in spite of continual failure to achieve success, refuse to be daunted and persist in their efforts, though these are unrewarded. An illustration of the power of thinking by analogy is the discovery of the Gothic style of architecture. We can imagine an architect setting out to find some improved design for the construction of churches and cathedrals and being struck by the resemblance of an avenue of trees meeting overhead to a beautiful roof. This I believe was the origin of the wonderful Gothic nave in some of our cathedrals. We all, I fancy, are in the habit of saying at times when faced by some knotty problem, that it is better to sleep on it. This means nothing but that we are deliberately giving the unconscious element an opportunity to come into action. I am so firm a believer in the value of the unconscious element that I much prefer when engaged on any specially difficult work, to call a halt for some few days and allow my mind to put in what I may call its automatic work.

In the realm of scientific discovery Michael Faraday stands out as one of the great figures, and it is very fitting to refer to his methods when addressing a gathering of electrical engineers; imagination played a great part in his achievements.

In a note on the margin of one of his papers he warned himself to be practical: "I must keep my researches really experimental and not let them deserve anywhere the character of hypothetical imaginations."

Tyndall in his address on "Faraday as a Discoverer" says: "When an experimental result was obtained by Faraday, it was instantly enlarged by his imagination. In virtue of the expansive power which his vivid imagination conferred upon him, he rose from the smallest beginnings to the grandest end." Faraday admitted that he was no lover of mathematics and pleaded almost pathetically in a letter to Clark Maxwell for some easier mode of expressing scientific ideas. I feel sure that many will sympathise with Faraday in his appeal. Surely many of the papers read before this Institution could with advantage leave out the pages of symbols and substitute, as Faraday says, common language.

In his aversion to the use of mathematical methods, Faraday is a striking contrast to Newton, whose great work in the discovery of the laws of motion and of gravity may, however, be said to be almost entirely the achievement of his wonderful mathematical imagination. In commerce again there is a great field for the imagination. In fact, the stories of the development of some of our great commercial enterprises read like romances. I consider that the greatest discovery Ford has made is the principle of service. I have referred to Faraday and Newton in scientific discovery and to Ford in commercial discovery. All of us, in whatever department of engineering we are engaged, require a creative imagination.

The layout of a power house and a system of distributive mains, the manufacture of machinery for the generation and transforming of electrical energy, the design of switchgear, the installation of electric power and light, the provision of telegraph, telephone, and wireless communication, the development of furnaces and welding appliances—all the wide range of constructive problems which confront the electrical engineer, involve the faculty of discovery and invention in a greater or less degree. The field open to the electrical engineer with creative imagination is enormous. Take the steam-driven generating station: it is well known to all that the overall efficiency from the heat energy in the fuel to the electrical energy at the switchboard is dismally low, not more than, say, 10 per cent. in the average station and 20 per cent. in the most recent super-station. Surely there must be some means of reducing this enormous waste of heat energy, from 80 per cent. to 90 per cent. of the total energy in the fuel. On a small scale a much higher overall efficiency has been obtained by the utilisation of the waste heat in the exhaust. No remedy, however, is yet forthcoming for the large station. The lead accumulator has held the field almost without threat of competition for the last 30 or 40 years. It is the weak link in any scheme which involves the storage of energy, since it has an extremely low capacity compared to its cost and weight, and its life even when treated with the utmost care is very short. The question of atomic energy may be looked upon as a subject which concerns the physicist rather than the electrical engineer, but at any moment it may become of vital importance to the latter. Shall we ever be able to tap this energy? Sir William Bragg says: "I am of opinion that atom energy will supply our future need. A thousand years may pass before we can harness the atom or to-morrow might see it with the reins in our hands. That is the peculiarity of phy —research and accidental discovery go hand in hand.

I have suggested one or two fields in electrical engineer where there is unbounded scope for the creative imaginat but I am sure everyone will agree that there is practically limit to the number of scientific problems awaiting solut Imagination is possessed in some degree by all normal pers I would venture to claim that the average engineering signer's imaginative power is above the common level, but view of the nature and scope of his work I consider that development of this faculty has not kept pace with his te nical powers.

In electrical apparatus in particular there appears to b boundless field for imagination, especially in connection w appliances in which means have to be devised to circumv the unconscious human tendency to commit suicide. The signer must, in fact, bring himself to realise that the desire gratify the sense of touch has not yet been eliminated e in the trained electrical attendant. To still greater leng must the use of the imagination be carried in the design apparatus for domestic use. The designer must, by full use his imaginative faculty, suppress for the time being the stincts of his training so as to adjust his focus to see, say griller switch through the eye of the average cook. In sphere is the need for imaginative enterprise more immediat apparent than in industry where the search for an explanat of trade depression is engaging so many minds. Lack of im ination in catering for foreign needs and conditions may be the principal course, but I suggest that it may be a stro contributory factor in the decline of overseas trade: the ti has passed when our wares will sell on the strength of th place of origin. In the conduct of human relationships t necessity for what may be termed the sympathetic imaginati is truly enormous. The relations between employers and e ployed are at the present time in a very strained conditi I suggest that one of the principal obstacles in the way o solution of many of our difficulties is simply lack of imagi tion on both sides.

What are we doing to encourage the growth of the imagi tion? The child is father of the man, and we needs must st with the child.

Material, and it may be inspiration and encouragement, m be given, but the inventive mind can only work when free a untrammelled. The course of the school is obvious. In constructive work it should leave as free a hand as possible the planning: should welcome originality even if it spoil mat rial and should give to those who show they can imagine ne constructions, generous opportunity to carry out their practic ideals. In the majority of public schools the zeal for sport every kind is tremendous. Is it not possible to awaken simil zeal for the pursuit of knowledge?

As a final word I would say that imagination is one of t greatest faculties with which we are endowed. If we give fu scope for its exercise and have the courage to follow its le we shall have added power to deal not only with the technic problems which confront us as engineers, but also with t wider problems of human relationships to the solution which engineers can make valuable contributions.

The Supply of Electricity by the Gas Industry.

Some Statistics, and a Gas Engineer's Opinions.

In his presidential address to the Scottish Junior Gas Association (Western District), on October 10th, as reported in the *Gas World*, Mr. Robert Gray, assistant manager, Hamilton, said that within recent months they had read and heard a great deal regarding the development of the electrical industry; greater prominence had been given to this industry within very recent times than they had before experienced in its whole history. The quantity of coal consumed in the generation of electricity in this country was about 7,500,000 tons per annum, or about 4.5 per cent. of the total coal consumption of Great Britain. It was an admitted fact, however, that less than 20 per cent. of this amount was converted into electrical energy. Not only was our coal being destroyed, but valuable by-products were being thrown away. About two million tons of coke, 60 thousand tons of sulphate of ammonia, and 60 million gallons of tar could be recovered from this quantity of coal, not mentioning the tremendous volume of gas which could be recovered and converted to useful purposes. He would not, in the slightest degree, attempt to belittle the necessity of an electrical industry in this country, as he knew it to be absolutely essential. There were purposes to which electricity could be better applied than could any other power; the gas industry made use of it for such purposes. The objection to the proposed development was that it was to be carried out at the nation's expense. Surely the electrical industry was capable of its own development, and quite independent of State subsidy.

As shown by the Board of Trade returns, the gas industry carbonised just over 17,300,000 tons of coal last year, or a little more than 10 per cent. of the total coal consumption of Great Britain. In 1924, 237,000 tons less were carbonised than in 1920, and yet the quantity of gas produced was over 17,0 million cu. ft. more than in 1920—an increased production gas from a decreased quantity of coal. Last year the ga industry recovered from the quantity of coal carbonised an placed at the nation's disposal 11,600,000 tons of coke, 124,7 tons of ammonium sulphate, and 195 million gallons of ta Of the total coal consumption of Great Britain, the gas industr could claim to treat its portion more scientifically and, at th same time, more efficiently than any other consumer of coal.

The president believed the future of low-temperature carbon sation would be very bright. It might not be a commercia proposition at the moment, but the future would bring thi to success upon a large scale process. It was a process whic extended very great possibilities; not only did it offer a soli smokeless fuel, but very large quantities of fuel oil. Ou wealth of coal, if scientifically treated, would yield more fue oil than was necessary to meet our requirements. Low temperature carbonisation was a small-scale process at present but would yet become one of the most essential and most im portant industries in this country.

The gas industry could not stand aloof from the low temperature carbonising process, but must assist in the pre liminary work necessary for ultimate success. Low-tempera ture carbonisation opened out a new field of products almost distinct from those derived from the high-temperature pro cess. A market must necessarily be found for the solid pro duct, but was there not a tremendous problem awaiting solution in atmospheric purification? This could only be overcome, and permanently solved, by the enforced use of smokeless fuel for industrial and domestic purposes. In low-temperature carboni sation he foresaw a great industry.

point worthy of great consideration was that of the
geration and supply of electricity by gas undertakings.
Within recent months many gas undertakings had applied for
n. obtained powers to generate and supply electricity. This
w; not altogether unusual, as the number of gas under-
tings which were also supplying electricity had increased
fly rapidly within recent times. Had they to take it that
tl; was to be a new branch of the gas industry? Was it
psible that the present gas industry might yet become the
l·trical industry? Would the two competitive industries
bome one great combine for the supply of light, heat, and
p·er, in the form of gas and electrical current? Was it
psible to imagine such a combination of industries? The
psident believed that it was not impossible.

he generation of electricity by means of the consumption
draw coal without the recovery of residual products was
wsteful, and did not coincide with the present age of science.
It might be argued that the electrical industry could put down
pat for the scientific treatment of coal coinciding with the
geration of electricity. This was to be admitted as being
qte possible—but why duplicate the coal-carbonising plants
of the country? Would it not involve ruthless capital expen-
dare? Must the nation's wealth, in coal and money, be
srificed and squandered simply for the purpose of preserving
o industry's dignity against another?

;t was possible for the gas industry to generate electricity
; one or by a combination of methods, whichever might be
decided upon as being most adaptable to the existing condi-
tis. In many gas undertakings there was a quantity of
splus heat available which could be utilised for steam-raising
prposes, and the steam in turn could be used as power for
gerating sets. Again, it was possible, with carbonising
pnt available, to carbonise coal slack for the production of
c-grade coke and breeze for steam-raising purposes, the
sam being utilised as before for generating sets.

;t might be said that the surplus heat available would be
nable to generate sufficient steam for the desired purpose.
This might be so in certain instances, but it would always be
psible to have gas-driven generators as auxiliary plant, so
t these could be brought into operation when the load was
gater than the output of the steam generating sets.

With the introduction of low-temperature carbonisation and
smokeless fuel plants it was probable that greater possibilities
f the generation of electricity by gas undertakings might
bome obvious. Where the smokeless fuel plant gave a gas
o low calorific value the gas could be utilised for steam-
rsing purposes. In the case of plants giving a high-grade gas
this could be used for driving large gas engines for the pur-
pe of generating electric current.

he coming of the gas turbine was still delayed, but the
psident believed the present difficulties would eventually be
orcome and that the gas turbine would displace less efficient
nchinery now in use. With the coming of the gas turbine
there would open out to the gas industry an entirely new field,
wereby the industries of the country would benefit to a very
gat extent. At present they had no high-speed gas-driven
nchine to compare with the steam turbine, but he hoped that
th future would bring a gas-driven machine as efficient and
enomical as the steam turbine.

t might be asked: "What advantages are to be gained when
g; and electricity are supplied by the same undertaking?"
I believed the advantages to be many, although there were at
th same time disadvantages set up in such cases. Probably
th greatest advantage was that the work of the joint under-
ting would be more economical and more efficient than
to separate undertakings. It would be possible for a gas
ndertaking to generate electricity by a variety of methods,
wereas in the electrical industry, at present, they were bound
dwn almost entirely to one method, and that was admittedly
vy wasteful and inefficient. In a joint undertaking for
th generation and supply of gas and electricity it would be
psible by one, or by a combination of methods, to generate
ad supply electricity more efficiently and more economically.
Nt only would this be so from a national viewpoint, but also
fm that of the consumer.

t had been suggested by a committee over which Mr. Lloyd
Corge presided that it would raise the efficiency of electricity
pduction if the coal was subjected to carbonisation previous
t being used for steam production. Was not that the every-
dy practice of the gas industry? Why should it be necessary
t set up new coal carbonising plants for the production of
ectrical current when plants were already in existence all
or the country? Many electrical undertakings were realising
th value of one of the principal products of the gas industry,
ad utilising it for the production of steam. Large quantities
o coke produced by the gas industry were being consumed
anually by the electrical industry for steam-raising purposes.
Was not this a sign of the times? The president believed it
rarked a further stage in the gas industry.

Apart from the advantages to be derived by the nation from
th combined industry, he believed the consumer would
benefit to a very great extent. In some parts of the country
a present they had competition between the two industries
which certainly amounted to rivalry. This was quite un-
necessary. Was there not a tremendous field and a great
future for both gas and electricity? At present both industries
were advocating their products as being more efficient and
more economical than the other for every purpose, and it was
in such instances that he believed the consumers did not
receive the service which could be provided by a combined
industry. Gas and electricity had each their fields, in which
ce was of greater service to the consumer than the other.
Each had its purposes to which it could be best applied, but at present they were not always being applied to their best purposes. Gas and electricity were not both best for the same purpose, but that was as they had it to-day, with the result that the consumers did not receive the proper service from either industry. A combined industry would give the consumers a service which at present was not obtainable. Gas and electricity would be applied to the uses and purposes of the consumers to which they were best suited. Those in authority in both industries knew the limits to which their products might be best applied in the form of light, heat, and power, but as long as the industries were separate those limits would be over-reached, to the consumers' loss.

In answer to the question: "Do you think gas a thing of the past?" the president said he utterly failed to understand why anyone should ask such a question. The total quantity of gas sold last year (1924) showed an increase of more than 15,000 million cu. ft. over 1923, and almost 21,500 million cu. ft. more than the quantity sold in 1920. Compared with 1923, the quantity of gas consumed for street lighting last year increased by 637 million cu. ft.—greater than the quantity in 1920 by almost 2,700 million cu. ft. Last year 183,000 more people realised and secured the services of gas, and since 1920 the number of gas consumers had increased by more than half a million. The future extended great progress and prosperity to the gas industry—greater progress and prosperity than it had yet experienced.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Is the Contracting Business Degenerating?

The letter from the "Hard-Working Ex-Service Electrical Contractor" comes as a little additional recreation for the "sit-at-home" contractor to ponder over during a few of the leisure moments of which he has such a surplus.

One feels that the arguments or contentions would be better supported if his (the hard-working gentleman's) earnings could not exceed, say, 12s. per day. Why does he not get busy and find men to work for him who may possibly earn, say, 16s. per day! Look at the enormous profit he would make by joining the happy band of "sit-at-homes" in such a case. He would find it all so easy.

Another little point, on this gentleman's own showing, is that his customers (or his portion of the "British public") appear to be paying at least 12s. 6d. for not more than ten shillings' worth of value in his work.

There is, however, a serious side, and we owe this hard-working gentleman some slight thanks for this publicity. It must be perfectly obvious that if this gentleman can earn 25s. per day by doing work at 10s. 6d. per point, any contractor would be able to do such work at such a price (and even pay his men above the standard rate) and still make a substantial amount to cover his overhead expenses and allow for profit. Also, we imagine, the average builder or house owner would (prices being equal) prefer to place his work with a person or firm of some substance and standing, rather than with a purely one-man firm which generally works with such a stock as is easily movable and kept in his own backyard, and does the accounts at night.

Of course, the letter is only alluding to the little cheap house jobs which are about at present. On large contract work the one-man concern would never be entertained for a moment. On the whole, the one-man concern lowers the standard of work and does considerable harm to the electrical trade. Our hard-working friend will, we hope, be an exception, but he will know, as well as most of us, that a lot in his letter is sheer nonsense.

C. J. B. Barlow.

Warrington, *October 21st*, 1925.

Two-way Pendant Switch Flexibles.

Under the pen name of "Safety First," we had occasion some two years ago to refer to ignition caused by electrical stress across the insulation of the cores of two-way flexibles, of which we have experienced no fewer than seven instances, all occurring in periods of exceptional humidity.

Our explanation was coldly received by some manufacturers, and misunderstood or denied by others.

During the past two days the condition of extreme humidity has again given rise to further outbreaks of this dangerous nature. There is still no 2-way ratchet action ceiling switch on the market.

We have reason to believe that such a switch would meet the approval of contractors throughout the world. That, however, would appear to be a matter of little importance to British manufacturers.

Does anyone know of a foreign source of supply for these long overdue necessities?

For **Teesdale & Jones.**

W. I. Jones.

Swindon, *October 22nd*, 1925.

Motor Converters v. Rotary Converters.

It is now becoming a matter of frequent occurrence in specifications that motor converters are being called for in cases where rotary converters would obviously be a far more economical proposition and, to all appearance, entirely satisfy the technical requirements.

Although the fashion of the moment in the matter of equipments seems often to play a rather important part in the preparation of specifications, it is hardly credible that a type of plant should be reverted to, which was admittedly evolved to meet conditions of other days. At the present time such a high degree of efficiency and reliability has been reached with rotary converters that hardly a case remains in practice where these machines cannot be used with advantage in preference to motor converters. At the same time, there is no longer any essential point in which motor converters can be regarded as superior to rotary converters. A review of the principal claims put forward in favour of motor converters will make this perfectly patent; these claims can be summarised as follows:—

1. Possibility of connecting the plant direct to the high-pressure supply without transformer, up to 11,000 volts.
2. Simple starting up and nearly immediate synchronising.
3. High efficiency and possibility of maintaining a power factor always in the neighbourhood of unity.
4. Large range of regulation on the d.c. side.
5. Perfect balancing in the case of three-wire systems.
6. Low peripheral speed.
7. Safe operation without highly-trained staff.

Let us now consider these claims one by one and see wherein they differ from those which can be brought forward for rotary converters, or how far they represent practical advantages over rotary converters.

1. The advantage is here on the side of the rotary converter, as the fact that this plant requires a transformer means that the high-pressure windings are immersed in oil, and consequently more reliable than the best designed high-pressure windings of the motor. Furthermore, the transformer acts as a choking coil in case of resonance or similar troubles. On the other hand, the repairs can be carried out more easily than in a motor, in the event of a breakdown of insulation.
2. There is no difference as compared with a rotary converter, which is quite as simple to start up and synchronise as a motor converter.
3. The efficiency of a rotary converter, including the transformer, is higher than that of a motor converter, as on the one hand the efficiency of the transformer is considerably higher than that of the best three-phase induction motor, and, on the other hand, the efficiency of the rotary converter is higher than that of the generator of a motor converter.

   In the case of a 1,000-kW equipment, for instance, the efficiencies would be as follows:—

Transformer	about 98.6 per cent.
Rotary converter ...	about 95 per cent. at full load
Total efficiency ...	about 94 per cent.

   If we further include 1 per cent. for the series reactances, we arrive at about 93 per cent.

   In the case of a motor converter, the efficiencies would be under the most favourable conditions, as given below:—

Motor	about 95 per cent.
Generator	about 94 per cent.
Total efficiency	about 89.5 per cent.

   With larger sets the gain in efficiency secured through the use of rotary converters is still greater.

   The power factor of rotary converters, on the other hand, is also approximately unity or leading.
4. The range of regulation of motor converters is actually larger in view of the fact that the d.c. machine works partly as a generator. In the case of a set where the number of poles of the three-phase induction motor and of the d.c. machine are the same, so that the latter works half as a generator, the range is about double that of a rotary converter; this seeming disadvantage can, however, easily be compensated for by making use of an induction regulator, by means of which it is possible to deal not only with the regulation on the d.c. side, but also with the large fluctuations liable to occur on the a.c. side. The efficiency of the rotary converter, including the induction regulator, is, even then, higher than that of the motor converter.
5. There is no difference here between a rotary converter and a motor converter, with regard to the balancing of three-wire systems.
6. The small reduction in peripheral speed, in the case of motor converters, is obtained at the expense of the size and price of machine. At the present day, when commutator and brush design has reached such a degree of perfection, small differences in peripheral speed are of no consequence. As regards noise, it is possible with the peripheral speeds adopted at the present day for rotary converters, to build machines practically noiseless in operation. It may be said, in this connection, that a machine, although it may have a peripheral speed of only 25 metres per sec., may be more noisy than another machine with 35 metres per sec., if not properly designed.
7. The operation of a rotary converter is as simple as of a motor converter, while the fact that the high-pre winding is in the transformer is an important adva of the rotary converter.

   The rotary converter is, on the other hand, simpler than the motor converter as regards design the case of the latter plant, for instance, the leads necting the two rotor windings have to be led thr the hollow shaft and middle bearing, this being a weak point from a constructional point of view.

   It may be added that a better utilisation of the available is possible with rotary converter equipm as the position of the transformer can be chosen inde dently of that of the rotary converter. This is a siderable advantage seeing that converting plant is us installed in large centres where floor space is very c

   As regards the plea that motor converters are reliable owing to their lower speed, this can hardl taken seriously, as experience has shown that 50-c rotary converters could be built for a speed of 1,500 r.p with every guarantee of reliability in service, for press as high as 1,500 volts.

The mere fact that so few makers of electrical machi have taken up the construction of motor converters is, in writer's opinion, a clear indication that the advantage rotary converters over motor converters are generally re nised; it is, however, quite comprehensible that those have been unable to produce 50-cycle rotary converters c ating satisfactorily from a commutation point of view, sh encourage the present fad for motor converters, but the chaser cannot fail to appreciate that, in view of the lim number of manufacturers of motor converters, the cost of type of plant, already so disproportionally high as comp with that of rotary converters, will tend to ascend still furt

G. Wüthrich, M.I.E.E

London, *October 24th*, 1925.

Firemen's Risks.

Your leader on the above subject draws attention to important point in connection with wiring, not only from point of view of fatal shocks, but also that of electrica caused fires.

There is no doubt in my mind that slip conduit wir especially as found in City premises, is a frequent cause fires. When installed in private suburban houses it form reasonably safe installation, because there is generally r to isolate it from other metal work. But in City premises all wiring contractors know, it is invariably jumbled up w a mass of lead-covered telephone lines, gas and water pi screwed electrical conduit, &c., all forming, more or less, g earths. Of course, as you remark, "everything depends u the honesty and skill of the workman," and a badly-erec "screwed" or "grip fitting" installation is as muc source of danger as any other, but the point is that e the best workman cannot make an electrically sound job o "slip-conduit" system.

It seems to me that the various electrical supply authori possess the power to raise the standard of wiring. Any co pany which adopts the I.E.E. rules, and an increasing num are adopting them, must refuse to connect any "slip" c duit wiring, and this in course of time will tend to eli nate it.

Your point about cutting off the supply, as the fire briga do with gas, was mentioned to a fire officer during the case question, who pointed out that in large buildings they often glad of the light to see their way about. If it is deci that it is safer to cut off the supply, then the main swi should be *outside* the building.

A. Roberts,
City Electrical Engineer

Guildhall, London, *October 20th*, 1925.

Broadcasting Power.

I would not trouble to reply to Mr. Amphlett's somewh bombastic letter did I not realise, he has already addressed r personally, that he is at least enthusiastic. It is his rema concerning the bankruptcy of science that intrigues me.

Science is not bankrupt; it is those persons who refuse use their imagination and who devote their lives to events historical interest who are responsible for the fact that am teurs succeed where professionals fail.

Your correspondent refers to the fact that of the energy p into broadcasting, not one thousand-millionth part is useful employed. Quite so. Does he seriously imagine that in a fe centuries' time—not a long period other than relative to o short lives—the only changes that will take place in wirele will be in the colour of the knobs employed on receiving set Does he think that the scientist of the future will be conte with such wastage?

Does Mr. Amphlett realise that thirty years ago to send message one mile by radio was an achievement, and that that period Sir William Preece wrote of Marconi's experimen that "Radio would never be of commercial value"?

It is only about three centuries ago that a judge and jury i England killed old ladies, on the evidence of children that the were witches and that they employed familiar imps to do the bidding. Our knowledge of radio to-day is on a par with th period. Is it not honest to admit it? I tremble to think wh

Amphlett's grandfather would have said if he had been
that in 1925 one would be able to fly across the Atlantic
speak to one's house *en route*! ! !
e experiment referred to by Mr. Amphlett is not the only
Tesla's experiments are interesting, as are those of many
rs who realise that we who live to-day will be cave men
e light of the knowledge of 3,000 A.D.
take a case of which I have personal knowledge, I might
t out that in the early days of photo transmission by radio
of radio television, many of the greatest experts said that
lts were impossible and the suggestion was attributable to
dman's dream.
merely expressed a courteous opinion of what might happen
erhaps a thousand years' time. Your correspondent, less
ely, refers to Senator Marconi's sarcasm. It might interest
to know that Marconi *does* believe in the possibilities I
d. We should surely remember that if many learned
le are of opinion that even spirits can be seen, he should
in, in my humble opinion, from denying every possibility
he himself cannot visualise.
e possibility of to-day is the probability of to-morrow.
thing is so difficult to define as the impossible.

A. M. Low, A.C.G.I., &c.

ndon, *October 18th*, 1925.

The Æsthetic Aspect of Advertising.

e letter of "Advertiser," of Liverpool, in reply to my
hetic Parable raises such an interesting point that I feel
asking the Editors to grant me half-a-dozen pages in
h to reply. However, as such a course would probably
e a howl of protest from the electrical industry in general,
ill encroach upon the pages of the REVIEW as little as
ible, and endeavour to be concise.
iefly, then, my letter was correctly described by its title.
ealt with the æsthetic aspect of advertising. "Adver-
's" letter raises quite a different question; I do not think
all be unfair to him if I word it thus: Is not even artis-
ly bad advertising better than none at all?
this I reply, certainly it is; and I invite "Advertiser"
onsider with me, starting from this basis of common
ement, whether æsthetically good advertising is not better
æsthetically bad advertising. My letter was an expres-
of my views on this point, which, speaking generally,
that artistically bad advertisements either cancel out or
oke only disgust. It is not sufficient to attract attention:
ust is a form of attention. But I have never heard any-
advocate the selling value of disgust!
am sorry if my purely artistic criticism has been taken
eflecting in any way on the work of those who laboured
uild up "Advertiser's" statue of Truth, and to deserve
noble words which he gives as their epitaph. Their
lem was to create a good name by giving honest value,
this object and the sacrifices they made to gain it, were
noble. I join with "Advertiser" in revering their
nory. But may I point out that the problem of the
ern advertiser is quite different? Advertising is now
blished. It has grown, and is now risen to the dignity
employing artistic means to accomplish its ends. That
is so is recognised at least by those who set the com-
tion which is running in the pages of the REVIEW. The
points upon which entries will be judged are all artistic;
they are secured by employing artistic means. And
o far as any advertisement claims to use artistic means,
open to artistic criticism.
ay I put before your correspondent a consideration rather
e general than even the above? The use of trade marks,
ness names, advertising, &c., was a great reform. It
ed its purpose of preventing, to a great extent, fraudulent
ufacture. But, as businesses have enlarged, and have
red more into the life of the Empire, so advertising has
rged. It is a growing thing, and it is the nature of
wing things to require direction and pruning. They must
hecked here and encouraged there. They are at all times
le to irregular growth, abuse, and deterioration. And it
often happens that those who have grown up with any
icular reform from the outset, are unable, because of the
nny which preconceived ideas exercise over all of us, to
eive where the reform is tending, and what are its defects
growth. It is here that outside criticism can be most
uable. The very fact that advertising is capable of pro-
cing æsthetic criticism is evidence of a state of healthy
wth.
s my artistic criticisms have not been questioned by
dvertiser," it is not necessary for me to defend them.
ideal REVIEW, from the standpoint of good advertising,
uld be one containing such attractive advertisements that
lers would be unable to tear themselves away so much as
ook at the letterpress. May the efforts called forth by the
IEW competition hasten such a happy result!

B. Twigg.

reat Malvern, *October 18th*, 1925.

The Manufacture of Alternating-Current Motors.

s I am interested in the publicity methods criticised in
last paragraph of Mr. F. Parkinson's letter in your issue
he 23rd inst., may I assure Mr. Parkinson that the adop-
of a distinguishing name is quite dignified, legitimate,
sound publicity. Notwithstanding Mr. Parkinson's dis-approval, the treatment is being shared by very good company in engineering advertisements.

That engineering products *do* lend themselves to the adoption of a trade name is corroborated by the success of the policy in this case, a success which is emphasised in the thinly-veiled chagrin apparent in Mr. Parkinson's remarks. That he should publicly disparage his competitor's publicity policy is a good indication that the policy is effective.

D. Ross Kennedy.

Denton, Manchester, *October 24th*, 1925.

Legal.

American-German "Bosch" Litigation.

IN the Chancery Division on October 22nd, Mr. Justice Astbury commenced the trial of a case which was in the nature of an appeal from a decision of the Registrar of Trade Marks, allowing the word "Bosch" to be registered in respect of magnetos and sparking plugs. The applicants for registration were a German company, the Robert Bosch, A.G., and the application was opposed by the American Bosch Magneto Corporation.

Sir Arthur Colefax, K.C., and Mr. Moritz, K.C., appeared for the American company, the appellants and opponents, and Sir Duncan Kerly, K.C., Mr. Sebastian and Mr. Bray, for the respondents and applicants.

SIR A. COLEFAX said that the German company applied for the registration of two marks—the word "Bosch" in both cases—in respect of (1) magnetos, charging dynamos, and electrical self-starters, all for use with internal combustion engines; and (2) sparking plugs. Each application was dated September 11th, 1922. The application was made under Section 9, Sub-section 5, of the 1905 Act as amended by the 1919 Act, which provided that a mark should not be registrable except on evidence of distinctiveness, and "distinctive" meant "adapted to distinguish the goods of the applicants from those of other persons." The name "Bosch" was a surname which was not readily registered so far as our courts were concerned. The applicants carried on business at Stuttgart and they said that the word "Bosch" was their most important trade mark and had been used in Great Britain continuously since 1906. The applicants also said that the word had been regarded since 1906 by their customers as their trade mark designating their goods, and it was recognised as exclusively applied to their goods. They further said they had spent thousands of pounds in making the goods known; that their opponents never used the word "Bosch" as their trade mark, and were only a concern with a place of business here having "Bosch" as part of their name; and that the use by any other person would tend to confusion. The opponents, on the other hand, said that the word was not and could not be distinctive of the products of the applicants and was calculated to deceive for the reason that the word "Bosch," which formed part of the corporate title of the opponents, had been used by them for many years past in the United Kingdom. The opponents, continued Counsel, were incorporated in the United States in 1919 and they acquired the stock, patents, patent applications, and goodwill of an American company—the Bosch Magneto Co. (Inc.), which was formed in 1906 and had acquired certain rights from Robert Bosch. It appeared from an affidavit filed on behalf of the applicants that Robert Bosch started business in 1886 and in 1896 the individual business became a firm's business and the applicants themselves were incorporated in 1917 in Germany. Opponents' case was that the word "Bosch," whatever its meaning was in this country at the outbreak of war, ceased in the war to distinguish or to be capable of distinguishing the German-made goods: the word was applied here, equally to any surviving German goods, any American goods, and any English goods, more especially magnetos. Since the war ended "Bosch" had been applied as largely to American-made products as to German-made products here. Further, there was an enormous business in the United States in American-made products with which the applicants had nothing whatever to do. From 1914 to 1920 the German-made goods were not coming to this country, but since 1920 the applicants' conduct showed that the word did not distinguish their goods in their conduct amounted to an abandonment of any right—if they had any—in the word "Bosch." "Bosch" to-day meant a type of magneto, and that type was made in Germany and elsewhere, notably in the United States. Another consideration for the Court was this, that if this registration were to be allowed, they would have this position: there were and had been for a very considerable number of years thousands of American cars coming into this country which had got as part of their standard equipment, some product of the American company marked "Bosch" with a perfectly clear indication of American origin. The Bosch Magneto Company (Inc.), the predecessor of the opponents, was in existence when the war broke out in America and went on until May, 1918, when the Custodian of Enemy Property in the United States took possession of the property of that company, which was a German company in America, and was substantially owned by Robert Bosch. The company remained in the Custodian's possession and was carried on for a few months, until October, 1918, when its property was sold to the present opponents. In 1898 a Mr. Sims was appointed

the selling agent for Robert Bosch, then carrying on business at Stuttgart, and in 1907 Bosch acquired from Sims the Sims-Bosch Magneto Department of the Sims Manufacturing Company. In 1907, Bosch appointed that company selling agents, the name was changed in 1908 to the Bosch Magneto Company, Ltd., and that company was in existence at the outbreak of war here. In 1916 or 1917, the Custodian of Enemy Property here seized the business after it had been carried on by the Ministry of Munitions, and ultimately, in 1917, Messrs. Vickers purchased the assets and formed the British Lighting and Ignition Company.

His Lordship: The English company was originally a German Bosch company?

Sir A. Colefax: Unquestionably; at the outbreak of war substantially all the shares were owned by Robert Bosch. The English company up to the outbreak of war imported from Germany. In America he thought the business was in American-made goods; in England the business was undoubtedly in German-made goods. He understood that from 1906 to 1911 the magnetos were not manufactured in the United States; the American company was selling Stuttgart-made magnetos. In 1911 the parts were imported and the assembling was done in America. In that year the American company acquired a site and erected the Springfield factory, which was planned to produce 100,000 magnetos a year. They commenced to manufacture in 1912 and by the end of 1915 all parts with quite unimportant exceptions were made in the United States at this factory and sold as Bosch magnetos with the country of origin plainly stated.

Counsel went on to say that in this case there was a gentleman named Heins, who formed with one named Clyne the original American company, and there was no question that there was always a close association between Heins and Robert Bosch. There had been started two actions in the United States, claiming in substance that the American Bosch Magneto Corporation was not the successor of the American company and had no right to the goodwill, &c., of that company. One of those cases had been dismissed for want of prosecution and the other for five years had never been brought to issue. On the other hand, Heins had, since this application was launched, registered in America the Robert Bosch Magneto Co. (Inc.), and the present opponents, the American Bosch Magneto Corporation, had started an action against him and that company in respect of that registration.

The hearing was adjourned.

Fox v. A. Jurd & Co.

In the Shoreditch County Court of October 22nd, before Judge Cluer, Isaac Fox, Clapton, E., sued A. Jurd & Co., Heatherley Place, N., to recover £13 5s., being the value of a radio set (£10), and the cost of repairs (£3 5s.). It was stated for plaintiff that he purchased the set in 1923, but finding something wrong with it took it to the defendants, who agreed to put it right for the sum named. The set was repaired but as it was still unsatisfactory the plaintiff took it back. On the following day a fire occurred at the defendants' premises and the set was destroyed. The Judge pointed out that the plaintiff would have to prove negligence on the part of the defendants; he should have insured the set himself. The plaintiff produced a note from the defendants showing that the set was guaranteed for a period of 12 months from mechanical defects, but the Judge said that the defendants had taken the set back to repair the defects and it had not been proved that the fire was due to their negligence. He accordingly gave judgment for the defendants, with costs.

First Unlicensed Radio Set Prosecutions.

On October 23rd, at the South London Police Court, Mr. Ratcliffe Cousins had before him the first prosecution under the recently-amended Wireless Telegraphy Act of 1904, of a person using a radio receiving set without having obtained the necessary licence. Counsel for the Post Office said that although the penalty on summary conviction was £10 and on indictment £100 or two months' imprisonment, they had no desire in the circumstances for a heavy penalty.

The defendant, H. Hazlewood, a wheelwright, living at Battersea, admitted the offence. The magistrate bound over the defendant in £5 under the Probation of Offenders' Act for six months.

In a similar case at the West London Police Court on October 26th, the summons was dismissed under the Probation of Offenders' Act upon payment by the defendant of 4s. costs.

Radio Instruments, Ltd., v. Charles & Co.

As reported in our last issue (p. 654), Mr. Justice Astbury granted an *ex parte* interlocutory injunction on October 13th restraining the defendants from selling the plaintiffs' radio transformers at less than the stipulated price. On October 20th the defendant appeared in Court and consented to a perpetual injunction, agreeing to pay the costs.

Marconi's Wireless Telegraph Co., Ltd., v. Fada Radio, Ltd.

In the Chancery Division, before Mr. Justice Astbury, on October 23rd, Mr. Whitehead, K.C., mentioned this case and said that he had a motion for an injunction. The action was a patent action and related to the plaintiffs' grid leak patent. He had agreed with Mr. Stafford Cripps, for the defenda to the following terms:—The defendants would undertak pay into Court within seven days the sum of £500 as secu for costs and damages and would undertake to keep an accou on these undertakings there would be no order on the mot except that the costs would be costs in the action.

His Lordship assented to these terms.

Trade-mark Applications.

The following are among the recent applications for Bri trade marks. Objections against any of the proposed ma may be entered within one month from October 21st:—

B.B.C. (lettering and design). No. 449,385. Class 8. Apparatus for us radio-telegraphy and telephony.—British Broadcasting Co., Ltd.

Davreach. No. 461,692. Class 8. Radio-telephonic apparatus.—E. Millingon, 5, Vaughan Street South, Birmingham.

Hyten. No. 462,173; and Hymeg. No. 462,174. Class 8. Electric sto batteries and accumulators.—The Edison Swan Electric Co., Ltd.

Stethophone. No. 461,616. Class 11. Instruments, apparatus, and trivances for surgical and curative purposes.—Western Electric Co., Ltd.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the prin specification.
The numbers in parentheses are those under which the specifications will printed and abridged, and all subsequent proceedings will be taken.

1924.

13,179. "Electrical cooking apparatus." J. Gogan. May 29th, 1 (240,509.)

13,182. "Thermionic valve circuits." J. H. T. Roberts. May 29th, 1 (Cognate application 22,456/25.) (Divided application on 13,182/24.) (240,5

15,670. "Dynamo-electric machines." British Thomson-Houston Co., L and F. P. Whitaker. June 30th, 1924. (240,524.)

15,706. "Electric power supply systems." M. B. Bean and W. I. Price. June 30th, 1924. (240,526.)

15,712. "Telephone receiver." W. Dubilier. June 30th, 1924. (240,528

15,811. "Wireless telegraph receiving systems." Marconi's Wireless T graph Co., Ltd., and J. Brown. July 1st, 1924. (Addition to 199,4 (240,534.)

16,117. "Coiling machines for wire." British Thomson-Houston Co., L July 6th, 1923. (218,674.)

16,134. "Variable inductances." N. H. Clough. July 4th, 1924. (240,5

16,194. "Winding machines, particularly for coils of wire." Sir H. Holden. July 5th, 1924. (240,557.)

16,198. "Electrical switchgear." D. R. Davies and Metropolitan-Vick Electrical Co., Ltd. July 5th, 1924. (240,558.)

16,246. "Electrical inductance coils." E. W. Kirk. July 7th, 19 (240,559.)

16,276. "Activated material for electron-emission purposes." A. S. Cac maille (Westinghouse Lamp Co.). July 7th, 1924. (240,560.)

16,615. "Illuminated appliances." W. A. Dorey. July 10th, 19 (240,569.)

16,794. "Method of and apparatus for the production of radio-waves." Japolsky (A. Seleznev) (in part). July 12th, 1924. (240,572.)

16,865. "Safety device for use with portable electrically-operated m chines." E. E. Grover. July 14th, 1924. (240,574.)

18,398. "Electrical condensers." G. F. A. Stone. August 1st, 19 (240,591.)

18,956. "Acoustic devices." Western Electric Co., Ltd. (Western Elect Co. Inc.). August 9th, 1924. (Patent of addition not granted.) (240,596.)

19,619. "Automatic and semi-automatic telephone systems." Weste Electric Co., Ltd. (Western Electric Co. Inc.). August 19th, 1924. (240,605.)

19,641. "Method of and means for preventing unauthorised use of th mionic valves before sale." W. R. Bullimore. August 19th, 1924. (240,606

20,076. "Electrolytic manufacture of dental plates." E. E. B. Weigele a E. Jansz. August 25th, 1924. (240,610.)

20,878. "Visual system for testing telephone receivers." C. E. Brigha June 16th, 1924. (235,512.)

21,761. "Telephone systems." Automatic Telephone Manufacturing C Ltd. February 25th, 1924. (230,006.)

21,911. "Carriers for accumulators and the like." E. B. West. Septemb 17th, 1924. (Patent of addition not granted.) (240,626.)

22,189. "Thermionic tubes." Dr. E. F. Huth Ges. April 11th, 19 (232,159.)

22,218. "Apparatus for testing telephone receivers." W. H. Gerns. Ju 21st, 1924. (235,831.)

23,837. "Solenoid for operating electric contacts." British Thomso Houston Co., Ltd. October 8th, 1923. (223 236)

24,073. "Surface wiring for electricity distributing systems." Macinto Cable Co., Ltd., and T. H. M. Harvey. October 10th, 1924. (Cognate app cation 25,375/24.) (240,649.)

24,662. "Electric circuits of switchboards adapted for charging accum lators." F. J. Gates. October 17th, 1924. (240,658.)

25,345. "Portable electric lamps." J. E. Flesher and E. J. Bangerte October 24th, 1924. (240,660.)

26,938. "Thermionic tubes." Deutsche Glühfadenfabrik R. Kurtz u Dr. Ing. P. Schwarzkopf Ges. and Dr. P. Schwarzkopf. May 21st, 192 (234,435.)

27,835. "Electric discharge tubes provided with an incandescent cathod an anode, and a controlling grid." Naamlooze Vennootschap Philip Gloeilampenfabrieken. November 27th, 1923. (225,541.)

28,455. "Variable resistance devices." L. L. Jones. November 27th, 192 (240,675.)

30,150. "Process of electrolytically depositing an insulating coating or ski on aluminium." Zaidan Hojin Rikagaku Kenkyujo. December 19th, 192 (226 536.)

30,523. "Manufacture of tungsten powder by electrolysis." Naamlooz Vennootschap Philips Gloeilampenfabrieken. June 27th, 1924. (236,152.)

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The

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Electrical Contractors and Original Ideas.

WE must not allow ourselves to be so seriously engaged in discussing whether or not the electrical contracting business is degenerating that we shut our eyes to the real spirit of enterprise that is frequently displayed by some representatives of this much-maligned section of the electrical trade.

We can hardly remember the time when there was not something seriously wrong with contractors and contracting in the United Kingdom—at any rate on paper. It were the easiest thing in the world for the clever cartoonist to produce a series of progressive sketches of "the contractor—what he may become" either a great success and a help to electrical development, or a failure to himself and an undercutting jerry-working nuisance doing harm to everybody.

As far back as we can remember there were always both bad and good examples and, write all that we and our correspondents may, it always will be so. We look to the spread of registration to do much to relieve the situation, and we wish the movement full success wherever it is being tried. On that point our views have been so emphatically expressed from time to time that there is no need for their reiteration now. But we do want to have a word here directly in the ear of the electrical contractor himself—whether he is already registered, is about to register, or is indifferent to the whole question—on the subject of enterprise.

Large and effective showrooms are springing up in many parts of the country which contracting firms should find of great assistance to them both directly and indirectly, but however many centrally-placed showrooms there may be they will not be regarded by the enterprising contractor as a substitute for his individual display or his original policy and activity. Local individual ingenuity must be allowed the freest possible scope, and it must be remembered, too, that such ingenuity does not necessarily involve a big outlay in cash.

We are aware that there are cases where small men, as they are called, become discouraged in their local efforts because of what the authorities are doing to accelerate the rate of development, and they grouse and they grouse about rate-aided competition until their appeal to the public becomes more like a propaganda than a live, interesting, and convincing business-getting operation. They stand to gain far more in the shape of orders by getting on with their business than by indulging in exhibitions of ill-temper regarding inevitabilities.

We are sure that if the information could only be brought together, a fine record might be shown of hundreds of original individual efforts on the part of electrical contractors. It would go far to remove the effects of the fog of critical and belittling depreciation which seems to be the small man's heritage.

We welcome communications which keep the trade informed of the "stunts," if we may use a modern newspaper term, of the real live contractor, whether on this side of the Atlantic or the other. We would go so far as to urge him to concentrate at this moment on the production of stunts and yet more stunts to win the interest and orders of the public during these dark evenings when outdoor recreation for the average man and woman is practically non-existent and when shopping and the improvement of the home fill a large place in the pastimes of the winter.

If the electrical contractor will do as we suggest, he will develop as part of his business system a regular habit of seeking out new ways of securing work and sales. That there is room for ingenuity and enterprise in the electrical business we have not a shadow of doubt. Just as a type we may quote from our contemporary, *Electrical Merchandising*, the success that attended an original action on the part of a contractor, English by name but American in origin—J. C. English, of Oregon—who very much wanted to get hold of orders for electric fittings and fixtures required for housing schemes. Here we record from week to week the new housing schemes that are being undertaken in different parts of the Kingdom so that contractors and traders can bid for the electrical installation and apparatus work, if any. We, of course, have to leave it to the contractor to exercise his own brains in finding out how best he may succeed in such cases. Sometimes he tells us what he does and the result that ensues. In the case of Mr. English, mentioned by our contemporary, what he does is this: When a number of houses have been erected he sends a man to inspect them in their unfinished condition, with the lighting and other points wired awaiting the visits of the prospective tenant or purchaser. The said man before he leaves bends the wires into the form of a hook, upon which he hangs up a cardboard lantern sign stating that an estimate for the lighting fixtures required for "this home" is "ready for you" at the address of Mr. English. He jots down necessary data on a prepared form, and on this basis an estimate is prepared which is ready for the aforesaid tenant or purchaser. Of course, it is easy to anticipate a crop of objections from less pushful people who consider that their rights and privileges have been over-ridden, but we quote the result: inquiries are being received from 40 per cent. of the houses where the lantern signs are left. The lantern-sign effort does not stand alone—it is supported by appropriate correspondence of the follow-up order; but the estimate is ready—that is the important help that goes far to secure the business.

It may be that somewhat similar enterprise is being displayed by a number of firms here in connection with housing scheme operations. If so, we should like to have particulars for the assistance of others who are ready to avail themselves of such suggestions. We are sure that there is no lack of original ideas among electrical contractors; we merely quote the American example as a type that has just come before us. We should like to quote many of British origin if our readers will assist us.

Charges for Electricity in London.

In view of the attention which has recently been devoted in the City of London to the need for the charges for electricity to be reduced, it is of interest to direct attention to a communication that was issued by the Electricity Commission under date October 26th, 1925. Each of the companies affected by the London Electricity (No. 1) Act, 1925, has been notified that the sliding scale of prices and dividends provided for in that Act shall come into force as from the first day of January, 1926. A similar communication was also sent to each of the companies affected by the London Electricity (No. 2) Act, 1925.

The communication points out the importance of all necessary steps being taken by each company, without delay, to fix the standard prices for approval by the London County Council in order that the sliding scale may come into effective working at the earliest possible date. The hope is officially expressed that, even if it is not found practicable for the standard prices to be finally determined before January 1st next, each company will be able to announce such reductions of charges as may be warranted by a forecast of its prospective net revenue and of the appropriations thereof under the new conditions.

Booth's Circus.

Recent experiments instituted by the Advisory Committee on London Transport in Aldwych and elsewhere, with the system of continuous circulation of traffic in one direction, recall to our minds the fact that the late W. H. Booth strenuously advocated this system in our columns and elsewhere many years ago; although he may not have been the first to suggest the idea, his enthusiasm, combined with the obvious resemblance of the system to a circus, led to its being known amongst his friends (and who was not his friend?) as "Booth's circus." That the idea was practicable and possessed valuable features was undeniable; the only serious objection to it was the absence of any opportunity for pedestrians to cross the roads without bringing the whole system to a standstill, but this difficulty would be minimised by the absence of blocks, and would be felt only at times of exceptionally heavy traffic.

Booth's services to the community never gained the recognition that was their due. His interest in combustion prompted him to deliver lectures and to write books on the prevention of smoke from boiler furnaces, and his advocacy of the larger and higher furnaces which are to-day accepted as the correct practice for water-tube boilers was embodied in numerous articles which appeared in our pages some five-and-twenty years ago. A man of strong opinion, he had a fluent pen and a ready command of forcible language to drive his points home; and he used them both with vigour in support of his "circus."

Baking by Electricity.

We have frequently had occasion to point out that what electricity can do, cheaply and efficiently, is not to be determined by surmise or guess-work; only by actual trial over a sufficient period can its merits be truly appraised. On paper, the cost of industrial heating by electricity may seem unduly high, but in practice it is often found that owing to the adaptability of electric heaters, the ease with which the supply of heat can be controlled, the efficiency of utilisation which can be attained, and the saving in labour and capital cost, the actual outlay is less than with any rival heating agency, whilst the cleanliness and convenience of the electric way are unapproachable.

An apt illustration of this proposition is met with in the application of electricity to the baking of bread and pastry on a large scale. Hundreds of large electric ovens are in use in the United States. In our issue of October 23rd we described three notable examples of British baking ovens, and in the following pages Major T. Rich gives particulars of French practice. On account of its magnitude and nature, the baking load is of great value to supply undertakers. How many of them have canvassed the bakers in their districts?

Notes on Bakers' Electric Ovens.

With Special Reference to the Grenoble Exhibition.

By THEODORE RICH.

Among exhibits of interest to be seen at the Exhibition at Grenoble, some bakers' electric ovens take an important place. Two ovens, one for bread and the other for pastry, are shown in operation in a special pavilion, and a continuous pass-through oven is shown at work in a special building arranged for the demonstration of biscuit making by a Grenoble firm.

At first sight one would think that the only scope for the commercial bakers' electric oven would be in areas supplied from water power, as the thermal efficiency of the average steam power station—heat units in the coal

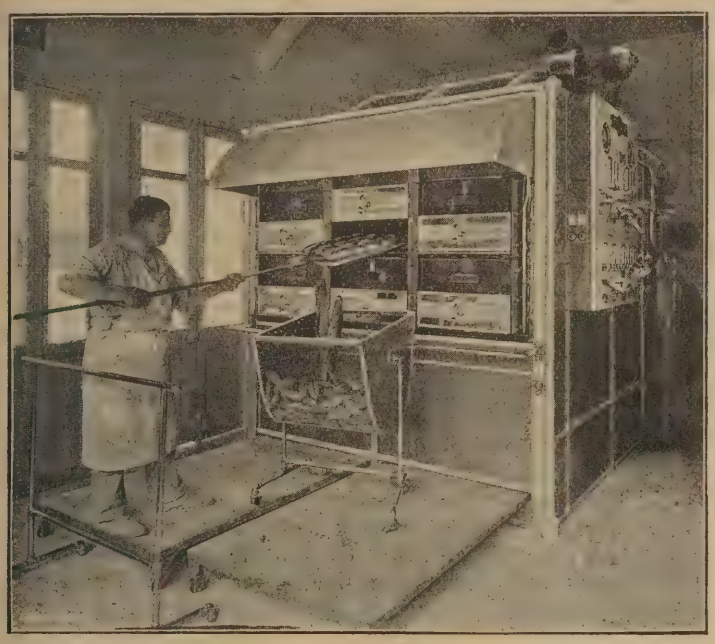


Fig. 1.—An Electrically-heated Bread Oven.

as compared with heat units available from the power station—is so low. But the question is how much of the heat in the coal used in the average bakery goes to heat the bread and evaporate the water content, and how much goes to heat up and keep hot hundreds of square feet of brickwork and flues and to heat up the air which passes through the furnace; and whether the electric oven which utilises such a very high percentage of the heat energy given in the form of kilowatt-hours will not prove an economic proposition, especially when many operating advantages are thrown into the scale. Coal is not the only factor in the cost account of a bakery, although an important one; wages, rent for the cubic space occupied, ever-increasing rates and taxes, and overhead charges generally add up to a formidable percentage during the year, and what is termed general convenience, to which a definite money value cannot be given, is also a material consideration.

Although it may be difficult for one baker, in the case of household bread, to charge more than another, and while people are conservative regarding the bakers they patronise, yet a high uniform quality of the product and an attractive appearance are very important factors towards the attraction of business. There is also the point that, owing to the difficulty of obtaining and keeping domestic servants, the restaurant habit has largely increased, and this has led to a demand for French and fancy bread for which a higher price can be obtained per pound weight than for household loaves. Besides the trade in pastry, in the United Kingdom there is perhaps the largest trade in Europe in such items as cakes, buns, scones, and such like, where the selling price in proportion to weight is very much higher than that of bread, and where quality as expressed in lightness, texture and appearance counts for so much. With regard to such products, the proportion of fuel costs to total costs tends to be smaller than with bread, and the various manipulative incidentals can easily mount up to a material percentage of costs; for such a trade, the electric oven has special advantages as compared with the old arrangements.

Underground Bakehouses.

In the past the use of the old-fashioned brick oven, with its flues, necessitated construction on solid foundations, and this fact encouraged the construction of underground bakehouses, a point that sociological enthusiasts usually overlook; the heat given out by the brickwork, the poor ventilation which so often existed below street level, the stuffy and objectionable atmosphere, and the hot, perspiring operatives, the presence of coal and dust and often bad illumination all combined to encourage vermin, dirt, and general insanitary conditions. It is not astonishing therefore that in some of our towns many persons who are British in race and instinct hesitate to enter a trade with such a reputation, and we find that too often men for such work come from the other side of the North Sea, a serious matter considering the seemingly chronic unemployment which exists among our own people at the present day. Despite the efforts of the professional political agitator who seems to live on grievances and unemployment, amelioration of the general conditions under which the craft of bakery is carried on can hardly fail to attract a good class of British labour into the trade.

It is also recognised nowadays that persons in an apparently healthy condition can be the carriers of dangerous diseases, and this encourages the demand that food, so far as is reasonably possible, shall be untouched by hand during preparation, and shall be comparatively free from contamination from the time it is prepared to the time it is delivered to the customer.

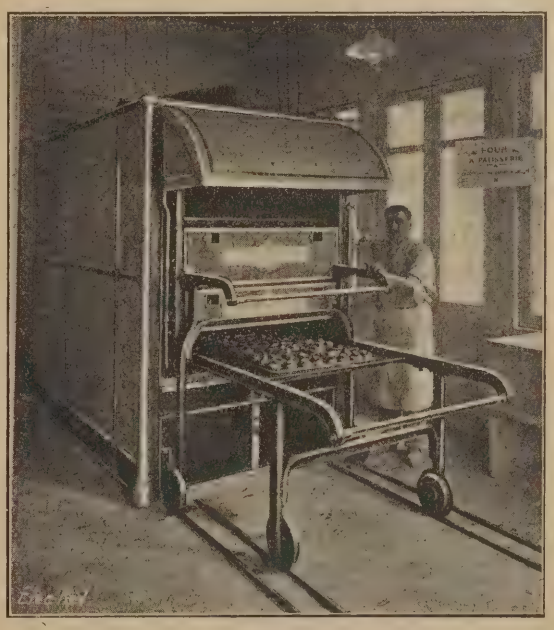


Fig. 2.—An Electric Pastry Oven.

It is relatively more important to take special care over an absorptive substance like bread that is eaten without further treatment than to bother about plate-

glass windows for such a commodity as meat, which in England is always cooked before it is eaten. Master bakers have in recent years done a good deal to improve their establishments, and to remove the reproach that medical men have often levelled against them, but there may be still some master bakers who would not like their lady clients to inspect without notice the exact conditions under which their bread is made and baked.

It is not in the interests of the community as a whole

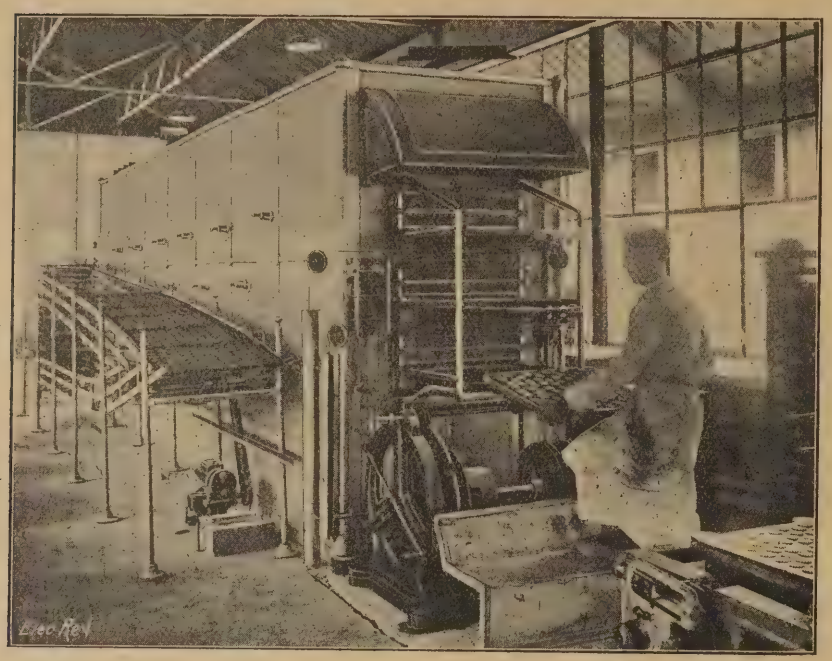


Fig. 3.—An Electric Biscuit-baking Oven.

that large octopus concerns should be able to squeeze smaller tradesmen almost out of existence, and there is a feeling in some quarters that in some classes of trade and business, people with ample capital resources, who can afford to wait, have encouraged Government and local rules and by-laws which, however intrinsically desirable, have made it more difficult for small businesses to exist. There is a demand, therefore, for appliances which can be produced and sold at a reasonable capital cost, which in small sizes, through facility of manipulation and adjustment and general efficiency, will enable the small trader to compete with large widely advertised concerns. Large undertakings often attract the public to less favourably priced articles by selling specific items below prime cost, a practice which acts unfairly towards those who try to make a living in the line affected by such "dumping"; it is open, however, to the smaller man to show the public the attractive up-to-date methods by which his wares are made, and thus gain an advertisement which is more lasting than some of the vulgar puffing which is so much in vogue at the present day.

Electricity to Aid the Small Man.

Electricity, when it is intelligently handled, and not tied up with too many fads and capital-wasting restrictions, can be a boon to the small employer and tradesman. In some parts of the Continent, even in small towns and villages, where electricity supply is available from high-pressure mains, an astonishing variety of electrical appliances for industrial use can be found, and in such areas electric ovens will undoubtedly make their influence felt. In the North of England, near the coal pits, electricity is, as a rule, cheaper than in the South, but considering the valuable nature of a baker's oven load, power supply authorities in many Southern areas, especially considering the high power factor, should be able to encourage the use of such appliances by their customers.

The heavy cost of British ca'canny coal during the last decade has encouraged the development of water power in Southern Europe; this has been a factor towards improvements in many electrical appliances, among them electric ovens, the use of which is spreading to areas where power from steam stations only is available.

The above ideas arose after an examination of the ovens exhibited at Grenoble on the "Media" system, the design of which is the outcome of 13 years of experience, a number of features being the subjects of patents by Messrs. Antonelló & Orlandi; they are constructed in France by the Société Générale des Fours Electriques, of Grenoble, a firm that specialises in ovens for the preparation of food. They are made in a number of sizes, from a small confectioner's oven which takes on an average 2 kW to operate, to a baker's oven which will handle about 12 cwt. of bread per hour; up to date the makers state that there are over a thousand of various types in use in various parts of the world. A number of ovens of this kind are at work in Paris and in other areas where power is supplied from steam stations, and it is of interest that the same makers have on order for use in the Paris area an oven taking up a floor space of three metres by four metres, which has a baking surface of 32 square metres (340 sq. ft.), and which can bake in eight hours 90,000 pastries and five tons of bread. The normal types are made for bread, pastry, or biscuits, and comprise one, two, or three tiers. One of the smallest bread ovens of this type is made with a baking surface of 2 square metres; it takes as a maximum 10 kW, and can produce 55 to 77 lb. of bread per hour with a consumption of between 0.1 and 0.16 kWh per lb. The bread and pastry ovens are designed for a maximum working temperature of from 300 to 350 deg. C. (570 to 660 deg. F), although the heating elements and other parts are arranged so that a very much higher temperature can be withstood without damage. The heating elements are formed of spirals of non-rusting wire. Most of the pastry ovens supplied by this firm have been connected to steam-driven electricity systems.



Fig. 4.—A Restaurant Pastry Oven.

A 60-kW Bread Oven.

The bread oven shown at the Exhibition is illustrated in fig. 1; it is the largest size made for the use of general bakers. There are two chambers one above the other,

each with a surface 2 metres by 3 metres, that is to say, about 130 sq. ft. total baking surface. There are six balanced doors, of a non-radiating type sliding in grooves, arranged to give easy access to the upper and lower chambers; one can operate the doors in rotation, and therefore the loss of heat through the opening of the doors can be reduced to a minimum. An experienced baker, with only one mate, can produce up to 220 kg. (484 lb.) of bread per hour. The space taken up is 2 metres 40 wide (7 ft. 8¾ in.), 3 metres 30 (10 ft. 8¼ in.) deep, and 2 metres 50 high (8ft. 2 in.), including all gear, &c. Its maximum consumption is 60 kW; the mean consumption varies from 0.1 to 0.136 kWh per pound of bread, depending on the type of bread and loaves to be baked. It should be noted that a greater weight of English bread can be got on to a given area than is the case with most classes of bread made on the Continent. The ovens have a slight slope towards the front to aid the charging and discharging. A chamber is arranged underneath to hold bread during fermentation. In order to facilitate the operation of the upper chamber, especially where the operatives are not very tall, there is a sliding platform which can be pulled out as shown in the illustration.

The total weight of the bread oven empty is about 5 tons, and when spread over about 85 sq. ft. this gives 135 lb. a sq. ft.; when the weight of bread is added, it will be seen that, owing to the absence of the necessity for any brick flues, it can be placed almost anywhere.

The Pastry Oven.

This has also two chambers, one about 6 in., the other about 10 in. high. There are two baking plates; each plate rests on a sort of trolley, so that it can be pulled out with the greatest ease when the balanced door is raised. The baking plates can be lifted off and replaced by a new batch, pushed in, and the door closed again almost in a matter of seconds; the loss of heat is therefore very small. Each oven has a working surface of 2 square metres. This oven takes a maximum of 22 kW, with an average under normal conditions much less than this. It is illustrated in fig. 2.

The following features apply to both types of oven. Each type is self-contained; it is made of metal, it requires no foundations and no expensive flue; it can be dismantled with ease, so that the owner of an oven could, if he so desired, take one to an exhibition or similar undertaking without great expense for skilled labour. The oven walls are so well insulated that, so far as the baking is concerned, the temperature of the bakehouse remains very low; the outside walls remain quite cool, and as the general appearance is pleasing, the makers recommend that the pastry ovens should be placed, where possible, inside the confectioner's shop and operated in view of the public as being a valuable advertisement. Some of those connected with the direction of the Société des Fours Electriques are gentlemen with years of experience in practical bakery, especially with regard to high-class French bread, and the ovens have been designed not merely to give convenience of regulation, but also to minimise the number of movements required for each operation on the Taylor system. Each oven chamber is fitted with a pyrometer, and top and bottom heat can be switched in and out and regulated independently; by this means the rise, thickness, colour, and humidity of the product can be influenced as desired, and an adjustment obtained which is out of the question with fuel-heated ovens. Owing to the disposition of the heating elements, a high radiating efficiency can be obtained. The interior of each chamber is continuously illuminated, and the process of baking can be observed without opening the main doors. There is a pilot light belonging to each chamber; this tends to prevent the waste of energy which would go on if it were left switched on with the oven empty. When baking bread, the oven can be raised to the required temperature in about 20 minutes; this tends towards economy in labour. To a considerable extent the power required can be regulated to suit the quantity of material to be baked.

An electrically-heated steam boiler of a patented type is attached to the exterior of the ovens on one side. By means of suitable connections steam can be admitted to the oven chamber when it is required to give the bread the maximum brightness—a matter of importance with French bread—and by means of steam the rise of the bread can also be controlled. The boiler has a very rapid action; it can be used to supply hot water at any temperature required when the oven has been shut down and no hot water is available from the condenser. A condenser is placed over the oven; it warms the water by means of the water vapour rising from the bread which is being cooked on a sort of regenerative principle, and the hot water required for the kneading can be obtained from this source. Ovens can be arranged so that one chamber is specially suited for pastry and the other for bread. The same makers supply a small pastry oven which takes a maximum of 3½ kW and a mean of 2 kW; it is designed to meet the requirements of small confectioners, tea rooms, schools, hospitals, institutions, and hotels. The oven proper is 1 metre high, 1 metre broad, and 1.25 metres deep. It is placed on a wooden stand, which serves at the same time as a cupboard. This tends to show how well it is insulated. It can bake about 1,000 little pastries in four hours or 20 lb. of bread per hour; the baking surface is practically 40 in. by 24 in. by 7 in. high. Fig. 4 shows one of these modified for making pastry in a restaurant in view of the public.

The continuous biscuit oven made by the same company is on view in connection with a demonstration of biscuit making arranged by Messrs. Brun, a large biscuit firm in Grenoble. It has a capacity of 400 kg. (880 lb.) of biscuits an hour. The biscuit trays are pushed in on one side from the paste-rolling and biscuit-stamping machine and slide out at the other ready to be placed on cooling racks (fig. 3). This machine takes 65 kW in operation. They are also made in small sizes. The electricity supply to Grenoble is almost exclusively from water power, and coal is very dear; such an oven might prove attractive in districts supplied by waste-heat power stations and also in countries like Canada, where there is so much water power. One generally associates the operation of model apparatus with large concerns, but the particulars supplied by the makers show that, provided electrical energy can be had at reasonable rates, the electric baking oven is within the reach of quite small establishments. Where a new bakery is to be put up in the middle of a big city the saving in cost of foundations, brickwork, and flues would amount to a material item, and provided simple arrangements can be made for the hoisting of flour, there should be little to prevent a bakery being put in an upper, if not on the top, storey of a building, which might be a great convenience in the case of the bakery of a hotel or institution. From the point of view of hygiene, probably no method of baking can compare with the electric oven.

Cost of Energy.

The Compagnie Parisienne de Distribution d'Electricité, the supply company for the major part of Paris, which operates with steam power only, and in whose area of supply a number of ovens have been installed, has informed us that on October 7th last (when the exchange was in the neighbourhood of 100) its price for energy for purposes other than lighting, that is to say, for electric ovens and electric motive power, was 0.816 fr. low pressure and 0.582 fr. high pressure per kilowatt-hour, coal then being 130 fr. a ton. At an exchange rate of 100, that would mean 1.95 and 1.31 pence respectively, with coal at 26s. a ton. The above prices are subject to rebates calculated quarterly, which are based on the load factor of the plant installed; the day rebate may reach a maximum of 40s., and the rebate for night time 45s. In France, where power comes from a steam station, there is a price variation depending on the price of coal.

The electric oven is no mere fad; it has come to stay.

The Commercial Motor Exhibition.

Some Notes and Comments on Electric Vehicles and other Exhibits.

Few industries in Great Britain have developed so strikingly during the last two years as that connected with the manufacture of mechanically-propelled road vehicles for general commercial purposes. The numbers of registered goods-carrying vehicles and hackney carriages, which amounted to 100,000 and 60,000 respectively in 1919-20, had increased by 50 per cent. at the time of the last commercial motor show in 1923, while to-day the figures are estimated at 224,287 and 98,833, and the seventh International Commercial Motor Transport Exhibition, staged by the Society of Motor Manufacturers and Traders, Ltd., at Olympia, London, from October 29th to November 7th, has proved that more real progress in design has been achieved during the period that has elapsed since the 1923 show than in any equivalent period.

Whilst trade in goods vehicles is progressing, if somewhat slowly at the moment, passenger transport is growing in a remarkable manner, particularly in connection with omnibus services, and the most noteworthy developments are therefore naturally seen in passenger-vehicle design. The exhibits are representative of the leading makes of petrol-, steam-, and electrically-driven vehicles, and the specialised industry of coach and body building. Amongst the 68 different makes of vehicle displayed, seven manufacturers of "electrics" are exhibiting a number of battery-driven trucks, vehicles, and trolley-'buses. So far as the passenger-carrying models are concerned, practically all the latest embody a chassis having a low frame level, and considerable attention is devoted to efficient braking, an increasing number of chassis being provided with four-wheel brakes. To-day the Municipal Tramways and Transport Association, according to the programme, is to discuss local authorities' problems in connection with the operation of omnibus services, at the last of the six conferences arranged at the Exhibition.

Electric Trolley 'Buses.

The ever-increasing popularity of the railless car is once again made manifest by the decision of the Birmingham Corporation to increase its fleet of double-deck



Fig. 1.—A "Railless" Trolley 'Bus.

cars, twelve of which type have operated in that city for several years with success, and have had the effect of increasing the traffic returns of a route which was considered to have reached the limit of its capacity when operated by tramcars. The large seating capacity and the "all-weather" adaptability are features which cannot be overlooked. A low-floor car of the open-cab type that was recently placed in service at Southend-on-Sea is shown in fig. 1. Made by Railless, Ltd. (proprietors: Short Bros., Ltd.), who claim to be pioneers in this form of passenger transport in the British Empire and China, the 'bus is a single decker, whereas the show model is built to take 52 seats, the lower and upper saloons each being fitted with 26 seats. A feature of the upper saloon is the provision of drop windows at the sides, these being easily adjustable and operated on the "lazy-tongs" principle. The current-collecting gear consists of "Railless" vertical trolley stands equipped with two tapering booms approximately 19 ft. 6 in. in length, mounted on channel supports.

Specially designed for the production of the low-frame chassis, the rear axle (by the Kirkstall Forge Co.) is of the double-reduction type, consisting of worm gearing and of a pinion and internal ring gear bolted directly to the road wheels. The internal gear is totally-enclosed, being grease tight, water, and dust proof. By removing the road wheels and driving shafts, the worm and differential gear can be lifted from the axle casing, through the trap provided in the floor of the car, as a complete unit. Timken taper roller bearings are employed for mounting the wheels, and two independent sets of brakes are fitted to the double deck car, operated in conjunction or independently. The emergency brake acts on the rear wheels and is applied by a pedal. The electrical equipment fitted to this particular model includes two motors of 35 h.p. (by the English Electric Co., Ltd.) arranged in tandem directly on the chassis frame, which is so well sprung that independent springing of the motors is quite unnecessary.

A 36-seater single-deck trolley 'bus was also shown on the stand of Messrs. Richard Garrett & Sons, Ltd. It is driven by a single 50-h.p., 1,060-r.p.m. "Bull" motor, and is fitted with pneumatic tires; in addition to front-wheel brakes, a Westinghouse air brake operates on the rear wheels. The side entrance door is 4 ft. wide.

Petrol-Electric Vehicles.

Amongst the exhibits of Tilling-Stevens Motors, Ltd., is a petrol-electric chassis (fig. 2) with a 50-h.p., 4-cylinder engine and a worm final drive. The maximum load capacity is 5 tons, including the body. C.A.V. constant-voltage equipment is provided for electric lighting. A similar chassis is fitted with a single-deck London-type omnibus body with seating accommodation for 30

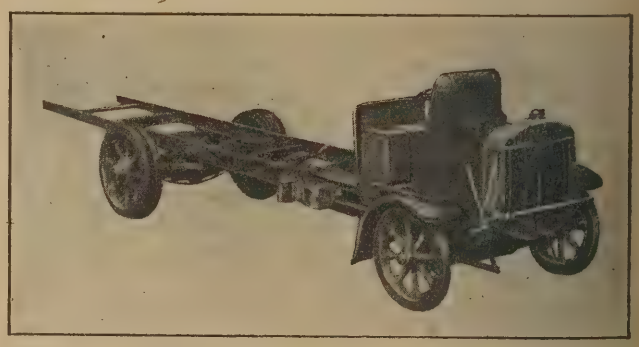


Fig. 2.—A 50-h.p. Petrol-electric Chassis.

passengers. In this case the makers' direct-lighting system is installed, the electricity being derived from the chassis dynamo.

Battery-propelled Lorries and Trucks.

Several makes of battery-propelled chassis are on view. The "Garrett" 2-ton vehicle is driven by a single "Bull" 9-h.p. motor, and the control gear is so arranged that the vehicle can be steered from the pavement, thus obviating the necessity for the driver to mount into the cab on each occasion as the vehicle moves from door to door for refuse collection and similar purposes.

Messrs. Ransomes, Sims & Jefferies, Ltd., exhibit one of their standard 3½-ton "Orwell" electric tipping

wagons (fig. 3) for refuse collecting. These electric vehicles are used by nearly 40 cleansing departments, also for highway maintenance, overhead tramway work, street watering, and commercial transport in towns. They also show the C.11 model electric industrial truck, which is fitted with 4 ft. 16 in. wheels for use on rough ground, and with an electrically-operated elevating platform, by the use of which, in conjunction with several trays or stillages which can be loaded at convenience, transport is effected without loss of time in loading and unloading, the truck being kept in constant running service.

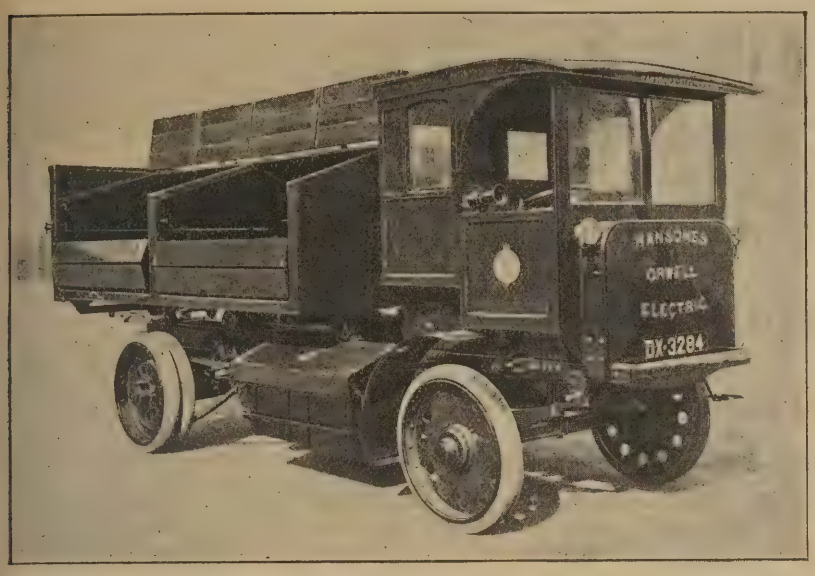


Fig. 3.—An "Orwell" Electric Tipping Wagon.

The "Ransome" runabout crane will travel, turn, hoist, and derrick under its own power, turning about its own centre like a turn-table, and by reason of its mobility is suitable for the many jobs of daily occurrence outside the capacity of the ordinary lifting appliances, as indicated in fig. 4, and have hitherto been performed by hand. These cranes are used by the Port of London Authority, the Mersey Dock and Harbour Board, the L.M. & S. and L.N.E. Railways, and other leading undertakings throughout the country.



Fig. 4.—An Electric Runabout Crane.

(To be concluded.)

An Economical Heat and Power Scheme.

The Electrical Installation at the Bucklow Institution, Knutsford.

An electrical installation has recently been completed at the Bucklow Institution, Knutsford, which presents some interesting features. Steam had previously been used to a considerable extent for heating the building and also for domestic hot-water purposes. A scheme was prepared by Messrs. Cramp and Frith, consulting engineers, of Manchester, whereby all the energy required in the Institution for lighting and power could be generated electrically by using a back-pressure engine as a prime mover, and utilising the exhaust steam for the work previously done by live steam direct from the boilers. By carefully proportioning the plant and by the installation of a storage battery of about 600 Ah capacity, it was found possible to provide all the heating, lighting and power necessary without any increase in the steam drawn from the boilers; thus for a very slight increase in coal consumption due to the higher pressure of steam, the Institution now has its lighting and power services provided for electrically.

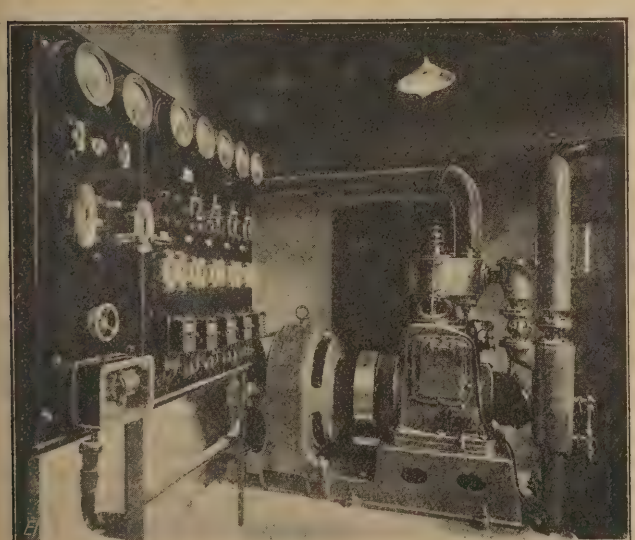


Fig. 1.—Generating Plant and Switchboard.

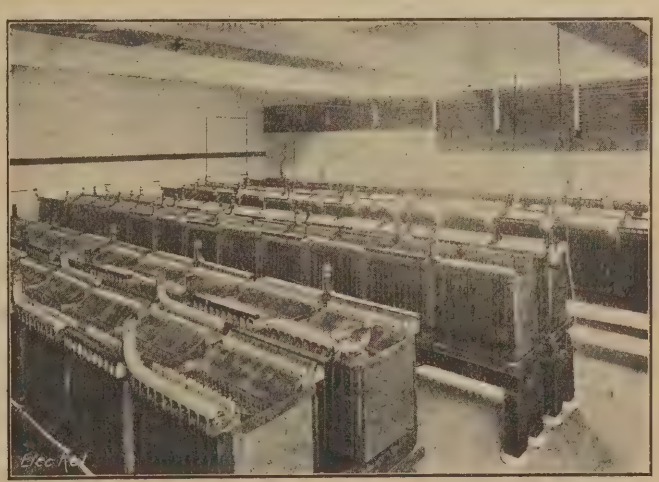


Fig. 2.—Storage Battery.

The plant comprises a 32-h.p. high-speed enclosed steam engine, fig. 1, designed for taking steam at 100 lb. pressure, and exhausting against a back pressure of 5 lb. This is directly coupled to a 20-kW 200/280-V d.c. generator, arranged so as to supply direct or for charging the storage battery. The battery, fig. 2, consists of 106 cells, and is contained in a large and up-to-date battery room.

The total number of lamps installed is between 400 and 500. The electrical plant also provides energy for a 15-h.p. motor used for driving the laundry machinery, which was previously driven by a low-speed horizontal steam engine. Since installing this electric motor, there has been a very considerable improvement in the operation of the laundry machinery; it deals with all the variable loads due to hydro extractors, &c., without any noticeable variation in speed, whereas when operating with the steam engine, excessive speed variations were frequent.

The exhaust steam from the engine passes into an exhaust header, one "way" from which is connected to an atmospheric exhaust pipe with an automatic valve designed to release the steam at 5-6 lb. pressure. Two of the remaining "ways" on the header are connected to calorifiers which provide a supply of hot water to a 750-gallon storage tank, the water being intended for domestic purposes in the kitchen, &c. Another "way" on the header provides steam for a "Recto" apparatus, which is used for re-heating the return water from the water heating system. In actual operation no steam passes out of the atmospheric exhaust pipe, and it has been found possible to provide a constant supply of hot water, although the engine is shut down each week-end from Friday afternoon until Monday.

The whole of the work was carried out by Messrs. Drake & Gorham, Ltd.

The Uruguayan Electrical Market.

A Field for British Enterprise.

(From our own Correspondent.)

Electrical wiring is undertaken in Uruguay practically without any restrictions either as to kind or quality. When, however, it is used on public supply systems, such as the half-dozen owned and operated by the Usinas Electrícas del Estado, the works inspector has to approve of all jobs before connections are made to the lines. This regulation, it is considered, gives greater latitude to the wiremen than is desirable, since industrial inspectors vary in their estimation of the quality of the work carried out. There has been of late a strong inclination in Uruguay to combat certain European influence, since this has always meant low-grade material. Simultaneously with the formation of the Electrical Engineers' Association in Buenos Aires, the Administration of Central Stations in Uruguay formulated a set of rules which have almost eliminated the use of poor material, and have done much to destroy the damaging practice with which customers had been undoubtedly afflicted in past years.

The Bandá Oriental (Republic of Uruguay), with its total area of 72,180 sq. miles and 1,663,000 inhabitants, offers many opportunities for the sale of electrical goods, not alone in the capital, Montevideo, where there are over 400,000 people, but in the suburbs and seaside resorts outside it. There is no longer any private supply enterprise, since the Government long ago decreed that all public services should be considered State monopolies. The electricity supply is cheap and the undertakings are well managed. The General Department of the Government Central Stations, which has its headquarters in Montevideo, administers the affairs of all power stations through one central organisation, staffed by capable engineers and local representatives allotted to each of the four more important cities. No small part of the prosperity achieved is due to the policy initiated from the first, and strictly maintained, of appointing only competent and intelligent men entirely without political bias or influence as members and officials. All purchases of supplies are effected by public bids, as in the case of the insulated copper wire purchase mentioned in "Business Notes" in our issue of October 23rd.

Montevideo, like the sister capital, Buenos Aires, is among the more progressive of the South American cities. Especially has this been the case in the adoption of the latest electrical devices irrespective of origin. One of the more notable features of this policy has been the construction of a large and admirably-equipped showroom containing working models of practically every well-known electrical device for the household, and including, of course, several types of water-heaters, cooking ranges, &c. These models are arranged for immediate operation under conditions approximating closely to those of actual service. The prospective customer is thus enabled to determine readily how far any particular apparatus will be likely to suit his or her house and obtain a precise estimate of the cost of the appliance and also of its running expenses after its installation. An additional advantage is offered by the remarkably low rates charged for energy for both cooking and heating. In Montevideo, as in other Uruguayan cities and, indeed, throughout the "camp" (or country where the farming population resides) the sale of heating and cooking apparatus is becoming increasingly important. In the winter months the temperature is sufficiently low to call for the provision of some artificial warmth, and the summer heats are torrid enough to call for the use of powerful electric fans. The type of house warmer most in demand is the small focusing reflector pattern. A considerable trade is done in this type of heater with the adjacent city of Buenos Aires, where it is manufactured. The same appliance is also furnished with fixtures to provide hot water and to make toast. The Argentine article is not made of very good material, nor is it of attractive design. Cheapness, however, is considered before good quality, and the apparatus sells at prices considerably lower than those asked for similar imported goods. Were it possible to place upon the Uruguayan market a British-made heater at the same price as the Buenos Aires article, there is no question that it would be preferred, since "British made" attached to any article offered for sale in South America becomes a *cachet* of value. In the central station workshops of the Usinas Electrícas del Estado a larger type of heater is made, after designs by one of the State engineers. This type, although little better in quality than that of Argentine origin, has the same advantage of cheapness, since the raw material is obtained locally and the finished product is not called upon to pay either import duties or freight. The demand for this heater has not, however, been as extensive as was hoped. Consumers usually prefer to pay a rather higher price for a superior foreign article, provided this comes within their means.

Montevideo has long been an attractive market for the sale of cooking ranges. The Usinas Electrícas, which holds a fair stock of these appliances, has no prejudices against foreign-made articles, and allows its customers to make their own choice without attempting to influence their judgment. In the display room are to be found many kinds of ranges—American designs predominating, and German makes coming next—which can be demonstrated to prospective customers. Special rates are quoted for domestic supplies. The most popular ranges are fitted with four plates, but there are no ovens, these best meeting the peculiar conditions of Uruguayan households. In view of the heating element being more liable to damage when exposed, a form of protective covering must always be provided.

The voltage is 220, but in ranges thus fitted it has been found that the breakage ratio is higher than in connection with a voltage of 110. In these circumstances the free allowance of renewal parts is always found advantageous. In order to encourage the further use

of cooking ranges in the City of Montevideo, the central station charges only four centesimos per kWh for the first 2,000 kWh consumed, and 2 centesimos for each kWh above that quantity.

An increasing sale for other heating devices, such as flat irons, bread toasters, curling tongs, and immersion heaters has lately been reported. Water-heaters of sufficient capacity for general household purposes have an extensive sale in the "camp." Since few Uruguayan houses are equipped with a hot-water storage tank, there is also a demand for the instantaneous type.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The Æsthetic Aspect of Advertisements.

I was more than gratified to read in to-day's Review Mr. Twigg's answer to my letter, and in view of the great interest which the competition must of necessity attract to your advertising pages, perhaps you will permit me to answer not only Mr. Twigg's gentle impeachment of my irrelevance, but to meet him on his own ground, or rather that plot to which he has carried his defences.

In your correspondent's opening paragraph in his letter of September 26th, he refers to "Advertising Street," by which I judge he means the advertising world of to-day; in fact, he develops this theme, and makes the significant statement that "some hurry through without stopping—these are wise." One might justifiably assume that Mr. Twigg is not satisfied with modern advertising, charging it with vulgarity, exaggeration, and irrelevance, to say nothing of theft from the masters of our tongue.

Now to come to the æsthetic aspect—dare your correspondent suggest that modern advertising does not pay? Surely the capacity for a return on money expended is the standard by which a commercial effort must be judged. It does pay, because it is a young craft evolved from bitter practical experience, proved, and successful.

Why, therefore, should we be æsthetic, why artistic? What better criterions can we follow than those demanded in your competition, in which artistic qualities come a very definite last? We at any rate who are concerned with the prosaic manufacturing branch of the electrical industry on its publicity side have a definite duty to perform—to echo our firm's reputation and policy, to give to the purchaser our firm's message as if it emanated from a solid British concern, not a Chelsea studio. In our factories we do not lay Persian carpets in our foundries, or fit our lathes with gold tassels, but, to abandon an exaggerated simile, we build machinery for efficiency and life in Great Britain and not for beauty.

Can Mr. Twigg tell us why we should not convey these ideas in our advertisements, and why we should not first of all concentrate on:

(1) Power of immediate attraction,
(2) Qualities compelling continued attraction,
(3) Boldness of design,

with "artistic arrangement," a fourth desideratum capable of interpretation in its widest meaning—"neatness"?

I cannot fight a worthy opponent from the shield of a pseudonym, and therefore beg to subscribe myself—

J. P. F. G. Turner
(Advertiser).

Liverpool, *October 30th*, 1925.

Non-Dazzle Car Lighting.

Many years ago the following experiment was made:—A very bright electric lamp was suspended without any reflector, or shade, from the roof of a large building, the walls and roof of which were very dirty, and the pupil of the eye of an observer was measured. Then, without making any other alteration except placing a large white disk behind the lamp, the pupil of the eye of the observer was again measured. In the second case, although a larger amount of light was falling on the pupil of the eye of the observer, the pupil was larger, showing that there was less strain on the observer's eye. Would not the dazzle of a motor-car's lamps be reduced if the motor-car itself were made visible to the observer by allowing some of the light to illuminate the motor-car?

Experiments in this direction might lead to useful results.

Non-dazzle.

October 26th, 1925.

Combustion Engineers.

I have been interested of late in the advertisements appearing in your columns under the heading of combustion engineers, and am surprised at the amount of salary offered for such positions.

A combustion engineer must be thoroughly proficient in all power plant problems; he is, or should be, entrusted with the handling of the largest item of expenditure in any power station, *viz.*, the fuel; and he can often effect economies covering many times the salary paid. And yet supply authorities place this class of engineer in the lowest grade. Perhaps these authorities and their managers do not yet realise that there is something more in combustion than merely carrying out a few tests.

American power plant managers are, however, realising this, and in many instances the combustion engineer is among the highest paid officials.

Combustion.

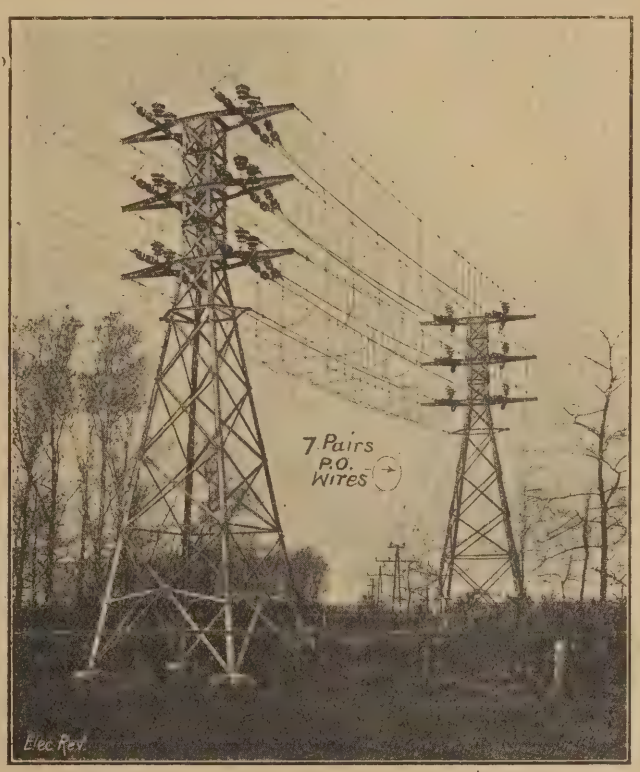
London, *October 30th*, 1925.

Rural Electricity Supply.

It is quite true I am not that kind of "big man" who would subside immediately Mr. Bartholomew ordered him to do so. This is the typical "I have spoken" attitude of the Post Office which we are out to combat.

Mr. Bartholomew's simile of St. George and the Dragon is excellent. He has produced the exact picture of the situation. We must slay the dragons of unreasonable rules and regulations which are neutralising our efforts to be useful. I do not think anything I have written could hurt the feelings of the higher officials now I know that Mr. Bartholomew shyly and wisely disclaims any certain right to be one of their number. They cannot possibly read the Electrical Review; if they did T.E. 80 and similar concoctions would not exist in their present unreasonable form, and I would have nothing to write about. Unless Mr. Bartholomew seeks audience with them and "tells on me" they will never know!

The short answer to Mr. Bartholomew's belated indignation as to my use of the word "paltry" in connection with short



Power Lines Crossing Telephone Lines.

exchange interconnection lines is the enclosed photo of an actual crossing recently erected by the North Wales Power Co., over this same Northwich to Winsford local line. This is a cheaper design than the one submitted to me officially as that approved, but it is "accepted" as a sort of concession. It costs about £250. We are, in effect, asked to plant two more of these monstrosities on an innocent and hitherto smiling countryside. Your readers will now be able to decide if the Post Office line is a "paltry" thing to have required this fearsome structure, designed apparently to cope with elephants in bulk rather than electricity. Underneath is the Post Office line. It would need a great deal of exaggeration to make it reasonably visible; in fact, it has failed to affect the plate. There are seven pairs of very thin 'phone wires passing where I have indicated by a ring.

I am sorry that Mr. Bartholomew's description of the heavy thinking which goes on in connection with these projects leaves us to seek further for an explanation. I have just remembered that our proposals to cross were dealt with in the holiday season; perhaps the office boy had to deal with them. Seriously, look at the picture and remember that I saw about 1½ miles of this 'phone line put underground about 18 months ago. One trembles to think what would have happened to our Winsford calls if a few yards more had been laid underground by mistake! It would be laughable if it were not so serious.

Mr. Bartholomew, being a "big" man, has run away from my challenge to produce figures to support the Post Office

refusal to put this line underground at our cost. I tried hard to get them before this discussion arose. The longer the figures are kept back the more the suspicion grows that there are no figures; that the line could be put underground, and that all that prevents it is an old order that this line is to be overhead in the country. The order was made, I suggest, on the ground that the line is too paltry to be put underground in the country on the score of cost, and that as we are prepared to pay it is merely inertia and indifference which stand in our way.

I suggest that Mr. Bartholomew makes too much of the generosity of the Post Office in putting subscribers' lines underground *at our cost*. It is their well-known policy to get them underground, even at their own cost, as soon as they can. I expect they would be glad if we asked and paid for them all to be put underground forthwith!

I am hoping that crossings such as that illustrated will not be required in future, unless the Electricity Commissioners are convinced that no alternative is possible. I even suggest that the Commissioners should take the initiative and scrutinise proposed crossings when proposals are put forward, to see that money is not wasted in unnecessary elaboration. After all, these transmission lines may be purchased later on by a Joint Authority, and the public will then have to foot the bill. If the Commissioners do not exercise the necessary scrutiny, this can be assured by an appeal under the Electric Lighting Clauses Act, 1899. The Commissioners have power to decide whether a requirement of the Post Office is reasonable or not, and may decide what shall be done.

Mr. Hunt, of Haywards Heath, exposes the Post Office "second comer" injustice very neatly. His belief that P.B.J. (allowed in practice for the last 10 years or so with excellent results) will help him on low-pressure a.c. crossings is to have a rude shock. Post Office officials have just dug up a forgotten clause in T.E.80 which forbids it for a.c. exceeding 125 volts, and the word has gone round that T.E.80 must now be enforced. This means that a.c. overhead distribution is killed—unless we appeal to the Commissioners.

I envy Mr. Hunt his sectional engineer who will stretch a point, but I am sorry he has mentioned it publicly as someone may report the statement at headquarters. The whole system of Post Office organisation is contrary to any such thing as elasticity.

Mr. Walker's excellent letter hits the supply engineer very hard, and rightly so. We have no right to make freak rules, as uniformity is as necessary in this as in periodicity and voltage. The electrical industry seems to exercise an uncanny fascination upon all concerned, and some who are not, to make rules.

If you have spare space perhaps you will publish the annexed extract from the new Mid-Cheshire Conditions of Supply:—

> Wiring must be carried out in accordance with the Institution of Electrical Engineers' wiring rules; the 1917 edition is accepted by the company.
>
> *Note.*—Unsatisfactory installation work is a source of expense and annoyance to all concerned. The company is prepared to carry out installation work on request, at the cost of the consumer. Consumers may, however, employ any wiring contractor, but it is suggested that only firms of good standing, who are on the National Register of Electrical Installation Contractors, should be employed. The tests carried out by the company before connection are solely for the purpose of ascertaining the leakage and compliance or otherwise with the statutory requirements.

The rest of the conditions merely recite the legal position as to services, meters, connection, and disconnection. Your readers will note that we accept the 1917 I.E.E. rules and recommend employing only registered contractors. The latest I.E.E. rules are far too elaborate, and we want to help consumers, rather than frighten them.

W. Fennell.

Northwich, *October 29th*, 1925.

Is the Contracting Business Degenerating?

In agreement with "Contractor's" and "Ghost's" letters published last week concerning examinations for wiremen, &c., may I suggest that until such time as these become compulsory, employers should take into consideration when employing men that there are some who pay substantial fees and devote their spare time to gaining technical knowledge, either through the I.C.S. or other institutes.

It must be admitted that by doing this the men are proving their interest and willingness to learn their trade, else why should they take the trouble and pay the fees when others who don't trouble or care, but simply bluff through, are enjoying their leisure?

Not only in civil life do some trades demand a minimum efficiency, but, in the Services, trade tests are in force, and the result is that the best men go forward and leave the duds behind—not as it is to-day in most cases when the good workman has to carry the bad one with him.

Wireman.

London, *October 26th*, 1925.

I would just like to break in on the discussion of the trials of wiring contractors and the recrudescence of the "Diplomas for Wiremen" idea.

Now, whilst there undoubtedly is such an individual as the "Jerry Wireman," the jerry wiring contractor also exists, and to those engaged in the industry who seek foes to conquer I would say that he is the greater enemy. He is the man who cuts your price with cheap and nasty 1/18, who runs "umpteen" wires in tube where you would have provided an easy draw-in. Some of his under-the-floor jobs seem to say "Oh where, oh where, has that little tube gone?"

In a long experience the writer has found more trouble and breakdowns traceable to the unscrupulous contractor than to the bad workman.

Do not leave him to his own funeral; he is cutting your price all the time. He may be that jerry wireman you sacked last week, he may be a grocer or a candlestick-maker, who cares?—but the house he wires may be burnt out next week.

Then for the good of the industry let us have registered contractors first, and maybe the jerry wireman will go along with the jerry wiring contractor, wherever that may be.

Oh yes, I know that registered contractors do exist, but I am asking for a scheme which shall include every electrical contractor.

The support fire insurance companies, supply authorities and the like, should give such a scheme would make it practically compulsory for a contractor to be registered, and the fear of loss of registration would be an effectual safeguard against the kind of work put in sometimes, by the plumber, the ironmonger, or the local radio stores.

H. Verrall.

London, *October 28th*, 1925.

Mr. E. O. Walker's communication of the 14th inst. draws attention to many anomalies which hinder the progress of electrical installation work on an economical basis as compared with gas. At the same time, while one must agree with him regarding the general absence of accidents with electrical fittings, I would suggest that it would be absolutely fatal to the future of the industry to allow any slackening of the regulations. A lot of "shoddy" wiring jobs are done now, and any attempt to modify the rules in the direction indicated will only tend to increase this kind of work. We want an installation to possess safety and reliability after years of service and this without expensive maintenance and renewal of fittings.

Do not let us be led away by a desire to revise the wiring rules in order to permit of greater laxity in safety measures. Let us turn our attention to a crusade for the more stringent regulation of gas. As Mr. Walker points out, how often does one read of fatal results due to gas leakage from defective pipes. Only a few days ago, a Manchester innkeeper was asphyxiated in his own electrically lighted premises by a leakage from a large gas main running under the pavement outside. According to published accounts, the gas department merely explained that the main was laid several years previously and no tests had since been made to determine its condition. Further, it would appear that there was not any test, short of pulling up the ground, which would indicate the whereabouts or even existence of any leakage. What a confession to make. Are there no regulations governing gas supply? If not, then it would appear time that the standard was raised to that at which we aim in electricity supply.

Touching on the penultimate paragraph of Mr. Walker's letter and also on the remarks of some other correspondents, it is not always the odd job wireman who is in the picture. One has only to glance at published lists of tenders submitted by reputable and registered electrical contractors to discover an amazing difference between the prices. Especially is this noticeable in the case of a large institution contract, where, presumably, there is the same specification to meet and a consulting engineer to satisfy. One can only draw one conclusion—shoddy work which initially just passes the rules.

"Ghost" refers to "popularising electricity." Popular handbooks on "how to do this and that," and cheap correspondence schools, have made many electricians (!) for a few shillings, and the tragedy is that the non-technical public believes it. Electricity is a side line with plumbers, watchmakers, stationery and fancy goods dealers, &c., and people will employ these where on the other hand they would not dream of consulting anybody except a registered medical man, licensed dentist, or a chartered accountant for their other affairs. Why? Because a non-trained individual would be prohibited from practice in the latter professions and the respective associations would see to it. It is up to us to put the electrical engineer on the same footing and then, and only then, shall we get electrical work properly done.

W. T. Critcher,
A.M.I.E.E., Assoc.M.C.T.

Swinton, *October 26th*, 1925.

[This letter has been abbreviated.—Eds. Elec. Rev.]

Waste Heat from Steam-driven Stations.

The chairman's address to the South Midland Centre of the I.E.E. says that no remedy is forthcoming for the waste of heat by steam-driven stations on a large scale.

I have repeatedly suggested that most effective use can be made of it to stimulate crop growth. The warm water can be used in open channel irrigation, or passed through a grid of buried pipes.

The new sugar industry is a good field for trial. Probably two or three crops of sugar beet could be raised per annum, instead of one, which would improve the present low annual load factor of the refinery. The refinery itself is a good customer for waste heat, at the times when the crop is off the ground.

This is an example. Other crops may pay as well or better, specially early market garden stuff, and, with the assistance of glass, grapes, tomatoes and the like.

I believe there is no other general application of low-temperature heat which can give so good a return.

Experiments on a small scale would not be very costly, and should investigate the questions of fertilisers and other matters, arising from working the soil harder.

Henry M. Sayers.

London, *November 1st*, 1925.

Motor Converters v. Rotary Converters.

The subject of motor converters *v.* rotary converters is one that interests me greatly, and as I am in favour of the former venture to reply to Mr. Wüthrich's remarks.

Taking the points in the order that he gives them:—

1. I agree entirely with his first statement that it is an advantage to have a separate transformer; incidentally, most modern power systems work at higher voltages than 11,000 V, so the motor converter would be no different here to the rotary.
2. I have frequently started up rotaries and induction motors (the a.c. side of a motor converter), and of the two I think the induction motor is considerably easier. Most people will, I am sure, agree with me.
3. At full load the rotary is certainly far more efficient, but at about ½ to ¾ load there is but little difference, and this is usually about the working load. I agree that the two forms of converter are equal as regards power factor correction.
4. Mr. Wüthrich admits that the rotary is inherently inferior to the motor converter as regards d.c. regulation, but suggests using an induction regulator. Admitting that the efficiency is still higher—which I doubt—induction regulators for large-sized machines are too big and costly to be of much use, otherwise why aren't they more often used?
5. Here I am in agreement.
6. This Mr. Wüthrich dismisses practically by saying that it is a "small reduction in peripheral speed"! Does he consider 50 per cent. small? The wear and tear on bearings must of necessity be less; while on the d.c. side the motor converter is practically immune from flash-over on sudden overload, a thing far from rare on a traction rotary. In fact traction rotaries of 50 cycles, 1,500 r.p.m., 1,500 V, are, to the best of my belief, not manufactured in this country; and in the States, where they are made, I believe the commutator looks like a ploughed field.
7. This is practically a repetition of No. 2, and if an induction regulator is inserted with the rotary then certainly the motor converter is the easier to handle.

As regards space the rotary "has it every time." To state that the design of a rotary is easier surprises me. Surely there is no difference. The mere fact of passing leads from one part of the machine to the other does not strike me as a complication.

Finally, with regard to manufacture, I believe I am right in saying that until recently only one firm in this country held the patent rights of manufacture. These expired lately, and as soon as they did so at least one other well-known firm started to manufacture La Cour motor converters.

H. A. Sieveking (B.Sc.).

Rugby, *October 30th*, 1925.

Mr. Wüthrich, in his letter appearing in the current issue of your paper, once again raises this time-honoured controversy, and makes comparisons which would appear to suggest that the firm with which he is connected does not build motor converters, and that he is perturbed by the steadily increasing demand for these machines.

The various arguments which he puts forward have been fully answered in previous discussions, and he has evidently overlooked the fact that it was only after the British master patent expired a few years ago that motor converters could be manufactured in Great Britain by other than one company; and the additional firms who are now building these machines are just those who have had the most extensive and successful experience in the manufacture of rotary converters.

I would like to point out two errors in Mr. Wüthrich's letter:—

(*a*) He states that the full load efficiency of a 1,000-kW motor converter is about 89.5 per cent., whereas the efficiency of such a machine is actually 93 per cent., which is the same figure as he claims for a rotary converter of this size with series reactance.

(*b*) He says: "The leads connecting the two rotor windings have to be led through the hollow shaft and middle bearing, this being a rather weak point, from a constructional point of view."

This is perfectly true with the old 3-bearing machine, but motor converters of modern design are built with only two bearings, and consequently his criticism does not apply.

The motor converter has steadily increased in favour since it was first introduced into this country, and its present popularity is neither a fad nor a fashion, as Mr. Wüthrich suggests, but is due to its proved merits.

As the firm with which I am associated equally manufactures motor converters and rotary converters, I am perhaps in a position to take a more disinterested view than is possible with your correspondent.

John H. Bunting.

London, *October 31st*, 1925.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Our Telephone Number.—The telephone number of the ELECTRICAL REVIEW (all departments) has been changed to "Central 7072" (three lines).

E.C.A. Conference, 1926.—It is announced in the *Electrical Contractor* (the official organ of the E.C.A.), that the first annual conference of the E.C.A. Allied Organisations will be held in Brighton during the summer of 1926. The proposal was unanimously adopted by the Council at its meeting on October 21st. The matter came forward in the form of a resolution from the Western Section that an annual summer Convention or Conference extending over two days should be held. The various branches and members are to be notified at the earliest possible moment.

Difficulties of German Electrical Companies.—In its report for the year 1924-25, the Isaria Meter Works G., of Munich, stated that trade activity was generally favourable, and in some departments overtime had to be worked, but the net profits of 31,000 marks did not permit of the distribution of a dividend, the reason for this being that selling prices, particularly for meters, were too low. Since the beginning of the new financial year, however, prices have advanced, and are gradually approaching the level of the former peace-time rates. The report of Brown, Boveri & Co., of Mannheim, for 1924, states that orders received showed a considerable falling off in the second half of the year. They were in many cases only obtained at prices which yielded no profits and often resulted in a loss. Since the beginning of the year, wages increased by 60 per cent. Differences of a few per cent. in the costs of production were a determining factor in the matter of the competitive capacity of the industry in the home and foreign markets. The burden of taxation prevented the operation of the undertakings on a basis which promised a regulated and moderate return, and it hindered competitive capability in the world's markets. The liquidation of transactions dating from the period of the inflation continued to burden the year's working, and would only be completed in 1925. Notwithstanding all these difficulties, the departments made satisfactory progress; it had been found possible systematically to simplify and further improve production. The accounts for 1924 show a loss of 141,000 marks. At the recent annual meeting it was stated that orders during 1925 have been satisfactory, and will provide employment for some time, although selling prices still leave something to be desired.

Depression in the Rhine Provinces.—The *Times Trade and Engineering Supplement* states that industrial conditions in the Rhine Provinces are weekly becoming more serious. In the iron and steel industries employés are being thrown out of work by the closing down of factories. One electrical works has closed down and dismissed all its employés.

A Trade Forecast.—In the forecast of the Federation of British Industries, published in its organ, *British Industry*, it is stated:—"There are fairly definite signs that the lull in world trade which, in accordance with our previous forecast, prevailed throughout the last quarter, is coming to an end, and that a new period of expanding trade is about to begin. This movement, which is primarily seasonal in character, received considerable encouragement from the change over to a policy of cheap money and plentiful credit which occurred in August, followed by a subsequent further reduction of the Bank Rate on October 1st. If some official assurance could be obtained that the present monetary policy is to be persisted in, this movement might easily reach substantial dimensions, especially if the inflationary tendencies already at work in America remain unchecked. Unfortunately, the recent weakness in our exchange, coupled with the heavy outflow of gold, amounting to nearly £7,000,000 during the first three weeks of this month, introduces the possibility of a reversion to a higher Bank Rate during the next few weeks; but such a change would imply miscalculation. Much will also depend on the policy pursued by the New York Federal Reserve Board. There are, however, as yet no signs of the removal of the embargo on foreign investment; and our labour costs are not yet adjusted to our exchange."

Support for the E.D.A.—The Electricity Committee of Exeter City Council has resolved to contribute ten guineas per annum to the British Electrical Development Association.

Local Exhibitions. — Glasgow. — A radio exhibition organised by Consulting and Radio Service, Ltd., was opened at 15, Gordon Street, on October 31st, by Sir R. Wilson. The exhibitors include the Western Electric Co., Ltd., the General Electric Co., Ltd., Burndept Wireless, Ltd., the Marconiphone Co., Ltd., the British Thomson-Houston Co., Ltd., the British Radio Corporation, Metro-Vick Supplies, Ltd., the Radio Communication Co., Ltd., Messrs. Cahill & Co., Ltd., and Messrs. S. G. Brown, Ltd.

Elland.—An exhibition of electrical appliances, principally domestic, was opened on October 26th, by Mr. W. B. Woodhouse, general manager of the Yorkshire Electric Power Co. The Elland electricity undertaking was established in 1903, but in 1921 local generation was stopped and supply has since been obtained in bulk from the Yorkshire Electric Power Co.

Burnley.—We are informed by the borough electrical engineer (Mr. J. E. Starkie) that the Electricity Committee is planning an exhibition on a large scale to be held about the end of January next.

A "Siemens" Sign.—A striking illuminated neon sign of approximately 1,000 candle power, measuring 10 ft. by 2½ ft., representing the trade mark "Siemens," has recently been fixed above the facia of the Siemens & English Electric Lamp Co., Ltd.'s premises at 38-39, Upper Thames Street, E.C.4.



A Siemens Neon-Tube Sign.

The light given is very distinctive and peculiarly attractive. When illuminated the sign is quite a landmark and can easily be seen from the Blackfriars end of Upper Thames Street on the one hand and from Cannon Street Station on the other. We reproduce herewith a photograph of the sign.

Trade Announcements.—The Marconiphone Co., Ltd., whose head office is now 210-212, Tottenham Court Road, London, W.1, has lately opened a number of new branches in various parts of the country, to facilitate distribution of its products. In addition to the branches stated in the company's recent advertisements it has opened others at Southampton (81a, Above Bar); at Leeds (15, Wellington Street); and at Liverpool (1, Oriel Close, Water Street).

Messrs. Austin Walters & Son, Ltd., have appointed Messrs. S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.C., as their sole agents for London and the South of England, and export.

Mr. J. C. White, of Manchester, has installed an additional telephone line; the numbers now are: Central 1090 and 1091.

The Mullard Wireless Service Co., Ltd., has opened a depôt at 30, Handyside Arcade, Percy Street, Newcastle-on-Tyne, under the management of Mr. F. F. Turner. Stocks are carried.

Mr. Charles Clout, electrical and radio engineer, 134-5, Snargate Street, and Worthington Street, Dover, has opened new premises at 1 and 2, Priory Place, in that town.

The County Electrical & Wireless Stores, Ltd., of 2-3, Norfolk Street, Strand, London, has removed its business at Folkestone to larger premises at 124, Sandgate Road.

The Foster Engineering Co., Ltd., has opened an additional office and stores for the trade at 37, South Castle Street, Liverpool, for the sale of "Apex" ironclad switchgear, "Foster" transformers, "Crown" cable and wires, &c., and electrical accessories. Mr. G. S. Williams has been appointed manager of the branch.

The English Electric Co., Ltd., announces that instead of treating the Manchester, Bradford, Sheffield and Liverpool districts as four distinct sales areas, each controlled by a separate branch office, it is combining them so as to form a "Northern Area" with headquarters at 196, Deansgate, Manchester, under the direction of Mr. P. H. Symonds, M.I.Mech.E., A.M.I.E.E., who has been appointed Northern area sales manager for the company. The existing offices at Bradford, Sheffield and Liverpool, will be maintained as subsidiary offices and will continue to deal with the company's business in their respective districts.

Messrs. Clarke & Pitcher, electricians, have opened new premises at 10a, Dover Road, Folkestone.

Catalogues and Lists.—The Sterling Varnish Co., 196, Deansgate, Manchester.—A pamphlet advertising the firm's insulating varnishes.

Simplex Conduits, Ltd., Garrison Lane, Birmingham.—A comprehensive catalogue (96 pp.) of "Simplex" conduits and conduit fittings. Fully illustrated and priced.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester.—An illustrated booklet entitled "The Hospitality of Light," presenting the case for electric lighting generally—and by "Cosmos" lamps in particular.

The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, W.1.—Three well-illustrated and priced catalogues dealing respectively with "Marconiphone" and "Sterling" radio apparatus, and "Marconi" valves.

Messrs. Herbert Morris, Ltd., Loughborough.—Book 105, containing particulars of the Morris gravity conveyor, &c.

The Midland Accumulator Co., 47, Newhall Hill Parade, Birmingham.—A priced pamphlet giving details of the firm's accumulators for radio work.

Tok Switches, Ltd., Granville House, Arundel Street, W.C.2.—November blotter illustrating rotary snap switches.

The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.—Pamphlet L356, describing "Mazda" electric decoration lamp outfits for shop windows, Christmas trees, &c.

Delco-Remy & Hyatt, Ltd., 111, Grosvenor Road, S.W.1.—A series of slips containing information relating to the company's bearings, mine-tub wheels, belting, thermostats, and starting, lighting and ignition apparatus.

Messrs. Austin Walters & Son, Ltd., Little Peter Street, Manchester.—An illustrated and priced catalogue of electric signs, containing views of actual installations.

The Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—A calendar-blotter for November, illustrating one of the firm's fires.

Electricity Services, Ltd., 27, Martin Lane, Cannon Street, E.C.4.—A pamphlet dealing with good illumination and advertising the firm's installation-maintenance service.

Messrs. John Bennie, Ltd., Moncur Street, Glasgow.—A leaflet illustrating examples of the company's electric and other lifts.

Messrs. Garnett, Whiteley & Co., Ltd., "Lotus Works," Broadgreen Road, Liverpool.—A coloured showcard advertising "Lotus" vernier coil holders. Priced.

Messrs. Alfred Herbert, Ltd., Coventry.—A pamphlet dealing with pulverised fuel for boiler firing in the paper industry.

The Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—A booklet giving details and prices of "Igranic" radio accessories generally, and a series of leaflets dealing with particular components.

Bankruptcy Proceedings.—W. R. J. White, electrical agent, 29, Great Pulteney Street, W.—This bankrupt applied, on October 27th, to Mr. Registrar Mellor at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that the bankrupt failed in September, 1922, with liabilities of £1,151; the assets realised £131, and a first and final dividend of 1s. 5½d. in the £ was paid. The bankrupt commenced business in October, 1920, and carried it on with various partners. He attributed his failure to depreciation in the value of his investments. The application was opposed on the ground of rash and hazardous speculations and unjustifiable extravagance in living. A discharge was granted, subject to a judgment for £50 to be satisfied by an immediate cash payment.

S. S. Schreiber, dealer in electric lamps and accessories, 175, Great Portland Street, W.—This debtor was made bankrupt in May last on the petition of the British Thomson-Houston Co., Ltd., his only liability being £131 in respect of costs of an injunction restraining him from infringing the company's patents. He applied on October 27th to Mr. Registrar Mellor, at the London Bankruptcy Court, for an order of discharge, when the Official Receiver reported insufficiency of assets to equal 10s. in the £ on the amount of the liabilities, and omission to keep proper books of account. After hearing Mr. A. W. Horsell, in support of the application, his Honour granted a discharge subject to judgment for £20 to be satisfied by an immediate cash payment.

W. R. Ball and H. J. Leech, trading as R. Ball & Company, electrical engineers, 287, Upper Street, Islington.—The public examination of these debtors was held recently. The accounts showed liabilities of £2,328 (unsecured £2,230), and assets "cash in hands of Sheriff," £20 17s. Replying to Mr. F. Vyvyan, Official Receiver, the debtor Ball stated that in January, 1922, with £100 capital, he commenced business at the above address as an electrical and mechanical engineer; the debtor Leech joined him as a partner fourteen months later, introducing £200 in cash and machinery in return for a half share of the profits. They subsequently traded as R. Ball & Company, until last March, when their stock, machinery, and furniture, were sold under an execution. In September, 1924, they entered into a contract to supply 15,000 pairs of headphones at the rate of 500 pairs per week. Owing to the late delivery by the manufacturers of certain materials required for the contract, delivery was not made to time, and, in consequence, the contract was cancelled, and in February,

1925, they were sued for breach of contract and judgment was given against them for £369, of which £70 had been paid. The examination was concluded.

H. McCLELLAND, 12, Leigham Avenue, Streatham Hill, S.W., late 48, Strand, London, radio apparatus merchant.—The first meeting of creditors was held on October 30th, at 29, Russell Square, W.C.1. The statement of affairs showed liabilities of £1,862 and there were no assets. Debtor attributed his failure to lack of capital and bad trade in a partnership business. After being in partnership with another from September, 1919, to July, 1923, his partner retired without receiving any payment, and debtor took over the assets and liabilities. He traded on his own account until August, 1924, when he sold the lease of the premises and a portion of the stock for £250, and out of this sum discharged the greater part of his liabilities. In September, 1924, he entered into verbal partnership with another and they traded as radio apparatus merchants at 48, Strand, W.C., under the style of the X.L.O. Company. He brought the remainder of the stock (about £150) from his previous business to the business. In May, 1925, the second partnership was dissolved, his partner taking over the assets and liabilities without payment to the debtor. Debtor became aware of his position in October, 1924. The case being a summary one, was left with the Official Receiver as trustee of the estate. The following are creditors:—

	£		£
Battersby, Mrs. T.	160	McClelland, J.	... 1,220
Marconiphone Co., Ltd. ...	110	McClelland, W.	... 200
Renold, M.	80	Reid, H.	... 90

W. R. SQUIRE, 11, Steward Street, Spring Hill, Birmingham, electrical engineer.—The first meeting of creditors was held on October 29th at the Official Receiver's offices, Birmingham. The statement of affairs showed ranking liabilities of £68, and a deficiency of £41. Debtor attributed his failure to depreciation in value of stock, bad debts, and trade depression. He commenced business as an electrical engineer at Redditch in 1907, but this was discontinued. In April, 1919, he recommenced business as an electrical engineer at Edgbaston with £140 capital, and in March, 1921, he removed to his present address. The matter was left with the Official Receiver as trustee of the estate.

W. J. LATTIMER, trading as W. J. Lattimer & Co., 52, High Street, Croydon, electrical engineer.—The receiving order in this matter was made recently on a creditor's petition. The statement of affairs shows liabilities of £285 against assets of £11, leaving a deficiency of £274. Debtor attributes his failure to lack of capital and underestimating the cost of contracts carried out. In 1919 debtor commenced business without capital as an electrical contractor, with a shop, where he sold electrical fittings. The shop, however, did not prove profitable and he closed it down in March, 1922, and continued only the contracting business. He became aware of his position in February, 1925, since when most of the present debts have been contracted. The following are creditors:—

	£		£
Emanuel & Sons, Ltd.	25	Electrical Supplies, Ltd.	50
Cysiles, Ltd.	20	Falk, Stadelmann & Co., Ltd.	55
Thomas & Co.	20		

J. MITCHELL and F. MITCHELL (F. Mitchell & Co.), electrical engineers, 97, Stockport Road, Ardwick, and 58, Ashton Old Road, Openshaw, Manchester.—Last day for proofs for dividend, November 14th. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

F. MITCHELL, lately carrying on business with J. Mitchell (F. Mitchell & Co.), electrical engineer, 113, Broom Lane, Levenshulme, Manchester.—First and final dividend of 5s. 0¾d. in the £, payable November 9th, at the Official Receiver's offices, Byrom Street, Manchester.

W. K. COXON (Western Manufacturing Co.), wireless apparatus manufacturers, Nurshell, Lydney, Glos.—Receiving order made October 21st, on creditor's petition. First meeting, November 4th, at 34, Park Lane, Cardiff; public examination, December 15th, at the Town Hall, Newport, Mon.

S. PURCELL, electrical contractor, The Arcade, Goole, Yorks.—First meeting, November 3rd, at the Official Receiver's office, 1, King Street, Wakefield; public examination, November 12th, at the Court House, Wakefield.

Company Liquidations.—ISAACSON & BROWN, LTD., electrical engineers, 39, Furnival Street, Holborn, E.C.4.—A meeting of creditors was held on October 24th at 14, Chancery Lane, W.C., when Mr. R. Chudleigh, the liquidator of the company, presented a statement of affairs, which disclosed liabilities of £1,644 and debentures and interest amounting to £562. The assets totalled £11, leaving a deficiency of £2,195. The deficiency account showed that there were trading losses to June 8th, 1923, of £2,053, and for the period from June 8th, 1923, to October 4th last there was a loss of £334. The company was formed in June, 1923, with a nominal capital of £1,000, which, in November, 1919, was increased to £5,000. Debentures were issued in January, 1913, amounting to £800, and on June 8th, 1923, when a receiver was appointed, there was a balance of £775 outstanding. It was stated that in 1916, 1917, and 1918 profits were made, but since then losses had been incurred. The liquidator said that all goods obtained since the appointment of the receiver had been paid for in cash. It was decided that the voluntary liquidation of the company should be continued with the present liquidator.

J. SPRINGER, LTD., 152, Wardour Street, W., and High Wycombe, electrical engineers and kinema furnishers.—A further meeting of creditors was held recently. The meeting was called by Mr. C. B. Holland, C.A., of Messrs. Prideaux, Old Square, Lincolns Inn, W.C., who had been appointed as the liquidator in the voluntary liquidation of the company, for the purpose of considering an offer of approximately 1s. in the £. The creditors passed a resolution agreeing to accept a composition of not less than 2s. in the £.

ELECTRIC LOCOMOTION & FOUNDRY CO., LTD.—A meeting of members is called for December 1st at E. Milburn House, Newcastle-upon-Tyne, to hear an account of the winding up from the liquidator, Mr. T. C. Martin.

ELECTRIC DISTRIBUTING CO., LTD.—Particulars of claims are to be sent to the liquidator, Mr. H. S. Jones, 3, York Street, Manchester, by November 16th.

CONSOLIDATED DIESEL ENGINE MANUFACTURERS, LTD.—Liquidator, Sir W. B. Peat, 11, Ironmonger Lane, released October 26th.

ELECTRIC REPAIRS, LTD.—Meeting of creditors, November 11th, at Imperial Buildings, Bridge Street, Walsall; particulars of claims to the liquidator, Mr. J. T. Bunch, Imperial Buildings, by December 18th.

Dissolutions of Partnership.—BROWN & MASON, electricians, Barn Street, Strathaven, Lanarkshire.—Messrs. W. Brown and H. Mason have dissolved partnership. Mr. Brown will carry on the business at Barn Street, and Mr. Mason at Sun Buildings, Kirk Street.

WARDELL & Co., electrical contractors, 83, Raleigh Road, Richmond, Surrey.—Mr. F. W. Wardell and Mr. J. W. Poultney have dissolved partnership. Debts will be attended to by Mr. Wardell, who will continue the business.

Book Notices.—"Year Book and Diary" (88 pp. and diary pages). Edinburgh: The Electrical Contractors' Association of Scotland. Price 3s.—This contains lists of members and officers of the Central Board and branches, with notes of the Association's activities. In addition there is a great deal of information of service to contractors; including regulations, model tender conditions, legal notes, and organisation details.

"Scientific Paradoxes and Problems." By A. S. E. Ackermann, B.Sc., A.M.Inst.C.E. Pp. viii + 131. London: Old Westminster Press. Price 5s. net.—The author of "Popular Fallacies," having broadcast a series of "talks from 2LO" on that subject, was bombarded with knotty problems and paradoxes, 100 of which are dealt with in this volume. Many of them are strictly genuine physical or dynamical problems, requiring a wide range of scientific information for their solution; others are puzzling only to the layman unfamiliar with elementary mechanics or mathematics, and others, again, are of the "trick" variety, or purely plays upon words and figures—but all are interesting, and it is not easy to put the book down once it is opened. Certainly its publication was well worth while.

"The *Ironmonger* Pocket Book." (64 pp.) London: The *Ironmonger*. Price 1s.—This is a real pocket book, *i.e.*, it is of a convenient size for a pocket, and contains a large number of tables of data relating to tinplates, bolts and nuts, copper, lead, cast-iron, boilers, tanks, belting, and numerous other matters. It also contains a squared-paper notebook.

"Mechanical Testing of Materials." By W. M. Crossman. Pp. 36; 11 figs. London: Association of Engineering and Shipbuilding Draughtsmen. Price 2s.—The author of this pamphlet recognised that a full treatment of the subject was impossible; his aim was to briefly outline the several methods employed in scientific and commercial testing, with the object of creating practical interest in this section of engineering rather than entering into the mathematical aspect of the subject.

"Power Alcohol from Beet." Pp. 16. London: British Power Alcohol Association.

The McGraw-Hill Publishing Co., Ltd., has issued a list of American books on business and economics. Details of the scope of these works and their prices are given.

"The *Journal* of the South African Institution of Engineers." Vol. XXIV, No. 3. October, 1925. Price 2s.

"Scientific Papers of the Institute of Physical and Chemical Research, Tokio, Japan." Vol. 3, No. 37, July, 1925; Nos. 38-40, August, 1925.

"Coils and Magnet Wire." By C. R. Underhill. Pp. xi+494; figs. 197. London: McGraw-Hill Publishing Co., Ltd. Price 20s.

"The Mathematical Theory of Electricity and Magnetism." By J. H. Jeans. Pp. viii+652; figs. 139. Cambridge University Press. Price 21s. net.

"Behind the Counter." A practical guide for shop assistants. By W. H. Beable. Pp. 102. London: Simpkin, Marshall, Hamilton, Kent & Co., Ltd. Price 3s. 6d. net.

"Anniversary Volume of Voluntary Contributions," dedicated to Prof. Hantaro Nagaoka, on the completion of 25 years' professorship at the Tokio Imperial University. Tokio, 1925.

Electrical Goods for Brazil.—A slight improvement is recorded in exports of British electrical goods to Brazil. A recent monthly consignment from the United Kingdom consisted of 10 metric tons (164 cases of mixed goods), compared with 36 metric tons (2,064 cases) from the United States, and 27 metric tons (227 cases) from Germany.—*Reuter's Trade Service* (Rio de Janeiro).

New Belgian Companies.—Among the recently-formed Belgian companies are the following:—Les Etablissements Edouard George et Cie. (Brussels, capital 250,000 fr.), for the manufacture and sale of heating, electrical, telephone, and radio apparatus, &c. Constructions Electriques Marelli (Brussels, capital 800,000 fr.), for the sale and, later, manufacture in Belgium of electrical machinery. Electricité de la Lesse (Anseremme-lez-Dinant, capital 300,000 fr.), for the supply of electricity for all public and private purposes. Ateliers E.-R. Lataire Frères (Eecloo, capital 1½ million fr.), for the production, *inter alia*, of electric motors and speed-reduction apparatus. La Cuivrerie Liégeoise (Liége, capital 225,000 fr.), for the manufacture and sale of lighting glassware and electro-technical apparatus.

Lead.—Messrs. James Forster & Co. on October 31st stated:—"Supplies are coming in steadily, and there is no shortage of prompt lead. A scarcity is now predicted for next month, but, as this was said of October, we do not attach much importance to it. With the shipping strike collapsing in Australia, the prospect is for full supplies and, if consumers continue to hold off the market, this can only result in lower prices."

The New Southport Showrooms.—In our last issue we reported that the new municipal electricity showrooms and offices at Southport were recently opened. We have now received a number of photographs of the new premises from the borough electrical engineer (Mr. E. Moxon); three of these views are reproduced herewith. The first shows the exterior of the building, which is situated in a far better position than the Department's old offices. The premises were formerly a skating rink. Fig. 2 is a view of one of the principal rooms, and shows a number of electrical appliances, including an ironer, several types of fires, a vacuum cleaner, and an electrically-driven sewing machine, as well as various kinds of lighting fittings. The third illustration is of the demonstration room. This is equipped with tip-up seats and a *dais*, on which are mounted cookers and other kitchen requisites, which can be shown in action to prospective users.



Fig. 1.—Exterior.



Fig. 2.—One of the Main Rooms.



Fig. 3.—The Demonstration Room.

The New Southport Showrooms.

The New North Wales Company.—With reference to the new company named "Electricity Distribution of North Wales and District, Ltd.," the registration of which was announced in some detail on page 706 of our last issue, we understand that this company will operate under statutory powers and distribute in detail electric supplies in a number of towns in North Wales, including Denbigh, St. Asaph, Flint, Holywell, Rhuddlan, Sandbach, Alsager, Pwllheli, Wrexham Rural District, Abergele, Criccieth, Nantwich, and the surrounding districts representing an area with a population of some 300,000. Supplies of electricity will be derived in bulk from the North Wales Power Co., which owns hydro-electric stations in the Snowdon and Carnedd Llewellyn districts of North Wales, and whose system of transmission lines already substantially extends from Carnarvon Bay to Crewe. The expenditure on the initial programme is estimated at some £200,000, all of which has already been provided for. The directors include Messrs. H. J. Jack, A. F. Bott, R. F. Legge, and G. V. Twiss. Mr. E. C. Heymer is the secretary, and the registered offices are at Wellington House, Buckingham Gate, S.W.1. The Power Development Co., Ltd., of 25, Victoria Street, which has been concerned in the formation of the company, is acting as engineers. Mr. G. V. Twiss, who has founded the Power Development Co., Ltd., has merged with it the organisation of the consulting business of G. V. Twiss & Co., and has moved to offices at 25, Victoria Street, S.W.1. (Telephone Nos.: "Victoria 4544 and 4545.")

A Large Floating Crane.—The *Morning Post* reports that the Port of London Authority has decided to place a contract with Messrs. Cowans, Sheldon & Co., Ltd., Carlisle, for the construction of a floating crane capable of lifting weights up to 150 tons. The largest of the Authority's existing cranes is only intended for a maximum load of 50 tons. The crane will be self-propelling, the driving engines being steam-driven, while the actual crane power will be electrical.

Strike at Wire Works.—Last week over 200 wire drawers employed by Messrs. Richard Johnson & Nephew ceased work owing to differences as to the distribution of work among the hands.

Large British Contracts.—Among the important contracts recently awarded to British firms the following may be mentioned:—The English Electric Co., Ltd.: Forty large railway motors for the Southern Railway, and five electric locomotives for the Montreal Harbour Board. Westinghouse Brake and Saxby Signal Co., Ltd.: Power signalling apparatus for Charing Cross and Cannon Street stations (Southern Railway). Henry Simon, Ltd.: An electrically-operated pneumatic coal-handling equipment (25 tons per hour), for a London brewing firm.

British and Continental Cable Prices.—A discussion arose at a meeting of the Accrington Town Council recently, when it was reported that the Continental quotation for 1,000 yards of main cable was nearly one-third less than the British on a contract of £600, while the cable was guaranteed to be as good as the British. Alderman Higham, chairman of the Electricity Committee, said it had been suggested to ask the members of the Cable Makers' Association to accept a lower figure. Personally he would like to keep the order in this country, because he believed in finding employment for our workpeople, but his fiscal doctrine led him to favour the purchase in the cheapest market. He would like the opinion of the Council. It was not a matter of one small contract, for this year Accrington had spent over £10,000 on cables, and they wanted to settle the policy once and for all. In the course of the discussion one speaker said that how the Continental goods were produced as compared with the British was an important consideration and Mr. Higham said they would try to obtain information as to hours and wages for the Continental product. A later speaker remarked that the question affected all municipalities, and he suggested that Corporations should amalgamate and try to secure a re-adjustment of prices. Councillor Slack thought it better to leave the matter with the Committee for the present. Mr. Roberts said it would be too late to protest after the order had been given. As a trade unionist, he would object to any order, however cheap, if trade union conditions were not observed. Other speakers wanted the order to remain here to prevent our men being thrown on the streets, but wanted to stamp out consultation between firms before tendering. Alderman Barlow said the Council must not overlook the question of quality. The British cable test was a very efficient one, and little trouble was experienced with the cables. They had no information as to the testing systems of the Continental product. No resolution was passed, the matter being left to the Committee for the time being.

For Sale.—Worcester Corporation electricity department has for disposal two Weir direct-acting feed pumps. Swansea Corporation electricity department invites offers for surplus generating plant, including motor generators, motors, meters, gas engines, &c. Messrs. H. Butcher & Co. will sell by auction on November 19th and following day, at 13, High Holborn, W.C., surplus electrical stores and accessories, &c. (See our advertisement pages to-day.)

Social Events.—The seventh annual dinner of those engaged in the Wakefield Electricity Department was held at the Great Bull Restaurant on October 30th. Mr. H. G. Frazer, city electrical engineer, presided, and he was supported by the Mayor-Elect (Alderman C. Mellor, J.P.), Alderman W. Emmett (chairman of the Electricity Committee), Councillor J. D. Jackson, J.P. (deputy-chairman), and other members of the Committee. The toast of "The Undertaking" was proposed by Alderman Emmett and responded to by Mr. Frazer. There was an interesting musical programme.

The employés at the head office and works of Messrs. William White & Co., together with their friends, spent a social evening last Saturday at the "Horns," Kennington. Mr. H. Foster presided. After dinner the evening was devoted to music and dancing.

Ex-British Westinghouse Association. — Mr. L. S. Richardson, the secretary of the Association, has sent us an up-to-date list of members and "bad lads." We have also received a copy of "Inter Nos," the Association's occasional journal, which is full of bright reminders regarding the payment of subscriptions, and also contains some notes on the last annual dinner. The next annual dinner is to be held on March 5th at the Holborn Restaurant.

The Dutch Electrical Market.—The position of the electrical market in the Netherlands was recently reviewed by *Commerce Reports*. According to our contemporary electricity is employed to only a very limited extent in Dutch homes owing to the high charges for electricity which prevail generally as well as to the conversatism which exists. Where domestic electrical appliances are used, however, they are mainly of German origin, although Great Britain and Switzerland supply articles of a better class. Vacuum cleaners are an exception to the general rule in that they are widely employed; most of these are of American manufacture. There is no scope for washing machines as usually laundry work is not done at home. Fans, too, are not much used owing to the equable temperature, and for the same reason there is little demand for refrigerators. In most cases the retailer buys electrical appliances from an agent or importer, but some large retailers import direct from the manufacturer.

A Report upon Angola.—Mr. A. B. Hutcheon, the British Consul-General at Loanda, has forwarded a report upon Angola (Portuguese West Africa) to the Department of Overseas Trade (Stationery Office, 1s. 6d. net). It is stated that as the country develops its purchasing power will increase and it will afford greater possibilities for trade. Business, on the whole, is said to be very risky at present. Mention is made of a concession granted to a Portuguese group for the harnessing of the Mabubas Falls on the Dande River. Owing to a dispute with the Government regarding the price to be charged for energy the work has not yet been commenced. The Government has undertaken a survey of the country's water-power resources. Concessions have been granted in respect of copper, manganese, and mica deposits, but it appears that little has been done as yet.

Trade with Colombia.—In the course of a report upon Colombia which he has forwarded to the Department of Overseas Trade (Stationery Office, 2s. net), Mr. W. J. Sullivan, British Vice-Consul at Bogotá, says that, without unduly magnifying the importance of Colombia as a market, it may fairly be urged that more could be done to develop British enterprise in various lines. Experience has shown that the practice of having energetic travelling agents in the country has yielded satisfactory results. Credit facilities on terms no less generous than those offered by competitors should be granted, and all catalogues and correspondence should be in Spanish. In the supply of electrical goods the United States predominates at present. Opportunities, nevertheless, occur from which British manufacturers might derive some profit. The installation of new telephone or lighting systems in the smaller towns of the Republic is cited by way of illustration. Colombia possesses large, though at times uncertain, reserves of water power, and their adaptation to the generating of electricity may be expected to increase, if slowly, during the coming years. The Government intends to renovate the telegraph system when funds become available, and developments in the telephone service are also under consideration. The Government has recently purchased radio-telegraph and telephone installations and proposes to extend the use of these services.

A Travelling British Empire Exhibition.—For the benefit of those in provincial centres who were unable to visit Wembley, the Self-Supporting Empire League, under the chairmanship of Admiral Mark Kerr, C.B., M.V.O., has organised a representative British Empire Exhibition which is to make a tour of the chief towns of England and Scotland shortly. The towns scheduled are Southampton, Bournemouth, Exeter, Plymouth, Bristol, Cheltenham, Cardiff, Birmingham, Stoke, Chester, Liverpool, Bradford, Glasgow, Edinburgh, Newcastle, Stockton-on-Tees, York, Leeds, Manchester, Sheffield, Nottingham, Coventry, Leicester, Northampton, Norwich, and Ipswich. The largest hall in each place will be taken for a period ranging from six to 21 days, and the whole tour will occupy about a year. Further details can be obtained from the Secretary of the League at Polebrook House, Golden Square, W.1.

Austrian Lighting Development.—The Austrian Lighting Technics Association has recently organised in the works of the Norma Instrument Co., in Vienna, an exhibition devoted to the technical side of lighting with the object of developing and encouraging the use of modern lighting equipment in the country.

New French Companies.—La Société Union Electrique du Finistère is the name of a new undertaking which has recently been formed at Landerneau, with a capital of 700,000 fr., to establish a plant to supply electricity in the Department of Finistère.

A new company has lately been formed in Paris (9, Rue de Rocroy), with a capital of 125,000 fr. and the title La Société des Applications Radiophoniques, to manufacture radio apparatus.

A new company has just been formed at Clichy, Paris (31, Rue de Madame Sanzillon), with a capital of 2½ million fr. and the title La Société des Etablissements Leclanché, to acquire and carry on works for the manufacture of Leclanché batteries.

The British Empire Exhibition.—The Exhibition came to an end on Saturday last, when it was officially closed by the Duke of York. At a meeting of the Exhibition Association on October 26th, under the chairmanship of Mr. J. H. Thomas, M.P., it was unanimously decided that the company should be wound up voluntarily, and a meeting to confirm this decision is to be held on Tuesday next.

The Sydney correspondent of *The Times* says that action is being taken in Australia by leading citizens who were prominently connected with the British Empire Exhibition to support the suggestion of a permanent British Industries Fair. Representations have been made to Senator Wilson, chairman of the Australian Commission, to convene an early meeting of his colleagues with a view to communicating with the British Government. There is a considerable body of feeling in the Commonwealth that unless the Wembley display is used as the starting-point of a constant advertising campaign, its cost will ultimately be regarded as almost wasted.

The Australian Tariff Board.—Following upon the presentation to the Federal Parliament recently of the annual report of the Tariff Board, reports by that body on specific applications for revised duties have been published. The board was of opinion that the electrical engineering industry was in need of further protection because of the marked difference in wages paid in the United Kingdom, and the difference in cost of raw materials in the two countries. The board recommended that duties be increased in order to endeavour to equalise the cost of goods produced abroad with the cost of production of similar goods in Australia. The Board considered requests for duties of 50 per cent. and upwards on certain types of machines and appliances of British origin, with corresponding increases that would be necessary under the general tariff to preserve British preference; but, having regard to the burdensome effect that such imposts would have on other industries, was of opinion that those requests should not be granted.

Chinese Notes.—The residents of Chapoo, near Shanghai, have raised $20,000 for the construction of an electric lighting plant.

A new power station has been built by the Suiyan Electric Light Co. to replace its obsolete and inadequate plant.

The Soochow telephone system is being extended to Hukwangchen and Motoh, two neighbouring market towns.

The Min Hsin Electric Light Co., Shihpu, Chekiang province, has been registered at the Ministries of Agriculture and Commerce, as have also the Wei Yu Electric Light Plant, Yutsehsien, Shansi province, and the Han Ming Electric Light Co., Chutangchen, Taihsien, Kiangsu province.

The board of the Peking Tramway Co., Ltd., proposes to construct a line round the city and is to undertake the south-western section in the first place.

The Changsu Electric Light Co. (Kiangsu Province) has recently increased its capital from $36,000 to $40,000 for the purpose of purchasing new plant.

The Chang Ming Electric Light Co. is being formed with a capital of $20,000 to supply electricity to Changlientang, Kiangsu Province.

The police authorities in Shansi Province have placed a levy on electric signs.

The Shanghai-Paoshan Tramways Co., organised to install and operate a system of tramways between Shanghai and Paoshan, is shortly commencing the construction work. The company has a paid-up capital of $300,000 and a nominal capital of $1,500,000.

The Japanese Electrical Industry.—A special meeting of the Japanese Electrical Association was held in September to consider methods of improving the organisation, &c., of the electrical machinery and apparatus industry. A number of matters were recommended to the attention of manufacturers, including the formation of combines to produce on a large scale, standardisation, the training of suitable men as engineers, the combating of price cutting, the organisation of the export trade, the prevention of the production of inferior goods, &c.

New Italian Companies.—Among the new concerns recently formed in connection with the electrical engineering and supply industries in Italy, are the Società Costruzioni Elettricita Friuli Orientale, of Trieste, capital 1,000,000 lire; La Società Italiana Porcellane Elettrotechnichi Poul, Milan, capital 125,000 lire; the Società Elettrica Salentina, formed at Bari with a capital of 100,000 lire; La Società Elettrica Latronichese, Latronico, 200,000 lire; and La Società Idroelettrica Stura, Turin, 100,000 lire.

The British Industries Fair. — The Comptroller of the Department of Overseas Trade says that a practical illustration of the advantage to British manufacturers of exhibiting at the British Industries Fair has just been forwarded to the Department by an exhibitor. The firm in question recently received a very large order from an overseas buyer, and as the firm had no agent in that country it was naturally puzzled as to why it had received the order. Accordingly it asked the buyer, who said that it was entirely due to the British Industries Fair catalogue. The buyer, before leaving for England, had asked for the names and addresses of several genuine British manufacturing firms in the particular trades in which he was interested, with the result that a copy of the catalogue was placed in his hands. Not only does this catalogue, which contains the names and addresses of all exhibitors, together with a note of their productions, reach all buyers who attend the Fair, but advance copies are distributed by the Department to known overseas buyers. Its classified index is printed in nine languages, and, retained by buyers for reference as a guide to British manufacturers, constitutes a very valuable advertisement for exhibitors from which results have been known to accrue after the close of the Fair.

Electric Steel Production in Chile.—*Commerce Reports* states that the Cia. Electro-Siderurjica e Industrial de Valdivia, organised by Chilean engineers and capitalists in 1924, has acquired certain hydro-electric rights near the city of Valdivia, Chile. The company, which is to have a capital of 13½ million gold pesos (£1,060,000), will erect a 32,000-h.p. hydro-electric station and works capable of producing 50,000 tons of iron and steel annually. The Government is to be allotted shares to the value of 400,000 pesos and given the right to obtain further stock not exceeding 40 per cent. of the total.

Film Publicity.—The use of the kinema for advertising commercial products calls for a great deal of ingenuity, for it has to be remembered that the large public which attends picture theatres has paid for entertainment, and is not disposed to swallow too much advertising unless this is very skilfully carried out. Film publicity has accordingly become a fine art—the difficult art of combining amusement and advertising. Last week we witnessed a number of up-to-date examples of this class of work, produced by Publicity Films, Ltd., at the Rialto Theatre, Coventry Street, W. These dealt with products so far apart as pills and radio valves, and each possessed originality and interest in a great degree. The producers seem to be capable of treating any subject in a fascinating manner; some of the subjects with which the exhibited films dealt were very unpromising indeed. In the list of the undertakings which have utilised this service we notice the names of several well-known electrical companies.

New Municipal Electricity Offices and Showrooms.—The borough electrical engineer of Plymouth has been instructed to present a report to the Electricity Committee with regard to the establishment in the centre of the town of electrical showrooms and inquiry offices.

American Loan for Norwegian Company.—The Oslo correspondent of the *Financial Times* reports that the Norwegian Power Co., Sandefaldene, has arranged for a $4 million loan in New York at 98 per cent. The security is a first mortgage upon the company's property, plus a guarantee.

Visit to Electrical Showrooms.—On Tuesday last a party of members of the Electrical Association for Women paid a visit to a display of electrical apparatus in appropriate settings at Messrs. Shoolbreds, Tottenham Court Road, W. Mr. Geary gave an address on "The Artistic Value of Electricity in the Home," followed by tea.

Works Visit.—On October 29th a party of wholesalers from the London district visited the Cosmos Lamp factory at Brimsdown, Middlesex, making a tour of inspection of the lamp-making and heating and cooking departments. This was one of many trade visits arranged by Metro-Vick Supplies, Ltd., in connection with its 1925-26 "Cosmos" lamp campaign.

The Rumanian Electrical Market.—The American Commercial Attaché at Bucharest, in the course of a report upon the possibilities for electrical sales in Rumania, says that the use of electric fans in offices, hotels, &c., is increasing, although they are not much employed in the home. There is scope for washing machines, as the home laundry facilities are far from modern. Very few electric cookers are used, and these are mainly of German origin. Grills and immersion heaters are popular and the use of toasters is growing, but electric kettles, percolators, &c., are rarely found in homes. A few radiator type heaters of German manufacture are in use, but there are no luminous heaters on the market. The local dealer buys electrical appliances direct from the manufacturer, and firms undertaking representation usually require an agency for the entire country.

Copper, Lead and Rubber Prices.—Messrs. F. Smith and Co. report November 3rd:—Copper (electrolytic) bars, £69, 10s. increase; do. do. sheets, no change; do. do. wire rods, £79, 10s. increase; do. do. h.c. wire, 9 13-16d., 1-16d. increase.

Messrs. James & Shakespeare report November 3rd:—Copper bars (best selected), sheet and rod, no change; English pig lead, £39 5s., 30s. decrease.

Messrs. Edward Till & Co. report November 3rd:—India-rubber, Para fine, 3s. 9½d., ½d. increase.

Lighting and Power Notes.

Abergele.—Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Urban District Council to supply electricity in the district.

Adwick.—Electricity Scheme Hitch.—A difficulty has arisen in connection with the Urban District Council's electricity scheme, on which about £30,000 has been expended, so far as the supply to the district of Woodlands East is concerned. The Council's scheme is to buy electricity in bulk from local colliery undertakings and to distribute to householders at a fixed charge of 1s. 6d. per week for five points per house, and 1s. 7½d. for seven points. The scheme was accepted by public meetings, and the Council proceeded with the installation of cables, &c. Householders at Woodlands East, which is one of the first places to be served, have now submitted a petition demanding a 50 per cent. reduction in the charges, and refusing to take the electricity otherwise. The Council declares that the price fixed is the lowest possible without making the undertaking a charge on the rates.

Barnstaple.—Loan.—The Town Council has applied for sanction to a loan of £2,000 for mains, services and meters.

Barrow.—Hydro-Electric Scheme.—At a meeting of the Town Council, on October 27th, the terms were discussed of the compensation to be given by the Corporation in carrying out the Backbarrow hydro-electric scheme to the Backbarrow Charcoal Iron Co., and the Lancashire Ultramarine Co., whose works are on the banks of the River Leven at Backbarrow, and who own the water rights. The proposed terms with these companies are an allowance of 200 kW and 400,000 kWh per annum free of charge, that each company be paid .375d. per kWh for unused energy up to 400,000 kWh (the maximum payment to each company in any year not to exceed £330), and that the companies pay the Corporation .625d. per kWh for the next 350,000 kWh. The terms also include the installation of motors by the Corporation in both works. Objections were raised to the terms by members of the Council, and it was ultimately agreed that they should be reconsidered by the Negotiating Committee and the final terms submitted to the General Purposes Committee.

Bewdley.—Electricity Supply.—The Town Council has received a communication from the Shropshire, Worcestershire and Staffordshire Electric Power Co. stating that the company's programme for 1926 provided for an extension of the overhead system into Bewdley. It was hoped that the work of the Stourport-Bewdley section would be proceeded with at the beginning of next year, and that an electricity supply would be available by about June.

Bexhill.—New Plant.—The Town Council has sanctioned the purchase of new plant at a cost of £13,600, and an order is to be placed for one 1,250-kW converter and switchgear at a cost of £7,883. A duplicate converter, to cost £5,760, is contingent on financial assistance from the Unemployment Grants Committee.

Canada.—Export of Electricity.—Lack of rain in the State of Washington has caused a serious shortage there this year of hydro-electric power, with the result that heavy calls have been made on the power resources of British Columbia. Arrangements have been made between the Puget Sound Power & Light Co., of Seattle, and the British Columbia Electric Railway, for connecting up their respective systems.—*Reuter* (Vancouver).

Carlisle.—Extension of Supply.—The Electricity Committee is to provide a supply of electricity to the Cocklake Works of the Gotham Co., which will necessitate an expenditure of £6,201 for mains, switchgear, and transformers.

Cheltenham.—Electricity Supply.—At a meeting of the Corporation Electricity Committee the electrical engineer reported having conferred with the Gloucester city electrical engineer as to the future supply of power for the areas of the two authorities, and that they considered it desirable that reports and estimates should be considered by an independent consulting engineer. The Committee has appointed Messrs. Preece, Cardew and Rider to report on the proposals for a joint supply.

Chester.—Rural Electricity Supply.—Two years ago the Corporation obtained sanction for loans amounting to £38,338 for the purpose of distributing electricity in parts of the area covered by the Chester Electricity (Extension) Special Order. The loans have been used to construct three lengths of high-pressure transmission lines aggregating 15.4 miles, and the construction of 29 miles of low-pressure distribution lines. Thirty-seven isolated consumers have undertaken to make yearly payments, which aggregate an income of £1,618 per annum. The distribution lines pass approximately 1,800 premises, of which 605 have either been connected or have applied for a supply. Judging by the inquiries made by the residents in the district, and the interest taken in the scheme, Mr. S. E. Britton has no doubt that the effort the Corporation is making to supply electricity in the rural area around Chester is much appreciated, and when the system has had sufficient time to develop it will be a complete success. The scheme to supply the area, as originally formulated, provided for the construction of three high-pressure transmission lines from Chester towards the boundaries of the area and the interconnecting of these lines so as to form a complete ring line capable of supplying the whole of the area. The three lines and two sections of the ring line have been constructed and are in use. To complete the ring an additional twelve miles of transmission line is required, costing approximately £10,800; a further sum would be required for the provision of additional sub-stations and low-pressure distribution lines, say £9,400, making together a total of £20,000. At a meeting of the City Council on October 28th, a resolution was passed authorising the Electricity Committee to apply for sanction to a loan of £20,000 to complete the scheme.

Clacton.—Electricity Supply.—An extension of its electricity supply to rural areas is to be considered at the next meeting of the Urban District Council. The charges for

electricity to the neighbouring parish of Little Holland have been fixed as follows:—Lighting, 8d. per kWh; power, 3d. per kWh; heating and cooking, 2d. per kWh.

Congleton.—Proposed Electricity Scheme.—At a recent meeting of the Town Council Mr. Vernon Hope, electrical engineer, of Macclesfield, submitted a scheme for obtaining an electricity supply for the town. He recommended the Corporation to obtain a supply from the Stoke-on-Trent Corporation, by means of overhead lines.

Continental.—Germany.—An 80,000-h.p. steam turbine and 60,000-kW Siemens-Schuckert 7,000-V generator have recently been added to the Goldenburg super-power station of the Rhenish-Westphalian Electricity Co. The brings up the capacity of the plant to 290,000 kW, making it the largest generating station in Germany using lignite as the steam-raising medium.

Austria.—According to a report lately drawn up by the Austrian Ministry of Commerce and Communications, there were at the commencement of the current year 537 generating plants with a maximum capacity of 89,087 h.p. in operation. The report shows that 244 new hydro-electric stations, representing a total of 292,754 h.p., were in course of construction at the beginning of 1925, the most important being the Luner Lake station of 60,000 h.p. which the Vorarlbergen Ilwerke Gesellschaft is erecting in the Vorarlberg.

Bulgaria.—The Government has nationalised all available water power and announced the terms on which it is prepared to grant concessions. Among the more important hydro-electric stations now in course of construction are the Watschar on the River Kritschin and the Orion undertaking on the Rila river. The last-named will comprise three stations at Rila, Pastra, and Ilina respectively. The first portion of the Pastra plant has already been completed; it comprises three 3,300-h.p. Francis type turbo-alternators. The output is being utilised in the town of Subrica, at various works in the vicinity, and at the State Collieries at Pernik.

Croydon.—Loans Sanctioned.—The Corporation Electricity Committee has received sanction to loans of £17,410 for boiler-house buildings and £23,719 for boiler-house plant.

Eccles.—Year's Working.—The accounts of the Corporation electricity undertaking (engineer: Mr. H. W. Angus) for the year ended March 31st last, record a total revenue of £41,018, as compared with £36,928 in 1923-24. Working expenses amounted to £29,331, as against £24,782, leaving a gross profit of £11,689 (£12,146). After deducting capital and other charges there was a net surplus of £3,377, as compared with £4,480 in the preceding year. This was transferred to the reserve fund, which now stands at £12,778. The capital expenditure during the year amounted to £12,483, and included £9,199 for mains. The sales of electrical energy increased from 4,332,172 to 4,942,464 kWh.

Exeter.—Electricity Agreements.—The Topsham Parish Council has accepted the terms offered by the Corporation Electricity Department for street lighting, and the Crediton Urban Council has also accepted the terms for a supply of electricity in its area.

Halifax.—Year's Working.—The report on the working of the Corporation electricity undertaking (engineer: Mr. W. M. Rogerson) for the year ended March 31st last, records a total revenue of £180,679, as compared with £178,596 in 1923-24. Working expenses amounted to £96,546, as against £91,130, leaving a gross surplus of £84,133 (£87,466), to which was added interest on investments, making a total of £88,652. After providing for capital charges a net profit of £23,026 remained, as compared with £32,596 in the preceding year. A contribution of £6,864 was made to the borough fund. The amount spent on capital account during the year amounted to £100,236, and included £43,153 for machinery and £11,905 for mains and services. The electrical energy sold increased from 21,367,440 to 23,668,249 kWh, and the average price obtained fell from 2.005d. to 1.832d. The maximum supply demanded rose from 11,150 to 12,540 kW.

London.—Stepney.—*Year's Working.*—The report of the borough electrical engineer, Mr. W. C. P. Tapper, on the working of the electricity undertaking for the year ended March 31st last, shows a total income of £287,505 and working expenditure of £153,287, leaving a gross profit of £134,218. The corresponding figures for the previous year were £261,283, £148,373, and £112,910, respectively. To the gross surplus were added receipts from other sources, making a total of £141,389 available. Capital charges absorbed £85,707, and there was a net surplus of £55,682, as compared with £38,736 in 1923-24. The capital expenditure during the year amounted to £135,957, the chief items being £42,492 for machinery and £51,999 for mains. The sales of electrical energy increased from 42,140,142 to 44,520,753 kWh, and the average price obtained from 1.476d. to 1.528d. The maximum load rose from 19,070 to 21,680 kW.

Sliding Scale Prices.—A decision has been arrived at by the Electricity Commissioners that the effective date of operation for the sliding scale of prices and dividends relating to those companies affected by the London Electricity (Nos. 1 and 2) Acts, 1925, shall be January 1st, 1926. The companies concerned are to fix their standard prices for approval by the L.C.C., in order that the sliding scale may come into effective working at the earliest possible date.

Manchester.—Progress during September.—During the month of September the Corporation electricity undertaking showed an increase in connections of 1,353 kW, bringing the total to 269,703 kW; and the number of applications received for supply, including existing consumers for additional supplies, was 929, representing a total of 2,155 kW. The number of consumers connected increased by 394, and the number of hired cookers connected by 62, bringing the total actually on circuit to 990. Applications for the hire of cookers totalled 100.

Northern Ireland.—Portrush (Co. Antrim).—A fire recently occurred at the municipal power station. The outbreak originated in a store where oils, cable, bitumen, and other inflammable materials were kept, and this part of the building was gutted. The fire spread to the roof of the main buildings of the station, which was considerably damaged.

North Wales.—Electrical Development.—At a recent meeting of the North Wales and South Cheshire Joint Electricity Authority, at Llandudno, it was reported that the following transmission lines had been completed:—The Trevor to Pwllheli section, the St. George section, and the section from Connah's Quay to Bagillt. Considerable progress had also been made with regard to the lines from Llanfrothen to Four-crosses, Cwm Dyli to Llanfrothen, Legacy to Crewe, and Hawarden to Mountain Colliery, and work had commenced on the Llanfrothen to Maentwrog and Crewe to Sandbach sections. The actual construction of the main dam of the new reservoir at Maentwrog is proceeding, the foundations having been laid. The meeting decided to communicate with the North Wales Power Co. with a view, eventually, to submitting a report to the Electricity Commissioners on the policy which it may be desirable to adopt with the object of carrying electricity into rural areas.

Lake Dam Bursts.—It is reported in the daily Press that the North Wales Power Co.'s lake dam above Dolgarrog, in the Conway Valley, burst on November 2nd, and the water poured down the hillside. Apparently the Eigiau dam burst about 9.30 p.m., and the water swept away the smaller dam. Buildings were damaged, cattle drowned, and loss of life is reported.

Plymouth.—New Plant.—Application is being made by the Corporation Electricity Committee for sanction to a loan of £41,275 for additions to the generating plant. It is proposed to remove two obsolete engine-driven sets at the Prince Rock power station and replace them with an additional turbo-alternator with a capacity of not less than 6,000 kW, together with the necessary auxiliaries, pipework, and switchgear. The estimate also covers an additional converter.

Preston.—Electricity Supply.—The Electricity Committee is applying for sanction to further loans, including £4,250 for the alteration of the system of supply in the Ribbleton area and £900 for the equipment of a meter test room at Crown Street. The Council has been asked to approve the agreement for the supply of electricity in bulk to Blackpool, together with resolutions for sanction to the construction of transmission lines at a cost of £66,000 (each Corporation paying one-half).

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

London.—*The Charing Cross Electricity Supply Co., Ltd.*—Heating and cooking: Reduced to 1½d. per kWh.

Brighton.—Sliding scale: First 10,000 kWh per annum from 5d. to 4½d. per kWh; second 10,000 kWh, from 4d. to 3½d.; next 10,000 kWh, from 3d. to 2½d.; all energy in excess of 30,000 kWh to remain at 2d. per kWh as at present. Power, heating and cooking: Flat rate from 1½d. to 1d. per kWh. Street lighting: From 2d. to 1¾d. per kWh. Electricity supplied in the areas of Southwick, Portslade, and Rottingdean to be charged at 7d. per kWh for lighting, and 2d. per kWh for power.

Rugeley. — Electricity Scheme. — The Urban District Council, after considering a draft agreement with Major C. H. B. Prescott-Westcar with reference to an electricity scheme, decided that the agreement should contain a clause to the effect that the company shall, if requested by the Council, supply electricity for street lighting. Mr. W. H. Robins, borough electrical engineer, Stafford, has been asked to advise the Council on the technical side of the scheme.

Skegness. — Electricity Supply. — The Urban District Council has revoked a former decision to take a bulk supply of electricity from the power station of the National Electricity Construction Co., Ltd., at Boston, and has decided to install its own generating plant.

South Africa.—Durban.—According to the *South African Power Engineer* the plant at present installed in the municipal power station will be unable to cope with the demand for power until such time as the Electricity Supply Commission's power station at Congella (which is not due for completion until October, 1927) is in working order, and the Town Council is now in consultation with the Commission regarding the purchase of another 5,000/6,000-kW turbo-alternator set, which, with the first set recently installed, will be ultimately taken over by the Commission at a price to be mutually agreed upon, and installed by the latter in its Congella station. A second 45,000/60,000-lb. boiler will also be required, and it is anticipated that this, as well as a plant of similar capacity installed at the municipal station about a year ago, will also be taken over by the Commission.

West Mersea.—Opposition to Scheme.—The proposal to establish a hydro-electric generating station on the creeks at West Mersea, near Colchester, is being opposed by the Parish Council on the grounds of alleged damage to navigation, oyster fisheries, and the health of the district.

Willesden.—Year's Working.—The accounts of the Urban District Council's electricity undertaking (engineer: Mr. A. W. Blake) for the year ended March 31st last show a total income of £133,678, as compared with £118,492 in the preceding year. Working expenses, including the purchase of a bulk supply from the North Metropolitan Power Supply Co., Ltd., amounted to £98,105, as against £82,975, leaving a gross profit of £35,573 (£35,517), to which was added revenue from other sources, making a total of £45,622. Capital charges absorbed £35,884, and works of a capital nature charged to revenue amounted to £15,613. Thus there was a deficit of £5,876, as compared with a surplus of £8,402 in 1923-24. The capital expenditure amounted to £38,957, and included £12,798 for mains and services. The electrical energy sold increased from 12,590,487 to 15,109,106 kWh, and the average price per kWh obtained fell from 2.259d. to 2.123d. The maximum supply demanded rose from 7,206 to 8,330 kW. During the year the work of converting the street lamps from gas to electricity was completed, and a 750-kW converter was installed at Salusbury Road sub-station.

Windsor.—Reduction of Maximum Charge.—The Windsor Electrical Installation Co., Ltd., has applied for a Special Order to reduce the maximum price of electricity from 1s. to 10d. per kWh, with the deletion of the minimum quarterly charge.

Wirral.—Inquiry.—The Electricity Commissioners are to hold an inquiry on November 17th into the Rural District Council's application for a loan of £135,000 to cover the cost of its electricity scheme.

Worthing.—New Plant.—Acting on the advice of the borough electrical engineer, Mr. G. Porter, the Town Council has decided to apply for consent to an extension of its generating plant by the installation of one 750-kW Diesel set at an estimated cost, including foundations, switchgear, cable connections, and other accessories, of £15,850.

Tramway and Railway Notes.

Birmingham.—Accident.—The first accident to be recorded on the railless-car system occurred on October 30th. A tram-car was proceeding from the city to Nechells when the steering gear broke and the vehicle crashed into an electric cable standard. Five of the passengers received serious injuries and were conveyed to hospital for treatment.

Brighton.—Tramway Extension.—The Tramways Committee has decided to extend the Lewes Road tramway track to Natal Road, at an estimated cost of £11,000.

Colne.—Track Renewals.—The Town Council has received sanction from the Minister of Transport to a loan of £3,700 for the renewal of the tramway track in Burnley Road.

Continental.—Spain.—Work is well in hand on the construction of an electric railway between Zumarraga and Zumaya, which will connect the Northern of Spain (Madrid-Hendaye) railway with the Vascongadas (Bilbao-San Sebastian) line. The new line, including a branch to the harbour at Zumaya, will be about 23 miles in length, and is expected to be ready for operation within 12 months.

Norway.—*Modern Transport* states that the Holmen Kollen Co., of Oslo, has arranged for a loan of 11,500,000 kroner with a consortium of Norwegian banks and insurance companies, for the construction of an underground railway.

Belgium.—The Société Nationale des Chemins de Fer Vicinaux, of Brussels, has decided to extend the local railway between Ostend and Westende as far as the Franco-Belgian frontier. The work will be put in hand as soon as the financial arrangements have been completed with the Government.

The Société des Tramways Electriques du Pays de Charleroi et Extensions is extending the electric tramway between Charleroi and Couillet to Chatelet, and the Charleroi-Gilly line to Vieux Campinaire.

Italy.—The Minister of Railways and Communications has authorised the immediate electrification of the line from Genoa to Ovada; authority has already been granted for the electrification of the Ovada-Alessandria line. It is also proposed to electrify the route from Ovada to Asti.—*Reuter's Trade Service* (Rome).

A new electric railway has lately been completed and opened for traffic between Intra and Premeno.

Austria.—The *Gazette de Prague* says that in addition to the electrification of the Innsbrueck-Bludenz section of the railway from Arlberg, which was opened four months ago, the Austrian Federal Railway Board has recently electrified the Stanach-Inning and the Attnang-Puchheim lines, the total length of which is 243 km. The necessary power is supplied by a station on Lake Spuller, and the economy in coal resulting from the electrification of these two lines will amount to about 130,000 tons a year. The electrification of the Salzburg-Woergl-Innsbrueck-Brenner, Kufstein-Woergl and Simmering-Gloggnitz-Murz lines will be begun in the near future.—*Reuter's Trade Service* (Prague).

London.—Inauguration of Watford Line.—The new electric railway from Baker Street to Watford, *via* Croxley Green, constructed by the Metropolitan and the London & North-Eastern Railway Companies, was formally inaugurated on October 31st and opened to the public on Monday last. There is a service of 140 trains a day, a proportion of which is electrically operated by the Metropolitan Co. to Baker Street. The London & North-Eastern Railway Co. has introduced a new steam train service between Watford and Marylebone. The cost of the scheme was £300,000.

Newcastle-on-Tyne.—Purchase of Undertaking.—At a meeting of the Corporation on October 30th, it was agreed to purchase the tramway undertaking of the Tyneside Tramways and Tramroads Co. for £118,125.

Port Stewart.—Abandonment of Route.—According to the *Electric Railway and Tramway Journal*, the London, Midland and Scottish Railway has decided to abandon the tramway service between the railway station and the town, and to replace it by a motor-omnibus service. The tramway track is in a bad condition, and the company does not consider it advisable to incur the expense of reconstruction.

St. Helens.—New Type of Tramcar.—A new design of tramcar, built in the Corporation tramway sheds, will shortly be put into service. The car will carry 82 passengers, 30 below and 52 on top. The new seats, which are placed across the car, are of the tip-up type. A special type of compressed-air brake is also fitted to the car.

Venezuela.—Railway Electrification.—According to *Commerce Reports*, work on the electrification of the railway connecting Caracas with its port, La Guaira, is reported to be starting within a few months. Most of the necessary material has been ordered from England. The power station, which will probably be situated at Zig Zag, will be equipped with Diesel engine sets. The present 30-ton steam locomotives will be replaced by five electric units of 35 tons each. The cost of electrification, including the new rolling stock, is estimated at $750,000, and the length of line is 23 miles.

Yorkshire.—Route to be Abandoned.—The Yorkshire (West Riding) Tramways Co., Ltd., has announced that it is withdrawing the whole of its tramway service on the route between Pontefract, Castleford, and Normanton. Since the introduction of motor-omnibuses on the route there has been a considerable falling-off in the receipts, and the company has decided to substitute an improved 'bus service.

Telegraph and Telephone Notes.

China.—New Telephone Co.—The Hongkong Telephone Co., Ltd., is a new local (British) company, whose scheme for the acquisition of the China and Japan Telephone Co. has been approved by the Government of Hongkong, according to the *T. & T. Age*. It was planned that the shares of the old company would be bought up for 1,400,000 Hongkong dollars, and that the new company would have a capital of 5,000,000 Hongkong dollars issued as 500,000 shares of 10 Hongkong dollars each.

Irish Free State.—Telephone Service.—In a recent address to the Dublin Chamber of Commerce, Mr. J. J. Walsh, Minister for Posts and Telegraphs, sketched the work of his department since it was taken over by the Free State. The deficit in the working of the Post Office, he said, according to the *Irish Times*, had been reduced from £1,400,000 to £540,000. For the first time in the history of the country the telephone system had shown a profit, and he favoured concentration on the telephone as the service most likely to benefit the business community. In Dublin underground schemes of considerable magnitude were in progress, and, since 1923, 54 miles of conduit had been laid, 123 manholes and footway chambers constructed, 94 miles of cable drawn in, 480 new distributing poles had been provided, 36 additional trunk lines had been set up, and new main distributing frames for 10,000 lines at the Central exchange, 3,200 lines at Ship Street, and 6,000 lines at Merrion Street had been installed. Now there were three trunk circuits between Dublin and Cork, two between Dublin and Limerick; one connecting Cork and Dublin, and when the traffic justified it another could be provided at once. It was expected that the first automatic exchange would be working in Dublin by the end of next year. A relief exchange was being installed in Merrion Street to relieve the congestion in the Central Exchange, and to open up an area which had been closed for some time owing to shortage of plant. A new exchange would be installed in Limerick early next year, and arrangements were being made for replacing the old exchange at Cork by up-to-date equipment. In March, 1922, there were 19,101 telephone stations, and at the end of September last 10,006 stations had been added. Principally owing to the depression in trade, 7,347 stations ceased operation during the same period, leaving a net increase of 2,759 stations. The present total was 21,800 stations. There were 194 exchanges in the Saorstat in March, 1922. Since then 127 new exchanges, of which 80 had been opened since the beginning of the year, and 210 telephone call offices, had been completed. There were now 762 call offices, as compared with 552 in 1922.

Party-line Telephones.—The Free State Posts and Telegraphs Department is endeavouring to encourage and extend the use of the party-line system of telephone service in rural districts.

(*Continued on page 743.*)

Swiss Railway Electrification.

Some Particulars of Recent Power-Transmission and Railroad Schemes.

Electric traction on the Swiss railways has been entirely satisfactory up to the present, and is a constant source of congratulation amongst the Swiss themselves, who



Fig. 1.—A St. Gothard Locomotive.

feel delightfully independent of their neighbours' coal, and pleased with the cleanliness and increased travelling speed on the electric railways.



Fig. 2.—Electric Train on Meienreuss Bridge.

The whole of the network of Federal railways is not yet electrified, but by 1928 it is hoped 1,566 km. of track will be completed; this will include practically all the lines of the C.F.F. At the present time, the greater part of the railroad, with the exception of about 76 km., which is still run on a three-phase system, is supplied with single-phase energy at $16\frac{2}{3}$ periods, 15,000 volts. The different hydro-electric generating stations are linked up by an overhead transmission line at very high pressure, the distance between the distribution stations not exceeding 60 km., so that it is hoped that about 30 of the latter stations will be sufficient, taken in connection with the five big power houses, to supply the C.F.F. in its entirety in 1928. The transmission lines are mounted on open-work iron transmission towers, and the energy is transmitted at 60,000 V and at 30,000 V on the underground cables between Ritom-Amsteg-Glarnico. The converters in the distribution stations are generally 3,000- or 5,000-kVA machines, capable of dealing with 4,500 or 7,500 kVA for half-an-hour. The Gothard distribution stations are covered in, but those of more recent construction are of the out-door design, and have therefore cost less to erect. The contact overhead wires are of copper, and are supported by steel, copper-eased steel, or iron wires.

As to the locomotives and automotrices used by the C.F.F., they are of differing weight and type according to whether they are for use on the long steep declivities of the St. Gothard, or the easier slope of the Simplon, or the flat ground of the plateau. All are fitted with hand brakes and Westinghouse brakes, and the Gothard machines have an electric brake as well. Their maximum speed varies from 40 to 90 km. an hour according to the power and grade, and the kind of train to be drawn. Each locomotive is furnished with extra plugs affording a supply at from 800 to 1,000 V for the heating of the train. The railway carriages are each fitted with a radiator, or radiators, and during the coldest season the energy consumed for heating amounts to about 120 to 130 watt-hours per axle-kilometre. On the express trains, in which are included non-electrically-equipped carriages, coal-vans are placed between such carriages, so as to warm them by steam.

Extensive railroad schemes are also in hand. The Berne-Geneva section, which was expected to be finished by the end of this year, with the enlargement of the station at Romont, includes no fewer than eleven bridges between Renens and Nyon, and nine betyeen Nyon and Geneva, and also three viaducts. The total cost is estimated at three million francs. It is interesting to learn that an expenditure of a million francs has been incurred during the past year in replacing or reinforcing bridges, while considerably over two million francs has been spent on the provision of plant for the



Fig. 3.—St. Gothard Tunnel Entrance.

lighting and heating of coaches, goods vans, &c. The Federal Railways, whose plant at Vernayaz was

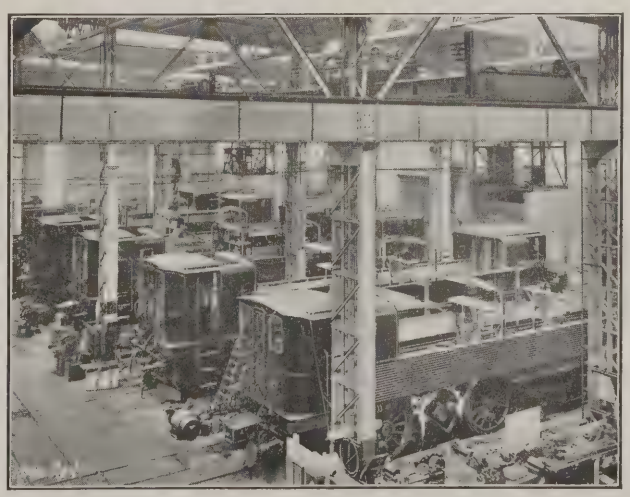


Fig. 4.—Electric Locomotives Under Construction.

to have a capacity of 108,000 h.p., were recently in negotiation for land for a new station at Etzee.

E

Electrical Developments at Stoke-on-Trent.

Extensions to the Plant at the Hanley Generating Station.

On Thursday, October 15th, the development of the Stoke-on-Trent electricity supply undertaking was marked by the inauguration of considerable extensions at its Hanley generating station, one of a group of five such stations completing the system. The Hanley works was the original station of the group, and was established in 1894. The group includes the central power house to which the other stations at Hanley, Longton, Stoke-upon-Trent and Burslem act as sub-stations. The new plant consists of four boiler units, a 6,000-kW turbo-alternator and auxiliaries, and two cooling towers.

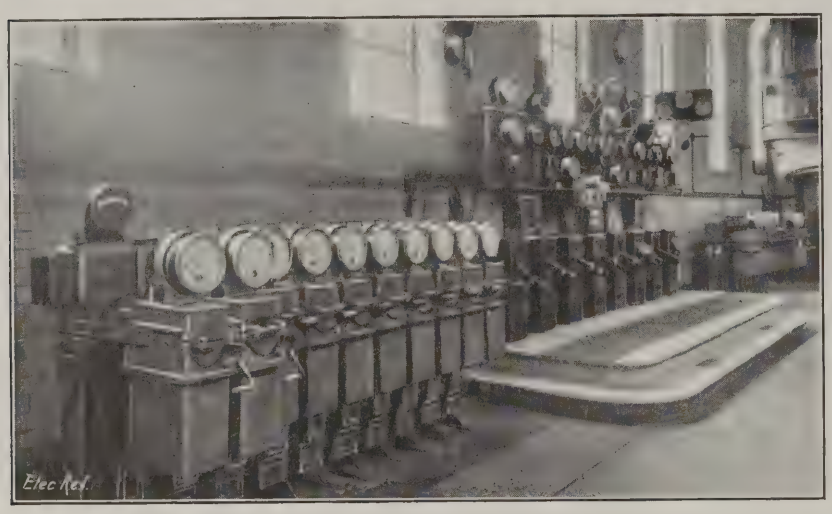


Fig. 1.—Switchgear at Hanley Sub-works.

Each boiler unit consists of a Stirling three-drum water-tube boiler, with two self-contained "Underfeed" chain-grate stokers. The total heating surface of each unit, including boiler, superheater, and economiser, is 8,632 sq. ft., and the normal output is 30,000 lb. of steam per hour at a pressure of 260 lb. per sq. in., and a temperature of 600 deg. F. The guaranteed efficiency is 84 per cent. on normal duty. The economisers are arranged at the rear of the units, while the induced draught plant, chimney, and grit arresters are carried on a platform above the boilers. Each boiler is fitted with Dewrance mountings, a Kent's steam-flow meter, a Cambridge CO_2 recorder and distance thermometers for indicating the steam, feed water inlet and outlet, and flue gas outlet temperatures. Two of the boilers are fitted with "Crosby," and two with "Copes" automatic feed water regulators. The stokers are designed for burning coal having a calorific value of from 10,500 to 12,500 B.th.u. per lb., and the consumption of each is measured by Lea coal meters. The induced draught fan for each boiler is driven by a 27-b.h.p. motor at 480 r.p.m. The runners are 45 in. in diameter.

The new generating set consists of a 6,000-kW turbo-alternator, fig. 2, with suitable surface condensing plant, the complete set having been constructed and installed by the Metropolitan-Vickers Electrical Co., Ltd. The turbine is of the impulse type, and is designed to give an economical output of 6,000 kW with a stop valve pressure of 250 lb. per sq. in., and a superheat of 250 deg. F.

The alternator is designed for a continuous output of 7,500 kVA at 0.8 power factor, 3 phase, 51½ periods, 6,000-6,600 V. It is of standard design, with steel slip rings and overhung exciter, having a radial commutator. The stator windings are protected by the Merz-Price balanced-current system, and by an automatic field switch mounted behind the switchgear control panel. The stator core has embedded thermo-couples, and the machine is fitted with the M.-V. closed circuit ventilating system.

The condenser, fig. 3, is of the surface type, having a cooling surface of 8,250 sq. ft. It is designed to maintain an absolute pressure of 1.72 in. at full load (corresponding to 28.28 in. vacuum) when supplied with cooling water at 70 deg. F. Air extraction is effected by either of the two-stage air ejectors with jet intercoolers which are mounted on the turbine floor level. Two rotary condensate extraction pumps are provided, each being designed to deliver 104,000 lb. per hour against a head of 60 ft. The cooling water is circulated through the condenser by either of the two centrifugal pumps, each designed to deliver 288,000

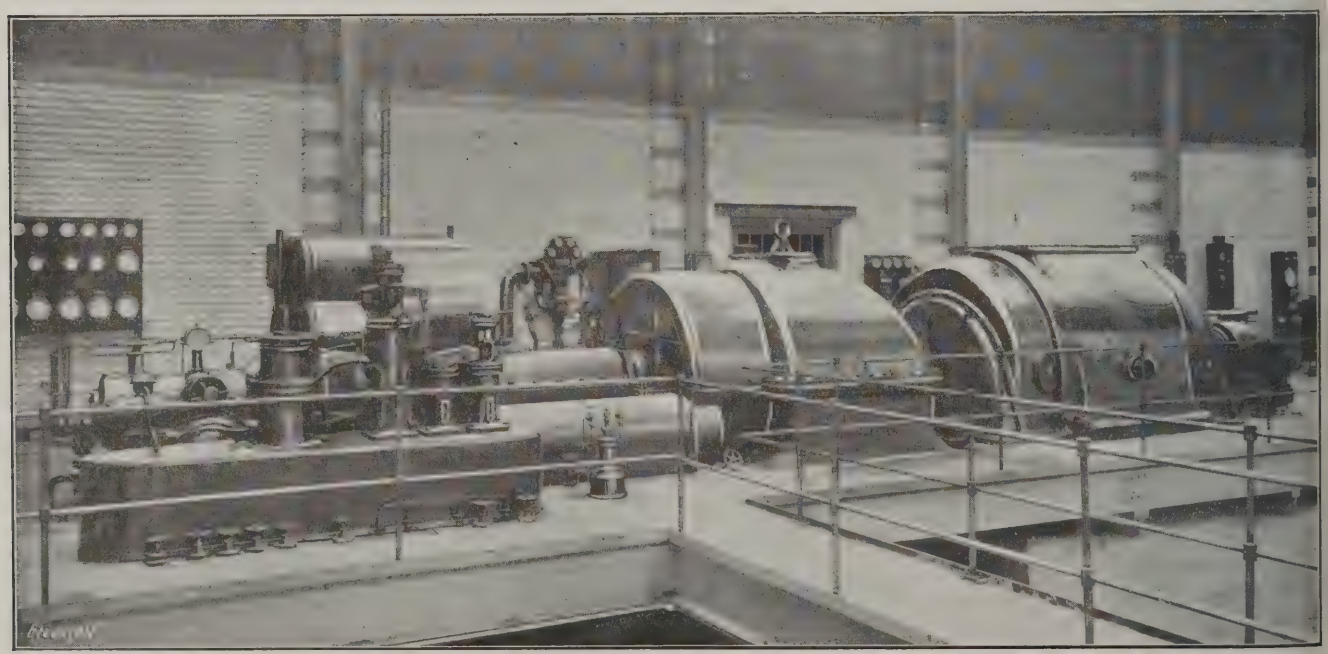


Fig. 2.—The New 6,000-kW Turbo-generator Set.

gallons per hour against a 44-ft. head. The switchgear controlling the alternator and the cables linking up the new set to the existing bus-bars have also been supplied by the Metropolitan-Vickers Co. With the new No. 5 set a radical departure has been made from the old system, and the switchgear is of the totally enclosed "ironclad" type, embodying many of the original features, such as the draw-out type switch, and mechanical interlocks. The type K3 switches controlling the new set are rated to carry 1,200 A at 6,600 V, with a breaking capacity of 300,000-kVA. The two bus-bar switches are non-automatic. The alternator switch is tripped automatically either by the operation of the Merz-Price relay, or by an inverse time limit overload relay of the new "PB" type. Fig. 1 shows the switchgear at the Hanley sub-works. In the basement, close to the alternator, is mounted an earthing resistance, controlled by an electrically-operated oil switch. The resistance is designed to carry 660 amps. leakage current for 30 seconds, or 110 amps. continuously. A Reyrolle low-pressure distribution switchboard is also provided in the new equipment.

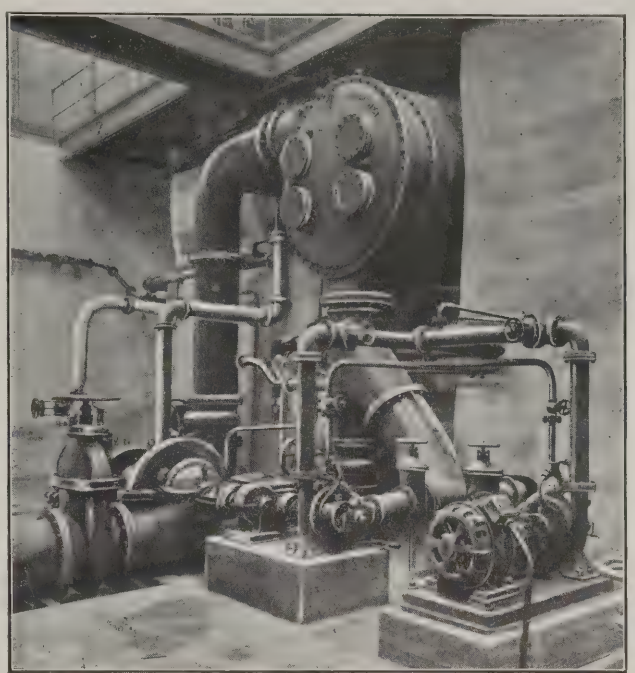


Fig. 3.—New Condensing Plant.

Two extension cooling towers by the Davenport Engineering Co., Ltd., of Bradford, have also been installed. They are of the natural draught, chimney type, and are designed to deal collectively with 400,000 gallons of circulating water per hour, reducing the temperature of this water from 86 deg. F. to 74 deg. F. with a wet bulb atmospheric temperature of 55 deg. F.

The extension coal bunkers, conveyors and elevator have been manufactured and installed by Ashton, Frost & Co., Ltd., of Blackburn. The coal is brought to the central power house from either the railway siding or the collieries direct by three automatic end-tipping battery electric vehicles.

A Fifeshire Hydro-Electric Undertaking.

The Balgonie Colliery Co.'s Installations.

Were it not for the facts that good coal is available at a reasonable price and that most of her larger potential water power sites are remotely situated in relation to the industrial areas where the power might be used, Scotland's hydraulic resources would have doubtless been developed more rapidly than they have been for the production of electricity. It is accordingly of interest to note that the Balgonie Colliery has had the enterprise to develop the River Leven, which flows out of Loch Leven through its property, with a total fall of 56 ft., for power production purposes.

The Balgonie Colliery Co. has operated upon the Dysart main seam between the rivers Orr and Leven, in the upper Fifeshire coalfield, for over four centuries, and it is of interest to point out that nearly two centuries ago the colliery took advantage of the power of the river to drive a water-wheel pumping installation. The old lade which was then constructed, 2,000 yards in length, with the head works and tail race were later reconstructed and utilised in connection with the development in 1919 of a 13-ft. fall at the Milton Mill, from which it has been possible to obtain as much as 239 h.p.

The Milton plant consists of a double-runner open-type turbine with a central discharge, and separate gate control for each runner in order to obtain economy of water. The power developed by the turbine is transmitted to the generator through a set of double-helical spur gears arranged for forced lubrication, the gears increasing the number of revolutions of the turbine from 155 r.p.m. to 800 r.p.m. on the generator. A flywheel is fitted to the generator shaft, and the connection of the gear shaft to the generator is by a flexible coupling of the belt type.



Fig. 1.—Castle Hydro-electric Station, Fifeshire.

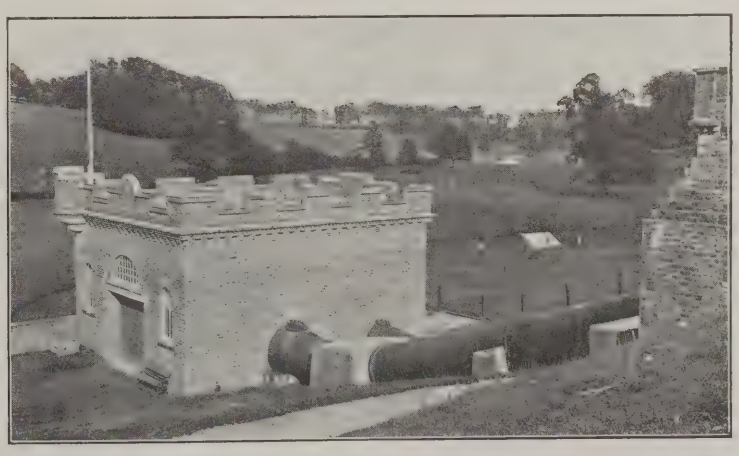


Fig. 2.—Back View of Castle Station.

The generator is a direct-current compound-wound machine with an output of 160 kVA at 440 volts. The speed of the alternator is controlled by an oil-pressure governor which automatically regulates the guide vane of the turbine. This installation was supplied complete by Messrs. James Gordon and Co., Ltd., and the results obtained were so encouraging that the Balgonie Company decided to develop the other 44 ft. of available head.

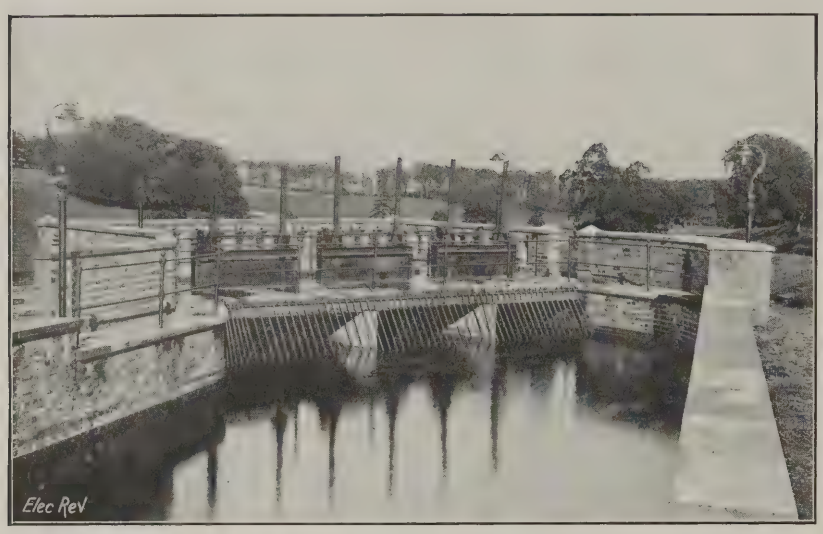


Fig. 3.—Intake, Showing Screens.

Incidentally, it should be stated that during the coal miners' strike of 1921 this Milton plant supplied power to the pits and the pumps, when no other sources of power were available, and thereby prevented flooding and the consequent serious damage underground and loss to the mine.

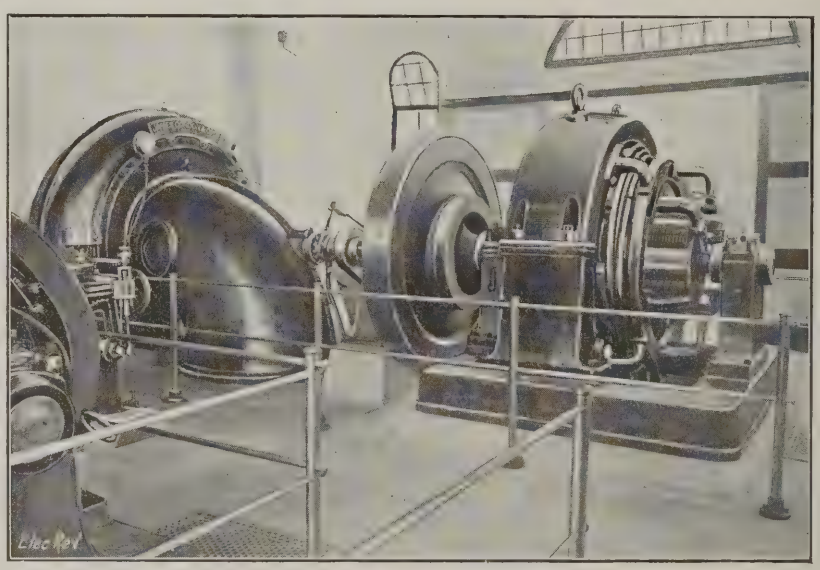


Fig. 4.—The 550-H.P. Turbo-generator.

The second plant, the Castle installation, is a much more extensive one, and necessitated a considerable amount of civil engineering work, in addition to the installation of the water-power plant proper. After a careful survey of the site and prevailing conditions, it was decided to lead the water to the turbines by means of a new headrace cut in earth, over a mile long and 22 ft. wide, and from the end of this by two short riveted-steel pipe lines (figs. 1 and 2).

The main intake from the river is controlled by three sluice gates, in addition to a by-wash gate in the weir. No puddle clay was used in the construction of the headrace, a procedure that has been fully justified by the results obtained. The first 100 yards, however, had to be constructed of substantial brickwork, as the North British Railway Co. made this a condition before permitting the headrace to be carried under one of the arches of the Markinch Viaduct. A by-wash is arranged near the pipe-line intake to take overflow water and to maintain as far as possible constant head on the turbines.

At the end of the headrace an intake (fig. 3), built in concrete and bricks, is arranged in which three sluice gates, each 7 ft. wide, are situated. The intake is divided into two sections, each complete with its own fine strainer, so that access to any one of the two pipe-lines and turbine can be obtained without interfering with the working of the other turbine. A set of coarse strainers is fitted in front of the sluice gates in order to catch heavy debris without interfering with the water flow. The intake is arranged with reinforced-concrete platforms to give convenient access to the strainers and sluices. After its removal from the strainers, debris is pushed along the platform to an opening in the parapet wall, from where it is thrown down on to a steep slope where water from the wash-out valves in the headrace acts as a powerful conveyor of the debris into a basin below. This cleaning of the water at the Castle installation almost eliminates the necessity of cleaning the strainer racks at the Milton installation lower down the river.

The pipe-line consists of two riveted-steel pipes both 63 ft. long; the one serving the large turbine is 60 in. in diameter, and that serving the smaller turbine is 54 in. in diameter. There is no necessity for expansion joints in this case, but a wedge-shaped section is provided at the junction of the turbine and the pipe-line to permit easy removal.

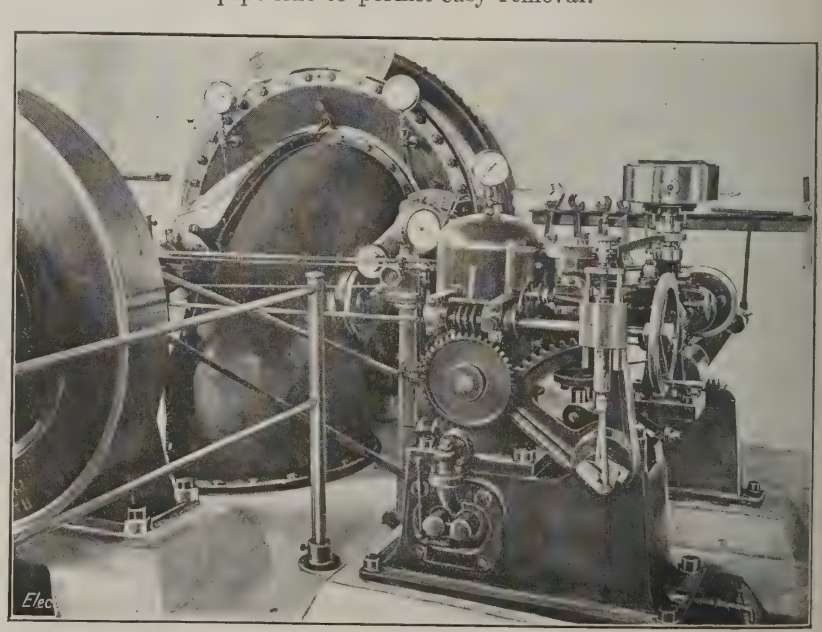


Fig. 5.—Turbine Governor Gear.

The turbines themseles are of the axial-entry cased type. The working head is 40 ft., and the larger tur-

)ine (fig. 4) is producing with this head 550 h.p. at 280 r.p.m., the smaller one giving 270 h.p. at 400 r.p.m. The turbines are fitted with cast-iron flywheels, and coupled direct through belt-type flexible couplings to the generators, which are of the direct-current type working at 450 volts. The load is of an exceptionally varying nature, but it has been found that the two oil-pressure governors (one of which is illustrated in fig. 5) are easily capable of taking care of all variations in a most satisfactory manner.

The switchboard embodies the usual equipment for an installation of this kind, which is arranged for working in parallel. A 4-ton overhead hand-operated crane is also provided.

The power generated at the Castle power station is conveyed by underground feeders to overhead lines. The feeders comprise two 1.0-sq. in. paper-insulated, lead-covered, and heavily braided cables in parallel per pole, positive and negative. The feeders are laid in wooden troughing, this being a mechanical protection only, as the feeders pass through fallow ground. The connection to the overhead line forms a "tee," as this line feeds in two directions, one to a sub-station at the Milton Colliery surface workings, where there is mining type ironclad switchgear with change-over switches for the purpose of supplying the Milton mine with power, either from the Milton or the Castle power stations, as may be found most convenient. The overhead line also feeds a sub-station where powder is distributed to the Julian pit and other underground workings. The Julian pit has a large steam generating plant, and the arrangement of the switchgear is made so that either, or both, the Castle water-power station or the Julian pit steam station can supply power wherever and whenever it is required.

It will be noticed from the accompanying illustrations that not only has the Balgonie Colliery Co. taken great care and trouble on the technical side of the installation, but has gone to considerable trouble to produce an exceptionally pleasing exterior of both intake and power house, all in keeping with the surrounding neighbourhood, where the Balgonie Castle dominates the architecture.

The civil engineering work was carried out under the supervision of Mr. W. Proudfoot, of Kirkcaldy, whereas the water-power plant proper, with the turbines, pipe-lines, strainers, &c., were supplied and installed by Messrs. James Gordon & Co., Ltd. The generators were supplied by the English Electric Co., Ltd., and the transmission line work was carried out under the supervision of Mr. R. M. Russell, of Glasgow.

This installation, despite its rather high capital outlay, has been a great commercial success. Electricity was first introduced at Balgonie in 1895, and considerable development has taken place underground in recent years. Haulage motors are in use on the main and service roads, and there is not a single pony in the pits, while it has been found possible to utilise cutters and conveyors at all the faces; in one pit the whole of the output is gotten with the aid of cutters, and in another only one per cent. of the production is obtained by the hand and pick.

B.E.S.A. Specification.—The British Engineering Standards Association has issued a specification (No. 230, 1925), which covers the requirements for portable photometers intended for the measurement of illumination, and in some cases of brightness also, under conditions where portability and convenience in use are of more importance than great accuracy. The specification includes definitions of the principal terms used in photometry, which are in accordance with the decisions of the International Illumination Commission, in so far as such decisions are applicable. It divides the photometers into two ranges: A, those intended for use in measuring exterior illumination, and B, those intended for use in measuring interior illumination. It is specified that the effective range of a range A portable photometer shall be from 0.01 to 2 ft. candles, and that that of a range B portable photometer shall be from 0.2 to 20 ft. candles. The questions of weight, the test and comparison surfaces, the use of reducing screens, the electrical measuring instruments, the comparison lamp and battery, and also the limits of error to be permitted, have all been gone into carefully. Copies of the specification may be obtained from the B.E.S.A. Publications Dept., 28, Victoria St., London, S.W.1, price 1s. 2d. post free.

Telegraph and Telephone Notes.

(*Continued from page 738.*)

Costa Rica.—Telephone Agreement.—An operating agreement for the telephone system of San Jose and vicinity was signed by a representative of the Compania Nacional de Electricidad and the President of Costa Rica on August 26th. *Commerce Reports* explains that the company agrees to keep all its present lines in operation should the number of subscribers warrant it, install only modern equipment, and within one year erect a new line connecting Cartago and Alajuela with a branch to Heredia. Within 18 months a new connection must be constructed between San Jose and Puntarenas.

Germany.—Telephotography.—A step forward is claimed to have been made in the speed of transmission and reception of writing and pictures by wireless. The announcement was made at Leipzig on the occasion of the unveiling of a monument to the German physicist Hertz by Dr. Schröter, of the Research Department of the Telefunken Gesellschaft, with whom Dr. Karolus, who is chiefly responsible for the improvements, has been collaborating.—*The Times.*

The Telegraph Conference.—Telephony.—A novelty in telephonic communication, adopted on October 30th at the closing meeting of the Paris International Telegraph Conference, is a system of "lightning" conversations, which will take absolute priority over all other calls. The rate chargeable will be approximately ten times the ordinary tariff. The system, which has already been applied in Scandinavia, will now be made general internationally, though its introduction is not obligatory, and is only applicable by mutual arrangement between the different countries.

Another innovation, accepted by the Conference, is the adoption of a rule that the time taken in excess of the first three minutes, in the case of international telephone calls, shall be charged "per minute" and not "per three minutes," as hitherto, a change which will mean a great saving to users of international telephones.

The Conference also adopted a new feature as regards wireless telegraphy, whereby wireless messages under multiple addresses will be accepted in plain or in code language.—*Reuter* (Paris).

Telegraphists' Strike.—Marconi Operators.—The following statement was issued on November 3rd by Marconi's Wireless Telegraph Co., Ltd.:—

On October 31st the management at Radio House gave notice to nine telegraphists whose services were no longer required. At 4 p.m. on November 3rd the whole of the telegraphic staff went on strike. The Marconi Co. has no official knowledge whether the strike was caused by the notices given to the nine men or not. During the morning of November 3rd the secretary of the men's union telephoned asking for an interview, as there was likely to be trouble with the Radio House telegraphists. He was told that if he wished to see the manager unofficially, to discuss any grievances the men might have, the manager would be glad to see him, but that any official representations must be made to the Engineering and Allied Employers' London and District Association. So far as the Marconi Co. is aware, no approach was made to the Federation, and the men came out on strike without any notice.

The Telephone Service.—New Automatic Exchanges.—The first towns in the South-West of England to have the automatic telephone system installed are Torquay and Paignton, where the change was made on Saturday. The formal opening ceremony took place on Monday, when the Mayor officially inaugurated the new system and inspected the plant at the head post office. The telephone kiosks in various parts of the two towns are to be provided with a new type of coin box, with slots for shillings and sixpences as well as pennies, thus allowing calls of any distance to be effected.

United States.—Government Radio Service.—The maze of wires formerly used by the Government has been supplanted by a network of radio stations manned by Army and Navy *personnel* and transmitting messages not only to the two military arms, but to other Government departments as well. About two million words in Government messages are radiated monthly from Washington, through Army and Navy stations. Until recently about half of the Government's messages were dispatched over commercial lines, and radio not only has expedited and effected economy in communication, but its wide use, says *T. & T. Age*, has served to train a large force and erect a system that would be highly valuable in the event of war. The Navy sends and receives an average of more than one million words monthly by radio, its own leased land wires, and through commercial companies. Of this, little more than one-fifth is now transmitted by private concerns, with radio handling the larger part. Development during the past year of short-wave sending has considerably increased the Navy's capacity for handling messages, and when the battle fleet was in the antipodes recently two-way short-wave communication was readily established with Washington. The War Department has established a net of 60 radio stations, and it undertook its first great expansion of the use of radio for departmental business at the beginning of the fiscal year 1923 and transmitted through its stations that year less than 4,000,000 words. In the fiscal year 1925, ending last July, nearly 8,500,000 words were transmitted.

Radio Notes.

Germany.—LICENCES.—A considerable reduction in the number of German broadcasting subscribers is announced, and according to *The Times*, the Post Office officials whose duty it is to collect the fees are urged to greater efforts, the official view being that the decrease is more probably due to "licence-fatigue" than to lack of interest in the broadcast programmes. Severer measures against the owners of unlicensed receiving sets are also hinted at. Proceedings against "black-hearers," as they are called in Germany, have always been a feature of German broadcasting, and periodic announcements are made of convictions, the appeals to the dilatory usually ending with a reminder of the smallness of the fee. It is at present 24 marks (£1 4s.) per annum.

Japan.—"DUMPING" TARIFF.—Manufacturers of the cheaper grades of wireless apparatus in the United States and Great Britain, particularly the former, are to find the Japanese market closed to them in the near future, if the plan of the Finance Department materialises, which the *Daily Mail* thinks is certain. This plan is to include all wireless materials and parts under the "luxury tariff" enacted a year ago, which imposes an import duty of 100 per cent. Recently American wireless material has been imported in great quantities. There are now 70,000 subscribers in Tokio to the broadcasting service, and it is expected that this number will be doubled by the end of the year.

Latvia.—NEW STATION.—The construction of the two towers for the radio broadcasting station at Riga has been completed, and it is expected that the station will be in operation shortly. *Commerce Reports* believes that the Latvian postal administration will not monopolise the future radio business in Latvia as originally planned.

Licences.—DEMAND CONTINUES.—The latest figures issued by the Post Office show that at the end of September 1,464,500 licences had been issued. This figure shows an increase of 41,500 over the figure for the end of August, which was 1,380,000. At the end of September, 1924, the number was 998,607.

New Studio.—OXFORD.—A new studio has been fitted up by the British Broadcasting Co., Ltd., in Magdalen Street, Oxford, and will be opened on November 26th. It is understood that it will be used for broadcasting events connected with Oxford and University life from time to time.

Peru.—LICENCES.—The Government of Peru is to enforce the provisions of the wireless law calling for the inspection of all radio installations and the collection of a tax of one Peruvian pound for each receiving set in use. The general administrator of mails, telegraphs, and wireless is intrusted with the assessment and collection of this tax, together with the establishment and maintenance of a registry of all sets in use.

United States.—RADIO ANTI-TRUST INQUIRY.—The United States Federal Trade Commission has begun hearings in New York in an investigation of the methods and practices of the Radio Corporation of America. According to the *Manchester Guardian*, Mr. David Sarnoff, vice-president and general manager of the Corporation, issued a statement the day before hearings commenced, in which he said that his company welcomed the investigation.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia. — MELBOURNE. — December 15th. Postmaster-General's Department. Junction apparatus for manual exchanges.*

December 29th. Magnet and resistance wire.*

Barking.—January 1st. County of London Electric Supply Co., Ltd. Water-tube boilers with mechanical stokers or powdered fuel equipment, steam turbo-alternators, condensing plant, and auxiliary apparatus for the Barking power station. (October 30th.)

Belgium.—November 25th. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Supply and laying of telephone cables at Soigmies, La Bouverie, and Profondeville. Particulars (Cahier des Charges Special No. 3-146) for 6 fr. 65 c.

Birkenshaw (Yorkshire).—November 17th. Installation of electric light in 22 houses on the District Council's housing estate at Old Lane. Mr. Ralph Brooks, Council Offices.

Bradford.—November 14th. Tramways Committee. General stores required during year commencing January 1st, 1926. Particulars from Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

Carlisle.—November 19th. Electricity Department. L.p. cast-iron piping for condensing water system. (October 30th.)

Dublin.—November 12th. Great Northern Railway (Ireland). Stores for six months (including electrical fittings, lamps, cable, and wire, &c.). (October 23rd.)

India.—BOMBAY.—November 11th. Bombay, Baroda ar Central India Railway. D.c. motors and starting pillar (October 30th.)

DELHI.—November 30th. Indian Stores Department. Sul station equipment for Jaipur (comprising insulators, wire, l. cable, switchgear, transformer, &c.).*

Kingston-upon-Hull.—November 16th. Electricity Depar ment. Two natural draught cooling towers. (October 30th

London.—LONDON COUNTY COUNCIL.—November 16t Reconstruction of electrical switchgear at Shoreditch sul station. (October 30th.)

New Zealand.—WELLINGTON.—December 15th. Post Offi Stores Department. Key switches.*

Oldham.—November 21st. Electricity Departmen Three 12,500-kW turbo-generators and auxiliary plan (October 30th.)

December 5th. Eight water-tube boilers, with superheater chain-grate stokers, steel chimneys, and induced draught plan (See this issue.)

Pentre (Glam.).—November 16th. Rhondda Urban Di trict Council Electricity Department. Two 35-h.p. and or 20-h.p., 400-V, squirrel-cage induction motors. (See th issue.)

Richmond (Yorks.).—Town Council. Electrical plan and material for electricity scheme. Specifications from M W. W. Foster, town clerk, Corporation Offices.

South Africa.—JOHANNESBURG.—December 4th. Electricit Supply Commission. Plant and material for transmission lin and sub-stations in connection with the supply of electricit in the Cape area rural districts.

December 23rd. Union Tender Board. Telephone apparatu and supply of telegraph material for the Department of Pos and Telegraphs.—*S.A. Mining and Engineering Journal.*

CAPE TOWN.—December 3rd. Electricity Departmen Three-phase induction voltage regulators.*

FORT BEAUFORT.—December 10th. Municipal Counci Generating plant and materials for electric lighting.*

QUEENSTOWN.—January 7th, 1926. Municipal Council. E tensions to the electricity undertaking.*

Uruguay.—MONTEVIDEO.—January 5th. State Electricit Supply Works. Bare copper wire, quicksilver.*

January 11th. 96,000 metres lead-covered wires and cables.

January 12th. 44,500 metallic and carbon-filament lamps

January 18th. 170,000 metres of r.i. cords.*

Administration Nacional del Puerto de Montevideo. Januar 2nd. Machine tools and equipment.*

West Ham.—November 16th. Education Committe Installation of electric lighting and central heating at th Cumberland Road new secondary school. (October 23rd.)

York.—November 12th. Electricity Department. Or 6,000-kW, 3-phase turbo-alternator, with condensing plan pipework, &c. (October 23rd.)

*Further particulars can be obtained at the Department Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Closed.

Barrow.—The Council has adopted the Electricity Com mittee's recommendation to purchase six sets of switchge from the Swedish General Electric, Ltd., at £13 10s. per se It was stated that the British firms quoted £40 per set, bu the Swedish apparatus was very much lighter than the Britis though efficient for the purpose required.

Belgium.—The Belgian Post and Telegraph authoritie in Brussels last week placed some large contracts for miscell neous telephone material with the Bell Telephone Manufa turing Co., the New Antwerp Telephone Co., of Antwerp, an the Société Electrique et Mecanique, of Brussels.

Birmingham.—Education Committee. Accepted:—
Installation of electric light in the Domestic Subjects Centre Harborne.—E. Hill & Sons.

Bradford-on-Avon.—Urban Council. Accepted:—
Installing electric light at the Baths.—Rossiter & Co.

Burnley.—Electricity Committee. Accepted:—
360 yds. of conduit (£123).—J. & R. Howie, Ltd.
2,025 yds. of cable (£1,001).—P. E. Bantling, Ltd.

Chesterfield.—Town Council. Accepted:—
Cable extensions.—W. T. Glover & Co., Ltd. (£379); Western Electr Co., Ltd. (£310).

Erith.—Urban Council. Accepted:—
Two lots of cable (£358 and £552 respectively).—Callender's Cable ar Construction Co., Ltd.

London.—ST. MARYLEBONE.—Electric Supply Committee Recommended:—
Two e.h.p. truck-type cubicles (£172).—Ferguson, Pailin, Ltd.

DEPTFORD.—Town Council. Accepted:—
Electrically-driven vertical centrifugal pump for Laurie Grove bat (£770).—Worthington, Simpson, Ltd.

Manchester.—Baths and Wash-houses Committee. Ac cepted:—
Installation of electric light at Mayfield baths.—R. H. Clampett & C

Education Committee. Accepted:—
Electric lighting installation, Longsight Municipal school.—R. Seddon an Sons.
Rearrangement of the electric lighting installation, Burgess Street scho —Ward & Booth.

Electricity Committee. Accepted:—
Cable troughing, capping and boards.—Burt, Boulton & Haywood, Ltd.; Hall Bros. Timber Co., Ltd.
One 10-ton hand-operated crane for Burnage sub-station.—H. Morris, Ltd.
Switchgear, Hetherington & Sons' sub-station.—Ferguson, Pailin, Ltd.

Gas Committee. Accepted:—
Overhauling and maintenance of telephone installation (Bradford Road).—L. E. Wilson & Co.

Morecambe.—Electricity Committee. Accepted:—
H.p. cable.—W. T. Glover & Co., Ltd.

Oldham.—Tramways Committee. Accepted:—
12 tramcars.—English Electric Co., Ltd.

Electricity Committee. Accepted:—
Meter boards.—C. Schofield & Co., Ltd.
Switchgear.—Ferguson, Pailin, Ltd.

Preston.—Corporation. Accepted:—
Supply of a third turbo-generator (£50,257) for the new Ribble power station.—English Electric Co., Ltd.

South Africa.—DURBAN.—Electricity Department. Accepted:—
3 miles cable (£2,435); 10 tons bare copper wire (£944); fuses (£187); stay rods (£71).—T. Barlow & Sons, Ltd.
6 miles cable (£2,327).—Bartle & Co., Ltd.
One automatic synchroniser (£164).—British Brown, Boveri, Ltd.—*S.A. Mining and Engineering Journal.*

SOUTH AFRICAN RAILWAYS.—*The Times* states that the Metropolitan-Vickers Electrical Co., Ltd., has secured a large repeat order, upwards of a quarter of a million pounds in value, for more combined passenger and freight locomotives with gears, similar to the 78 supplied by the company in 1922, and put into commission during the last two years, in connection with the electrification of the South African Railways.

Spain.—SPANISH ELECTRIFICATION CONTRACT.—The Santander-Bilbao Railway Co. has awarded the contract for the electrification of the line between Bilbao and Las Avenas to the Allgemeine Elektrizitäts Gesellschaft. Contracts for the motors and certain accessories remain to be awarded, and tenders will be invited very shortly.—*Reuter's Trade Service* (Madrid).

Stafford.—Electricity Committee. Accepted:—
Construction of circulating-water ducts.—Mitchell Conveyor and Transporter Co., Ltd.

Tynemouth.—Electricity Committee. Accepted:—
Wiring houses under assisted scheme.—J. E. Robinson.

Forthcoming Events.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, November 9th. At the Institution, Victoria Embankment, W.C. At 7 p.m. Discussion on "Modern Developments of Telephone Cables," to be opened by Mr. E. S. Ritter.

(Irish Centre) (Dublin).—Thursday, November 12th. At Trinity College, Dublin. At 7.45 p.m. Paper on "Underground Telephone Construction," by Mr. G. G. Sutcliffe.

(North-Eastern Centre).—Monday, November 9th. At Armstrong College, Newcastle-on-Tyne. At 7 p.m. Paper on "Dielectric Problems in High-Voltage Cables," by Mr. P. Dunsheath.

(North-Midland Centre).—Tuesday, November 10th. At the Hotel Metropole, Leeds. At 7 p.m. Address by the chairman, Mr. S. Derwen Jones, and smoking concert.

(Scottish Centre).—Tuesday, November 10th. At the Royal Technical College, Glasgow. At 7.30 p.m. Address by the chairman, Prof. M. Maclean.

(South-Midland Centre).—Wednesday, November 11th. At the University, Birmingham. At 7 p.m. Paper on "The Development of Alloys of Nickel and Chromium for High-Temperature Work and Electrical Resistance Heating," by Mr. W. R. Barclay.

(Dundee Sub-Centre).—Thursday, November 12th. At the University College, Dundee. At 7.30 p.m. Paper, "A Comparison of Electrical Wiring Installations and Analysis of their Costs," by Mr. I. Sclar.

(North-Western Centre) (Students' Section).—Tuesday, November 10th. At Milton Hall, Deansgate, Manchester. At 7.30 p.m. Paper on "The Design of Current Transformers," by Mr. C. T. Melling.

(London Students' Section).—Friday, November 13th. At the Institution, Victoria Embankment, W.C. At 6.15 p.m. Opening address by Lt.-Col. K. Edgcumbe, R.E. (T.A.).

Nottingham Society of Engineers.—Monday, November 9th. At the Victoria Station Hotel. At 7.30 p.m. Lecture on "Automatic Machines," by Mr. L. Cord.

Association of Mining Electrical Engineers (London Branch).—Tuesday, November 10th. At the Engineers' Club, Coventry Street, W. At 6.30 p.m. Presidential address by Mr. J. W. Gibson.

Institution of Engineering Inspection.—Friday, November 13th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 7.30 p.m. Paper on "Modern Developments in Steels Resistant to Corrosion," by Mr. W. H. Hatfield.

Junior Institution of Engineers.—Friday, November 13th. At 39, Victoria Street, S.W. At 7 p.m. Annual general meeting.

Birmingham Electric Club.—Friday, November 13th. At the Grand Hotel, Colmore Row. At 7 p.m. Lecture on "Submarine Cable Manufacture and Laying," by Mr. H. G. Wood.

Physical Society of London.—Friday, November 13th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary scientific meeting.

Finsbury Technical College Old Students' Association.—Saturday, November 14th. At the Engineers' Club, Coventry Street, W. At 6.30 p.m. Annual dinner.

The "Electrical Review" Service Department.

ENQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

THEOLIGHT DYNAPOCKET lamps and cycle sets.

Notes.

Power Station Visit. — The Halifax Corporation power station was visited last week by some 200 employés of Messrs. John Crossley & Sons, Ltd., carpet manufacturers, of Dean Clough Mills. The party was divided into groups and conducted over the works by members of the staff, who explained details of the plant and its working. The visit was organised by the Dean Clough Mills Welfare Society, and hearty thanks were accorded the borough electrical engineer (Mr. W. M. Rogerson) and the members of the staff.

The 1926 Municipal Tramways Association Conference.—Liverpool City Council has invited the Municipal Tramways and Transport Association to hold its next annual conference in Liverpool.

Manchester Wireless Exhibition.—Over ninety firms exhibit in the second annual Manchester Wireless Exhibition (October 27th to Nov. 7th). The opening ceremony was performed by Capt. P. P. Eckersley, and the exhibits comprise everything from a cat's-whisker to a wireless-equipped lifeboat, the White Star Line having loaned a boat from the steamer *Baltic*. Messrs. Franks, Ltd., wireless dealers, of Manchester, have organised a £100 competition, by which they are seeking to discover the most popular types of loud speakers, receivers, and components. Another ballot competition was run by the exhibition authorities to determine which stands, in the opinion of the public, were the most interesting and attractive. The first prize was an eight-valve heterodyne receiver valued at £60, presented by Messrs. H. Clarke & Co., Ltd., Manchester; second prize, a two-valve amplifier and loud speaker valued at £30, presented by the Western Electric Co., Ltd., London; and the third prize, a Burndept Ethophone No. 3, valued at £25, presented by Mr. W. C. Barraclough, Manchester.

R.N.D. Engineers' Dinner.—The seventh annual dinner will be held on Friday, November 13th, at the London Tavern, 53, Fenchurch Street, E.C., at 6.30 p.m. for 7 p.m. On this occasion Nos. 1, 2 and 3, Field Companies, Signal Co. and Depôt Co. will dine together. Tickets (6s.) are obtainable from Mr. J. N. Robertson, 14, Woodgrange Avenue, Ealing Common, W.5. 'Phone: Ealing 2779.

London Electrical Engineers.—27th (London) Anti-Aircraft Battalion R.E. (T.A.). Officer Commanding: Lt.-Col. C. H. S. Evans, O.B.E.

The following orders have been issued for November:—

305th Company (Major A. W. M. Mawby, O.B.E., A.M.I.E.E.).—Tuesdays, 7 p.m. to 9.30 p.m.: Special instruction for officers, non-commissioned officers, and men for promotion.

306th Company (Major F. C. Clarke, A.M.I.E.E.).—Mondays, 7 p.m. to 9.30 p.m.: Special instruction for officers, non-commissioned officers, and men for promotion.

The headquarters at 46, Regency Street, London, S.W.1, will be open until 8 p.m. on week-days (11 p.m. on Mondays and Tuesdays), and 1 p.m. on Saturdays. All social arrangements for the year will be under Major W. H. Merrett, T.D., and the sports officer is 2nd-Lieut. T. H. R. H. Jolly.

Appointments Vacant.—Junior mains engineer for the Electricity Supply Department of Pooley Hall Colliery. Station superintendent and constructional draughtsman for the City and County of Bristol Electricity Department. Travelling meter inspectors for the Electrical Apparatus Co., Ltd. Plumber-jointer for the Hazel Grove and Bramhall U.D.C. Electricity Department. (See our advertisement pages to-day.)

Earthing the Neutral.—Referring to the efforts of wireless amateurs to operate their sets with current from the mains, Mr. James Nelson writes pointing out that it is forbidden by the electricity regulations to earth the neutral of a system at more than one point, and that persons trying to charge accumulators by connecting a battery between the earthed main and, for instance, a water pipe, would render themselves liable to prosecution. The lighting mains, when used in conjunction with a wireless set, should never be earthed except through a condenser robust enough to withstand the full voltage of the supply to earth.

An Institute of Wireless Engineers.—A meeting was held at the Hotel Russell, London, on October 31st, for the purpose of considering the formation of an institution to cater for the wireless engineer.

Mr. C. E. Baldwin presided, and said the object of those who started this movement was to co-operate with the existing institutions, and at the same time do work which was not done by them.

Mr. W. Y. P. Evans, of Manchester, who has been acting as secretary, regretted that the Institution of Electrical Engineers found it impossible to state a definite policy with regard to the aims of those who were behind this movement. One of the difficulties of the Institution of Electrical Engineers was that it obviously could not reduce the status which it had already established for those desiring to become members, and the result was that although the I.E.E. catered for the advanced wireless engineer, it did not encourage the junior or regularly employed wireless engineer. A certain section of wireless engineers

were not particularly keen on joining the I.E.E. because by doing so they became chartered electrical engineers—which they did not desire to be. On the other hand, Mr. Evans continued, the Radio Society had acted in a very straightforward manner by stating that its policy was to cater only for the amateur. Thus, there was a gap between the work which the Radio Society of Great Britain was doing and that which the Institution of Electrical Engineers did through its Wireless Section.

The chairman, in the course of subsequent remarks, stated that as the result of correspondence with wireless engineers all over the world, 50 had already expressed a wish to join some institution for wireless engineers, and contributions had actually been sent in amounting to £216. The fact that there were something like 500 members of the American Institute of Radio Engineers in this country indicated that there was ample room for a body such as that now proposed.

Mr. Evans said that one of the things which it was felt ought to be remedied was that a man in charge of a 10-kW Government station was considered merely as an operator and not as a wireless engineer. One of the tasks of the new body, if formed, would be to deal with such matters and endeavour to raise the status of such men by giving some hall-mark to their abilities. The people whom it was desired to bring together consisted, for the most part, of men who were really debarred from joining the Institution of Electrical Engineers.

A resolution was unanimously passed that a new body should be formed, and it was decided to call it the Institute of Wireless Engineers. A committee was formed to carry out the necessary preliminary work with a view to the preparation of the articles of association, Mr. W. Y. P. Evans, of 2, Parkside Road, Princes Road, Moss Side, Manchester, being elected secretary. It is the intention to have the headquarters of the Institute in London.

The Birmingham Electric Club.—The ladies' night of this club, held on October 23rd, at the Grand Hotel, Colmore Row, Birmingham, was very successful, about 450 persons being present. This being the 21st anniversary of the club, a special feature was made of the electrical decorations, which included electrically-illuminated signs reading: "1904-1925." The Grosvenor ballroom was tastefully garlanded with smilax, palms, and chrysanthemums, and whilst dancing proceeded to the strains of Messrs. Priestley's Band, coloured lights were played upon the dancers from the balconies. A whist drive was patronised by a number of guests until 10 p.m., when there was one hour's interval for supper, during which speeches of welcome were delivered by the President, Mr. F. R. Unwin, M.I.E.E., to Mr. W. Smith, and Mr. E. A. Morgan, two of the founders of the club, and also to Mr. R. A. Chattock, city electrical engineer, congratulating him on his election as president of the Institution of Electrical Engineers. After supper dancing was resumed until 2 a.m., when the company surrounded the President and Mrs. Unwin and with joined hands sang "Auld Lang Syne."

Tyne Electrical Engineers' Dinner.—The officers of the Tyne Electrical Engineers, R.E., held their annual re-union dinner at Newcastle-on-Tyne, on Saturday, October 24th. The gathering was well attended by past and present officers of the unit, who spent a very enjoyable evening. Following the loyal toast, Lt.-Col. A. K. Tasker proposed the health of the Tyne Electrical Engineers. The commanding officer, Brevet-Col. Ernest Robinson, C.B.E., replied, and outlined briefly the present activities of the unit. He mentioned that a very satisfactory report had been made by the inspecting officers of the last camp. With regard to the successes obtained this year at the Northumberland Rifle Association meeting, the Tyne Electrical Engineers had won over 30 per cent. of the prize money. The unit had also carried away 16 of the 44 medals awarded, and three of the 10 challenge cups. The coveted Chipchase Cup had again, for the sixth time in succession, been won by a member of the Tyne Electrical Engineers, which had the distinction of possessing the competitor who had made the highest aggregate score. Since the last re-union dinner two challenge cups in respect of technical work had been presented for annual competition amongst the sections of the unit. Major Forster proposed the health of the retired and attached officers. Replying on behalf of the retired officers, Lt.-Col. S. E. Monkhouse said it was with very much pride that they watched the achievements of the Tyne Electrical Engineers, and he hoped it would not be long before the authorities recognised their efforts by granting them a larger establishment. Major N. H. Firmin, O.B.E., proposed a toast to Col. Robinson, and said it was a great honour to the Tyne Electrical Engineers that the C.O. should have had the C.B.E. conferred upon him. Replying to the toast, Col. Robinson said it was to him a source of very much regret that he would no longer remain on the strength of the unit.

Fatalities.—W. J. Wainwright (27), an electrician employed at the Barugh works of the Yorkshire Electric Power Co., was killed recently in the works at a switch which he had been repairing. It appears that after effecting the repairs he asked the charge engineer to switch on. The engineer received the signal that everything was right and put on the current. On receiving no reply he went to see whether anything was wrong, and found Wainwright lying near the switch, face downwards. Artificial respiration was tried without success.

An inquest was held at Hayle (Cornwall) last week into th death of Richard James, an overhead linesman in the employ ment of the Cornwall Electric Power Co. It was stated tha James, in company with two other linesmen, was examinin the line through Hayle to Camborne for a cracked insulato when James fell from the telephone arm of a pole, a distanc of 21 ft., fracturing his skull. William Wills, the foreman said that James could not have got in contact with a liv wire, and he could only account for his fall by seizure wit sudden illness. Evidence was given by Mr. A. C. Owen, Camborne, distribution engineer to the Electric Power Co and a doctor testified to the fact that there was no evidenc that deceased had received an electric shock. The Corone returned a verdict of "Accidental death."

London Traffic Inquiry.—The inquiry by a sub-committe of the London Traffic Advisory Committee into the traff facilities of North London was re-opened on November 2nd A report was submitted by Mr. J. K. Bruce, general manage of the L.C.C. tramway undertaking, giving details of th tramway service at Finsbury Park tube station. The inquir is to be resumed to-day.

Institution Notes.

Institution of Electrical Engineers.—South-Midland Students' Section.—At the meeting on Tuesday last, a pape was to be read by Mr. J. T. Allen on "A Study of the Diffi culties in the Application of Electricity to Farming."

Programmes.—The arrangements for the first part of th 1925-26 session include the following provincial items:—

Irish Centre (Dublin).

November 12th.—Mr. G. G. Sutcliffe. "Underground Telephone Con struction."

December 10th.—Mr. J. Lindsay. Lecture on "The Mechanical Winnin of Peat."

January 21st, 1926.—Mr. A. P. Trotter, B.A. Faraday Lecture on "Illu mination and Light."

Mersey and North Wales (Liverpool) Centre.

November 16th.—Mr. T. Carter. "The Engineer: His Due and His Dut in Life."

December 14th.—Mr. E. H. Shaughnessy, O.B.E. "Post Office Wireles Stations."

January 18th, 1926.—Mr. A. P. Trotter. Faraday Lecture on "Illumina tion and Light."

North-Eastern Centre.

November 9th.—Mr. P. Dunsheath. "Dielectric Problems in High-Voltag Cables."

November 23rd.—Mr. T. Carter. "The Engineer: His Due and His Dut in Life."

December 14th.—Lt.-Col. K. G. Maxwell and Mr. A. Monkhouse. "Re cent Improvements in the Insulation of Electrical Machinery."

South-Midland Centre.

November 10th.—Mr. S. Derwen Jones. Chairman's address (followed b a smoking concert).

November 24th.—Mr. T. Carter. "The Engineer: His Due and His Dut in Life."

December 8th.—Prof. S. P. Smith. "An All-Electric House."

North-Western Centre.

November 17th.—Mr. P. Dunsheath. "Dielectric Problems in High-Voltag Cables."

December 1st.—Mr. T. Carter. "The Engineer: His Due and His Dut in Life."

December 15th.—Prof. S. P. Smith. "An All-Electric House."

January 19th, 1926.—Mr. A. P. Trotter. Faraday Lecture on "Illumina tion and Light."

Sheffield Sub-Centre.—The opening meeting and smoking concert of the season of the Sheffield Sub-Centre of the Institution was held last week, when Mr. W. F. Mylan was installed as chairman. In his speech, Mr. Mylan made a strong appeal for increased membership; in 1921 the Sub-Centre had a membership of 73, which had increased to 167, but there still remained many electrical engineers in the district who were not members of the Institution. The membership of the Students' Section had increased in five years from 36 to 52.

Scottish Centre.—The 25th annual report of the Committee of this Centre shows that 10 meetings were held during the 1924-25 session at which the average attendance was 75, and the session ended with a total membership of 652, a decrease of six as compared with the previous year. The two informal meetings held in Glasgow were very successful.

Scottish Students' Section.—The seven meetings and five works visits of this Section were considerably in excess of those of past years, and it is hoped to develop this Section in the future. The average attendance at meetings was 32.

Dundee Sub-Centre.—The attendance at the six meetings of this Sub-Centre averaged 24; the membership at the close of the session totalled 59.

Electrical Society of Glasgow.—The following are the arrangements for the 1925-26 sessions:—

December 1st.—"Wiring Systems." Mr. T. S. Seymour.
January 6th.—"Wiring Rules and Defects." Mr. H. M. Stronach.
February 2nd.—"Internal Combustion Engines." Mr. A. H. Crowther.
March 2nd.—"Industrial Heating Appliances." Mr. P. J. Sims.

Royal Institution.—At a general meeting on Monday last, the special thanks of the members were returned to Professor Percy Frankland for his gift of a number of relics of Faraday.

Institution of Heating and Ventilating Engineers (Inc.).—At the meeting on November 4th, Mr. J. J. Lassen dealt with the installation of heating plant, pointing out that some kind of instrument should be available to enable the attendant to watch the firing. When examining the performance

any heat-producing plant in detail, a proper heat balance set must be compiled in order to ascertain the efficiency of the plant. Carbon dioxide recording instruments were formerly constructed far too much by chemists, who did not fully realise the rough working conditions in the average workshop; but with modern plants far greater attention had been paid to the mechanical details so that they now had instruments which would stand years of hard work.

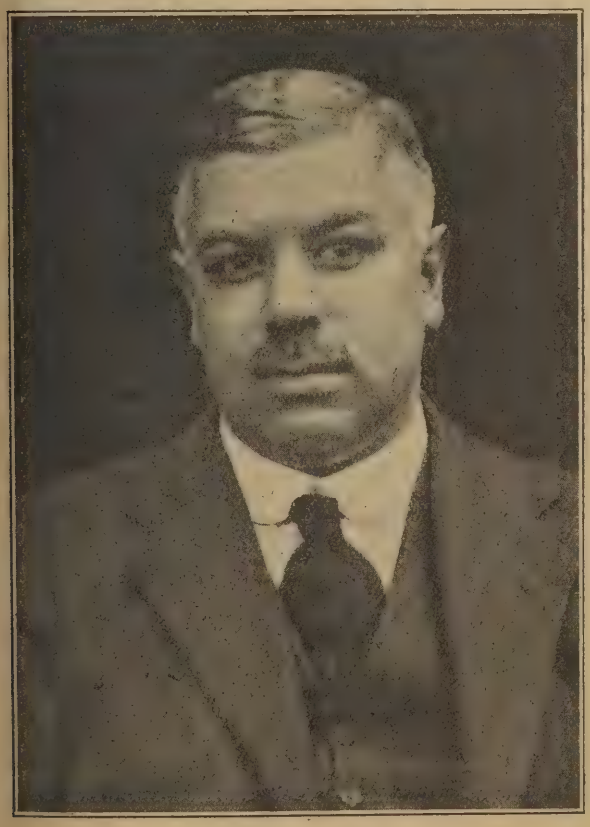
Junior Institution of Engineers.—At a meeting of the Institution held on October 30th, a film was shown illustrating the construction and assembly of the 50,000-kW turbo-alternator recently supplied by Messrs. C. A. Parsons & Co., Ltd., for the power station of the Commonwealth Edison Company of Chicago. Mr. G. S. Prest made some preliminary remarks on the features of the design of the machine, and summarised the improvements over existing practice which were expected to be obtained. There was a record attendance of members and visitors.

Institute of Transport.—ELECTRIC TROLLEY 'BUSES.—Mr. Frank Ayton, in his recent paper before the Institute, at Liverpool, urged the points of superiority of the electric trolley 'bus over the petrol motor 'bus. "The running cost per mile of the trolley 'bus is," he said, "1.46d., as opposed to 2.47d. for the petrol 'bus. Trolley 'buses can easily be employed for carrying goods and for handling such a transport service from town to town if necessary."

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

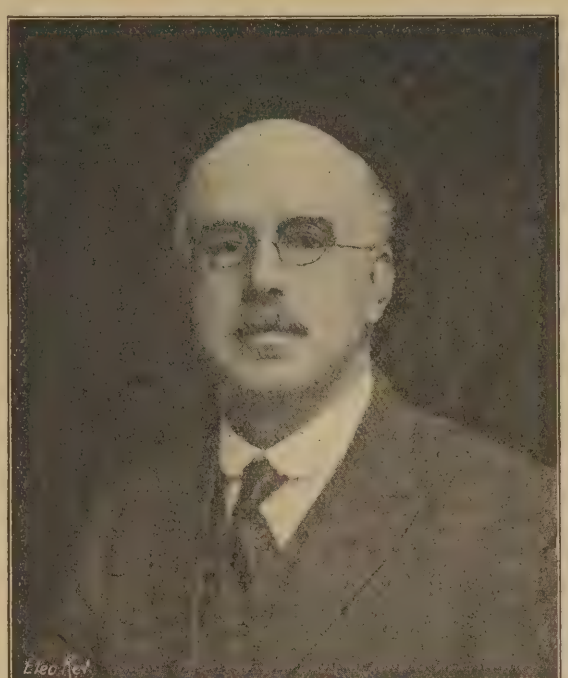
The accompanying portrait is of Mr. W. F. MYLAN, who is Chairman of the Sheffield Sub-Centre of the Institution of Electrical Engineers. Mr. Mylan was born in Edinburgh in 1881; he was educated privately and at the University College, Sheffield. In 1903 he joined the Sheffield staff of the British Westinghouse Co., and was then for a time engaged on testing for the company at Trafford Park. He returned to Sheffield in 1906 and shortly afterwards was appointed district manager. Mr. Mylan held this position until 1919, when with Mr. G. H. Smith, who was also with the British Westinghouse Co., he formed a company under the title of Mylan & Smith (Engineers), Ltd. Mr. Mylan's connection with the Institution has been a long one and he took an active part in the formation of the Sheffield Sub-Centre. From its inception he acted as treasurer until he relinquished this task to become chairman. Mr. Mylan was a footballer for many years, but his spare-time energy is now employed in golf and tennis. During the war he was an officer in the Yorks. and Lancs. Volunteers.



Mr. W. F. Mylan,
Chairman of the Sheffield Sub-Centre of the I.E.E.

Mr. W. HAMMOND SMITH has recently joined the staff of Messrs. H. J. Packer, Ltd., Bristol, as chief engineer.

Mr. S. DERWEN JONES, whose portrait accompanies this note, is chairman of the North Midland Centre of the Institution of Electrical Engineers for the current session. He was born in Manchester in 1866, and after working in several steam engineering works and tool shops, he studied electrical and mechanical engineering at the Manchester Municipal Technical School. One of his first jobs was the erection and starting of its first a.c.-d.c. battery sub-station for the Salford Corporation. Later Mr. Derwen Jones entered the service of the Bristol Tramway Co., Ltd., as assistant engineer, and from there he went to Doncaster as chief assistant electrical engineer during the period of the inauguration of the town's electric tramways. He was then appointed borough electrical engineer of Batley, a position which he still holds. In the course of his service with the Batley Corporation he has been solely responsible for a number of extensions, including the installation of a 3-phase system.



Mark E. Mitchell & Co. [*Harrogate*

Mr. S. Derwen Jones,
Chairman, North Midland Centre, I.E.E.

Mr. H. E. YERBURY, deputy manager of the Sheffield Electric Supply Department, at his installation last week as President of the Sheffield and District Section of the Junior Institution of Engineers, gave an address on "The Application of Metaphysics to Science and Engineering."

Mr. E. G. BEATON, acting electrical station engineer at Devonport dockyard, is replacing Mr. J. S. P. Willcocks, serving in a similar capacity at Portsmouth dockyard, he having been transferred to Devonport.

We regret to learn from the newspaper Press that Sir J. S. HARMOOD BANNER, Bt., is lying seriously ill at his residence, Ingmire Hall, Sedbergh, having had a relapse.

Mr. EDWARD D. KILBURN, Vice-President and General Manager of the Westinghouse Electric International Co., and Mr. WALTER S. RUGG, General Sales Manager of the Westinghouse Electric and Manufacturing Co., were named vice-presidents of the latter company at a recent meeting of the board of directors in New York.

Mr. D. E. BELL, general manager and engineer of the West Riding Electric Tramways Co., Ltd., has accepted the appointment of manager to the St. Helens Corporation tramways.

Mr. W. M. CITRINE, who has been appointed acting secretary of the Trades Union Congress, is an electrician by trade and for many years was district secretary of the E.T.U., at Liverpool.

Writing in one of the Leicester papers, Mr. H. PARSONS, managing director of Messrs. Gent & Co., Faraday Works, Leicester, mentions that some of the staff who assisted Mr. J. T. Gent in his telephonic experiments fifty years ago are still with the firm, as is also the assistant who actually made the telephonic apparatus for the Leicester Thorpe Street experiment in 1877. Mr. J. T. Gent first introduced electric light to Leicester with an arc light, on the grand stand of what is now known as Victoria Park, in 1882, the occasion being the visit of the Prince and Princess of Wales to Leicester.

Mr. R. C. BULLOUGH, for 21 years manager of the Colchester Tramways, has been presented with a gold albert by the employés on his retirement from the position.

Mr. ARTHUR FODEN has been appointed shift engineer by the Southport Town Council.

On the evening of October 27th, at the Grand Hotel, Birmingham, a complimentary staff dinner was given to Mr. R. A. CHATTOCK, M.I.E.E., city electrical engineer, to commemorate his election as President of the Institution of Electrical Engineers. Those present included the Lord Mayor of Birmingham, the Town Clerk, Sir David Brooks, Councillor

Beale, chairman of the Electric Supply Committee, Alderman Burman, M.P., Alderman Jephcott, M.P., and other members of the Electric Supply Committee, and over 160 members of the staff, including ladies. The secretary of the department, Mr. E. J. Jennings, Assoc. I.E.E., who was in the chair, referred to the remarkable growth of the department and said that they were out to give a great public service at as low a cost as possible. He referred to the output and other records which were constantly being broken, and he paid a tribute to Mr. Chattock as a distinguished electrical engineer, as a departmental administrator, and as an impartial and tactful chief. Mr. Frank Forrest, M.I.E.E., M.I.M.E., chief assistant electrical engineer, who proposed the toast "Our Guest," said that it was a source of great pride to all engaged in electrical undertakings, particularly on the municipal side, to know that the great Institution of Electrical Engineers, with its 12,000 members, had come to Birmingham this year for its president. The Lord Mayor of Birmingham, in supporting the toast, spoke most appreciatively of Mr. Chattock's work in Birmingham, and gave statistics showing the continuous and abnormal growth of the undertaking under his guidance. Since 1903, when Mr. Chattock came to Birmingham, the gross revenue had increased from £67,278 to £1,250,000; the number of 60-watt lamps connected from 84,193 to 721,337; h.p. of motors connected from 1,175 to 216,558; capital expenditure from £588,323 to £5,621,657. During the same period £2,166,386 of borrowed capital had been repaid. He said they were proud to think that Birmingham had been honoured by sending the first municipal electrical engineer to act as President of the Institution of Electrical Engineers. Councillor Beale said that he did not think anyone had seen a greater development in a municipal trading department than had taken place in the Birmingham Electric Supply Department. Mr. Chattock had, by his exertions, erected a monument for himself which few electrical engineers could equal. He designed and carried out the Summer Lane generating station; he designed the Nechells station, and the Committee hoped that he would design and carry out the super-station at Hams Hall. The toast was received with musical honours, and Mr. Chattock, in reply, expressed his appreciation of the loyalty and co-operation of the staff. He valued the cordial relations existing between the Committee, management, staff and workmen. He fully recognised that no one could enjoy life unless he enjoyed his work. There had never been any deficit in the undertaking, despite the advance in capital outlay, and he did not think there would be, as the position of the department was now stronger than it ever had been. During the evening musical interludes were provided by members of the staff.

Obituary.—MR. E. PRICE.—The death occurred on October 25th, at the age of 74 years, of Mr. Edward Price, who was the first engineer-manager of the Portsmouth municipal electric lighting undertaking, a position he held from 1891 until his retirement in 1903.

MR. H. F. FOSTER.—The death is announced of Mr. H. F. Foster, who was for a number of years electrical engineer to the Epsom Urban Council, and subsequently went into business for himself.

SIGNOR A. NETTI.—The death recently occurred in Rome at the age of 56 years of Signor Aldo Netti, a well-known electrical engineer who was associated with many of the large electricity undertakings in Italy.

New Companies Registered.

Oco Electrical Appliances, Ltd. (209,246).—Private company. Registered October 26th. Capital, £3,000 in 2,000 ordinary shares of £1 each and 20,000 deferred shares of 1s. each. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, &c. The first directors are:—T. Halliday, 181, Rochdale Road, Oldham (director of T. Halliday, Ltd.); S. H. Johnson, 35, Brunswick Square, W.C., manufacturers' agent; W. H. Back, "Woodbury," 6, Maple Road, Leytonstone. Qualification, 1 ordinary share. Remuneration as fixed by the company. Solicitor: J. Wurzal, 68, Albion Street, Leeds. Registered office: Palace House, 128-132, Shaftesbury Avenue, W.1.

Robert J. Kidd & Co., Ltd. (209,255).—Private company. Registered October 26th. Capital, £1,000 in £1 shares (500 6 per cent. cumulative preference, free of income tax, and 500 ordinary). Objects: To acquire the business of X-ray specialists, and to give or assist in giving under medical supervision X-ray treatment in connection with maladies and diseases of all kinds, &c. The first directors are:—R. J. Kidd (permanent managing director), 5, Mabel Avenue, Great Lever, Bolton; W. A. Rowntree, 359, Green Lane, Bolton. Qualification, £200 shares. Remuneration, £12 each per annum.

British Resistor Co., Ltd. (209,287).—Private company. Registered October 28th. Capital, £1,000 in £1 shares. Objects: To act as representatives or agents for British or other firms in the electrical engineering and allied trades in connection with trade in the British and Colonial and other markets, to carry on business as mechanical, electrical, motor, agricultural, mining, metallurgical, chemical, railway and general engineers, merchants, factors, manufacturers, importers, and exporters of electrical and other machinery, &c. The permanent directors are:—A. Imbery, 14, St. Albans Avenue, Skircoat, Halifax, electrical engineer (managing director); D. Jones, 123, Parkinson Lane, Halifax, insurance inspector; A. Dobson, address not stated. Qualification, £100. Remuneration of directors (except managing director), £25 each per annum. Solicitors: A. Bastide, Elland and Briggate, Brighouse.

Foolprufe Patent Accumulator Co., Ltd. (209,216).—Private company. Registered October 24th. Capital, £1,000 in £1 shares. Objects: To carry on the business of designers, inventors, patentees, manufacturers and merchants of, agents for and dealers in accumulators, lamps, batteries, dynamos, magnetos, motors, power, heating and lighting plant and machinery, &c. The permanent directors are:—W. A. Millington, address not stated; E. A. Millington, Uplands, Lubenham Road, Market Harborough, coal merchant; G. F. Judd, Ashley, near Market Harborough, battery engineer. Secretary: J. Lees Smith, 32, The Square, Market Harborough. Solicitor: C. J. Crowther, 23, Abingdon Street, Westminster, S.W.

Cook-oo Manufacturing Co., Ltd. (209,286).—Privat company. Registered October 28th. Capital, £100 in £1 shares. Objects: T carry on the business of manufacturers of loud speakers for wireless apparatu and all of such parts and accessories in connection therewith, manufacture of and dealers in metals and minerals, electricians, engineers, &c. Th directors are:—E. A. Ellis, 10, Deauville Court, Clapham Park, S.W., gentleman; Mrs. F. Cooke, 8, Russell Road, Moseley, Birmingham. Solicitors A. T. Parker & Co., 105, Colmore Row, Birmingham. Registered office Heath Works, Heathfield Road, Kings Heath, Birmingham.

Official Returns of Electrical Companies.

Euradic Electric Co., Ltd.—Particulars filed of £1,00 debentures authorised October 15th, 1925, charged on the company's property present and future, including uncalled capital, the amount of the present issu being £300.

Belgravia Electrical Co., Ltd.—Debenture dated Octobe 20th, 1925, to secure £500, charged on the company's undertaking and pro perty, including uncalled capital. Holder: A. J. Marquand, 180, Albany Road Roath, Cardiff.

Efandem Co., Ltd.—Satisfaction in full on October 10th 1925, of debentures dated September 1st, 1914, securing £12,000.

National Signs, Ltd.—Satisfaction in full on Septembe 14th, 1925, of debenture dated December 18th, 1924, and mortgage date January 7th, 1925, securing £2,000.

Electro Pocket Cinemas, Ltd. — H. Chapman, of 171 High Street, Lowestoft, accountant, was appointed receiver on October 23rd under powers contained in debenture dated February 24th, 1925.

Lancaster and District Tramways Co., Ltd.—T. Atkinson, of 2a, Euston Road, Morecambe, was appointed receiver on October 7th 1925, under powers contained in mortgage debenture dated March 30th, 1900.

Imperial Tramways Co., Ltd. (58,981).—Return dated April 4th (filed August 28th), 1925. Capital, £400,000 in 20,000 preference and 20,000 ordinary shares of £10 each. All shares taken up. £100,000 paid on 10,000 preference. £300,000 considered as paid on the remainder. Mortgages and charges, £300,000.

Guy V. Laycock, Ltd. (173,770). — Return dated June 19th, 1925. Capital, £10,000 in £1 shares. 5,200 shares taken up. £1,200 paid. £4,000 considered as paid. Mortgages and charges, nil.

International Electric Co., Ltd. (113,906).—Return dated September 23rd, 1925. Capital, £51,000 in 31,000 ordinary and 20,000 preference shares of £1 each. 30,100 ordinary and 5,388 preference shares taken up. £32,488 paid on 27,100 ordinary and 5,388 preference shares. £3,000 considered as paid on 3,000 ordinary shares. Mortgages and charges, £70,500.

New Development Co., Ltd. (112,145). — Return dated July 14th, 1925. Capital, £5,000 in £1 shares. 1,275 shares taken up. £1,275 paid. Mortgages and charges, nil.

Young, Osmond & Young, Ltd.—Mortgage on 28, Broadway, Bexley Heath, Kent, dated October 20th, 1925, to secure £1,500. Holder: H. G. Weaver, 170, Coldharbour Road, Redland, Bristol.

Receptors, Ltd.—Issue on October 26th, 1925, of £700 debentures, part of a series already registered.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Montevideo Telephone Co., Ltd.

The annual meeting was held under the chairmanship of Viscount St. Davids on October 26th. In presenting the report and accounts (*vide* ELEC. REV., October 23rd, p. 669) the chairman said that the position of the company had gradually improved since the serious strike of 1922 and the subsequent legislation by the Uruguayan Government, which had reduced the dividend from 8 per cent., free of tax, to 5 per cent., less tax. During the past year the increase of business had necessitated a somewhat heavy capital expenditure; a number of new junction lines between the city and the "camp" had been built. Their investments had increased and the value of investments had appreciated. The gross revenue had increased by £11,000, and notwithstanding increased expenses in Montevideo, the decreases in other directions had raised the profit balance from £22,600 to £32,800. This enabled the directors to increase the dividend from 5 to 7 per cent. and to transfer a larger amount to reserve. The chairman concluded by paying a tribute to the work of the manager and his staff.

North Wales Power Co., Ltd.

Mr. K. M. Clark (chairman) presided at the annual meeting, on October 28th, and in the course of his speech said that there had been a satisfactory profit on the past year's working. After the deduction of debenture and loan interest and the addition of the sum brought forward, there remained an available balance of £20,205, out of which the full 8 per cent. was being paid on the preference shares, leaving £3,218 to be carried forward. The increase in the sales had been maintained; in 1924 the figure was 50 per cent. above that of the preceding year. Supplies were being afforded to most large towns on the coast, and it was expected that the supply to the Crewe works of the L.M.S. Railway would be commenced in a few weeks. Arrangements were also in hand and nearing completion by which supplies would be given to practically all the large centres of North Wales and South Cheshire which were at present without electricity. Most of the transmission lines had been completed and the remainder of the work was in progress. A double circuit h.p. transmission line had been erected between Crewe and the Mersey Power Co.'s works at Runcorn by which that station would

j the near future be linked up with the company's system. A important part of the scheme was the building of a new ad important water-power station at Maentwrog, Merionethsire. The contractors were actively engaged upon the work ed the foundations of the main dam had reached river level. Difficulties had been encountered owing to the rock formaon. Three smaller dams were also being constructed. The ute of the pipe line and conduit had been settled and work ad begun on two tunnels. Every endeavour was being made shorten the unproductive construction period, and when e work was finished it would benefit both the inhabitants of e district and the shareholders.

International Light and Power Co., Ltd.

The annual meeting was held on October 26th. Sir F. M. Voules, who presided, said that the company's ability to pay off so much of the preference dividend arrears was sufficient proof of its recovery after a period depression. The foreign exchange position was steady and the case of Brazil an improvement was shown. The reently-acquired undertaking of the South Brazilian Railways ompany was now yielding net revenue at the rate of £20,000 r annum, which was £7,000 in excess of all fixed charges curred in connection with the purchase. Certain improvements and extensions were being made. He was hopeful that e beneficial influence of the new President of the Mexican epublic would result in a return to prosperity of the Electric ght & Power Co. The unbroken record of growth and osperity had been continued by the Caracas undertaking, ad the electricity and tramway undertaking in Parana was eadily increasing its business.

Lisbon Electric Tramways, Ltd.

The annual meeting was held on October 28th, Mr. L. Breitmeyer presiding. In moving the adoption of the report and accounts (*vide* our last issue, p. 707) the hairman said that the affairs of the company showed conued improvement. The new arrangements under which the mpany was working were far more advantageous and would ve the company an opportunity of doing justice to the longffering shareholders. Although the number of passengers rried had been lower, there was an increase in the receipts. fter a long period it had been possible to pay off some of the rears of preference dividend, and he (the chairman) trusted at the company would be able to continue on the same road. was the intention of the company to pay the preference ividends as they fell due and to clear off the remainder of e arrears as soon as possible to enable the ordinary shareolders to receive some return on their holdings. Mr. Breitmeyer concluded his speech with a tribute to the services of e Lisbon local board and the general manager and his staff.

Aluminium Corporation, Ltd.

The report for the year ended December 31st, 1924, records a profit of £73,227, and after deducting debenture, &c., interest, and adding £6,323 from the last account, there is an available balance of £23,990, hich it is proposed to carry forward, although the amount sufficient to cover the payment of a preference dividend. he value of the company's lands, water rights and other ssets, has been appreciated by £60,035 in the balance sheet nd certain items in that account have been written off. The aluation is still below that placed upon the assets by surveyors engaged by the company. A joint of the new pipe line t Dalgarrog ruptured in November last, but the work of aking good the damage, the reconstruction of the pipe line, nd the completion of the low level dam and leet, together ith the new power house, has been completed, and the new achines were put into commission at the end of September. Work has also been commenced on a tunnel connecting Eigiau nd Cowlyd Lakes, which will greatly improve the Corporaion's storage facilities. The meeting was to be held on Wednesday last.

Erinoid, Ltd.

Presiding at the annual meeting on October 27th, the chairman (Mr. A. Binnie) said that the balance sheet submitted was the best since the formation of the company in 915. The profits had risen from £27,000 in 1924 to £49,000 ast year due to increased sales. The progressive increase was lue to the company's concentration on the production of the aw material, leaving other firms to work it into articles. The ulk of the sales were in England, but the company had a ood market in Central Europe in spite of severe competition. The French market was supplied by the French company, aided by a high import duty. The French company was in a prosperous condition and enjoyed a high reputation in France. The dividend which was being paid was well within the company's means and the cash reserves were maintained. It was intended to clear off the whole of the debenture debt as soon as possible.

Prospectus.

Gretna and District Electricity Supply Co., Ltd.—This company, which is being formed for the purpose of supplying electricity for public and private use within the counties of Dumfries and Cumberland, has issued a prospectus. The company has a nominal capital of £15,000, divided into 15,000 shares of £1 each, the whole of which is offered for subscription. It is proposed that the company should enter into an agreement with the Government to purchase the existing electricity plant at Gretna for £6,204. The provisional committee includes Mr. J. S. Wise, electrical engineer, 86, The Rand, Eastriggs. Mr. James Hutcheon, solicitor, 58, Annan Road, Gretna, is secretary.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159 :—

Pettigrew & Merriman (1925).—125,000 7½ per cent. cumulative preference shares of £1 each, 10s. paid, Nos. 1 to 125,000.

Electrical Distribution of Yorkshire.—250,000 new ordinary shares of £1 each, issued at £1 6s. per share, partly paid and fully paid, Nos. 250,001 to 500,000.

Application has been made to the Committee to allow the following to be officially quoted :—

Madras Electric Supply Corporation.—250,000 5½ per cent. preference shares (free of income tax) of £1 each, fully paid, Nos. 53,201 to 303,200 (cumulative).

Singapore Traction Co.—93,739 ordinary shares of £1 each, fully paid, Nos. 1 to 93,739; and 152,890 7 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 152,890.

Southern Brazil Electric Co., Ltd.—A loss of £20,861 was incurred during the past year, representing mainly debenture interest charged in the accounts but paid after the close of the year. The interest payments are now only six months in arrear, and the debt due to the Inland Revenue has been reduced by £10,000. The earnings of the company's subsidiaries showed a satisfactory increase, but certain capital expenditure has to be incurred in conformity with the terms of concessions. During the current year the progress has been maintained. The meeting was to be held on Wednesday last.

Mann, Egerton & Co., Ltd.—A meeting was to be held on Tuesday last for the purpose of considering proposals to reduce the company's capital from £400,000 to £370,925 by cancelling 9s. per share; and to pay off arrears on the 8 per cent. preference shares from January 1st, 1922, to September 30th, 1924, by the issue of 6 per cent. funding certificates, the dividend on the preference shares to be cumulative only as to 6 per cent.

Alabama Traction, Light and Power Co., Ltd.—The proposal to exchange the company's 5 per cent. first mortgage 50-year gold bonds for 6 per cent. gold debentures, series "A," due 2025, of the South-Eastern Power & Light Co., with rights to subscribe for that company's common stock, was approved at a meeting held in Montreal on October 7th.

Missouri Power & Light Co.—The whole of the company's first mortgage and refunding general lien sinking fund series "A" 7 per cent. and series "B" 6½ per cent. bonds, due 1943, are to be redeemed on December 1st at 105 and accrued interest.

Ever-Ready (Great Britain), Ltd.—Interim dividends at the rate of 10 per cent. on the old preference and ordinary shares, and of 4d. per share on the new preference shares have been declared.

Swedish Company.—The report of the *Allmanna Telefon Aktiebolag L. M. Ericsson*, of Stockholm, for the last financial year shows a net profit of 2,040,000 kr., as compared with 2,060,000 kr. in the preceding twelve months. A dividend of 2½ per cent. is being declared. The report states that owing to increasing import duties it has been found necessary to establish affiliated companies in different countries. There are now Ericsson telephone works in England, Austria, Hungary, Holland, France, Poland, Mexico, Finland, Argentina, Spain, and Italy.

French Companies.—*La Compagnie Française des Câbles Télégraphiques*, of Paris, reports a net profit of 6,037,929 fr. for the last financial year as compared with 5,446,379 fr. in the preceding twelve months.

The report of the *Société Electro-Métallurgique de Dives* for the year ended June 30th last shows a net profit of 9,055,252 fr., as compared with only 5,535,631 fr. in the preceding year.

Belgian Company.—The *Société de Câbles et Corderies du Hainaut*, of Eupen, reports a net profit of 1,059,853 fr. for the last financial year. The directors state that during the year considerable extensions were made to the cable section of the works.

Italian Companies.—*La Società Ligure-Toscana d'Elettricità* is increasing its capital from 125 to 175 million lire. The *Società Elettrica del Valdarno*, which is acquiring an interest in the gas undertaking in Rome, also proposes to increase its capital from 80 to 150 million lire.

Fuller's United Electric Works, Ltd.—A meeting of the holders of income debenture stock was to be held yesterday to approve of the appointment of Sir W. H. Peat as a trustee in place of Brig.-Gen. H. A. Jones, the retiring trustee.

Aron Electricity Meter, Ltd.—An interim dividend of 3 per cent. actual has been declared on the 6 per cent. preference shares.

City of Buenos Aires Tramways (1904), Ltd.—A dividend at the rate of 5 per cent. has been declared in respect of the September quarter.

Isle of Wight Electric Light and Power Co., Ltd.—An interim dividend of 4 per cent., free of tax, has been declared on the ordinary shares as in 1924.

Calcutta Tramways Co., Ltd.—An interim dividend of 4 per cent., free of tax, has been declared on the ordinary shares, as last year.

Stocks and Shares.

Monday Evening.

Although to-day, Monday, is by century of tradition, a Stock Exchange holiday, many Stock Exchange offices have been fully staffed by partners and clerks glad (in their due proportions) to have the opportunity, afforded by a few quiet hours, for dealing with the work caused by busy markets and strenuous times. The tides of Stock Exchange activity roll rather capriciously. Some men have more business than they can comfortably handle: others could redouble their energies and still escape overwork. Each market in turn receives, however, its due meed of attention. Brokers, dealing in all the markets, are mostly busy all the time.

General recovery in steam railway stocks followed the intimation that the railwaymen do not intend to be swung at the tail of a tribe of turbulent agitators whose avowed object is to create trouble. The Undergrounds, however, are inclined to be lower: Districts and Metropolitans have both gone back. Lord Ashfield has been indicating the extraordinary way in which the Undergrounds have spread, physically and financially, within the last 25 years. The amount of capital employed, he said, in 1900 was fifteen million pounds in underground railways, in omnibuses and in trams: to-day, it reaches eight times that sum. Mileage on the Underground Railway has more than doubled, rising from 35 to 78. Lord Ashfield suggested that the extensions now in hand might prove to be the end of the present programme.

The same speaker, presiding at the recent meeting of shareholders in the United of Havana Railways, mentioned that the company owns a steam railway and an electric railway, while it also supplies electricity for power and lighting. An American group of capitalists has been trying, according to correctly-informed rumour, to acquire at any rate part of the United of Havana Railways' undertaking. The market price of the stock has been steadily rising for some time past by reason of purchases said to be made on this account. Calcutta Tramways shares are unchanged at 25s. 6d.; the interim dividend of 4 per cent. tax-free, is the same as that of a year ago.

British Columbia Electric Railway stocks are strong, the deferred being 4 higher at 118½, the preferred, at 78½, having gained a point. Brazilian Tractions reacted to 80; the 6 per cent. preference keep hard at 100. Anglo-Argentine first preference regained their small loss of last week, and Mexican issues have been uninteresting.

Edison Swan 5 per cent. first debenture is 3½ higher at 84, by way of reflection of the recent jump in the price of the ordinary shares. The company's 5½ per cent. second debenture stands at 78½ and the 7½ per cent. first preference shares at 22s. The ordinary retain their big rise at 9s. 3d. Manufacturing shares are again very firm, and shares are difficult to buy. Brush have stiffened to 24s. 6d. English Electric ordinary and preference are 6d. better in each case. Cables are good, too, Henleys at 3 7/16 being ⅛ up, and Callenders equally better at 3⅜. India-Rubbers are a florin higher at 1⅛. On the other hand, Johnson & Phillips lost 1s. after their previous big advance.

Globe Telegraph ordinary have improved to 18, Western Telegraphs to 17, and Eastern Extensions to 17¾. Indo-Europeans are down a sovereign, to 43½. The telephone shares hold their strength. United River Plates at 7 7/16 have gained 1/16 and the new shares are close to 46s. premium. Those who have the right to apply for the latter should see to it that they do not let slip the fine bonus offered to proprietors by the new issue.

Marconis drooped to 27s. 6d., Canadian Marconis to 6s. 10½d. The Radio Corporation of America reports, for the second consecutive quarter, a deficit that is thought to be due to rate cutting, and a smaller demand for radio sets. Burndept shares, still in request from America, have continued to harden, the shilling deferred shares being 5s. 6d. United States capital is now turning towards some of the British motor companies in its search for profitable employment. Possibly the Americans do not feel flattered at the reception accorded to their overtures for introducing United States capital into well-known electricity supply companies that operate on this side.

The list of prices in the London group is very quiet. London Electric preference strengthened to 5⅝. Elsewhere, sixpenny gains have been secured by Newcastle-on-Tyne ordinary and North Metropolitan preference. Lancashires remain at 25s. 6d.; the new issue of shares will be made, it is expected, almost at once. The iron and steel market is fairly good. Babcock & Wilcox have risen to 53s. Interest in rubber shares remains at a high level, though not so high as that of a month ago. Prices are good in all sections of the market. A hint may be dropped as to the advisability of using keen discrimination when applying for shares in new rubber companies.

Share List of Electrical Companies

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Nov. 2. 1925.	Rise or fall.	Yield p.c.
Home Electricity Companies.						
Bournemouth and Poole	1	13	14	2 15/16	—	4 15 4
Brompton Ordinary	1	10	10	1½	—	*5 14 3
Charing Cross Ordinary	1	14½	15	50/-	—	6 2 5
do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	1⅞	—	6 8 0
City of London	1	15	15	47/-	—	6 7 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	27/6	—	5 16 4
County of London	1	15	15	57/-	—	5 5 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12⅝	—	5 16 8
Lancs. Light and Power	1	7½	7½	25/6	—	5 17 8
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5⅝	+ ⅛	5 6 8
Metropolitan	1	10	11	38/6	—	5 14 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/3	—	5 7 10
Newcastle-on-Tyne Ordinary	1	6	7	22/6	+6d.	6 4 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/6	+6d.	5 6 8
St. James' and Pall Mall	5	17½	17½	14¼	—	5 17 8
South London	1	15	15	2 9/16	—	5 17 1
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	18/9xd	—	6 8 1
Westminster Ordinary	1	15	15	44/6	—	6 14 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6
Home Rails.						
Central London Ord. Assented Stock	4	4		67	—	5 19 5
Metropolitan	4	5		70	—1	7 2 10
do. District	8½	8½		46	—1	7 12 1
Underground Electric Ordinary	10	Nil	Nil	2¼	— ⅛	Nil
do. do. "A"	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds	6	6		97	—	*6 3 9
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref. Stock	6	6		102	—	5 17 8
do. Def.	1½	1½		24½	—	6 3 9
Automatic Telephone	1	8	6	47/6	—	2 10 7
Chili Telephone	5	6	5	6 5/16	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6⅜	—	7 8 2
Eastern Extension	10	10	10	17⅜	+ ¼	*5 12 8
Eastern Tel. Ord. Stock	10	10		174½	—	*5 14 7
Globe Tel. and T. Ord.	10	10	10	18	+ ¼	*5 11 1
do. do. Pref.	10	6	6	11	—	5 8 1
Great Northern Tel.	10	22	22	35	—	6 5 9
Indo-European	25	7	8½	43½	—1	*4 17 8
Marconi	1	10	10	1⅝	— 1/16	7 5 6
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord.	1	12	12	2⅜	—	*5 13 4
United R. Plate Tel.	5	8	8	7 7/16	+ 1/16	5 7 6
Western Telegraph	10	10	10	17	+ ¼	*5 17 8
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3⅜	+ 1/16	8 3 0
do. do. 2nd Pref.	5	6	6	3⅜	—	8 17 10
do. do. 5% Deb. Stock	5	5		78½	+1	6 7 5
British Electric Traction Ord.	6	6		123½	+1	4 17 2
do. do. 6% Pref.	6	6		107	—	5 12 2
Brazil Traction	100	4	4	80	—1	5 0 0
Brit. Columbia Elec. Rly. Pcc. Stock	5	5		89½	—	5 11 9
do. do. Preferred	96/-	96/-		96½	+3	*4 19 6
do. do. Deferred	129/5	129/5		118½	+4	*5 9 0
do. do. Deb.	4½	4½		77½	—	5 9 8
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb. Stock	4	4		42½	—	9 8
Mexico Trams, 5% Bonds	—	5	5	63½	—	7 17 6
Mexican Light Common	100	Nil	Nil	32	—	Nil
do. Pref.	100	Nil	Nil	63½	—	Nil
do. 1st Bonds	—	5	5	70½	+1	7 1 11
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8
Manufacturing Companies.						
Babcock & Wilcox	1	12	12	53/-	+6d.	*4 10 5
British Aluminium Ord.	1	5	10	1⅞	—	5 6 8
British Elec. Transformer Pref.	1	Nil	7	1	—	...
British Insulated Ord.	1	15	15	8½	—	4 0 0
Brush Ord.	1	10	10	24/6	+9d.	8 3 5
Callenders	1	15	15	3⅜	+2/6	4 9 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅜	—	...
Edison-Swan	4/-	10	10	9/3	—	5 6 8
do. 5% Deb. Stock	5	5		84	+3½	5 19 1
Electric Construction	1	10	10	17 1/16	+ 1/16	5 18 6
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	18/9	+6d.	5 6 8
do. do. Pref.	1	6	6	20/6	+ 6d.	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	28/-	—	5 3 5
Henley	1	15	16	3 1/16	+ ⅛	4 10 5
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1⅜	+2/-	*4 9 0
Johnson & Phillips	1	10	10	5⅝/9	—1/-	3 14 4
Met-Vickers, Ord.	1	8	8	24/4	+6d.	6 10 8
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	32/-	—	4 13 9
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

The Institution of Electrical Engineers.

Inaugural Address by R. A. CHATTOCK, President I.E.E. *(Abstract).*

(Concluded from page 693.)

From articles that have appeared in the Press it is fairly clear that the Report of the Committee set up by the Government will propose to change over to 50 periods those districts in the country that are being supplied with alternating current of periodicities other than 50. It appears that the proposal is designed: (1) to make it possible to exchange current between districts by means of large-capacity trunk lines linking them together; (2) to reduce the range of apparatus that now has to be manufactured and stocked, and so cheapen the purchase price of all electrical apparatus; and (3) to do away with the necessity of converting alternating current to direct current for general distribution.

Considering (1) first, trunk lines for this purpose would require to have a capacity of at least 20,000 kW, and run at a voltage not less than 110,000 between phases. The length of the lines required to connect up all large centres of supply would be roughly 1,900 miles, and the cost would amount to approximately £5,700,000.

It is obvious that the bulk of the supply in each district must be derived from stations on the spot, as the loss in transmission over 50 or 100 miles would cancel out any problematical saving that might be effected through better natural facilities. Such stations having high economy of operation are coming into existence, and it is becoming apparent that each district can economically serve itself and provide its own stand-by plant without any necessity for drawing supplies from other districts at such an enormous capital cost.

By all means link up the individual stations in each district, at a fraction of the cost of linking-up nationally, and take advantage of the high economy of operation of the best station in each district at times of light load.

It has been stated that such trunk lines will open up the rural districts throughout the country. It is, I think, obvious that such large-capacity lines cannot be safely tapped except at well-defined centres, and that the opening-up of rural districts must depend upon a network of thin overhead lines radiating from the large centres of supply. The rural demand can never justify a heavy expenditure on distribution, and the greatest care and economy will have to be used in designing such distributing systems.

Turning now to (2), there should be an average saving of 15 per cent. in the cost of 50-period electrical apparatus, such as generators, motors, and transformers, over 25-period apparatus. This is to some extent counteracted by the higher speed at which 50-period motors run, necessitating speed-reduction gear. 50-period induction motors also create a lower power factor on the system, the difference being about 5 per cent., and this curtails the carrying capacity of the distributing mains and necessitates the installation of larger transformers. There does not therefore appear to be much real advantage in this claim.

As regards (3), it is admitted that there is a very slight flicker noticeable on the lights when supplied with low-tension 25-period current. This can, however, be largely eliminated by suitable shading in living rooms, and it is only in these that there can be any reasonable objection raised. In factories and business premises, and even in drawing offices, it is being very largely used without any inconvenience.

In most large towns direct-current distribution is already in existence, and the recent development of the mercury-arc rectifier, whilst being admittedly rather more expensive than a.c. transformer distribution, has solved the problem of the high cost of rotary-converter sub-stations and the necessity of employing labour to run them for supplying outlying residential districts.

It must be admitted that direct current is safer than alternating current for domestic apparatus, and now that this apparatus is coming into such general use this point should receive careful consideration.

If railway electrification becomes general in this country—and there is strong evidence that this is coming in the near future—it seems certain that direct current at a pressure of 1,500 volts will become standard. This is being largely adopted on the Continent, and military considerations will probably weigh heavily in the matter. If so, rotary converters or mercury-arc rectifiers will probably be used, and for these 25-period current is far preferable to 50-period. We must not forget that we want the railway load to improve the load factor and reduce the cost of supply.

Let us now consider the probable cost of such a change. It would be necessary to replace the whole of the a.c. apparatus with new 50-period plant, not only that belonging to the supply undertakings, but also that installed on consumers' premises. It is estimated that about 25 per cent. of the electrical plant installed in the country is other than 50-period plant.

I have made a close estimate of the capacity of the a.c. plant that would have to be replaced in the Birmingham area. This amounts to 486,870 kW belonging to the undertaking, and 337,350 kW belonging to its consumers. Total, 824,220 kW.

The cost of this at £3 10s. per kW would be £2,880,000.

Allowing scrap value for the old plant of 6¼ per cent., because there would be no market for it, it would realise £180,000.

The net cost of replacement would therefore be £2,700,000.

There would be other costs, such as the provision of duplicate mains and switchgear to make the change-over possible, the salaries of a considerable staff, compensation for interference with consumers' business, &c., which I have estimated at £4,000,000.

The total estimated cost for Birmingham would therefore be £6,700,000.

Applying this estimate to the rest of the areas in the country using periodicities other than 50, we get a figure for the country of approximately £27,000,000.

Can such a colossal expenditure be justified, for the reasons I have indicated above—reasons which, as I have shown, will not really bear investigation?

If the Government wants to develop the electrical industry and to cheapen the cost of supply, it would be far more profitable to spend the money on improving the load factors throughout the country. This could be done by electrifying the railways and equipping the coal mines with complete electrical plant for getting the coal and pumping and ventilating the mines. Expenditure of this kind would prove to be remunerative, and could be regarded as a compulsory loan to cheapen and foster what are, after all, public utility services.

The United States of America is frequently held up as an example to be followed. They run two frequencies in America—25 periods and 60 periods—and they are not contemplating changing over one of these to the other. Let us therefore take a leaf out of their book and leave well alone.

A development that has recently been introduced in Birmingham has had the effect of relieving the ordinary direct-current three-wire network and its system of feeders. I refer to the arrangement that is now made to couple small power consumers to the extra-high-tension three-phase system. Hitherto this system, which is supplied at a pressure of 5,000 volts between phases, has been confined to consumers who have at least 100 h.p. installed, as each service entailed the use of three oil-switch panels for controlling the incoming and outgoing cables and the supply to the consumer. A special type of service connection has now been developed at a very much reduced cost, which makes it possible to supply power consumers whose demand is only 30 h.p. and upwards, the only difference between this and the larger consumer's service being that the connection is teed off the main instead of being looped in and out, so that there is no alternative source of supply. This is, however, only comparable with the ordinary power consumer off the d.c. network. It is found that this arrangement is likely to have a very beneficial effect upon the cost of distribution generally.

I am frequently asked by parents what kind of training I should recommend to fit boys for the engineering profession. As a broad principle, I think that a boy should enter a technical college when he leaves school. He should spend not less than three years at college, and should endeavour to obtain some engineering degree. The necessity for demonstrating that he has a good general education as well as a thorough technical education is very important, as he will find that after he has passed through the junior stages of his career, which of course chiefly require technical knowledge, he will have to undertake duties of a managerial nature, which require a more general knowledge and the power to conduct correspondence with lucidity. This can only come easily to a man who has had a good general education, who is conversant with literature, and who is able to convey his ideas with conciseness.

After finishing his technical course at college, he should spend at least two years in some large engineering works.

When his training is completed, the boy should be about 21 years of age, and should be capable of taking a position as junior engineer in any electric supply undertaking. His advancement from this position to higher positions must depend largely upon his own ability.

It is interesting to note that the Electrical Power Engineers' Association is arranging for those of its members who have passed a certain standard to be allowed to call themselves "qualified electrical engineers." Before they become so qualified, they must have had a certain number of years' experience in supply undertakings of a certain size, and they must have passed the Examination required for Associate Membership of this Institution or some examination equivalent to it. I think that this is a very valuable step in the right direction, in that it will tend to ensure that engineers of supply undertakings can demonstrate that they have been properly trained.

In my own undertaking it has been the rule for some years that engineers who have not passed the A.M.I.E.E. examination or its equivalent cannot rise higher in the technical staff than a certain grade, and those men who do not so fit themselves will find in a few years that younger men will be passing over their heads. In the case of old servants, a certain amount of latitude should be allowed as long as there is proper willingness and endeavour on the part of the individual to fall in with this very necessary requirement.

I should like to take this opportunity of urging those controlling not only electricity supply undertakings but also manu-

facturing concerns, to consider very carefully whether it would not be to the ultimate benefit, both of their own undertakings and of the industry as a whole, to make it compulsory that men on the technical staff should pass a certain standard. The necessity for this is clearly demonstrated by the fact that when one advertises for a technical assistant, out of the 150 to 200 applications that are received, only about 20 per cent. are of any real use. The rest, whilst they have had some experience, are generally either limited in such a way that they can be trusted to handle only one particular section of the work, or they are obviously unfitted for even as much as that.

If all employers had required a certain standard, men of this kind would never have got as far as they have, and the material available to be drawn upon, while being less in quantity, would be greatly improved in quality.

In conclusion, there appear to be two main points to which supply engineers should give special attention. I refer to improving the load factors of our undertakings, which have to all intents and purposes stood still for so long; and to decreasing the cost of distribution, which has recently tended to increase and to counteract the economies that are being practised in other directions.

A Survey of the Fields of Electrical Progress.

By J. P. THOMPSON.

(*Abstract of the Chairman's Address;* Dundee Sub-Centre *of the* Institution of Electrical Engineers.)

The duties of those engaged in electrical work are varied and complex. It is therefore natural that men should find themselves gradually specialising in one branch or department and, in fact, it would be quite impossible for the average individual, at any rate, to be an expert in every department of electrical development. Electricity is rendering, in a multitude of ways, great service to man. This service will go on increasing, and as electrical engineers we should endeavour to develop the spirit of service. We cannot cultivate the idea of service to any great extent without becoming enthusiastic in our work, and all electrical engineers should be enthusiasts. Enthusiasm run wild may, however, be dangerous. The man who insists that electricity should be used for every cooking, transport or hot water supply problem, without thoroughly going into the details of the case, may easily do harm. There are questions to be considered, such as the capital cost of the apparatus and the cost of altering existing arrangements, &c., and these may, for the time being, render a scheme impracticable.

The public cannot, I think, know too much about electricity, and in this connection the Electrical Development Association is carrying on very excellent educational work in bringing to the public notice the uses and advantages of electricity supply. The country, as a whole, is passing through a period of serious trade depression and it is encouraging to note that, while such is the case, the output of the electricity stations for the year ended March 31st, 1925, showed an increase of some 734 million kWh compared with the previous year. This is an increase of 11 per cent., but the fuel used increased by only 5.8 per cent., showing that the thermal efficiency is improving.

The problem for the country is to obtain reliable supplies of power at as low a cost as possible. For works making a large demand for both power and steam, where a case can really be made out for generation on the spot in place of purchasing power, I think the provision by the supply undertaking of suitable plant on or close to the consumer's works, coupled with a connection to the main cable system, would reduce the total amount of generating plant required and at the same time afford the most reliable supply at the minimum cost.

The demand for power purposes will, of course, not remain stationary, and certainly no one wishes that it should, but I want to bring out the tremendous possibilities being opened up by the domestic load. There seems no reason why the sale of energy to this class of consumer should not increase much more than ten-fold. While, according to the return of the Electricity Commissioners for 1920 to 1923, the sales for lighting and domestic uses and for power purposes represented respectively 19 per cent. and 68 per cent. of the total, the revenue was in each case approximately 42 per cent. of the total. A ten-fold increase in sales for domestic purposes would probably increase the revenue approximately three-fold. This perhaps is the reason why some engineers seem to fight rather shy of pushing the domestic load, apparently fearing that the whole of their cable system will quickly become loaded up and that in no time they will find themselves in all sorts of difficulties. But why not load up cables? Which is the better, a factory making a demand on the station of 100 kW, or a considerable number of houses providing a combined load on the station of the same amount? Such a factory working 44 hours per week might possibly take 220,000 kWh per annum, and this would be possible only on a load factor of 100 per cent. Take, now, 100 houses, each using 200 kWh for lighting and assume an increase in consumption of 180,000 kWh for domestic uses. The maximum load on the station for this output of 180,000 kWh for domestic purposes would, however, due to the better load factor of that class of load, be less than 100 kW and probably not more than 68 kW. While the load factor of the individual domestic installation is low, the diversity factor comes to the rescue to such an extent that the load factor on the station in respect of supplies for domestic purposes other than lighting is considerably higher than that from supplies to factories and other concerns working the ordinary day hours only.

So far, then, as the cost of generation, transmission to substations and transformation is concerned, current for domestic supplies can be delivered at the low-pressure terminals of the sub-station transformers more cheaply than for factory supplies. The only additional cost, therefore, of supplying energy for domestic purposes from the low-pressure distribution mains compared with supplying energy to a factory from a sub-station in the factory, is that in respect of the outlay in providing additional copper in the distribution mains. The interest and other charges on such additional outlay is certainly more than provided for by the revenue received from the sale of 50 per cent. more current than would be taken by the factory for the same loading on the station plant, transmission cables and transformers. It would appear, therefore, sound practice not to cut down too much the copper in new low-pressure distribution mains, especially as such additional copper is generally obtained at comparatively little extra cost. The problem may be considerably simplified by having transforming sub-stations placed at frequent intervals. This allows a fuller use to be made of the copper in the low-pressure mains without undue voltage drop. For purely residential districts and thinly populated areas it would seem desirable to adopt a higher pressure, say, 3,000 volts, for the distribution mains, using transformers for each house or for groups of houses as required, and in this way ultimately limiting the low-pressure distribution cables fed from each transformer to, say, not more than a few hundred yards in length. It would seem unnecessary to provide any switch or fuse gear on the 3,000-volt side of these transformers, and the transformers would simply form part of the cable system. The space taken up by a transformer of, say, 100 kW, arranged in this way is very small and should easily be arranged for.

Supply engineers are apt sometimes to look upon installation work as a job that any fool can tackle. That is not my own view, and I think there is a large scope in the contracting business for good engineers. Unless premises are wired, the supply undertakings cannot sell energy, and it is the business of contractors to wire premises. Supply undertakings should, therefore, welcome every application brought in by contractors and should give contractors, especially the smaller firms just starting business, all the assistance possible. On the other hand, contractors should see to it that only sound jobs are carried out, as otherwise they will bring discredit, not only on themselves, but on the whole industry, and retard the rate of development. There is no doubt that but for the high cost of wiring, new consumers of electricity would be secured at a very rapid rate. To reduce the cost of wiring by using inferior material and rough workmanship will not help matters. Is there no other way of reducing installation costs? Any method of providing satisfactory installations at less cost would undoubtedly secure increased business for contractors and supply undertakings both. There would still remain, however, the difficulty of the tenant occupier, and some system of assisted hire purchase or free wiring, call it what you will, seems necessary in order to deal with a very large proportion of the at present unwired premises. Even now the supply undertaking takes the risk of putting down power stations, transmission cables, sub-stations, distribution mains, service lines, and meters. Why not carry on a stage further and wire up to the actual lamp or other current-consuming device, and by so doing secure more consumers per unit length of distribution main?

As one kWh has a fixed heat value, all electric fires have, in one sense, an equal efficiency of 100 per cent. What may, however, be called the effective efficiency, varies very considerably, and it is always necessary when advising on the use of electric heating, to try and figure out what exactly is the duty required of the heater, otherwise the best results cannot be expected. In this connection it is well to remember that the best condition for working is to have warm feet and a cool head. For example, a small amount of heat applied under a desk or table from, say, a 250-watt fire, will frequently give better results than a 2,000-watt fire placed in the wrong corner of the room. The heating of water offers some very interesting problems, and while it may be difficult to see how electricity can compete in cost with coal or coke for heating large quantities of water, there are many cases where the matter is not nearly so hopeless as may appear at first sight. The very high efficiency of the apparatus, the ease with which the water may be heated at points of use and the absence of all labour, fumes, dust, &c., are frequently sufficient to turn the scale

ntirely in favour of electricity. Water heating also opens up ossibilities of securing a considerable load at a steady rate ver the 24 hours of each day. The battery vehicle does not eem to make the progress in this country one would have xpected. We all know the dislike many engineers have for torage batteries, a dislike brought about, in many cases, I elieve, by installing a battery for a certain purpose nd using it for duties for which it was never intended. We hould, however, be just, and in such cases it is hardly fair o blame the battery.

The trolley 'bus is being tried in a number of districts and ne would like to see this type of vehicle proving successful; n certain districts, given definite routes of suitable mile-ge, one would imagine that the battery vehicles even might lso find a place. With batteries suitably arranged for quick xchange at a depôt, these vehicles would appear to possess ertain advantages over petrol vehicles, in addition to providing profitable load for the supply undertaking. And why not use ome of the country's coal for this purpose instead of import-ng petrol? The surface of our roadways generally is being teadily improved, and I really think we should give more ttention to the use of battery vehicles in transport problems han we have perhaps done in the past, and I hope we shall oon become more familiar with the appearance of such vehicles n our streets.

I am glad to notice that the supply of electricity o farms is receiving increasing attention. Where 6,600-olt or 11,000-volt lines or cables exist there is no difficulty n giving a supply from them. In my own area a supply is t present given to some 50 farms and I know how greatly the dvantages are appreciated by the farmers. There is no doubt bout the advantages arising from a supply of power "on ap" at the farm, and it is, I think, up to us to see that elec-ricity is brought within reach of as many farms as possible, nd in the interests of the country we cannot do this too soon. 'or purely farming and rural areas, I think, it is likely that ome cheap form of distribution, for the most part overhead, t a pressure of about 3,000 volts, will be found the most suit-ble all round.

We still hear a good deal about "cheap and abundant sup-lies of electricity"—a rather unfortunate phrase, I think, and ne that is apt to do more harm than good. The price of elec-ricity in this country is not high and is certainly not respon-ible for trade depression. It is questionable if many indus-ries finding it difficult, in these days, to make ends meet, would be appreciably better off if supplied with electricity free. The price of electricity for various uses should very largely e regulated by the cost of the alternative methods of obtaining he power, light, or heat required.

The Buenos Aires Transport System.

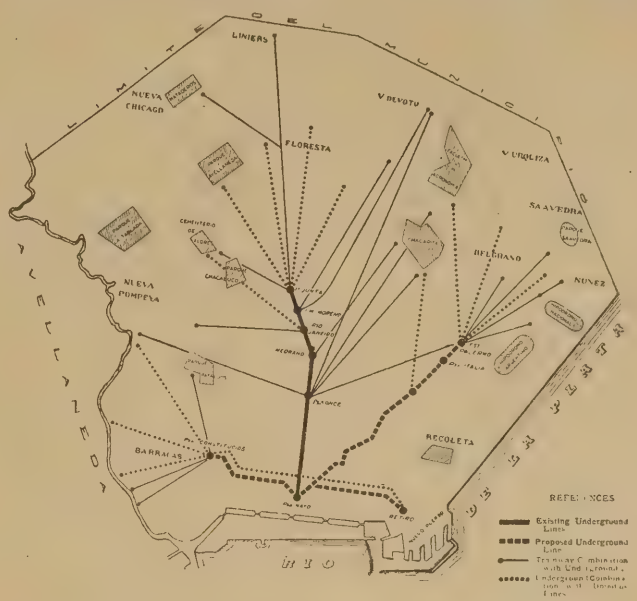
The Anglo-Argentine Tramways Company's Plan.

The accompanying map, for which, together with the descrip-ive notes, we are indebted to the *Review of the River Plate*, nakes clear the traffic arrangements in Buenos Aires so far as he Anglo-Argentine Tramways Co., Ltd., is concerned. The otes are based on a report by the general manager of the ompany (M. Marcel Rongé) to the municipal authority.

In Buenos Aires the communication between the centre of he city and the outer areas is becoming daily more difficult nd slower. This is due to the fact that the centre of activity quite a small area) does not coincide with the geographical entre; the narrowness of the streets in the centre of activity; nd the absence of an efficient traffic-regulating scheme. lthough the tramways contribute to the congestion it is con-idered that upon the whole they have helped to make the rouble less acute owing to their large carrying capacity in elation to their bulk. The company realises, however, that he best means of dealing with the problem is by means of ubways which combine the advantages of capacity, velocity nd commodity. The surveys effected by the company have ed to the conclusion that the construction of an underground ine in a north-south direction between Retiro and Constitu-ion, linking up the centre of the city with the great terminal tations of the Central Argentine, Cordoba Central, Pacific, nd Great Southern Railways and these stations with each ther, would play a part of the first importance in the sum otal of the measures designed to alleviate the traffic intensity f the central streets. This underground line, which would ross the zone of the greatest activity beneath the streets of Chacabuco-Maipú, combining with the line to Plaza Italia at trans-shipping station at the junction in the Avenida Presi-lente Roque Saenz Peña, and would likewise be in communi-ation by means of a tunnel with the Perú station of the exist-ng subway, would tend to facilitate the circulation in those streets within the central zone which run from north to south, nd would afford to the public constantly arriving by the rail-ways mentioned a rapid and comfortable means of transport to their places of daily occupation.

The company has also recognised the convenience to the ublic of the construction of a third underground line connect-ng the centre of the city with the densely populated zones n the north-west—Belgrano and neighbourhood. The connection f the three lines has been planned in such a manner that passengers who so desire can pass from one line to another at any of the trans-shipping stations without having to go above ground. The Anglo-Argentine Tramways Co. proposes as a result of the alleviation of the intensity of the surface traffic to reduce the circulation upon certain lines and to totally abandon others in the streets with the densest traffic. On one route, to avoid inconvenience to the public, an omnibus service will take the place of the tramway. To effect distribution of passengers from the subway termini a number of omnibus services will be organised as shown on the map.

In the opinion of the company, this plan, which takes account of the requirements for some years ahead, and would



The Buenos Aires Transport System—Existing and Projected.

add to the already vast transport system of the city 22 km. of underground lines and 180 km. of omnibus routes at a capital cost of $130,000,000 m/n, is at once methodical and progressive and permits of all the extensions which the future growth of this great capital may render desirable or necessary.

An expert committee appointed by the Buenos Aires Municipal Council to study the scheme has advised the Council to adopt it. This committee also proposed a new tariff of fares on the various parts of the Anglo-Argentine Tramway Company's system.

Conditions in Austria.

Power and Railway Developments.

The Commercial Secretary of the British Legation at Vienna (Mr. O. S. Phillpotts) has forwarded a report upon commercial and financial conditions in Austria* to the Department of Overseas Trade.

In his introduction to the report, Mr. Phillpotts says that the period of inflation, followed by one of severe industrial depression, is now passing, although industry and trade are still more or less in a condition of stagnation. Meanwhile the important results of the reconstruction scheme, the stabilisation of the currency, and the practical elimination of the deficit in the State finances, have not been affected. These would not in themselves be sufficient if the general economy of the country—the relation of production to consumption—were unsound, but they form the indispensable basis for any permanent solution of Austria's problems.

As happens in other countries after a period of inflation and a speculative boom, the general conditions of credit in Austria have been extremely bad since early in 1924. Creditors, both domestic and foreign, have had great difficulty in collecting payments, and there has been a regular epidemic of insolvencies. This has not only affected numerous new firms started to take advantage of the inflation period, but firms of older standing, too, have got into difficulties. The general shortage of capital and the high rate of loan interest is proving fatal to many concerns.

Trade and Industry.

A new tariff was put into force at the beginning of the current year; rates are in most cases higher, in many cases much higher, than those that have hitherto been in force, but they are, however, still considerably lower, generally speaking, than those in neighbouring countries. The import of certain British goods, including radio apparatus, will be affected by the increased duties. The Commercial and Shipping Treaty between this country and Austria was finally ratified in February last, and this should aid in the return to the pre-war trade conditions between the two countries. Commercial treaties have also been negotiated with Czecho-Slovakia, Germany, and France. Industrial depression and

* Stationery Office. 1s. 6d. net.

unemployment have been very prevalent of late (the report is revised up to August, 1925), but the iron and steel industry shows an improvement. Production in the first quarter of the current year was considerably greater than in the latter part of 1924, though it did not equal that of the first quarter of that year. Although the bulk of the imports of finished British goods into Austria consists of textiles, there are other important items. During 1924 machines and apparatus to the value of £63,500, electrical apparatus to the value of £65,000, and "other instruments not musical" to the value of £54,000 —an increase of £40,000—were supplied by Great Britain. The last increase is attributed partly to the greater imports of radio apparatus. The exports of incandescent lamps to the United Kingdom fell from £77,000 in 1923 to £62,000 in 1924. It is stated that Austrian exports to the United Kingdom during the first quarter of 1925, as well as trade in the opposite direction, showed substantial increases.

Mr. Phillpotts says that the share of the United Kingdom in Austrian trade has risen, and is likely to rise further at the expense of the Succession States, and he considers that Austria will probably continue to provide an expanding market for British trade.

An appendix to the report showing Austria's exports during 1923 and 1924 includes the following items:—Electrical machinery and blow lamps: 1923, 26,067,000 gold. kronen; 1924, 45,383,000 kr. Electrical apparatus and accessories: 1923, 12,438,000 kr.; 1924, 23,238,000 kr. These goods were supplied chiefly to Germany, Czecho-Slovakia, and Jugo-Slavia.

Hydro-electric Development.

Great importance has been attached in Austria, since the war, to the exploitation of the ample water power available in the Alpine districts, both for electrifying the railways and for industrial and other purposes, owing to the country's dependence upon foreign coal and oil. The total available water power in the country is calculated at 1,657,000 h.p. at minimum low water, or probably 3,500,000 h.p. yearly mean, of which under 10 per cent. was harnessed at the end of the war. The provincial governments took up the matter, and between 1920 and 1923 separate companies were founded for all the different provinces. The original capital was provided in the country by local authorities, banks, and the public. When this was exhausted, endeavours were made to obtain further capital from abroad, and as soon as the beneficial effects of the League of Nations Control became obvious, a good deal of foreign money was invested in some of the provincial companies, chiefly Italian, American, and Swiss, and some British, in Salzburg. More would have been available if Austrian companies had been willing to place orders abroad for equipment, but as Austria is well able to supply this herself the work has been done in the country. The provincial companies have undertaken a number of large works of several thousand h.p. each, involving big dams, large tunnels or pipe lines, and long power transmission lines. Other important works are being carried out by the Austrian Federal Railways and private companies, and altogether in the years 1921 to 1924, 68 works of over 500 h.p. each, totalling 214,300 h.p. (yearly mean) were commenced. At the end of 1924, 28 of these works (85,000 h.p.) had been completed, and in the first half of the current year a further 18,000 h.p. was added by the opening of the works at Opponitz, in Lower Austria, and at Teigitsch, in Styria, each delivering over 9,000 h.p.

In 1921 the Austrian authorities drew up a 15-year programme of hydro-electric works, aggregating 900,000 h.p., but it is unlikely that this programme will be fully realised in so short a period.

Railway Electrification.

The last 12 months has seen the completion of nearly all the first part of the railway electrification programme in the west of Austria, which was laid down in 1920. Electric traffic began on the Salzkammergut line between Attnang and Steinach-Irdning (108 km.) in July, 1924, and in May this year the electrification of the Arlberg line was carried as far as Bludenz in Vorarlberg (161 km.), so that electric trains now run all the way from Innsbruck through the Arlberg tunnel, and to within 30 or 40 km. of the Swiss frontier. The remaining short distances to the junctions with the Swiss electric lines at Bregenz and Buchs will, it is expected, be completed some time in 1926. Apart from the saving of time which this electrification will effect, it is calculated that about 130,000 tons of coal will be saved annually.

Early in 1925 the Austrian railway administration endeavoured to arrange for a foreign loan to carry out the next stage of the programme, chiefly the lines between Innsbruck and Salzburg. The Control Committee of the League of Nations refused permission for a new loan, but later sanctioned the release of 18 million dollars of the League of Nations Loan for this purpose. This sum is to cover the electrification of 306 km., and it is expected that the electrification of the lines will be completed by the end of 1928.

The necessary power is obtained partly from water-power works constructed specially for the purpose, such as the Spullersee in Vorarlberg, but in the future it will be taken also from the works built by the provincial companies, such as that on the Achensee. The Austrian railways employ the single-phase system at a frequency of 16⅔, and a pressure of 15,000 V. This system is also used in Bavaria—a fact that will facilitate through traffic with Germany.

The Electrical Import and Export Trade of Hungary.

The following table gives particulars of Hungary's imports and exports of electrical machinery and apparatus in 1924, the total values in gold crowns being stated, together with the total weights in quintals and the weights by countries of origin and destination. Where available, comparative figures for 1923 are also given. It will be noticed that owing to the lack of detailed classification in 1923, the weight of "Electrical apparatus not elsewhere mentioned" appears disproportionately high as compared with 1924.

	1923.		1924.	
	Imports.	Exports.	Imports.	Exports.
Dynamos, transformers and parts.—				
Value in 1,000 gold c'w's	—	—	1,301	3,172
Weight in quintals ...	4,129	17,172	6,511	14,927
Austria	1,745	995	3,077	2,821
Czecho-Slovakia ...	985	571	684	86
Rumania	70	2,082	84	1,626
Germany	869	197	2,283	278
Italy	321	2,700	113	4,910
Belgium	—	—	6	1,897
Holland	—	—	22	706
Poland	—	—	—	839
Telegraph, telephone, and signalling apparatus.—				
Value in 1,000 gold c'w's	—	—	216	1,390
Weight in quintals ...	—	—	373	2,619
Austria	—	—	71	13
Rumania	—	—	—	1,527
Jugo-Slavia	—	—	—	555
Germany	—	—	163	9
Bulgaria	—	—	—	445
Meters and parts.—				
Value in 1,000 gold c'w's	—	—	895	1,661
Weight in quintals ...	—	—	663	1,969
Austria	—	—	150	44
Czecho-Slovakia ...	—	—	10	76
Rumania	—	—	2	194
Jugo-Slavia	—	—	9	154
Germany	—	—	491	54
Italy	—	—	—	917
Switches, contacts, &c., and parts.—				
Value in 1,000 gold c'w's	—	—	234	366
Weight in quintals ...	—	—	701	1,195
Austria	—	—	212	101
Rumania	—	—	—	216
Jugo-Slavia	—	—	—	186
Germany	—	—	461	47
Incandescent electric lamps.—				
Value in 1,000 gold c'w's	—	—	253	9,727
Weight in quintals ...	672	12,056	588	15,433
Austria	45	964	70	1,765
Czecho-Slovakia ...	15	893	33	1,510
Rumania	—	924	—	669
Jugo-Slavia	—	493	5	608
Germany	612	2,576	479	2,362
Belgium	—	—	—	1,059
United States	—	—	—	2,582
Electrical apparatus not elsewhere mentioned, including arc lamps.—				
Value in 1,000 gold c'w's	—	—	678	741
Weight in quintals ...	3,249	8,456	1,601	1,773
Austria	977	255	598	290
Rumania	—	2,973	—	384
Germany	2,192	297	934	35
Poland	—	211	—	116
Cables and insulated wire.—				
Value in 1,000 gold c'w's	—	—	59	302
Weight in quintals ...	366	718	264	1,344
Austria	155	2	100	15
Rumania	—	433	—	762
Germany	—	—	142	165
Great Britain ...	—	—	—	197
Accumulators and plates.—				
Value in 1,000 gold c'w's	—	—	22	87
Weight in quintals ...	—	—	144	236
Austria	—	—	92	—
Rumania	—	—	—	28
Jugo-Slavia	—	—	2	169
Electric carbons.—				
Value in 1,000 gold c'w's	—	—	35	2
Weight in quintals ...	272	49	173	12
Austria	137	39	89	7
Germany	—	1	51	—
France	16	—	26	—

The Pacific Cable Board.

Annual Report and Accounts.

The annual report and financial statement of the Pacific Cable Board, which is representative of the British, Canadian, Australian and New Zealand Governments, for the year ending March 31st, 1925, outlines the year's working and shows that the receipts (£549,917) exceeded the ordinary working expenses (including the normal payment of £30,000 to the reserve and renewal fund) by £254,589. After taking account of the annuity of £77,544, payable to the National Debt Commissioners in respect of interest and repayment of capital, and the annuity of £9,150 payable to the reserve and renewal fund in respect of interest and repayment of money borrowed from that fund for the Sydney-Auckland cable (1912), a surplus of £167,893 remained, the whole of which has been devoted to the reserve and renewal fund. The traffic receipts (£535,013) were less by £9,768 than those of the previous year. This falling off is accounted for partly by rate reductions which were introduced on December 1st, 1924, and partly by a reduction in the volume of ordinary traffic. The expenditure (excluding special appropriations) was less by £5,682 than that of the preceding year, and the total assets of the reserve and renewal fund amounted to £2,279,826.

The forthcoming duplication of the cables between Vancouver Island and Fiji will involve expenditure of approximately £2,400,000 and the work will not be completed until the end of September, 1926. It is expected that during the period the reserve and renewal fund will be sufficiently strengthened to meet the cost of duplication in full. The effect of the reconstruction of salary scales has been to increase the liabilities of the pension fund and the net sum provided to cover the increased liabilities was £6,600.

The depôts, instruments and plant generally, have been maintained in a high state of efficiency. The cable between Norfolk Island and Southport became interrupted in the vicinity of Southport on June 13th and was repaired by the *Iris*; on June 27th a fault declared itself on the same cable in the vicinity of Norfolk Island, and a new shore end was laid out from Norfolk Island by the *Iris*. As the Board's facilities between Fiji and Australia enable traffic to be directed by three different routes, the disturbances did not cause any inconvenience to the Board's business. A new tri-core shore end was inserted by the *Iris* at Suva on the Fanning Island section in November, 1924. This completed the provision of tri-core shore ends on both sides of each of the long cables.

The Board was occupied throughout the year under review in giving consideration to the duplication of its system in the Pacific, and contracts have been placed (*a*) with the Telegraph Construction and Maintenance Co., Ltd., for the Vancouver Island-Fanning Island section; (*b*) with Messrs. Siemens Bros. and Co., Ltd., for the Fanning Island-Fiji section. The contractors have undertaken to complete the laying of these cables by September 30th, 1926. The new cables will be continuously loaded with a metallic alloy of high permeability and their guaranteed traffic transit capacity is more than twice as much as the capacity of the existing cables, and it is expected that in practice the guaranteed capacity will be largely exceeded. The total cost of the cables laid in 1923 (*a*) Suva-Auckland (direct) and (*b*) Southport-Sydney, including equipment and engineers' fees, amounted to £337,940.

The total expenditure on the wireless investigations at Vancouver Island and Fiji (referred to in the report for 1922-23) amounted to £7,155, and the investigations established that the reception possibilities in the localities referred to were satisfactory, but in view of the cost of running wireless stations, as compared with the extra cost of working duplicate cables, and of the difficulty of securing secrecy and the certainty of continuous communication, it was ultimately decided to complete the duplication of the cables.

The landlines leased by the Board from the Canadian Pacific Railway Co. worked well and the service on the landline which is allocated by the Australian Commonwealth Government for the exclusive use of the Board was generally satisfactory, but was affected during the latter part of the year by reconstruction work. The laying of the cables in the British West Indies and British Guiana was completed in July, 1924, and the last of the wireless stations was handed over by the contractors in February, 1925. Owing to the wireless stations not being completed, it was necessary to postpone the opening of the system until December 1st, by which time arrangements had been made for telegraphic communication with all the islands.

The office and residential property at the various stations has been maintained in a satisfactory state of repair. The new concrete office building at Suva was completed in September, 1924. The vessels of the Union Steamship Co. of New Zealand made five calls at Fanning Island, the total expenditure during the year on this service having been £10,886. The Board's cable maintenance vessel *Iris* continues to be maintained in first-class order. No changes in the membership of the Board took place during the year under review.

Mr. John Milward, the Board's manager in the Pacific, and chief electrician, retired on pension in August, 1924, having reached the age of 60. He had occupied a prominent position in the Board's service from the time the system was first opened. No successor has so far been appointed as manager in the Pacific, and Mr. R. I. S. Bain, the Board's senior superintendent, has been acting in that capacity since Mr. Milward left Australia. In future the position of chief electrician is to be kept distinct from the management. Owing to the growth of the Board's business it is not possible for the manager, who is mainly occupied with administration work, to devote the requisite attention to the technical side which is required of a chief electrician. Mr. G. B. Winkfield, who had been Mr. Milward's principal assistant in technical matters, has been appointed chief electrician. Two superintendents, Mr. T. R. Blackley and Mr. Alfred Smith, reached retirement age during the year under review and withdrew from the service on pension; the vacancies have been filled by the promotion of Mr. T. F. Price and Mr. J. Sherlock.

The Board has notified full adherence to the International Telegraph Convention which it has not hitherto been able to do owing to the fact that its connecting administrations across the Atlantic did not adhere in every respect. The rates for ordinary messages between the British Isles and Canada, on the one hand, and Australia and New Zealand, on the other hand, were reduced on December 1st, 1924; the reduction of receipts resulting from this cut is estimated at £35,000 per annum.

On May 1st, 1924, a night letter service was introduced for traffic exchanged between Australia and New Zealand and was extended on December 1st, 1924, to traffic between Fiji and Australia and New Zealand.

Some sensational results obtained in handling urgent-rate messages conveying to the news agencies in London results of cricket tests matches in Australia are worthy of record. For days at a time the delay on urgent-rate telegrams was never more than four or five minutes, and on several occasions was as low as one minute.

During the year approximately 11,900,000 paying words of international traffic (*i.e.*, traffic other than local messages between Australia, New Zealand, and the Pacific Islands) were transmitted across the Board's system; this was approximately 550,000 words above the total of the previous year, and established a further record. The ordinary or full-rate international traffic showed a falling off of approximately 105,000 words, week-end telegrams 145,000 words, and Press messages 250,000 words.

There was an increase of 36,000 words in the deferred ordinary international traffic, of 17,000 words Government, and of nearly a million words of daily letter telegram traffic. The increase as regards daily letter telegrams was for a whole year, as compared with only seven months of the previous year. The daily letter telegram service proved exceedingly popular, and the falling off of the ordinary and week-end traffic was no doubt accounted for by the use which was being made of the cheap " daily " service.

In addition to the international traffic, approximately 2,700,000 paying words were carried between Australia and New Zealand and between those Dominions and the Pacific Islands; this is approximately 600,000 words more than during the previous year. Ordinary local traffic was less by 240,000 words than that of the previous year, but the new service of night letter telegrams produced 868,000 words, and no doubt the introduction of this new service accounted for the reduction in the volume of ordinary traffic.

Hydro Electricity in Norway.—Before a meeting of the Polytechnical Association in Oslo in October, which was attended by the King and Ministers of State, Engineer Ove Collett discussed the reasons why Norwegian water powers were not being developed for industrial purposes. He stated that it had been a great disappointment that so little progress had been made in the further utilisation of the water powers and the consequential industries. Norway had the cheapest water power in the world, but it did not possess a stable value. If it were desired to render the water powers fertile it was necessary to get wealthy foreigners to take an interest in these powers. The only foreigners who had provisionally entered the field since the war had acquired at low prices the Hoyang, Tysse and Sundlokken undertakings, but not a single additional horse power of plant had been installed. Yet some millions were awaiting to be brought into use. Foreign power consumers were turned away from the idea of developing the water powers because of labour conditions, taxes, concession conditions, &c. Although the Norwegian fixation of nitrogen industry had had a favourable course at first, it was now in a difficult position and only produced some 28,000 tons per annum in various forms. On the other hand, in Germany a great industry had been developed and was now able to turn out about 400,000 tons of nitrogenous fertilisers per annum. At the close of the war there were from 25 to 30 undertakings engaged in the electrochemical industry in Norway; nine of these had been compelled to cease operations. Except the known aluminium and nitrogen works only one of the others had yielded any dividend since the war. During the discussion it was also submitted that taxes had reached an undue height and that the conditions under which concessions were granted ought to be ameliorated.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A New Speed Controller.

A new motor speed controller particularly suitable for use with stokers, conveyors, travelling ovens, &c., has been developed by the Louis Allis Company, Milwaukee. The device, (fig. 1) the "Allis Adjustable Delivery Motor Drive," consists mainly of three elements, the L-A multi-speed, squirrel-cage, a.c. motor, a revolving drum for establishing the average speed, and contactors for switching the motor. In the operation of the drive a fractional-h.p. motor is used to revolve the selector switch drum at 1 or 2 r.p.m. By changing the position of a movable brush, a two-speed motor, for instance, can be made to run all the time on the high speed, all the time on the low speed or any desired portion of the time on the high or low speeds. By choosing a motor the high speed of which is higher, and the low speed lower, than it is ever desired to run, an infinite number of steps can be obtained.

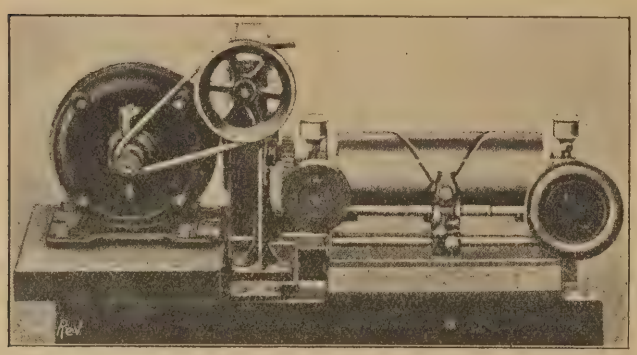


Fig. 1.—Motor Speed Controller.

A Portable Cable Testing Plant.

The accompanying illustration (fig. 2) shows a rather interesting portable generating plant that the ASTER ENGINEERING CO. (1913), LTD., of Wembley, Middlesex, has recently constructed to the order of British Insulated & Helsby Cables, Ltd., for supplying electricity for high-pressure testing apparatus in connection with cable installations.

The design of the set is such that it can be towed at high road speeds, thus constituting an extremely mobile plant. Suspension is on approved automobile principles, the set being carried on a single axle fitted with 820 by 120 mm. pneumatic tires and mounted on semi-elliptic springs. The towing eye is adjustable in height to facilitate attachment to lorries of varying loading heights. Accommodation is provided for a spare wheel, complete with a tire, and the equipment is enclosed in a sheet-steel casing with a hinged side panel, and is therefore entirely waterproof. The chassis is provided with two adjustable drop legs at the forward end and with a square thread jacking screw at the rear end to keep the set rigid when in operation. The jacking screw is also capable of lifting the set sufficiently to enable a wheel to be changed.

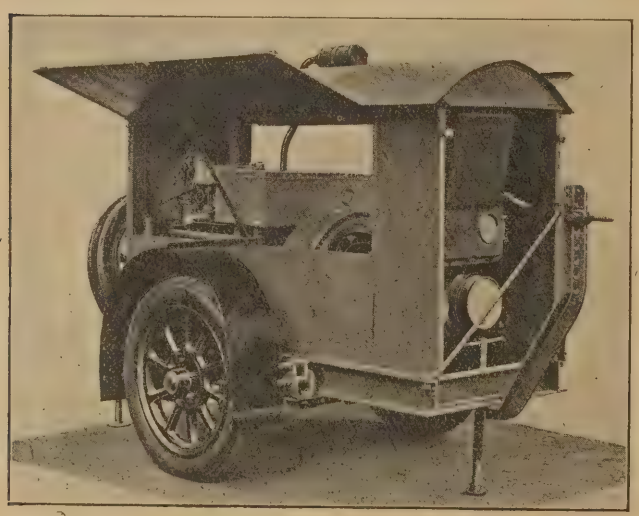


Fig. 2.—Cable Testing Plant.

The generating set consists of an "Aster" high-speed four-cylinder petrol engine, type 43 DMI, developing 12 b.h.p. at 1,500 r.p.m., coupled through flexible coupling to a Crompton alternator, developing 6 kW, 220 volts, 50 cycles. The switchboard consists of an enamelled slate panel mounted on a frame designed to minimise road shocks, and carries a d.p. overload and no-volt circuit breaker with suitable fuses, and an 8-in. dial voltmeter and ammeter; also a back-of-board regulator.

Spares for the engine and alternator, together with tools, are contained in a locker; an oil storage drum and foot tire pump are also provided. The circulating water of the engine is cooled by a radiator mounted in front of the equipment, the fan of which is adjustable for belt tension. The fuel tank is mounted beneath the canopy, the exhaust being led to the silencer mounted on the top of the canopy. The equipment operates in conjunction with special high-pressure apparatus. Amongst other special portable generating sets produced by the company mention may be made of a 30-h.p. self-propelling electric-arc welding set.

A New Fitting Suspension Method.

We have received from MESSRS. FALK, STADELMANN & CO., LTD., Veritas House, Farringdon Road, London, a sample "Holdrite" pendant set, fig. 3. This is a recent production of the firm in which is employed a new method of suspending one-piece glass electric lighting fittings. The suspension device consists of two semi-circular metal saddles sustaining the globe in a lip at the top. The saddles are clamped at the ends, where they are held by a dual chain suspension. The cover which holds the lamp holder and lamp merely rests on the top of the globe, and renders the interior of the fitting nearly dustproof. The "free" cover has the great advantage, when replacing or cleaning the lamp, &c., that it can be handled independently of the globe. The duplex saddle is designed to accommodate the varying flange contours which occur in a given type of fitting, by means of adjusting nuts at the clamping connections. Vibration troubles are guarded against by virtue of the saddles sustaining the globe round the whole of the lip. This also provides for glass expansion, it being unnecessary to clamp the saddle tightly to the fitting. It is claimed that the "Holdrite" method of suspension for heavy globes is the first practical one to be employed without gallery screws, &c.

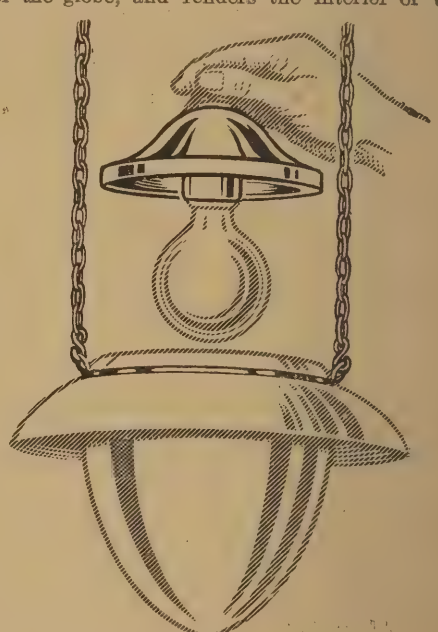


Fig. 3.—"Holdrite" Suspension.

A New Insulating Material.

We have received from THE SILUMINITE INSULATOR CO., LTD., The Green, Southall, Middlesex, some particulars of a new insulating material, "Siluminite, grade 2," which it has recently produced. It consists of a certain silica asbestos base and a small amount of phenol formaldehyde condensation product. It is claimed that this material greatly increases the mechanical strength and electrical insulation, and at the same time produces a finished product which is non-absorbent and capable of withstanding a discharge over the surface for a given period without carbonisation taking place. At the present time the material is made in sheet form in sizes 30 in. by 40 in., with a minimum thickness of $\frac{1}{4}$ in. It is also claimed that at high temperatures softening or change of shape does not take place, blistering is impossible, and that the material is fireproof. A copy of a report on the tests made on two samples of this material at Faraday House shows the specific resistance of a sample (dry), 1.48 cm. thick, to be 4.3×10^6 megohms; also that of the same sample, after 24 hours' immersion in water, to be 1.9×10^6 megohms. Another sample, 1.47 cm. thick, showed a specific resistance of 3.5×10^6 megohms when dry. Breakdown pressure tests gave a result of 27,900 V from the 1.47 cm. sample when dry, and 26,700 V for the 1.48 cm. sample after 24 hours' immersion. In another test a carbon arc was passed along the surface of a sample two or three times, and the insulation resistance was measured between two points of the treated surface with an "infinity" result. There did not appear to have been any carbonisation, nor did the material burn or lose its shape.

The Development of Electric Power Supply.

By R. W. GREGORY.

(*Abstract of the Chairman's Address;* NORTH-EASTERN CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

HAVE often felt that an essential part of a chairman's address ıould be a plea of justification for the continued existence the profession to which he belongs. Throughout the ages, ıe principal justification for the existence of the engineer ıas been that he has made it possible for large numbers of eople to live together more or less healthily in towns and ties. The present trend of engineering appears to be towards ıaking it possible for the rustic to obtain many of the ervices which in the past were only obtainable in the smoke-den air of the city.

I sometimes wonder whether we English are as enterprising people as we like to think ourselves to be. The country ppears to be hampered with a load of existing capital works ıd legal restrictions which in the electrical industry at least revent her from getting on with the business as quickly as ıe ought to. Whatever England does in the practice of ectrical development may have little effect on the rest of ıe world, but a large effect on England herself. The reluct-ıce of our home railways to electrify their main lines may e justified by the economies of the moment, but it is con-ivable that the electrification of British main lines would ave far-reaching effects on our foreign and Colonial trade railway electrification material.

Rural electrification, however, is more within the sphere operation of the electric supply authorities, and deserves ıe study of all supply engineers. The characteristics of rural ads are that they are sparsely distributed and small in ıantity; the capital cost per kW connected must therefore e larger than in the towns and industrial areas, and the sential to the solution of the problem is the reduction of ıe capital cost even at the expense of the service given.

At the recent conference in Newcastle, of the Institute of ritish Architects, sorrow was expressed at the manner in hich Dobson's classic façades had been treated by the men ho worked behind them. I join issue with the architects y saying that they should design their industrial buildings allow signs and letters to be applied so as to enhance the chitectural effect. Those of us who have seen the effect flood lighting on some of the business buildings in other ountries know how electricity and architecture can combine make advertising beautiful. There is an even more im-rtant question to consider than that of night signs in which e should join forces with the architect. The outstanding ıaracteristic of the majority of our industrial towns and ties is their darkness and dinginess and dirtiness. We know the experience of the coal strike a few years ago how fferent our atmosphere becomes if only we eliminate smoke, ıd we know that there are ways and means existing which, generally used, would eliminate 90 per cent. of the smoke hich pours daily from our industrial and domestic chimney acks. For the sake of cleanliness and the health and cheer-ılness of the community, everything should be done to ıcourage the use of smokeless heating systems, of which ere are many available. Gas engineers, electrical engineers, ıd heating engineers together can provide means of heating oth for domestic and public buildings, which do not foul e atmosphere, and the general use of these systems would, am convinced, do more for the general happiness of the mmunity than a dozen Acts of Parliament.

The electric supply industry in Great Britain is at present a state of rapid development, both technically and economic-ly. The economic trend in generating station practice is wards the large station with a plant capacity of the order 200,000 kW and with a site of sufficient area to double is capacity. As the efficiency of the large turbine is vitally pendent upon the vacuum obtained by the condensing plant, is more important to place our generating stations on our tuaries and larger rivers than it is to build them at the al pitheads. Electricity can be economically generated by eam only near a large supply of pure water; for every ton coal burned in an electric light and power plant 400 to 600 ns of water must be pumped to condense the steam that ives the big turbines. The longest distance that electricity n be transmitted economically over wires at present and mpare favourably with local power is 250 miles. The cost generating electricity is only about 20 per cent. of the tal bill, and the other 80 per cent. is the cost of delivering e service from the power plant to the consumer.

The large generating station brings in its wake increasing oblems of control and distribution, and certain branches this side of the electric supply industry have a little diffi-lty in keeping pace with the rapid growth of the generating ation. Generally it can be said that switchgear and cables e the sections which tend to lag, and transformers and erhead transmission lines are the sections which keep pace ith the generating plant. In 1914 the rupturing capacity generating station switchgear was sufficient to cope with short circuit on the station without fault limiting devices; -day it is not. The capacity of the generating plant has own more rapidly than the rupturing capacity of the circuit eakers controlling these plants. The 200,000-kVA station has arrived; the 2,000,000-kVA circuit breaker has not; for the reason that it is rare that the circuit breaker can be tested out as a breaker under service conditions. It is possible now to obtain from most of the reputable manufacturers circuit breakers with a normal rated rupturing capacity of upwards of 1,500,000 kVA. The general trend in the use of such circuit breakers is to limit their duty to a figure well inside their rated rupturing capacity. This is done, first, by so laying out the gear that a short circuit between phases in the precincts of the generating station is practically impossible.

The interest in metal-clad switchgear design has spread beyond this country, and is now world-wide. It is already being manufactured for the American market by Allis Chalmers of Milwaukee, and I don't think I am far wrong in stating that other switchgear manufacturers in America have designs in store ready to meet their almost certain home demand for this type of gear. Could not the larger switchgear manufacturers combine to provide a proving house which is worthy of the industry and the country? The organisation, to make such a venture possible, already exists. The labours of a well-equipped research laboratory would hasten the day when the breaking of an electrical circuit will not be explosive. What are the possibilities in this direction of devices like the automatically variable reactance or even of the thermionic valve?

The art of cable making and cable using is at present in a wonderfully interesting state of development, and the increased knowledge of dielectric phenomena now available has so widened the field of vision of the lead, paper and compound engineer, that he is endeavouring to turn out cables for use at pressures which, in the past, could only be applied to bare conductors hung on insulators.

Power transformer design continues to keep pace with the developments in other sections of the industry. Transformers can be built of capacities equal to that of the largest generators and for use with voltages as high as can be dealt with by the transmission lines. One of the primary problems of transformer design is that of the coiling of the windings to maintain the insulation, which resolves itself into knowing all about the "hot spots" which determine the rating of the transformer.

The oil temperature loading basis is one of great importance to the transformer user. In the largest transformers the heat generated by the losses is extracted from the oil either by water or forced air. A characteristic of the time, however, is the rapid increase in the sizes available of "self-cooled" transformers.

Overhead transmission lines, as now constructed, are remarkably reliable, and the best insulators now appear to possess a reasonable life even under the high mechanical and electrical stresses to which they are subjected. The main enemies to continuous service are birds and lightning. We know of bird troubles in this district, and "crow guards" are an essential part of the construction of our high-pressure lines. In India many of us have heard of delays to service caused by crows building nests on cross arms and pole tops, the nesting material sometimes being the scrap ends of armouring wire left from underground cables being laid in the district. Lightning is still a source of income to the trouble man and to the manufacturer of protective apparatus. The general experience seems to be that the higher the working pressure of the line the less liable it is to lightning troubles. Lines of over 100,000 V working pressure are practically immune from lightning troubles. It is uneconomic, however, to insulate all lines and the apparatus connected to them for this pressure, so the lightning problem resolves itself into the protection of the line insulators against destruction from arc-overs, and the protection of the insulation of the apparatus connected to the line. The protection of the apparatus connected to the line is obtained more or less successfully by the use of lightning arresters of many types, the best known of which are the electrolytic and the oxide-film arresters which act as safety valves against over-potentials. The wider knowledge of high-frequency phenomena now available from radio research and experience also helps in the attack on this problem, and it is probable that lightning and surge protection will ultimately be achieved by apparatus connected directly in the line, which will absorb the energy of the surge before it reaches the apparatus to be protected, and without any power current leaking to earth; that is, the line will not be shut down even temporarily when under the influence of lightning. The Campos arrester, well known in Italy, and the Grant surge absorber described by Captain de Ferranti at the recent Paris Conference are examples of this type of protective gear. The problem of the day, however, in this country, is not the construction of first-class, high-grade, high-pressure lines, but the construction of cheap high-pressure distribution lines which would enable the supplies to be given economically to farms, villages, and sparsely-loaded districts. The use of conductors of high tensile metals such as steel and silicon bronze in place of copper

or aluminium helps a little towards cheapening the lines. We, of course, have to remember that cheap overhead distribution as carried out in America is constructed to what might be termed agricultural engineering standards.

There has been much said recently on the desirability of easing the various regulations and restrictions which govern the construction of British overhead lines. These regulations and restrictions certainly do keep up the cost of our high-pressure overhead lines, and reasonable proposals for their modification are worthy of consideration by the authorities. The cost of rural high-pressure overhead lines could be considerably reduced if the figures for ice loading specified in the regulations were modified.

For transmitting quantities of power, overhead lines are less than half as costly as underground cables. The engineering difficulties of laying cables are increasing with the use of higher pressures and with the heavier and more elaborate road construction now required for modern traffic.

Probably the most notable development during the last few years is the automatic converter sub-station which has been made possible by modern improvements in the design of rotary converters and protective and control gear for them. It is now possible to obtain commutating machines which are practically unaffected by dead short circuits on their terminals. It is now generally accepted that a properly designed automatic sub-station, because it eliminates many of the chances of human error, which occur particularly at critical times, is more reliable in its service than a manually operated sub-station, and its employment can be economically justified, not only in districts where the standard of intelligence and the wages of the sub-station attendants are high, but also in districts where the standard of intelligence and the wages of the sub-station attendant are low; for example, the automatic sub-station is commercially and technically sound both in America and India.

The long-tried and popular rotary converter has, during the last few years, received a challenge from a new rival—the mercury arc rectifier. At the present time the capital cost of a rectifier installation is not less than that of a rotary converter installation to do the same duty, and its claims for justification can only be based on such factors as efficiency, simplicity, and reduced maintenance costs. Whether these factors are sufficiently strong to eliminate the more tried out, old-established rotary converter for railway work, it is perhaps too early to say at the present time.

Legal.

Alleged Radio Valve Theft.

At Nottingham, on October 25th, E. Morris was committed for trial (bail being allowed) on a charge of stealing radio valves valued at £158, the property of the General Electric Co., Ltd., Nottingham. F. S. Freeman and J.C. Baker were also committed on a charge of receiving the valves.

Postmaster-General v. Ford.

At the Marlborough Street Police Court, on October 28th, the Postmaster-General (represented by Mr. Percival Clarke) summoned Mr. R. M. Ford, Albert Gate, S.W., for having installed and worked a radio receiving set without a licence. In reply to Mr. Hay Halkett, the magistrate, the defendant said that it would be a long case, but the prosecution could not agree that this was necessary. Mr. Ford said that he had a long statement to make involving many considerations, and the case was adjourned until November 12th.

Tucker v. Wandsworth Manufacturing Co., Ltd.

In the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Warrington and Sargant, on October 28th and 29th, this case was heard upon the appeal of the defendants from the judgment of Mr. Justice Tomlin, holding that the appellants had infringed Mr. John Bristow Tucker's patent for improvements in electrical switches, No. 186,408 of 1923.

The first claim in plaintiff's specification was for a switch with quick-make and quick-break action by virtue of a compression spring pivotally operating, on the one hand, on a contact arm and, on the other, with an operating member, which was utilised for positively displacing the contact arm in the operations both of making and breaking in the event of the spring failing to act or to act effectively. The second claim was for a specific tumbler switch, though the inventor did not limit his invention to any particular form of switch.

Mr. Tucker alleged that the defendants had infringed both the claims. The defendants denied infringement, and alleged that the plaintiff's patent was invalid by reason of prior specifications, prior user, and common general knowledge.

Mr. Justice Tomlin held that the plaintiff's first claim was not valid, but that the defendants' switch was an infringement of the plaintiff's second claim.

The proceedings in the lower Court were reported in our issues of July 10th (p. 53); July 17th (p. 119); and August 7th, 1925 (p. 238).

Sir A. Colefax, K.C., and Mr. Courtney Terrell appeared fo the appellants; and Mr. Whitehead, K.C., and Mr. Morri for the respondent.

Sir Arthur Colefax contended that there was no subje matter for a patent with regard to the plaintiff's second clai having regard to general common knowledge, and that th judgment of Mr. Justice Tomlin was wrong in that respec and that the appellants were entitled to succeed.

Mr. Whitehead, for the respondent, supported the decisio of Mr. Justice Tomlin. He contended that there was inve tion in what the patentee had done. He said it was necessar to devise a switch which would be certain and quick in i operation in order to prevent arcing. The patentee ha counsel submitted, solved a new problem. The evidence w that tumbler switches had been made for 30 years. Th respondent had been making them for about 25 years, an the defendants had been making them since 1904. If re spondent's claim 2 was to be broken at all and held to b invalid it would have to be on the grounds of want o subject matter. To succeed on that the defendants mu prove that what the patentee had done was obvious havin regard to the state of the art.

Lord Justice Warrington said that the respondent did no say or pretend to say that he had solved any special proble of tumbler switches.

Mr. Whitehead replied that he had claimed a tumbl switch which he had described and illustrated, and no othe In claim 1 he had said too much, with the result that M Justice Tomlin had found that the claim was invalid. H (counsel) contended that neither Cox, Rose, nor Crabtree ha anticipated the problem which the respondent had succeede in solving.

At the conclusion of the arguments their Lordships allowe the appeal.

The Master of the Rolls, in giving judgment, said th action was brought to establish that there had been an in fringement by the defendants of the plaintiff's patent, an to obtain an injunction and damages. Mr. Justice Tomli had held with regard to claim 1 of the plaintiff's specificatio that the patent was invalid, but that claim 2 was a vali claim, and that he (the Judge) could exercise his discretio under the Patents Act, 1919, and allow an amendment b striking out claim 1 and holding that the plaintiffs coul obtain an injunction and damages.

Dealing with the plaintiff's amended specification, his Lor ship said that claim 1 was admittedly a wide claim. Th patentee indicated that the tumbler switch was an embod ment of his invention but not the sole object of his inventio Mr. Justice Tomlin, upon the evidence, came to the co clusion that plaintiff's first claim could not be limited t tumbler switches, and he (the Master of the Rolls) agree with him. With regard to claim 2 the Court had to giv effect to the whole body of the specification and the illustra tion. The claim was not for a "tumbler" electric switch but for an "electric switch substantially described as herei set forth and illustrated." He thought the claim was a wid claim and not a narrow one. Mr. Justice Tomlin had hel that claim 1 had failed for want of subject matter and novelty and he (the Master of the Rolls) thought that claim 2 faile for a like reason. Accordingly he thought it was impossible t hold that claim 2 was valid. In his opinion the appeal mu be allowed and judgment given for the defendants with th costs of the action and the costs of the appeal. If it ha been necessary to decide the question of infringement h would have felt some difficulty in holding that there had bee any infringement by the defendants.

The other members of the Court delivered judgment t the same effect.

Attorney-General v. Southern Counties Electric Light an Power Supply, Ltd.

This action came before Mr. Justice Tomlin in the Chancer Division on October 27th for judgment in default of defenc

Mr. Wilfrid Hunt, for the defendants, however, applied fo an adjournment. He said that a mistake had been mad The defendants had a defence but it had not been delivered i time. If, however, his Lordship would not adjourn the cas he could deliver a defence immediately.

His Lordship said he would give the defendants a week he could not enter judgment for the plaintiff when there wa a defence to the action.

The action was at the relation of the Battle (Sussex) Urba Council for an injunction restraining the defendants fro breaking up Battle High Street or any other road or path s as to cause obstruction or damage.

German-American "Bosch" Litigation.

The hearing of this case, the opening of which was reported i our last issue, was resumed on October 27th, when Counsel o both sides read the evidence on which the Registrar gave hi decision.

His Lordship asked if there was any evidence that Bosc magnetos were made in England.

Sir A. Colefax said there was evidence that during the wa some magnetos were made in England and stamped "Bosch in England.

His Lordship: Were they made by a firm in which Rober Bosch was interested?

Sir A. Colefax said that 700 were made by the then English company in 1915.

Mr. Arthur T. Murray, president of the American Bosch Magneto Corporation, was called, and gave evidence of the export from American to this country of motor-cars equipped with their magneto. Cross-examined by Sir Duncan Kerly, K.C., for the German company, witness said the general practice in America was to use battery and coil ignition. The presence of a magneto on an American car was unusual except in cars for export.

Counsel suggested that the result of all the importation of American Bosch magnetos into this country either as separate articles or on cars only amounted at most to a few thousands, and that it was wholly negligible in comparison with the Stuttgart trade.

The witness replied that during the last five years 60,000 electrical units had been imported with his company's name on them. In reply to Counsel, witness said that "electrical units" did not mean sparking plugs, but batteries, distributors, coils, &c.

The hearing was adjourned and was resumed on October 30th, when his Lordship said it was plain that for years in this country the American corporation had advertised its own manufactures as "Bosch." It sent thousands of batteries and ignition coils and magnetos all stamped "Bosch."

Sir D. Kerly, K.C. (for the German company): Stamped "American Bosch."

His Lordship: What could anybody suppose it meant; it does not mean German Bosch.

Sir D. Kerly: I will suggest that.

Herr Otto Heinz, on behalf of the German company, in reply to Sir D. Kerly, said that in his view a genuine "Bosch" in this country was the product of his company.

As to what it is in America you are engaged in litigation there?—Yes.

The hearing was adjourned until November 3rd.

Radio Instruments, Ltd., v. Plating & Co.

Mr. Justice Romer, in the Chancery Division on October 30th disposed of a motion by the plaintiffs against Plating & Co., Northampton, for an injunction restraining infringement of a licence under a patent for radio transformers.

Mr. Shelley, for plaintiffs, said it had been agreed by defendants that there should be a perpetual injunction, and an order for the payment of taxed costs and an inquiry as to damages.

Radio Instruments, Ltd., v. A. J. Hewens & Sons.

Mr. Justice Romer, in the Chancery Division on October 30th, had before him a motion by the plaintiffs for an injunction restraining A. J. Hewens & Sons, High Street, Lewisham, from infringing a limited licence under a patent for radio transformers. Counsel for plaintiffs said defendants had agreed to submit to a perpetual injunction and to pay the taxed costs of the motion and an agreed sum by way of damages.

Nettleton & Co., Ltd., v. Dawes.

In the Mayor's and City of London Court, on October 29th, before Judge Shewell Cooper, a claim was made by Nettleton and Co., Ltd., advertisement contractors, 126, Moorgate, E.C., against Mr. J. W. Dawes, wireless dealer, Finsbury Park, for £13 due under a contract for an electric sign placed on an electric light standard. The defendant pleaded that the sign was not in accordance with the contract and judgment was entered for him, with costs.

Brown, Douglas & Co. v. Enfield Ediswan Cable Works, Ltd.

Mr. Justice Finlay, in the King's Bench Division, on October 30th, had before him an action brought by Messrs. Brown, Douglas & Co., Export agents, Eastcheap, E.C., against Enfield Ediswan Cable Works, Ltd., claiming damages for alleged breach of two contracts. Defendants denied plaintiffs' allegations, and disputed the claim. Mr. Wingate Saul, K.C., and Mr. T. Beresford were for the plaintiffs, and Mr. Barrington Ward, K.C., and Mr. Cartwright Sharp for the defence.

Mr. Wingate Saul, for the plaintiffs, said that one contract was for the supply by the defendants of fifty miles of 1/18 S.W.G. single core cable at £13 15s. per mile, and the other for ten miles of 1/18 S.W.G. single core cable at £13 10s. per mile, the former contract being dated July, 1920, and the second contract January, 1921. The cable was for shipment to New Zealand, of which defendants knew. Defendants in their defence said there was no breach of any of the contracts, because the goods supplied were in accordance with the contracts. They pleaded that there was a clause in the contracts to the effect that the defendants in the case of defective material or workmanship were not to be liable for consequential damages, and that their only liability was to replace the goods. In the correspondence his Lordship would see that the plaintiffs offered to return the goods to the defendants, but the latter refused to accept them. The only difference in the specifications was that the first cable was described as "Non-Association" quality, and the second cable as "Association." The cable was required to have a minimum insulation resistance, and it was in that respect that the cable failed to be in accordance with contract. The claim did not relate to the whole of the cable as some was sold in New Zealand, where it had been shipped, before the results of the tests there were known, and some of the cable had been used for tests. The remainder of the cable, less that which had been sold and used for tests in New Zealand, was sent back to England. Tests were also made in England, and of fifteen coils of the "Non-Association" cable four were below the minimum of 2,000 megohms per mile, and eleven satisfied the minimum, and of twelve coils of the "Association" exactly fifty per cent. were below the minimum of 2,000 megohms per mile.

Mr. William H. Ballantyne, B.Sc., gave evidence as to the results of tests applied to certain coils and said that they were not up to standard. He did not think the rubber on the cable was perished by having been stored too near the boilers on ship. It did not bear the appearance of having been overheated in that manner. Some coils were bad, but other coils were much above the standard required.

The hearing was adjourned until November 2nd.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

In the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Warrington and Sargant, on November 2nd, the hearing was commenced of the appeal of the plaintiffs in this case from the judgment of Mr. Justice Lawrence in the Chancery Division, delivered on December 18th last year (*vide* Electrical Review, December 26th, p. 971).

The plaintiffs, the owners of Letters Patent No. 9,644 of 1912 of an invention of "Improvements relating to synchronous dynamo-electric machines," granted to Emanuel Rosenberg, brought the action for an injunction and the usual ancillary relief, alleging that the defendants had infringed the patent by the manufacture, sale and use of rotary converters constructed in accordance with the plaintiffs' specification. In particular the plaintiffs complained of the sale towards the end of the year 1923 by the defendants to the West Hartlepool Corporation of two 300-kW rotary converters.

The plaintiffs accordingly claimed an injunction to restrain the defendants from infringing their letters patent; damages or an account of profits; and delivery up or destruction on oath of all infringing machines in the defendants' possession or control.

The defence was a denial of infringement or a threat to infringe, and a plea that the plaintiffs' letters patent were invalid upon the grounds of prior publication and prior general knowledge. They pleaded that the plaintiffs' patent was bad for want of subject matter.

Mr. Justice Lawrence dismissed the action, and directed that the defendants should have the general costs of the action and also the costs of the issues raised by the particulars of objections, and the defendants were ordered to pay to the plaintiffs the costs of the issue raised by the particulars of breaches.

Sir Duncan Kerly, K.C., Mr. Whitehead, K.C., and Mr. McEwen attended for the appellants; and Sir Arthur Colefax, K.C., Mr. Trevor Watson, and Mr. Sandeman for the respondents.

Sir Duncan Kerly, in opening the proceedings, explained in great detail the invention of Rosenberg as disclosed in his specification.

Bartholomew v. Electrical Distribution of Yorkshire, Ltd.

At the Rotherham County Court recently, Thomas Bartholomew, Rotherham, sued the defendants for £35 damages. For the plaintiff it was stated that the company's workmen left a shallow trench across a roadway at Maltby. A car owned by the plaintiff passed over this and the back axle was broken. In reply to questions plaintiff said that the car was 15 years old and that it was bought for £25. The case was adjourned.

Aerodrome Lighting.—The installation of a system to enable aircraft to land safely in fogs has just been started at Croydon, the London air station. According to the *Daily Mail*, in parallel lines across the aerodrome trenches are being dug and in these neon light-tubes are to be sunk. This form of light, with its brilliant reddish hue, effectually penetrates fog. Above the lights, and flush with the ground, there are to be thick plate-glass covers, so that aeroplanes can taxi over them without damaging the glowing tubes beneath. Between the light-tubes there is to be laid a section of leader cable. After being guided by directional wireless to the aerodrome, the airman, flying through fog, will pick up the leader-cable and follow it round and round, gradually reducing his altitude till he catches sight of the lines of neon lights and is able to land.

French Electrical Conference.—The Société Française des Electriciens has during the current week held a conference. Among the subjects included in the scheduled programme were "Coefficients of Deformation of Alternator Curves," "Putting Synchronous and Asynchronous Machines in Short Circuit," "Definitions and Measurements of Coefficients of Loss and Reactances in Alternators," "Phase Compensation in A.C. Installations," "The Lighting of Works and Schools," "Motor Headlights," "Traction by Accumulators," and "Rural Electrification."

Trade-mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from October 28th. In the case of foreign applications, the names and addresses of the British representatives are also given.

N. & K. (lettering and design). No. 447,816. Class 8. Radio-telephonic apparatus.—Neufeldt & Kuhnke, Kiel, Germany. (L. J. Hydleman & Co., 32, Queen Victoria Street, E.C.4.)

Flor (lettering and design). No. 458,318. Class 8. Electric accumulators and parts.—La Société des Accumulateurs Tudor, 60, Chaussée de Charleroi, Brussels. (Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Radiolux-Amplion. No. 461,384. Class 8. Scientific and philosophical instruments and apparatus for useful purposes.—E. A. Graham, trading as Alfred Graham & Co.

Guarding the Pole—the Polar F Light Best Yet Made (lettering and design). No. 460,183. Class 8. Electrical dry cells.—Thomas Henrik Poulsoon, 43, Dronningensgade, Stavanger, Norway. (Phillips', 70, Chancery Lane, W.C.2.)

Hetroflex. No. 461,565. All goods in Class 8.—A. S. Cheetham, 3, Vernon Road, Edgbaston, Birmingham.

Wind design only. No. 461,624. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—Consulting and Radio Service, Ltd., 15, Gordon Street, Glasgow.

Nick-o-Time tunometer. No. 462,009. Class 8. Variable inductances.—M. E. Elliott, The Thistles, Kemps Lane, Beccles.

Prodonite. No. 462,418. Class 8. Detector crystals for use in radio-telegraphy and telephony.—S. B. Smith & Co., Ltd., 10, Savoy Street, Strand, W.C.2.

Ino (lettering and design). No. 460,049. Class 13. Electric lamps (ordinary).—Ino Guarantee Lamp Co., Ltd., 35, Aldermanbury, E.C.2.

Elektrolox. No. 460,957. Class 18. Refrigerating chambers and refrigerating plant.—Elektrolox Aktiebolaget, 2 Norrmalmsstorg, Stockholm, Sweden. (Haseltine, Lake & Co., 28, Southampton Buildings, W.C.2.)

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

8,341. "Method of winding for the improvement of the commutation in electric machines provided with commutators." Compagnie Electro-Mécanique. April 16th, 1923. (214,601.)

8,766. "Multiple-wave acoustic apparatus." Signal Ges. May 14th, 1923. (216,105.)

9,145. "Two-way telephonic and telegraphic repeater for use without balancing networks." A. W. Adams. April 10th, 1924. (240,680.)

13,621. "Electrical resistance." A. Dilger and Dubilier Condenser Co., Ltd. June 4th, 1924. (240,890.)

14,128. "Contacts for use in electrical apparatus." Western Electric Co., Ltd. (Western Electric Co., Inc.). June 11th, 1924. (240,895.)

14,184. "Electric driving mechanism for weaving, knitting, and like machines." Siemens-Schuckertwerke Ges. August 23rd, 1923. (220,931.)

14,366. "Control of electric motors." E. J. Ondoli. June 13th, 1924. (240,897.)

15,463. "Apparatus for the reception of wireless signals." N. Lea and Radio Communication Co., Ltd. June 26th, 1924. (240,899.)

15,995. "Screw-plug electric fuses." Siemens-Schuckertwerke Ges. December 13th, 1923. (226,155.)

15,996. "Non-interchangeable electric fuses." Siemens-Schuckertwerke Ges. December 14th, 1923. (226,156.)

16,199. "Means for correcting or minimising distortion of signals in electric telegraph systems." H. V. Higgitt and Eastern Telegraph Co., Ltd. July 5th, 1924. (240,906.)

16,273. "Manufacture of electron-emitting material and apparatus." A. S. Cachemaille (Westinghouse Lamp Co.). July 7th, 1924. (240 909.)

16,328. "Automatic cut-out for use with electrically-heated appliances." G. H. Collins and H. F. Collins. July 8th, 1924. (240,910.)

16,427. "Variable resistances for wireless and other purposes." H. Ingham and H. Clarke & Co. (Manchester), Ltd. July 9th, 1924. (Cognate application, 9,462/25.) (240,917.)

16,492. "Electron valve holders." Burndept, Ltd., L. J. Hunt, and C. F. Phillips. July 9th, 1924. (240,918.)

16,499. "Portable electrocardiographs and the like apparatus." H. E. Nichols and C. H. Chase. July 9th, 1924. (240,919.)

16,513. "Method of and electronic valve for modulating electric currents." E. T. Fisk. July 9th, 1924. (240,920.)

16,716. "Electrically-driven high-speed spindles applicable for use with woodworking machines." A. Ransome & Co., Ltd., and P. S. Robinson. July 11th, 1924. (240,927.)

16,936. "Adapters, connectors, or the like for lamps or other appliances employing electric current." A. J. Jung. July 15th, 1924. (240,937.)

17,611. "Electrodes for electric discharge tubes." General Electric Co., Ltd., and A. C. Bartlett. July 23rd, 1924. (240,944.)

17,670. "Means for bridging terminals of an electric circuit." J. Sutter. July 24th, 1924. (240,946.)

17,840. "Method and apparatus for measuring distance and time intervals, and more particularly for acoustic depth sounding." Submarine Signal Corporation. December 22nd, 1923. (226,489.)

17,966. "Induction couplers or high-frequency transformers." Igranic Electric Co., Ltd., and A. H. Curtis. July 28th, 1924. (240,953.)

17,980. "Apparatus for supplying high-frequency alternating electric current from a low-frequency source." Westinghouse Brake & Saxby Signal Co. (Union Switch & Signal Co.). July 28th, 1924. (240,954.)

18,463. "Electric radiators." Hotpoint Electric Appliance Co., Ltd., and F. W. Leevers. March 6th, 1925. (240,962.)

18,469. "Electric discharge tubes having more than three electrodes." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabricken). August 1st, 1924. (240,963.)

18,673. "Construction of rotor conductors for induction motors." J. Lea. August 6th, 1924. (240,967.)

18,808. "Dynamo-electric machines." J. A. Kuyser and Metropolitan-Vickers Electrical Co., Ltd. August 7th, 1924. (Addition to 220,362.) (240,971.)

20,343. "Electric switches." J. A. Crabtree. August 28th, 1924. (240,980.)

20,381. "Means for recharging an accumulator in apparatus requiring supplies of current." L. Barrett. August 28th, 1924. (240,981.)

20,496. "Electric switches." Cable Accessories Co., Ltd., F. H. Reeves, and A. Crawford. August 30th, 1924. (240,982.)

20,585. "Dial indicators for radio instruments." Igranic Electric Co., Ltd., A. H. Curtis, and G. F. Dandridge. September 1st, 1924. (240,983.)

22,933. "Electric condensers." Dr. H. Meusser. September 29th, 1924. (Convention date not granted.) (222,507.)

23,243. "Electric contacts." Siemens Bros. & Co., Ltd., and H. E. Humphries. October 1st, 1924. (240,996.)

23,553. "Crystal detectors for wireless telegraphic and telepl apparatus." H. Bowyer. October 6th, 1924. (241,001.)

24,941. "Galvanic batteries." Oldham & Son, Ltd., G. H. Darby, W. D. Wilde. October 20th, 1924. (241,014.)

25,787. "Contact caps for electric discharge devices." British Thom Houston Co., Ltd. October 30th, 1923. (224,233.)

25,845. "Electrode holders for use in electric welding and cutting." Jamison. October 30th, 1924. (241,023.)

26,036. "Electrical connectors." E. B. Stephenson. November 1st, 1 (241,026.)

26,302. "Controlling gear for electric vehicles having apparatus oper by compressed fluid." Siemens-Schuckertwerke Ges. August 30th, 1 (239,155.)

28,369. "Batteries of the type employed in electrotherapeutic treatn of physical ailments or disabilities." E. R. G. Greville and F. W. R November 26th, 1924. (241,043.)

30,040. "Radio communication systems." Soc. Française Radio-Electri December 13th, 1923. (226,227.)

30,666. "Electron discharge devices." Western Electric Co., Ltd. (Wes Electric Co., Inc.). December 20th, 1924. (241,050.)

1925.

168. "Devices for cooling electrodes of discharge tubes." Naamlo Vennootschap Philips' Gloeilampenfabrieken. January 24th, 1924. (228,1

4,630. "Method of and means for moulding insulators formed from po lain, clay, or the like." British Thomson-Houston Co., Ltd. (General Elec Co.). February 19th, 1925. (240,713.)

4,697. "Crystal detector for wireless reception." J. P. Eckersley. ruary 20th, 1925. (240,714.)

4,811. "Electrical condensers." G. A. Laughton. February 21st, 1 (240,716.)

5,683. "Process for local treatment of the surface of electric insulator Porcelainfabrieken Norden Aktieselskabet. March 5th, 1924. (230,445.)

5,820. "System for the reception or emission of high-frequency elec magnetic waves or of low-frequency fields." Soc. Industrielle des Procé W. A. Loth. March 8th, 1924. (230,452.)

5,854. "Electric cables." Johnson & Phillips, Ltd., and D. A. S. Porte March 3rd, 1925. (Addition to 230,764.) (240,721.)

6,647. "Systems of electric motor control." British Thomson-Houston C Ltd. (International General Electric Co. Inc.). March 11th, 1925. (240,72

7,368. "Electrolytic manufacture of iron." Le Fer Soc. Anon. March 24 1924. (231,179.)

7,679. "Electric radiators." W. Joice. March 21st, 1925. (240,372.)

7,838. "Continuous inductive train control." General Railway Signal April 7th, 1924. (231,852.)

8,496. "Electric apparatus comprising a filament of highly refractory m terial." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 5 1924. (231,861.)

8,839. "Electric heat accumulators." S. Sacerdote. April 2nd, 19 (231,878.)

9,244. "Automatic switching systems." British Thomson-Houston Co., L April 8th, 1924. (232,226.)

9,328. "Variable air condensers for wireless telegraphy." C. R. Jarv April 8th, 1925. (240,741.)

9,770. "Electrolytic rectifiers or valves." Elecktro-tau-Ges. April 14 1924. (232,271.)

9,975. "Subaquatic electric cables." Felten & Guilleaume Carlswerk A Ges. June 7th, 1924. (235,151.)

10,380. "Electric regulating system." British Thomson-Houston Co., L April 21st, 1924. (232,641.)

10,585. "Portable dynamo-electric machines." I. Zbar. April 26th, 19 (232,971.)

10,722. "Electric discharge devices for converting electric power." Haz tine Research Corporation. July 5th, 1923. (Divided application on 16,12 24.) (232,980.)

10,727. "Methods of mounting filaments for incandescent lamps and t like." Westinghouse Lamp Co. May 12th, 1924. (233,683.)

11,037. "Electric arc-welding machines." British Thomson-Houston C Ltd. April 28th, 1924. (232,995.)

12,024. "Connecting terminals for electric conductors." O. Ommundse May 8th, 1924. (233,724.)

13,452. "Method of cooling the electrodes in ozonisers." R. Graef. M 22nd, 1925. (241,125.)

13,616. "Headlight deflectors." R. L. Anderson. May 25th, 192 (240,098.)

13,659. "Electric water-heaters." T. H. McQuinn. May 25th, 192 (240,762.)

14,768. "Dynamo-electric machines." British Lighting & Ignition Co Ltd., and J. C. Hutton. May 16th, 1924. (Divided application on 239,900 (240,100.)

15,114. "Telegraph typewriters." Kleinschmidt Electric Co. Inc. Ju 5th, 1923. (Divided application on 218,643.) (235,573.)

15,117. "Telegraph typewriters." Kleinschmidt Electric Co. Inc. Augu 11th, 1923. (Divided application on 220,280.) (235,576.)

15,348. "Automatic voltage regulation of alternating-current circuits particularly for welding machines." J. J. V. Armstrong (Naamlooze Vennoo schap W. Smit & Co.'s Transformatorenfabriek). June 13th, 1925. (241,133

15,584. "Apparatus for supplying electric current to vacuum tubes. Reiniger, Gebbert & Schall Akt. Ges. June 17th, 1924. (235,879.)

15,622. "Anti-glare headlight lenses." C. H. Tumey, sen., M. D. Nealor and M. Tumey. June 16th, 1925. (240,393.)

15,843. "Variable condensers for use with high-frequency circuits." E Picard. June 19th, 1925. (240,769.)

17,031. "Starting and stopping devices for electromagnetic talking machines." Telegraphie-Ges. System Stille. July 3rd, 1924. (236,573.)

17,150. "Aerials for wireless telegraphy and telephony." Telefunken Ges fur Drahtlose Telegraphie. July 25th, 1924. (237,584.)

17,549. "Electrical heating elements." W. Guy-Pell. December 9th, 1924 (Divided application on 29,587/24.) (241,141.)

18,335. "Headlights for motor vehicles." W. V. Van Etten. July 17h 1925. (240,111.)

18,700. "Method of manufacturing electron-emitting cathodes." Suddeut sche Telefon-Apparate-Kabel-und Drahtwerke Akt.-Ges. July 24th, 1924 (237,614.)

18,787. "Electrical frequency filters." Westinghouse Electric & Manu facturing Co. August 9th, 1924. (238,211.)

19,855. "Telephone systems." Automatic Telephone Manufacturing Co. Ltd. December 14th, 1923. (Divided application on 226,154.) (238,245.)

Steam Generation on "Coal Site."—We have received some particulars of an extremely interesting event which recently occurred at the Barnsley electricity works. Some months ago it was arranged to construct an ash tunnel in the boiler house immediately under the "Bennis" chain grate stoker equipment of one of the boilers. The work of excavation had not been long in progress before a seam of useful coal, 1 ft. 8 in. thick, was uncovered. Twenty tons of coal were removed from immediately beneath the stoker into which it was fed direct, thus providing fuel for several hours' run.

The

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Electricity Supply in the London District.

THE inauguration of the new Joint Electricity Authority for the London and Home Counties Electricity District on Wednesday last week was, in the words of Sir John Snell, "an historic occasion," to which the newly elected chairman, Mr. Duncan Watson, referred as "the dawn of a new era that . . . will confer incalculable benefit upon the 8¼ millions of people in Greater London." We sincerely hope that these words will be justified by the event. London for a generation has awaited the reforming hand which shall bring order out of chaos and resolve the welter of discordant systems into one grand harmony; to Mr. Watson has fallen the lot of leader for the first three years of the campaign, and we heartily congratulate him on the honour conferred upon him by his 32 colleagues. We trust that under his guidance the Joint Authority will receive its initial impetus in the right direction, and that his successors will keep the ball rolling till the goal is won.

He will not, however, find the game all play and no work—nor would he wish it so, accustomed as he is to delight in a tough set-to; he is the captain of an ill-assorted team, the members of which have yet to learn to play for the side and not for their own ends. The problem of London's electricity supply bristles with vested interests, both company and municipal, to an even greater extent than that of any other area in this country, where possession seems to comprise 99 points of the law. The companies have made a good bargain with the London County Council; the municipal authorities have not yielded an inch, and there is—as yet—no power to compel them to do so, save the control over extensions wielded by the Electricity Commissioners, which has been exercised so far with remarkable restraint, except in the case of minor undertakings. *The parochial spirit still dominates the whole field of electricity supply.* This is none the less true because we see many undertakings reaching out to supply larger and larger areas, adding unto themselves acre after acre—that is good practice inasmuch as it makes for economy, but it is by a development and expansion of the same spirit that it is prompted.

Heartily therefore do we welcome Mr. Duncan Watson's declaration from the chair of the London Authority: "Hitherto, largely owing to our ultra-parochial and insular policy, electricity supply has developed into a complicated and chaotic condition which has no parallel. There has also existed a clashing and conflict of interests not merely between one section and another, but actually within representative sections, resulting in much misunderstanding, and not a little prejudice. From to-day this must go. Every barrier must be swept aside."

These are brave words; but they show the right spirit. It rests with Mr. Duncan Watson to convince his colleagues of their truth and wisdom. He will have a hard task, as he well knows; he will need all the courage and firmness with which he is credited, and he has our best wishes for his success in a great undertaking.

A Slight upon the Technical Press.

The inauguration of the most important Joint Electricity Authority in the country—the only such Authority that is in full operation at present, for the North Wales and South Cheshire J.E.A. has delegated its supply powers to the North Wales Power Company—might reasonably be regarded as a ceremony at which the electrical Press would be represented. The event is certainly of interest to its many thousands of readers, at home and abroad, not only in respect of its particular bearing upon the future welfare of one-fifth of the population of this country, but also in its more general aspect as one of the most important achievements of the Electricity Commissioners.

Nevertheless, whilst the lay Press was represented at the inaugural meeting of the London Authority, the technical Press was neither invited to send representatives nor even informed that the meeting was to take place.

Next Year's Wireless Exhibition.

We have received several further communications respecting the subject of too many wireless exhibitions since we expressed the opinion (Electrical Review, October 23rd, p. 643) in favour of the holding in 1926 of only one exhibition, and that open to all British manufacturers. Two of the communications before us support the idea of a single exhibition. Mr. J. Scott Taggart, of *The Wireless Dealer*, has received communications to the same effect from many in the trade, and some of his correspondents have given definite promises to take stands "at any exhibition we may be forced to promote to overcome a possible deadlock." He feels, as we do, that the time has come when manufacturers should realise that it is in the best interests of the industry that both N.A.R.M.A.T. and non-N.A.R.M.A.T. members should join hands in one big display, but we have no information regarding circumstances which can create a "possible deadlock" requiring him to promote an exhibition. The second communication is from a firm who announce their intention to hold an exhibition open to all during next autumn. They have been responsible for, or associated with, various wireless exhibitions at the White City, the Albert Hall, and at Manchester, and they invite all sections of the British industry to support a movement which would be held on the broad lines of the Motor Show, and which would be conducted on a co-operative basis in respect of the profits accruing. Messrs. Bertram Day & Co., Ltd., from whom this letter comes, say that trade publications consider it essential that an "impartial organisation" should arrange for the exhibition, and they disclaim any partiality "to any particular body, section, or publication."

We are faced therefore at the moment with the threat of two exhibitions next year, each promoted by a party which is convinced that what the industry needs is one big show! It may seem to be early to talk about what will happen in the autumn of 1926, but it is not too soon for firms who are interested in the trade to express themselves emphatically against duplication. We hold no brief for either party. We hope that the industry itself will find it possible to decide between the two Richmonds who are in the field. If it does not do so promptly we may have two and perhaps more wireless exhibitions in London next year.

The Progress of E.D.A.

As the result of the special efforts that have been made since the last annual meeting of the British Electrical Development Association, the permanent annual income from electricity supply members has been considerably increased. Between fifty and sixty new members from this department of the industry have been enrolled, and the new income thus secured, together with the additional contributions from authorities already subscribing, has more than trebled the supply quota of the total revenue of the organisation. There is, of course, still room for substantial improvement so that the movement may become that big affair that the future of electricity requires and fully justifies. The sum now guaranteed, however, is sufficient to enable the Council and its director, Mr. Beauchamp, and staff, to push on with their larger operations. It of necessity follows that the handling of a larger volume of material and the general increase of work have involved some adjustment of, and additions to, the *personnel*. It will be agreed that the strengthening of the staff by the appointment of an official to take charge of the accountancy side of operations was a desirable proceeding. That has been seen to, and the preparation of Press and advertising matter has been placed under the supervision of Mr. Lovelace, whose experience in advertising publicity will doubtless form a valuable accession, especially as a National Electrical Advertising Campaign is to be one of the more prominent activities of the Association during the coming months. Mr. V. W. Dale will continue to act as Business Manager, but the changes will release him for more direct action in co-operation with his Chief. Very shortly the Press campaign of the winter months will be in full swing, a large number of newspapers and periodicals being chosen as the vehicles for conveying to the public mind the appropriate story of what electricity can and cannot do.

The North Wales Accident.

The whole country has read with the deepest regret the story of the breakdown of a storage dam belonging to the North Wales Power Company, and its disastrous consequences, of which by far the most deplorable was the loss of 16 lives, including women and children, under terrifying conditions. It was indeed forutnate that the village of Dolgarrog was not in the direct line of the raging torrent of three million tons of water which rushed down the hillside—otherwise the death-roll would have been very heavy.

Nature's gifts of energy are not to be harvested like crops from the fields without the exaction of a toll of life and limb; our coal mines from time to time have been the scenes of catastrophes, none the less terrible because of their familiarity, but we have hundreds of mines and very few large water-powers, so that the spectacular failure of a dam exercises the imagination even more vividly than an explosion in a coal mine.

From the material point of view, the damage fortunately appears to be less serious than the earlier reports implied, and the fact that one generator at Dolgarrog was running a few days after the accident indicates that the power station was not badly injured. Mr. Theodore Stevens, M.Inst.C.E., who has visited the spot, communicates his observations on another page of this issue, and from these it seems possible that the lower dam will be made good within a few weeks. The condition of the Eigiau dam will doubtless call for serious consideration, for though the dam itself is intact, it will be useless until the soundness of the foundation is ensured. In the meantime the supply of electricity to the many towns concerned has been restored by various expedients.

Notes from New Zealand.

(From Our Own Correspondent.)

Storage Battery Tramcars.

Gisborne, N.Z., the leading city on the east coast of the North Island, decided in 1913 to go in for a system of storage battery tramcars; the experiment was watched with interest by other cities and towns, but the undertaking was run at a loss for a number of years. The cause of the loss was not suspected until Messrs. Vickerman & Lancaster, engineers, of Wellington, made an examination on behalf of the municipality, and their report just received should prove of great assistance to the Gisborne people in placing their tramway system on a thoroughly sound business footing.

At present the tramway system in Gisborne consists of only a few miles of track laid on the main thoroughfares, and it just fails to accommodate the potential passenger traffic located in three of the most populous portions of the city and its suburbs. The engineers recommend that extensions be added to the present track system to overcome this drawback, and also a general speeding up of the existing service. It is considered that the adoption of these proposals will put the tramway system on a very strong footing.

The interesting point in connection with Gisborne's tramcars is that they are the only storage battery cars operating in any part of the world under the authority of a municipality. The engineers have now recommended their retention, being of the opinion that they are cheaper than either the standard or the railless trolley type, and practically as cheap as either the petrol or the battery 'bus. It will be interesting to watch the new developments with the storage battery tramcars under the more favourable conditions.

Electric Milking Plants.

The chief engineer of the Franklin Power Board, N.Z., recently presented in a report to the Board the following scale of charges for milking installations:—100 cows, 2-h.p. motor, 6-cow plant: £27 to £30 per annum. 75 cows, 2-h.p. motor, 4-cow plant: £24 to £26 per annum. 50 cows, 2-h.p. motor, 4-cow plant: £21 to £24 per annum. 30 cows, 1½-h.p. motor, 3-cow plant: £14 to £17 per annum. 20 cows, 1-h.p. motor, 2-cow plant: £12 to £14 per annum.

The prices include water pumping and separating, but the actual cost in each shed was fixed according to the time taken to milk and the type and running condition of the plant.

Milking by electricity is becoming quite a feature of the New Zealand dairying industry, and the progress of reticulation is bringing into this field a rapidly growing number of electrically-driven milking plants. The Central Power Board operating in Hamilton and the Waikato dairying district reported at a recent monthly meeting that an addition of 408 milking motors had been registered. A similar condition of things is also reported from other Boards, especially in those districts where sub-stations have recently been erected.

New Zealand's Hydro Minister on the Government's Hydro-electric Policy.

At the recent function in connection with the inauguration of the Orua Power Board's sub-station at Bunnythorpe, the Hon. J. G. Coates, Minister of Public Works, outlined the Government's policy in connection with hydro development. He pointed out that the narrow and nearer view was not the one most calculated to conserve the best interests of consumers. The sooner New Zealand could secure favourable prices in the world's markets, the sooner would foreign capital invest in the country, and sound hydro development made this condition of things possible by cheapening the costs of production.

The Minister stated that the taxpayers' money had been invested in hydro schemes, and he meant to see that these investments bore a rich harvest of profit for the general public. It would be the duty of the Power Boards to see that no further rates were struck after the rate for the security of the loans had been levied. The Minister was satisfied that the Government had adopted the right policy in forming the Power Board scheme, and he looked to the Boards themselves to run the hydro industry in the interests of the consumers.

Auckland's Power Plant.

Recently the Auckland Power Board held an official reception at its power station at King's Wharf for the purpose of enabling the general public to view the extent of the Board's undertakings. The function was a great success, and was attended by the Minister of Public Works and other prominent persons.

The power station consists of four 5,000-kW and one 3,000-kW sets, including the original 5,000-kW set which was installed at the inception of the station. The aggregate capacity is stated at 25,000 kW, while the present load is given at 15,000 kW. It is anticipated that the next winter peak load will reach 18,000 kW.

Reticulation is proceeding apace, but there is still a very large number of houses to be connected. The actual consumption of power per house has been calculated at 20 kWh per month, and on this basis reticulation of each additional thousand houses only involves an extra 500 kW per day on the main load. The heaviest item before the Auckland Power Board at the moment is the replacement of portions of the heavy city mains, which have developed faults as a result of overloading as well as other causes, and the introduction of the heavier cables will be proceeded with as soon as the necessary material comes to hand. The estimated profit of the Board for the past twelve months was £13,000.

Lake Coleridge Record Overload.

The growing popularity of electricity is nowhere better exemplified than in the case of the Lake Coleridge plant supplying the city of Christchurch. The nominal capacity of the plant is 12,000 kW, but the maximum overload capacity is estimated at 15,000 kW; for several weeks past the load has been in excess of the normal capacity. The heavy tax upon the capacity of the plant is having the effect of spurring on the duplication works, which, it is said, will only meet the requirements for a limited period. No doubt the progress of reticulation will be retarded to some extent as a result of the present heavy tax on the capacity of the existing plant, and every effort will be made to persuade the Government to sanction the erection of one or other of the secondary schemes in the general report—probably the Waimakariri project at either the Gorge Bridge site or at Otarama.

The Wairere Power Scheme.

Though one of the most recently formed Power Boards in the country, the Wairere body has lost no time in getting itself on to the Dominion's hydro map. The Wairere Falls, from which power is to be derived, is situated some twenty-two miles as the crow flies from the thriving King Country town of Te Kuiti. The scheme decided upon involves the provision of 1,600 h.p. from an available head of 60 ft. The estimated cost of the work is £38,500, and a loan for this amount is being issued.

The policy of the Board is to erect lines only in those localities where the guaranteed revenue is sufficient to render the work self-supporting. Guarantees have already been received to cover estimated working expenses over and above interest and sinking fund.

The scheme is considered one of the most economical projects in the whole of the Dominion scheme, and the vigour and keenness with which the project has been pursued augurs well for the success of the undertaking.

Electricity Supply in Great Britain.—V.

Berkshire and Oxfordshire.

From a glance at the map of the above counties, reproduced from the 1917 Boundary Commission Maps by permission of the Controller of H.M. Stationery Office, it will at once be evident that there are many acres of "unoccupied areas" in both counties waiting to be "exploited" by some enterprising group of persons or companies (local authorities apparently do not favour the grouping policy—from this point of view, at any rate).

We do not propose at this stage to discuss these areas from an engineering standpoint, but would like to refer those interested to the scale of miles, and ask them to compare some of the distances between the various towns with the distances between towns which are connected in other countries.

For the present our purpose is to show which are the occupied or applied-for areas by hatching these portions on the map.

In addition to the Metropolitan Electric Supply Co., Ltd. (which has bulk supply powers in the Borough of New Windsor and the Rural District of Windsor), there are 16 other undertakers, 13 of which are companies, whose areas of supply are wholly or partly included in this map. The following is the list:—

Local Authorities.

Maidenhead Corporation.
New Windsor Corporation.
Witney Urban District Council.

Companies.

Abingdon Electric Supply Co., Ltd.
Ascot District Gas & Electricity Co.
Banbury & District Electric Supply Co., Ltd.
Chipping Norton Electric Supply Co., Ltd.
Cookham & District Electricity Corporation, Ltd.
Oxford Electric Co., Ltd.
Reading Electric Supply Co., Ltd.
Thames Valley Electric Supply Co., Ltd.
Urban Electric Supply Co., Ltd.
Wantage Electric Supply Co., Ltd.
Whitchurch & Pangbourne Electric Supply Co., Ltd.
Windsor Electrical Installation Co., Ltd.
York Town and Blackwater Gas Co.

The 1921 Census gives the following particulars of the Administrative Counties of Berkshire and Oxfordshire and the associated County Boroughs:—

Acres.	Persons.	Resident families.	Buildings not containing dwellings.
943,050	484,436	114,477	8,213

Since these Boundary Commission maps were prepared in 1917, the following alterations have been made:—

(1) The Parishes of All Hallows, St. Leonard, St. Mary-the-More, and St. Peter have been united to form the new Parish of Wallingford, which is co-extensive with the Borough of Wallingford.

(2) The Borough of New Windsor has been enlarged by the inclusion of the Parish of Clewer Without.

(3) The Parishes of Pishill and Stonor, in Henley Rural District, have been united to form the new Parish of Pishill with Stonor.

(4) The alteration to parishes, &c., in the City of Oxford, made under the Oxford Corporation Act, 1925, does not take effect until April 1st, 1926.

London and Home Counties Electricity District.

As previously mentioned in "Electricity Supply in Great Britain—III," we are not reproducing a map of the County of London or of Middlesex, but maps of the other six Home Counties have now been published in this series.

In this connection we may point out that a map of the London and Home Counties Electricity District has just been published, and is now obtainable from H.M. Stationery Office or through any bookseller (price 3s. net). It is a small-scale copy of the map deposited at the offices of the Electricity Commissioners, showing the boundary of the District as defined in Section 1 of the Schedule to the London and Home Counties Electricity District Order, 1925, which reads as follows:—

Constitution of District.

"The following areas all as constituted at the date of the commencement of the Order giving effect to this Scheme (hereinafter called "the date of the Order"), namely:—

The Administrative County of London, that is to say, the City of London (including the places known as the Inner Temple and the Middle Temple) and the Metropolitan Boroughs of Battersea, Bermondsey, Bethnal Green, Camberwell, Chelsea, Deptford, Finsbury, Fulham, Greenwich, Hackney, Hammersmith, Hampstead, Holborn, Islington, Kensington, Lambeth, Lewisham, Paddington, Poplar, St. Marylebone, St. Pancras, Shoreditch, Southwark, Stepney, Stoke Newington, Wandsworth, Westminster and Woolwich;

The Administrative County of Middlesex;

The County Boroughs of Croydon, East Ham and West Ham;

So much of the Administrative County of Berks as comprises:—

The Municipal Borough of New Windsor;

The Parish of Old Windsor in the Rural District of Windsor;

So much of the Administrative County of Buckingham as comprises:—

The Urban Districts of Beaconsfield, Eton and Slough;

The Rural District of Eton;

The Parishes of Amersham, Chalfont St. Giles, Chalfont St. Peter's, Chenies and Penn; Coleshill Hamlet and Seer Green Chapelry in the Rural District of Amersham;

So much of the Administrative County of Essex as comprises:—

The Urban Districts of Barking Town, Brentwood, Buckhurst Hill, Chingford, Epping, Grays Thurrock, Ilford, Leyton, Loughton, Romford, Tilbury, Waltham Holy Cross, Walthamstow, Wanstead and Woodford;

The Rural Districts of Billericay, Epping, Ongar, Orsett and Romford;

So much of the Administrative County of Hertford as comprises:—

The City of St. Alban;

The Municipal Borough of Hertford;

The Urban Districts of Barnet, Cheshunt, Chorleywood, East Barnet Valley, Harpenden, Hoddesdon and Ware;

The Rural Districts of Barnet, Hatfield, Hertford, St. Alban's, Ware, and Welwyn; the detached part (lying between the Rural Districts of Ware and Epping) of the Parish of High Wych in the Rural District of Hadham;

The Parish of Flaunden in the Rural District of Hemel Hempsted;

§ So much of the Urban District of Rickmansworth and the Rural District of Watford as are not included in the authorised area of supply of the Corporation of Watford as constituted at the date of this Order;

So much of the Administrative County of Kent as comprises:—

The Municipal Boroughs of Bromley and Gravesend;

The Urban Districts of Beckenham, Bexley, Chislehurst, Crayford, Dartford, Erith, Northfleet, Penge, Sevenoaks, and Sidcup;

The Rural Districts of Bromley and Dartford;

The Parishes of Brasted (excluding the detached portion), Chevening, Dunton Green, Halstead, Kemsing, Otford, Riverhead, Seal, Sevenoaks Weald, Shoreham, Sundridge and Westerham in the Rural District of Sevenoaks;

So much of the Administrative County of Surrey as comprises:—

The Municipal Boroughs of Guildford, Kingston-upon-Thames, Reigate, Richmond and Wimbledon;

The Urban Districts of Barnes, Beddington and Wallington, Carshalton, Caterham, Chertsey, Coulsdon and Purley, Dorking, East and West Molesey, Egham, Epsom, Esher and the Dittons, Ham, Leatherhead, Merton and Morden, Mitcham, Surbiton, Sutton, The Maldens and Coombe, Walton-upon-Thames, Weybridge and Woking;

The Rural District of Epsom;

The Parishes of Bisley, Byfleet, Pyrford and Thorpe in the Rural District of Chertsey;

The Parishes of Dorking Rural, Effingham and Mickleham in the Rural District of Dorking;

The Parishes of Addington, Bletchingly, Chelsham, Crowhurst, Farleigh, Godstone (except the detached portion), Limpsfield, Oxted, Tandridge (except so much of the said parish as lies to the south of an imaginary straight line drawn from the point where the western boundary of the said parish joins the southern boundary of the Parish of Godstone to the point where the eastern boundary of the said parish

joins the southern boundary of the Parish of Crowhurst), Tatsfield, Titsey, Warlingham and Woldingham in the Rural District of Godstone;

The Parishes of Artington, East Clandon, East Horsley, Merrow, Ockham, Pirbright, Send and Ripley, West Clandon, West Horsley, Wisley and Worplesdon; and part of the Parish of Compton in the Rural District of Guildford;

The Parishes of St. Martha (Chilworth) and Shalford in the Rural District of Hambledon; and

The Parishes of Betchworth, Buckland, Chaldon, Chipstead, Gatton, Merstham, Nutfield and Walton-on-the-Hill; and Kingswood Liberty in the Rural District of Reigate,

shall be constituted a separate electricity district for the purposes of the Electricity (Supply) Acts, 1882 to 1922, by the name of the London and Home Counties Electricity District, which District is more particularly delineated on the map deposited at the offices of the Commissioners and signed by the Secretary to the Commissioners. In case of any difference arising as to the boundary of the said District, the boundary shown on the deposited map shall prevail."

§ It should be noted that no part of the Urban District of Rickmansworth, as shown on the 1917 Boundary Commission Map of Herts., which we have reproduced, is included in the authorised area of supply of the Corporation of Watford.

The portion of the Rural District of Watford included in the authorised area of supply of the Corporation of Watford may be described roughly as follows:—The Parishes of Abbots Langley and Aldenham; and the Parish of Watford Rural except that part which lies to the south-west of an imaginary line drawn from the north-east corner of the Parish of Rickmansworth Rural (Detached No. 1) to the point where the railway cuts the southern boundary of the Parish of Watford Rural (Detached), as shown on the map which we reproduced.

In other words, the whole of Rickmansworth Urban District as shown on our map is part of the London and Home Counties Electricity District, together with the Parishes of Rickmansworth Rural and Sarratt, and that part of the Parish of Watford Rural (Detached) which lies to the south-west of the imaginary line described above.



Electricity Supply in the Counties of Oxfordshire and Berkshire.

SEVENOAKS.—In our issue of October 16th we said we believed the Sevenoaks and District Electricity Supply Co., Ltd., supplied no electricity in the part of its area outside Kent. This, we learn, was incorrect; the company's mains were extended into Surrey, and a supply was given throughout Oxted and Limpsfield in December, 1922.

Electricity Supply in Fulham. — With reference to our recent article on the extensions at Fulham electricity works, we are informed that Crosby feed water regulators are fitted to all the boilers in this station, including those just put in.

Modern Electric Cookers.

A Review of the Recent Improvements in Electric Cooking Stoves.

While much remains to be done in improving the electric cooking stove before it can be claimed to be within the limits of perfection, much has been done in the past, especially of recent years, that has enabled the manufacturers to put upon the market at least a comparatively efficient apparatus whereby cooking by electricity has become a practical proposition in every class of residence throughout the country. We find manufacturers still divided in opinion as to the best design which should be adopted for the electric cooker; in fact some differ on the main principles of cooking by electricity. But there is ample evidence that all are working hard to bring about the common desire, the efficient and practical cooker; one which deviates as far

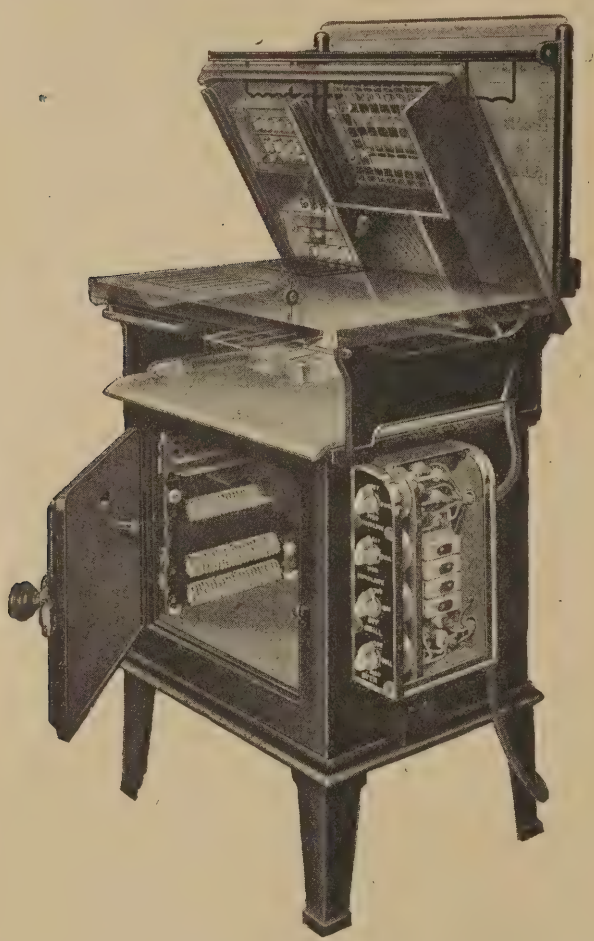


Fig. 1.—Typical Construction of Modern Cooker ("Ghost" View).

as possible from recognition as an electrical appliance and becomes a practical cooking outfit. With the co-operation of several of the electric cooker makers of this country we have been able to gather much interesting information on the subject, and some idea of the trend of the present and the probable future developments.

The construction of the frame and exterior casing of the modern cooker is little altered from that of the past. The general tendency in design is to build a framework of cast iron, with the body or oven panelled inside and out with heavy-gauge sheet-steel plates; varying enamelled finishes add greatly to the attractiveness of many makes. Particular attention has been paid by most makers to the question of suitable adjustment for the oven door in order to reduce to a minimum the heat losses in that direction. The ventilation of the oven is a point which is receiving the serious consideration of the makers, it being the opinion in some directions that in the circulation of the air in the oven lies a great advantage which cooking by electricity holds over other cooking methods. In most cases, thermometers are installed on the doors. In some designs the oven door i arranged with its hinges at the bottom so that it ma be lowered and used as a platform or shelf upon whic the hot foodstuffs may be drawn for inspection, &c The oven handle is so placed in these cases as to act a a support when the door is open. Fig. 2 shows cooker made by Messrs. Coley & Swinnerton with "drop" oven door. Several manufacturers have intro duced rounded corners inside the oven, rendering th task of cleaning the interior a much easier one. A important feature in the construction of several moder makes of cookers is the hinged hob, fig. 1. Thi arrangement proves most valuable for both cleaning an repairing operations with regard to the boiler and th grill elements, and also the crown plate and the top o the oven generally. Many troubles have been cause in electric cooking ranges by the use of flexible wires &c., for the internal connections, but in practically al the modern types, rigid bar connections have bee adopted, suitably protected, and at the same tim readily accessible.

It is perhaps a safe venture to suggest that by far th majority of electric cookers produced nowadays ar

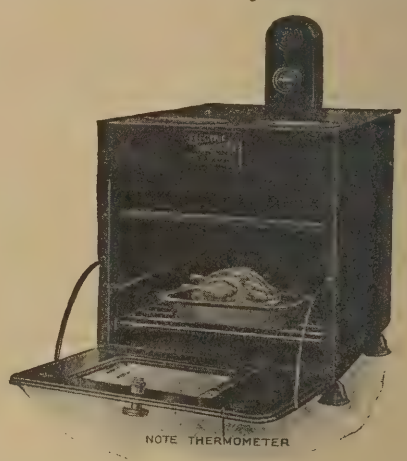


Fig. 2,—Small Oven, "Drop" Door.

either sold under special maintenance schemes or hire out by the supply undertakings, and it is a fact tha many supply engineers have felt the need, in order t be able to continue and progress with their schemes o maintenance, of great improvements which would resul in reducing the repairs bill and also in permitting th necessary repairs to be carried out more speedily an if possible, not on the consumers' premises. Most manu facturers have met this need by arranging the element so that they can be easily removed and replaced in th case of defect without causing any appreciable disturb ance or inconvenience on the site of the installation Generally speaking, three methods of housing and fixin the elements have been adopted to fulfil this require ment: first, by attaching the elements to rigid bar sup ports by means of fixed bolts and wing nuts; secondly by arranging the elements with plug and socket conne tions; and in the last case by building the variou elements in unit form, housed in a metal frame, so tha the whole unit can be removed or replaced simply b "dropping" it in a suitable provision in the main bod of the range. The use of porcelain bushes for fixin the terminals, &c., was at one time a great source o trouble, experience showing that porcelain woul neither stand the necessary temperatures nor th tightening up essential on the terminal and connectio bolts, &c. It is particularly interesting to learn tha Messrs. The Jackson Electric Stove Co., Ltd., are no using porcelain for the purposes specified. They clai that after many years of research they have obtained specially prepared material which will stand up to th

treatment required, and they believe that at the present time they are unique in the use of porcelain in the direction indicated. Further, no mica is used anywhere on the Jackson stoves, the makers being of the opinion that in the past much trouble has been attributable to the employment of this substance, due to its absorbing various liquids which are spilt during cooking operations. Asbestos is used only where it is considered necessary, immediately under the hob plate, for the same reason. For the main connection from the switch box to the elements in this stove, the makers use multi-core cab-tire cable. An illustration of the housing of the elements and the general connections of the modern Jackson cooker is given in fig. 1. The hinged hob is shown in ghost view in two positions.

The modern tendency in the matter of heat control is to install 3-heat rotary regulating switches for the groups of elements for the oven and plates, &c., and to place these in a suitable box either on the side of the oven or under the hob plate. In the "Cosmos" cooker made by Metro-Vick Supplies, Ltd., all the connections are suitably protected, and at the same time readily accessible. By an ingenious arrangement, the whole of the wiring, complete with the fuses and switches, which are mounted on a panel at the side of the cooker, can be removed by undoing a few wing nuts. This is an important feature from a mass production point of view, and also with regard to maintenance schemes, as it allows for any improvements or alterations in the design of the cooker to be readily fitted to a cooker out in service.

A problem with which the electric cooker makers are confronted to-day is to provide one which can be adopted in the very limited space of the modern kitchenette, &c. To design a cooker of high efficiency with dimensions to please the maker is a vastly different proposition to designing one of the same efficiency within the dimension limits necessary for accommodation in the apartments mentioned. The Jackson No. 20b model (Electrical Review, April 24th) is an excellent example of what is being done in designing cookers

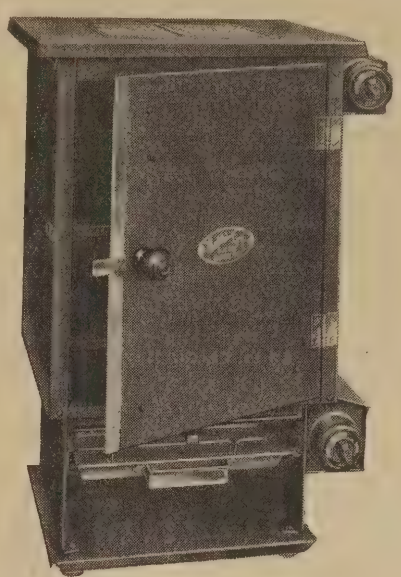


Fig. 3.—Cooker Designed for Limited Space.

for housing schemes, &c., where space is of vital importance. The overall width of this range is 23¾ in., and it has a total loading of 4,950 W for one boiling plate, one griller, and the oven. The "Belling" cookerette, fig. 3, is another good example; its overall width is 15½ in., and its total loading is 2,400 W for the oven and boiler-griller.

(To be continued.)

Three-phase Transmission Lines.

Rapid Preliminary Electrical Calculations with the Aid of Charts.

By GRAHAM ASHWORTH, B.Sc. (1st Class Hons. Eng.), Whitworth Senior Scholar.

The accompanying charts have been prepared to enable the preliminary electrical calculations required for three-phase transmission lines to be made quickly by graphical methods. The following is a list of the symbols employed:—

I. Symbols.

- L = Length of line in miles.
- f = Frequency of circuit in cycles per second.
- r = Resistance of conductor in ohms per mile.
- $R = rL$ = total resistance of one line in ohms.
- x' = Reactance of one line to neutral in ohms per mile.
- $x = 50\,x'/f$ = ditto, ditto, at 50 cycles per second.
- $X = x'L$ = total reactance of one line to neutral in ohms.
- b' = Admittance of one line to neutral in micromhos per mile.
- $b = 50\,b'/f$ = ditto, ditto, at 50 cycles per second.
- $B = b'L$ = total admittance of one line to neutral in micromhos.
- R' = Resistance of one line (and transformers) per cent. of received voltage to neutral.
- X' = Reactance of one line (and transformers) per cent. of received voltage to neutral.
- $S = \sqrt[3]{(A\,B\,C)}$ = effective spacing of conductors in inches, where
- A, B, C = Distances between each pair of conductors in inches.
- d = Outside diameter of conductor in inches.
- a = Area of (copper conductor) in sq. in.
- E_s = Voltage to neutral at sending end.
- E_r = Voltage to neutral at receiving end.
- I = Load current.
- $\cos\phi$ = Power factor at receiving end.
- $Y = jB \cdot 10^{-6}$ = total admittance of one line in mhos.
- $Z = R + jX$ = total impedance of one line in ohms.
- $j = \sqrt{-1}$.
- P = kVA delivered.
- kV = (Standard) line kilovolts at receiving end.
- w = Percentage resistance loss.
  = Total line loss per circuit in kW × 100/kW received.

All logarithms to base 10.

II. Theory of the Charts.

Reactance.— **Chart I.**

$$x' = 2\pi f\,(\text{constant} + 741 \log 2s/d)\ 10^{-6} \quad \text{.....(i)}$$

where

Constant = 102 for 7-wire cable.
= 89 for 19-wire cable.
= 80.5 for wire.

Taking the constant as 92.5 (an error in x of less than 0.7 per cent.), when $f = 50$, $x' = x$ and equation (i) may be written—

$$\log 2s - \log d = 4.30\,x - 0.125 \quad \text{.....(ii)}$$

Plotting $\log 2s$ and $\log d$ on rectangular axes, different given values of x in (ii) give different parallel straight lines at 45 deg. with the axes (with the same scales for $\log 2s$ and $\log d$). These lines give an even scale with any transversal, as may be seen by giving $\log d$ a constant value in (ii).

Admittance.— $b' = 2\pi f\ 0.0388/\log 2s/d$ .....(iii)

and when $f = 50$, $b' = b$; equation (iii) may then be written—

$$\log 2s - \log d = 12.20\ b^{-1} \quad \text{.....(iv)}$$

Comparing (ii) and (iv)—

$$4.30\ x = 0.125 + 12.20\ b^1 \quad \ldots\ldots\ldots\

Chart II.

Scales.—From the vector diagram for regulation, neglecting capacitance,

$$(100 \sin \phi + X)^2 + (100 \cos \phi + R')^2 = (100 + \text{regulation in } \%)^2.$$

The vertical scale is even, and the

Value of horizontal line $= 100\ (1 \pm \sin \phi)$.

The horizontal scale, to give a suitable type of chart, is spaced so that the regulation is proportional to (distance of regulation line from zero line)$^{\frac{1}{2}}$.

The curved lines are—

$$100 \cos \phi + R' = \text{constant}.$$

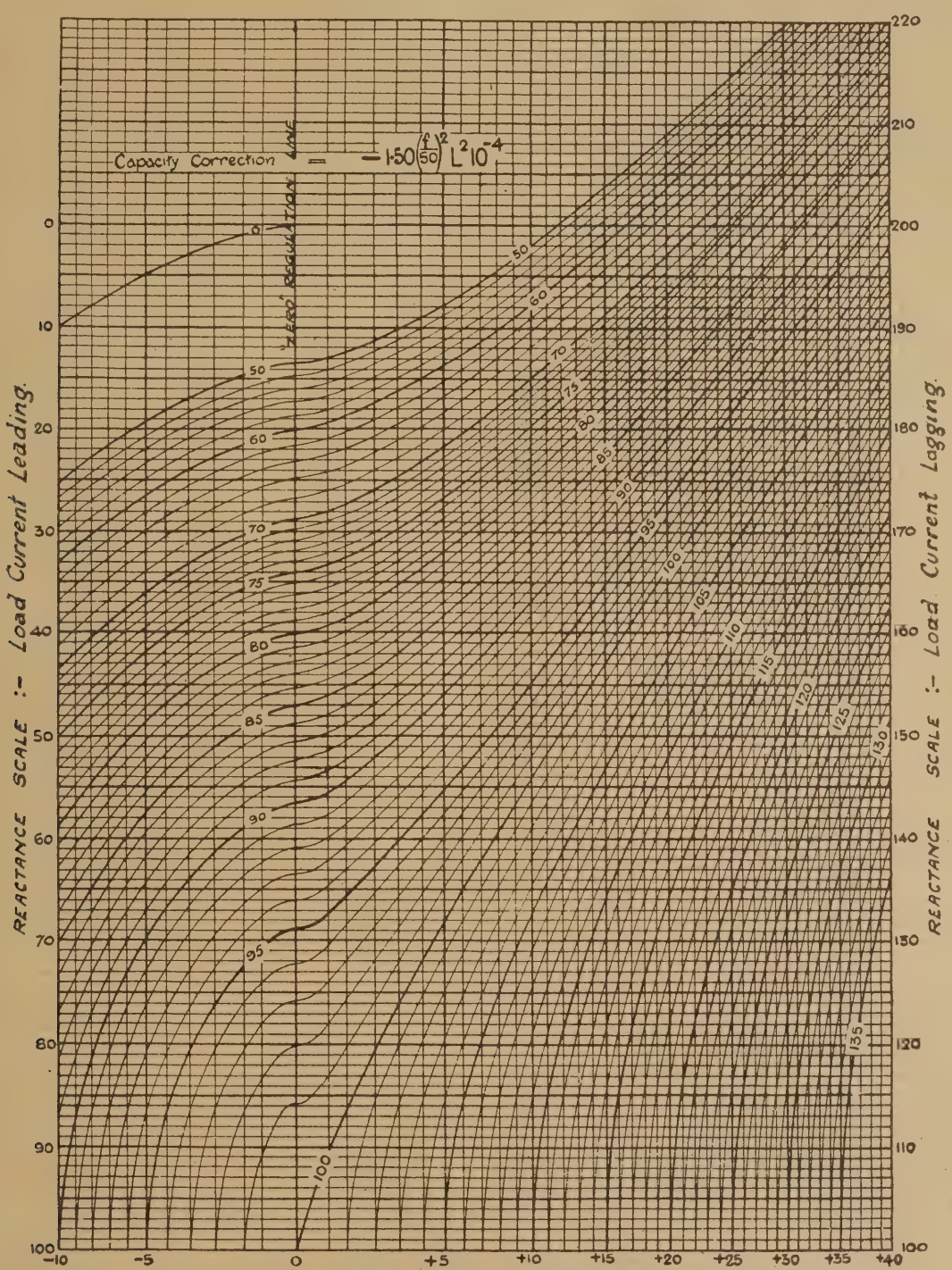
rigid mathematical solution of a line with distributed resistance, reactance, admittance, and leakance, is—

$$\text{Regulation} = (E_s - E_r)/E_r = YZ/2 + Y^2Z^2/24 + \text{----} + IZ/E_r \cdot (\cos \phi \pm j \sin \phi)\ (1 + YZ/6 + \text{----})$$

The chart gives, as accurately as it is drawn (*i.e.*, with a maximum error of about 0.1 per cent. on the regulation scale), the value of $IZ/E_r \cdot (\cos \phi \pm j \sin \phi)$, and so the important correction for capacity is—

$+YZ/2 = + \frac{1}{2} j B 10^{-6}\ (R + jX)$, assuming zero leakance,

$= -\frac{1}{2} B X 10^{-6} + \frac{1}{2} j BR 10^{-6}$.



Example:— Determine the regulation of a circuit consisting of a line 105 miles (=L) long, with two banks of transformers, operating at a frequency of 60 cycles per second (=*f*) and a lagging power factor of 75%.

The total resistance drop of the line and transformers (R′) = 4.5%.

The total reactance drop of the line and transformers (X′)=21.0%.

Solution:—Cos ϕ = 75.9

Add R′ = 4.5

79.5

The curve 75.0 meets the "zero" regulation line at a point measuring on the reactance scale:— 166.0

Add X′ = 21.0

187.0

At the intersection of curve 79.5 and horizontal line 187.0, read on the regulation scale + 18.0%

Capacity correction $= -1.50 \cdot \left(\frac{60}{50}\right)^2 \cdot 105^2 \cdot 10^{-4}$ = −2.4%

True regulation of circuit = 15.6%

Chart No. II.—Ashworth Regulation Chart.

The chart may, of course, be used for the determination of both line and transformer regulation, and the zero curve has been added for transformers operating with pure capacity current.

Capacity Correction.—The formula obtained by a

The value of the term $\frac{1}{2} j$ BR 10^{-6} is negligible, since not only is it small for lines in which the capacity effect is important, but it is practically perpendicular to the "received voltage" vector, and the correction is

$$-\tfrac{1}{2} B X 10^{-6} = -\tfrac{1}{2} b' x' L^2 10^{-6}.$$

Equation (vi) gives the value of $b'x'$ as $3.00\ f^2/50^2$, and thus—

$$\text{Capacity correction} = -1.50\ L^2\ \frac{f^2}{50^2}\ 10^{-4}\ \%.$$

Accuracy.

The accuracy obtainable by using the chart may best be demonstrated by the following table:—

Case.			I.	II.	III.	IV.	V.
Length of line ...	L	Miles	300	250	250	250	250
Frequency	f	Cycles/sec.	60	50	50	50	50
Apparent power received per circuit	P	kVA	18,000	19,000	100,000	100,000	100,000
Line voltage received	kV	Kilovolts	104	110	200	200	200
Resistance drop ...	R'	% of kV	17·5	8·3	6·5	6·5	6·5
Reactance drop ...	X'	% of kV	41·5	25·7	41·9	41·9	41·9
Load power-factor ...	cos ϕ	%	90 lagging	80 lagging	62 lagging	Unity	85 leading
Chart regulation ...	—	%	+37·0	+23·0	+37·5	+14·5	− 7·8
Capacity correction...	—	%	−19·5	− 9·4	− 9·4	− 9·4	− 9·4
Sum	—	%	+17·5	+13·6	+28·1	+ 5·1	−17·2*
Regulation by exact method ...	—	%	+17·7	+13·6	+28·4	+ 5·6	−15·6*

*The difference between these two results is chiefly due to the resistance drop of the capacity current, which has a greater effect at leading power-factor.

The pressure rise on no load is given (for the line only) by the correction for capacity derived above.

III. Formulæ

Voltage.—A purely empirical formula for voltages up to 110 kV is:—

Receiving end pressure $= \sqrt{(PL/104)}$ line kilovolts.

Power Loss.—$a = PL/225w \cos \phi\ (kV)^2$ square inches.

IV. Example.

Say, 20,000 kVA is to be delivered at 60 cycles and 75 per cent. lagging power factor over a distance of 105 miles, with a line resistance loss of about 4 per cent.

Formulæ.—With two circuits, $P = 10{,}000$ kVA, and receiving end pressure $= \sqrt{(10{,}000 \times 105/104)} = 100.5$, say, 110 line kV, since this is a standard.

Then $a = 10{,}000 \times 105/225 \times 4 \times 0.75 \times (110)^2 = 0.128$ square inch.

A convenient size of conductor is 7/.152, which has an area of 0.125 square inch; this gives a line power loss of 4.1 per cent.

Line Constants.—From Chart No. 1 the usual flat spacing for 110 kV is about 15 feet. Taking this value and a cable area of 0.125 square inch (noticing that there is no appreciable corona effect), the chart gives—

$$r = 0.36$$
$$x = 0.680$$
$$b = 4.35.$$

Whence $R = Lr = .36 \times 105 = 38$ ohms

$X = Lx' = 60/50 \times 0.68 \times 105 = 86$ ohms

$B = Lb' = 60/50 \times 4.35 \times 105 = 549$ micromhos.

Regulation.—Percentage resistance drop of line $= PR/10\ (kV)^2 = 3.1\%$.

Say for transformers' resistance (both banks) 1.4%, then $R' = 3.1 + 1.4 = 4.5\%$.

Percentage reactance drop of line $= PX/10\ (kV)^2 = 7.1\%$.

Say for transformers' reactance (both banks) 13.9%, then $x' = 7.1 + 13.9 = 21.0\%$.

From Chart No. II we see that the regulation from the low-pressure side of the transformers at the receiving end to the low-pressure side of the transformers at the sending end is 15.6%.

Voltage at sending end (referred to h.p. side) $= 110 \times 1.156 = 127.2$ line kV.

Zero Load Conditions.

Line Capacity.—$B\ (kV)^2/1{,}000 = 6{,}630$ kVA leading.

With both banks of transformers connected to the line, and each taking a magnetising current equal to 6 per cent. of the full-load current, the lagging kVA for magnetisation $= 10{,}000 \times .12 = 1{,}200$, and the load on generating plant $(6{,}630 - 1{,}200) = 5{,}430$ kVA leading.

Pressure Rise.

= Capacity correction + transformer regulation due to capacity current.

$= +2.4 +$ (reactance drop of one bank of transformers) × capacity kVA/full-load kVA.

$= 2.4 + 6.95 \times 5{,}430/10{,}000.$

$= 2.4 + 3.8.$

$= 6.2\%.$

Thus if the load is suddenly thrown off, the voltage across the transformers at the receiving end will rise to about $127.2 \times 106.2 = 135$ kV.

The Commercial Motor Exhibition.

Some Notes and Comments on Electric Vehicles and other Exhibits.

(*Concluded from page* 727.)

An innovation at this year's Olympia show was a section devoted to modern plant for general garage purposes and appliances and tools for general service and repairs which was of business interest to owners of both small and large fleets of vehicles. The exhibits included such things as electrically-operated machine tools, drills, lathes, pumps, air compressors, and tire pumps; a kerbside remotely-controlled electric tire inflator, a magneto armature tester, and garage lighting equipment, &c.

The electrical items in another section, which had been allocated for the display of recent inventions affecting road vehicles, were chiefly of the nature of direction indicators and traffic signals.

Amongst the vehicles in the main section of the show, six wheelers were no longer regarded as freaks, air brakes were noticed on several makes of chassis, and a steam brake on one wagon; pay-as-you-enter 'buses were in evidence, whilst the safety of enclosed omnibuses was enhanced in nearly all cases by the provision of an emergency door.

Electric Vehicles and Trucks.

A new comer in the battery-driven vehicle market was the G. V. road tractor, a neat and powerful machine suitable for hauling loads of from 2 to 4 tons. It was fitted with a "Philco" battery, and was shown in conjunction with a specially-made 2-wheel trailer for the collection of offensive trade refuse bins. The body has been designed on sanitary lines, being sheet-metal-lined, and the loading line is just over 2 ft.

The General Vehicle Co., Ltd., had the only "all-electric" stand in the exhibition, and amongst the vehicles shown was a 2-ton standard chassis fitted with a box-van body for carriers. One of the special features of this type of vehicle for parcels delivery work is the easy accessibility of the interior of the body through the driver's cab, thus enabling the delivery work to be carried out entirely by the driver. A 3½-ton chassis was equipped with an all-wood steel-lined end-tipping body. The tipping gear, which is electrically operated, is of the "Edwards" hydraulic type. Three- and 2-ton Baker industrial electric trucks have a 2-wheel drive and 4-wheel steering. An auxiliary motor raises the loading platform, and is controlled by a limit switch, while the 10-ton tractor is capable of a speed with the rated load of 4 miles per hour; it is also supplied for various rail gauges.

The 3½-ton "electric" exhibited by Clayton Wagons, Ltd., was driven by a single motor, and the controller under the driver's seat provides five forward and two reverse speeds. The body was provided with end-tipping gear, of the run-back type, operated by an independent motor.

Electric Lighting and Starters.

All the leading manufacturers of electric lighting and engine-starting ignition equipment is exhibited in the accessories section. Electric lighting, not so long ago confined to private cars, was a feature of the "commercials" at the show, including steam wagons. Electrically-lighted taxi-cabs are now commonly seen, and several makers have produced generating sets which function without the aid of batteries, cut-outs, &c. Amongst these mention may be made of the C.A.V. and Simms machines, but one of the simplest was on the stand of the Villers Engineering Co., Ltd. This 12-volt generator differs from the more usual type, since it has a rotating field magnet and a stationary armature, which fact makes it possible to dispense with commutators, slip rings, brushes, and other parts usually liable to give trouble. The field magnet consists of a brass shell containing two laminated-iron pole pieces and two cobalt-chrome steel magnets. The armature is a laminated assembly in the form of a cross, on to the arms of which are wound four coils connected together to form two absolutely independent circuits. Twin cables are used to connect the lamps to the dynamo, one wire of each pair being fitted with a push-in connector, and the other with a terminal to be bolted on to the armature plate. This arrangement is an improvement upon the system of an earth return through the frame of the vehicle. The normal running speed is 3,000 r.p.m., but there is no flicker with speed reduction, and a special 2-way switch is incorporated in each lamp adaptor so that either or both lamps may be used as required. As each pair of coils is independent of the other, a breakdown in one circuit would not affect the other lamp. Although starting motors are not yet provided to any extent on the heavier type of commercial vehicle, they are now extensively used on the delivery-van pattern of chassis, and are also fitted to some passenger-carriers and taxis. Magneto ignition seems to be most favoured still, though occasionally a coil ignition system was to be seen, for instance, on the Reo and G.M.C. vehicles.

Other Features.

Methods of driving generators and motors differ, but an ingenious new starting-motor mechanism is a product of the C.A.V. Co. A worm and wheel are employed in conjunction with an automatic cone clutch, which can be accommodated in a surprisingly small space. It enables the designer to place the motor where he will, gives any gear reduction required, and operates in silence.

A practical method of mounting the head-lamps on the new A.E.C. chassis, each with a ball carried in a bracket having a spherical seat bolted to the radiator side bracket, permits individual adjustment of the lamps, as well as either lamp to be turned right round to facilitate work on the engine or elsewhere at night. A De Dion idea is to mount the radiator fan on the end of the dynamo shaft and to belt-drive the two together.

On the Spa "one-man" 'bus two electric bell-pushes were fitted, one on each side, for communicating with the driver, and a feature of the electric lighting and starter wiring system was that full access to the rear of the switchboard was obtainable by lifting the engine bonnet. On the Sentinel steam wagon the dynamo drive was noticed as having been converted from link belt to chain; the former method is used on the Clayton steamer, but a typical modern design is to drive the water pump, magneto, and dynamo in line or tandem by one shaft. A Fiat pay-as-you-enter 'bus was provided with a recessed electric lamp, which illuminated the step as the door was opened.

Refractory Formers for Electric Fires.

Their Radiant Efficiency: Interesting Test Results.

By C. H. S. TUPHOLME.

Some interesting tests have recently been completed on the radiant efficiency of formers made of a new material, known as "Fosalsil moler," in comparison with a standard fireclay former in extensive use on electric fires. The two formers were rectangular in shape and recessed to take a heating spiral; they were similar in all respects, with the exception of their composition.

It is well known, of course, that in an electric fire the most desirable method of dissipation is by radiation, and the method which should be avoided, so far as is possible, is that of conduction. Heat conducted through the former to the frame and the back of the fire is, for all practical purposes, wasted and is undesirable. If two similar elements be mounted in formers exactly alike in shape, but differing in conductivity, the heat dissipated by conduction is less in the one case than in the other, the one with the greater conductivity losing more heat in this manner than the one with the less conductivity. In consequence, the temperature of the element in the latter will rise to such a value that the rate at which heat is then dissipated is equal to the rate of supply. The effect of this is that the latter element dissipates a smaller proportion of the total heat supply by conduction than the other element, and in consequence the greater is the proportion that must be dissipated by radiation and convection.

As the "Fosalsil moler" former had been found to have a lower heat conductivity than the standard fireclay former, it was to be expected that, if similar heating elements were fixed in the two, then, for the same consumption of electric power, the moler element would attain a higher temperature than the fireclay element, and the moler element would give out as radiant heat a larger proportion of the energy supplied to it than would the fireclay element. Tests were made to see if these conclusions were correct.

The power consumed in each case was 1,035 watts on a 200-volt circuit. The element temperatures, together with the element temperature of an element of one of the leading types of bowl fire, were:—

Fosalsil moler element	...	890 deg. C.
Standard fireclay element	...	830 deg. C.
Bowl-fire element	... ...	880 deg. C.

The results of the radiant heat tests were:—

	Intensity of radiant heat received normal to former at a distance of 48 ft. 5 in. Cals. per sq. in.	Ratio between normal radiant heats (Fireclay former = 100%). Corrected for equal watts. Actual.	equal watts.
Fosalsil moler element	0.0177	112½	113½
Fireclay former ...	0.0157	100	100

The correction was necessary, as the power consumed differed slightly in this test, being 1,030 watts for the moler former and 1,040 watts in the case of the fireclay former.

The conclusions arrived at by the investigators are:—(i) The low conductivity of the moler is favourable to its use as a material for the construction of formers for electric heaters, and (ii) the figures obtained show that the manufacturers who have adopted it secure an immediate increase in the radiant efficiency of their fires of 13½ per cent., when compared with the ordinary fireclay formers.

Clear and Opal Lamps.—The General Electric Co., Ltd., has sent us a picture which illustrates in a remarkable manner the difference between the light given by a clear gasfilled "Osram" lamp and that produced by a "White Osram" lamp. The latter gives a diffused light which softens shadows almost to the point of total elimination, while with the clear lamp they are very hard.

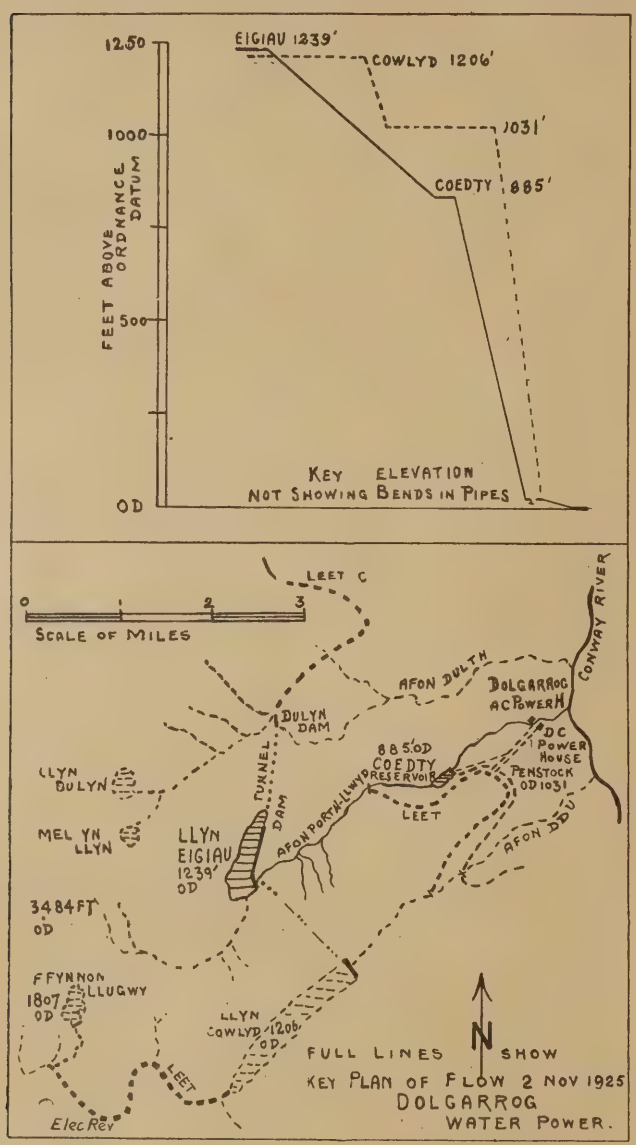
The North Wales Dam Accident.

An Account of an Investigation at Dolgarrog.

By THEODORE STEVENS.

The unexpected partial emptying of the stored water in Lakes Eigiau and Coedty which occurred on November 2nd with unfortunately fatal results—sixteen persons are dead or missing—was due to a washout beneath the dam at Eigiau.

Details of the development of hydro-electric power in 1908 were recorded in the Electrical Review at that time.* From the key map and elevation, which is too small to indicate bends in pipe lines, it will be seen that



Sketch Plan and Elevation.

the part of the present development affected by the accident is shown in full lines, and adjacent works are shown in broken lines. Eigiau lake's level was at 1,219 ft. above ordnance datum, and quoting from the issue referred to,* the dam is three-quarters of a mile long, and was built under the direction of Messrs. Harper Bros. & Co. and Messrs. Kincaid Waller Manville and Dawson by Messrs. Bott & Stennett, Ltd. It stores 160 million cubic feet up to its spillway at o.d. 1,239. The sluice is 25 ft. lower.

Leets, having a capacity of 3,500 cubic feet per minute, were constructed to collect the run-off, and a tunnel led water from the Dulyn dam into Lake Eigiau.

The dam varies in visible height from over 50 ft. at the river bed outlet to about 4 ft. at the bend in plan, but higher towards the tunnel end of the lake.

* Electrical Review, November 6th, 1908, pp. 803, *et seq.*

The opening beneath the dam structure through which the contents of about the top 20 ft. depth of the lake issued on the night of November 2nd is some 45 ft. long and 10 ft. or more deep. When this small remaining volume is drained off through a trench now being cut, the engineers will be able better to examine the ground on which the dam stands. At one end of this opening, boulder clay is visible above the water beneath the dam, and to the writer it was not apparent why a greater length of supporting boulder clay was not carried from beneath the dam by the rush of water.

The first intimation of the flood at the Dolgarrog power plant was at 9.30 p.m. on Monday, November 2nd, when a shift engineer and a driver were on duty in the "new," or alternating-current, power house, which then was carrying a load of 4,000 kilowatts (10,000 kilowatts installed plant).

In the "old," or direct-current, power house two others were on duty supplying 5,000 kilowatts to the aluminium furnaces.

After the first rush at the power house the water was noticed to recede, but Eigiau was discharging 85 million cubic feet total into the already full Coedty reservoir, so the water passed over, not only the spillway designed for maximum flood conditions, but over the crest of the Coedty dam, and it washed away a large part of the earth backing to this dam, exposing the 30-in. core of reinforced concrete, which could not withstand the pressure due to the velocity of the enormous flow (see illustrations elsewhere in this issue). Sir Douglas Fox and Partners were consulting engineers for the Coedty dam and subsequent works.

When this dam broke there was an additional 12 million cubic feet of water let loose. The Porthllwyd falls discharged this total of three million tons, and it is not surprising that all soil in its path was washed out and a vast weight of boulders thus denuded went forward and buried a considerable area.

The water-power service of electricity was cut off at Llandudno, Colwyn Bay, Conway, and Penmaenmawr from 9.30 p.m. on Monday until 4.55 p.m. on Tuesday. Llandudno got its own plant into service at 11.30 p.m. on Monday. Bangor and Carnarvon, having their own plants in service, were also able to restore supply on Monday evening. By 4.55 p.m. on Tuesday, November 3rd, full lighting supply over the whole area had been restored, as well as 70 per cent. of the power demand.

The area west of Penmaenmawr was not affected to an appreciable extent at any time.

Over the area all available sources of electricity are in process of being interlinked, and the Gresford Colliery, which has been feeding into this network since August 1st, 1925, was actually supplying at the time of the mishap, and has continued to carry the Wrexham load in conjunction with the Wrexham Corporation's steam plant, which was in reserve at the time of the mishap. Wrexham was "off" for two minutes. The Mersey Power Co. will be linked up by April, 1926.

With the exception of Colwyn Bay, every town in North Wales on the service has retained its former plant, but when the transmission system is completed, there will be no necessity for the smaller plants now retained in Bangor, Carnarvon, Llandudno, Rhyl and Wrexham.

The Cwm Dyli power house (outside the area of the key map) of 7,000 kVA capacity, with storage in Lynn Llydaw, has been continuously in service, and it could have maintained the supply on the Monday night had not the poles across the path of the flood been washed away.

The Dolgarrog Dam Burst and Flood Damage.

As we briefly reported last week, Llyn Eigiau, one of the natural lakes in the Welsh hills on the west side of the river Conway, which was converted into a reservoir about 17 years ago by the North Wales Power Co., undermined its embankment at 9.30 p.m. on November 2nd. The water thus released precipitated itself upon the north end of the village of Dolgarrog, and on its way to the River Conway demolished a long stretch of highway, a road bridge, and several houses, other buildings being damaged; 16 lives were lost.



Photopress] *[London.*

Fig. 1.—View Down the Pipe Line.

The flood swept through the Aluminium Corporation's works and the hydro-electric power houses, but, apart from the regrettable loss of life, the material damage seems to have been not so extensive as was at first reported. Fig. 1 is a view looking down the pipe line on to the Dolgarrog works, while figs. 2 and 3 show portions of the two dams. Other views of the damaged works are reproduced on page 783.



Photopress] *[London*

Fig. 2.—The Wash-out at Eigiau Dam.

Llyn Eigiau is about a mile long and 1,200 ft. above sea level, lying some four miles west of the village; the concrete dam is "L" shaped and in the middle of the shorter limb, the natural outlet of the lake, the Porthllwyd originates; it is near this spot that the wash-out is reported to have taken place. The water swept into the subsidiary Coedty reservoir, which is near the verge of the cliff above Dolgarrog, but the volume was too great and the lower dam failed to prevent the water falling 500 ft. almost perpendicularly from the edge of the table land on to the village below. According to Mr. H. J. Jack, managing director of the Aluminium Corporation and its allied companies, who was interviewed by *The Times* correspondent in the presence of General R. F. Legge, Treasury director of the North Wales Power Co., the accident is not to be described as a catastrophe for either manufacturing or electricity generating works. The damage to the high-level reservoir is comparatively slight. Electricity supply was restored from the generating station at Cwmdyli, near Beddgelert, and on November 3rd a small machine was running at Dolgarrog. The two pipe lines are intact, except that at the top end of the penstock dam a short length of branch pipe has been dislocated. Only four of the aluminium furnaces or baths exploded when the water reached them, and he estimated that all the material damage would be made good in four months' time.



Photopress] *[London.*

Fig. 3.—Breach in the Dam at Coedty.

The North Wales Power Co. purchases its power from the Aluminium Corporation and exercises the supply powers of the joint authority controlling the North Wales and South Cheshire Electricity District—the only such authority that has functioned under the Electricity Commissioners' scheme of reorganisation. A new distributing organisation is coming into operation in three months' time, and the accident will not affect the arrangements to any material extent.

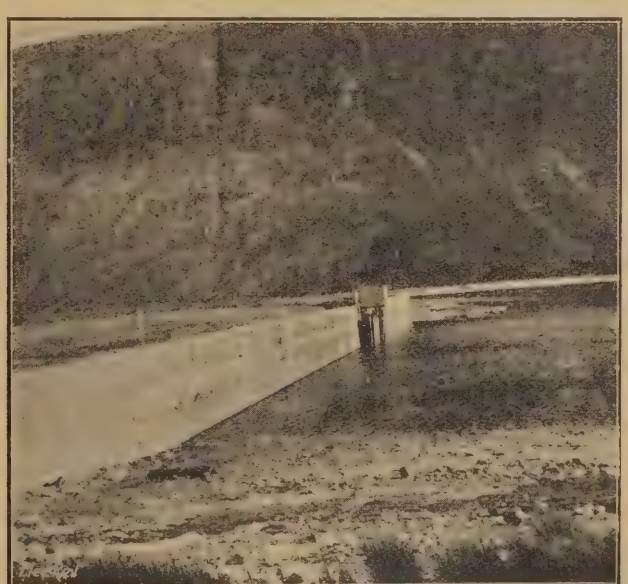


Fig. 4.—View of Part of the Dam at Llyn Eigiau.

(By courtesy of Mr. J. W. Griffith, M.Inst.C.E.)

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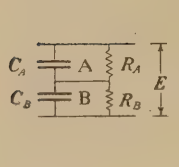
Dielectric Problems in High-Voltage Cables.

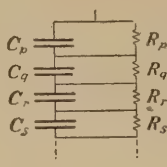
By P. DUNSHEATH, O.B.E., M.A., B.Sc., M.I.E.E.

(*Abstract of Paper read before the* Institution of Electrical Engineers.)

The three dielectric characteristics most generally considered in h.p cable work are a.c. losses, a.c. breakdown strength, and dielectric resistance (measured by d.c.), but the order of importance is a matter of opinion and the connection between the three not at all understood. For some time there has been a growing conviction that the phenomena displayed under the conditions employed for measuring the d.c. resistance are at the bottom of a.c. losses. For this reason prominence has been given in the paper to the consideration of dielectric absorption.

The correlation between a.c. and d.c. phenomena has been hindered in the past by the fact that d.c. resistance has usually been measured at voltages of 500 or less, whilst a.c. loss measurements have been carried out at from 10,000 and upwards and the uncertainty of the effect of voltage has made it impossible to bridge the gap between the two sets of published results. A.c. tests carried out under these conditions admittedly do not bring to light the phenomena connected with the ionisation of air entrapped in the dielectric, but the investigation of this factor separately is an advantage. The bringing together of a.c. and d.c. data for the same dielectric seems to be imperative for the fuller understanding of the complicated phenomena encountered. It does not take us the whole way, but it enables us, for example, to obtain a new conception of dielectric losses independent of "hysteresis." By the theory here put forward alternating dielectric losses are explained as I^2R loss, caused simply by a current flowing through a resistance as in other types of electrical loss, and the idea of dielectric hysteresis becomes unnecessary.





Figs. 1 & 2.—Model Dielectrics Illustrating Absorption.

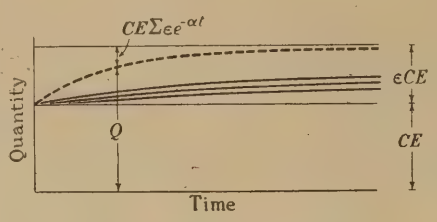


Fig. 3.—Effect of Time Constants.

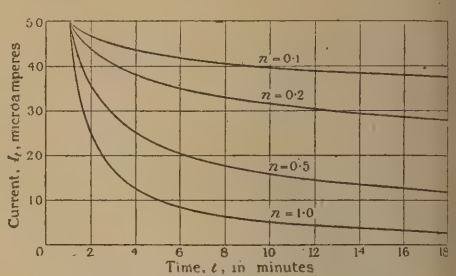


Fig. 4.—Empirical Absorption Curve, showing Effect of Varying n.

Dielectric Absorption (*Theoretical*).—"Electrification" has long been known in connection with the testing of gutta-percha cables, and it has recently appeared in a new form in connection with the testing of a.c. power cables with h.p. d.c. generated either by the Delon apparatus or by rectifying valves. If a cable for a working pressure of, say, 33,000 volts be charged up to 100,000 volts for a few minutes and afterwards short-circuited, it is not safe to remove the short-circuit for some time, as the residual charge absorbed by the cable will leak back and charge the conductor to a dangerous value. It is becoming increasingly evident that a.c. dielectric losses are largely the result of d.c. absorption, and the demands for the consideration of the claims of d.c. for high-voltage long-distance transmission are becoming insistent. For both reasons a summary of the underlying principles of absorption are called for.

Two main theories claim to explain in different ways the mechanism of dielectric absorption and residual charge. The first one, advanced originally by Maxwell, depends on the distribution of charge throughout a non-homogeneous dielectric. He considered the component capacities and resistances in the dielectric and showed that the distribution of potential under transient conditions is settled largely by the arrangement of component capacities, whereas under steady conditions it is fixed by the arrangement of component resistances. The time-lags of electrification and de-electrification are considered in this theory to be due to the time occupied in the rearrangement of potential between one of these conditions and the other.

In the second theory, advanced originally by Hopkinson and since elaborated by other writers, the phenomena are connected with the movement of the electron in the atom. Maxwell's original idea of a heterogeneous dielectric seems to be most useful for cable work, and by the use of this conception it is possible to build up a very simple theory which at the same time conforms exactly to the deductions of Pellat and Schweidler; moreover, it can be used not only for explaining dielectric absorption under d.c. conditions, but also as a basis for a simple conception of dielectric losses under a.c. conditions.

Two condensers and resistances connected as in fig. 1 approximate to a practical absorptive condenser. The ratio of the capacities must be different from the inverse ratio of the resistances, that is:—

$$\frac{R_A}{R_B} =/= \frac{C_B}{C_A}$$

Under steady conditions the potential of the centre point of the combination is settled by the ratio of the resistances, the capacities having no effect. Under transient conditions, however, such as occur at the instant of applying a difference of potential across the group, the potential of the centre point is controlled by the ratio of the capacities, and the resistances have relatively no effect. The potential distribution will be as shown in Table I, where E is the applied e.m.f.

At the instant of switching on, therefore, such an arrangement acts as a pure capacity taking a heavy momentary charging current. Immediately, also, redistribution of potential commences and requires further current, which dies away until, when steady conditions are attained, only that flowing through the resistances remains.

Table I.

Condition.	Potential difference across A.	Potential difference across B.
Steady	$\frac{R_A}{R_A + R_B} E$	$\frac{R_B}{R_A + R_B} E$
Transient	$\frac{C_B}{C_A + C_B} E$	$\frac{C_A}{C_A + C_B} E$

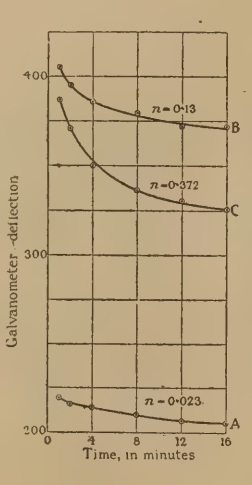
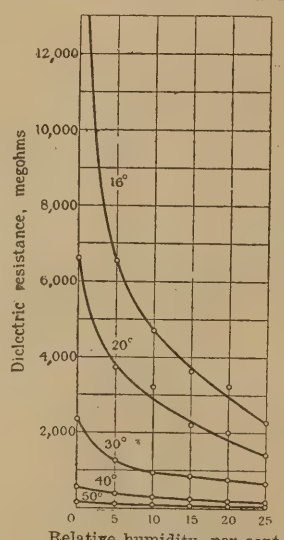
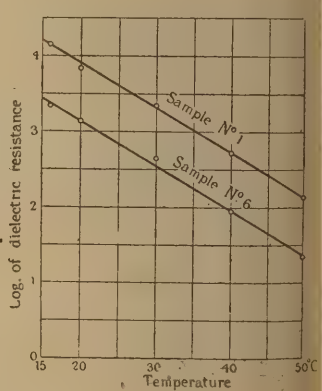


Fig. 5.—Cable Compound Charging Current.





Figs. 6 & 7.—Variation of Dielectric Resistance of Conditioned Celluloid.

When short-circuited, a sudden rush results in the total discharge of the smaller condenser and the taking from the other of an equal quantity. At this instant a quantity of electricity equal to the difference between the full charges of the two component condensers is set free and commences to discharge partly through its bridging resistance and partly through the other resistance component and the external circuit, the latter part representing the residual charge. If, after the initial short-circuit, the external circuit is opened, the discharge of the larger condenser which is still in progress charges the outside plates, giving rise to another phenomenon noted with absorptive condensers—the repeated reappearance of a charge on the plates after temporary short-cicuits. It is evident, then, that such an arrangement, in addition to giving all the charg-

ing characteristics of an absorptive condenser, also imitates the conditions during discharge.

Suppose that, instead of only two condensers and two resistances, we consider an infinitely large number of them as shown in fig. 2; we now obtain for the total quantity of electricity stored up to time t the following expression :—

$$Q = CE + CE\int \epsilon\,(1 - e^{-\alpha t})\,dt$$

At the instant of closing the circuit the charge CE enters the condenser. Immediately also an infinite number of additional charges commence to increase from zero at different rates, as indicated by the collection of curves in fig. 3. The dotted line represents the sum of these component curves and approaches asymptotically the ordinate CE $(1 + \epsilon)$. From the same considerations we obtain the following expression for the total current flowing after time t through the series of circuits with various time-constants :—

$$I_t = \frac{E}{R}\int_{\alpha=0}^{\alpha=\infty} e^{-\alpha t}\,dt$$

This analysis does not lead to a formula which can be employed for the practical estimation of the current flowing in an absorptive condenser after a given period, so that we are compelled to fall back on an empirical expression. The most commonly used expression for the charging-current time characteristic is $I_t = I + At^{-n}$, where I is a true conduction current still flowing after infinite time; A and n are constants, the latter having a value less than unity, and the quantity At^{-n} represents the current supplying the absorbed charge.

Results already published, as well as the author's own experiments, show that this expression never does represent accurately the actual variation of current in a cable dielectric over any considerable period of time. It appears to be sufficiently accurate over short intervals (seconds) to make it useful in connecting the d.c. and a.c. characteristics of a dielectric, and if we adopt the convenient reservation that n itself varies with time, we can use the expression in the form given with considerable advantage both for analytical discussion and for the interpretation of practical results. Fig. 4 shows the relative shapes of current/time curves calculated for different values of n from 0.1 to 1.0 and, to anticipate for a moment, curves plotted from experimental results obtained on cables appear to start on one value of n and to change gradually with time to a different value. It is evident from fig. 4 that the 1-minute value is an imperfect indication of the nature of the dielectric. A number of cables may all have the same 1-minute value and yet have widely different characteristics depending on the value of n.

Two methods of determining the values of the constant from an experimental curve are worked out in an appendix, allowing for the presence of I in the formula $I_t = I + At^{-n}$. In view of the change of n with time which took place in all cable dielectrics so far examined, the determination of the constants from different finite parts of the curve may lead to different values of I, in some cases the early portion giving a negative value.

To sum up, it is evident that whether we are discussing the correct ratio to adopt between d.c. and a.c. pressure for high-voltage testing, comparing d.c. and a.c. losses for theoretical interest, attempting to show that a.c. losses are partly due to d.c. resistance, or any other of the similar problems that are receiving special attention to-day in connection with high-voltage cables, we cannot be too precise in our definition of the d.c. resistance. Although the whole phenomenon of absorption can be shown as above to be based on resistance within the dielectric, the value of this resistance is elusive.

Dielectric Absorption (Experimental).—Experiments by the author show that n may change considerably between, say, 15 seconds and 5 minutes, and, in addition, the final value of I to which the curve is approaching may be different at different times. In a curve, for instance, which ultimately approaches zero the application of the empirical absorption formula to the early part of the curve may lead to a negative value for I. Methods outlined in an appendix enable the values of those quantities to be obtained notwithstanding these vagaries.

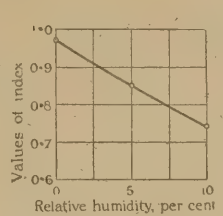


Fig. 8.—Variation of n with Humidity.

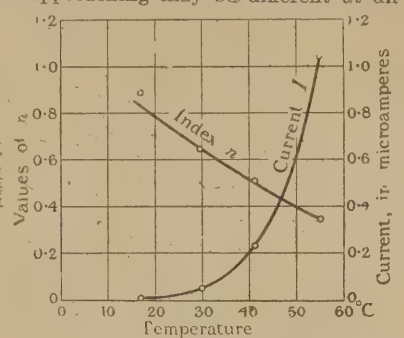


Fig. 9.—Impregnated-paper Cable; Variation of n and I with Temperature.

Quite a large number of tests have been carried out on various types of impregnated-paper cables, and fig. 5 shows the charging currents obtained on three samples of oil at 40 deg. C. The samples were mixtures of two ingredients used in the manufacture of cables. In order to investigate the effect of moisture content on dielectric absorption it is, of course, necessary to choose a dielectric in which the moisture content can be conveniently controlled during the test; the selection ultimately fell on celluloid as being homogeneous, subject to humidity conditions and yet changing so slowly as to make handling during the tests practicable.

Fig. 6 shows the definite connection between the dielectric resistance and the relative humidity of the atmosphere under which the samples were stored. In fig. 7 the logarithm of the dielectric resistance of the extreme cases is plotted against temperature (the other cases lie between) and the results indicate that the law connecting dielectric resistance and temperature is the same for all humidities: it is $R_\theta = R_0 e^{-0.06\theta}$ where R_θ = resistance at θ°C.; R_0 = resistance at 0°C.; and θ = temperature, °C.

The variation of the index n with the relative humidity of the controlling atmosphere is shown in fig. 8; the presence of moisture lowers the value of n, and it seems probable that if No. 1 sample had been perfectly dried its index would have been unity.

The values of n and I are plotted in fig. 9, from which it will be seen that raising the temperature of a paper cable reduces the value of the absorption index.

(To be continued.)

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Safeguarding of Industries Act.—We have received the following communication from Messrs. Leopold Farmer and Sons :—"It may be of interest to your readers to learn that whenever any move is made by the Government for protection of trade, this is immediately reflected by the inquiries made in England from foreign firms regarding conditions for manufacturing in this country. Since there is a new movement on foot to extend the scope of the Safeguarding of Industries Act for the better protection of English manufacturers, we are able to report many inquiries, and negotiations in hand with foreign firms to establish works in this country. There is no doubt that should they decide to locate themselves here, they would not only be able to use the trade mark, 'Made in England,' but obtain preference in rates in shipping to our Colonies. Messrs. Citroën, makers of motor-cars, have definitely acquired a manufacturing property at Slough, and other well-known motor firms and tire manufacturers are negotiating for areas of land on which to build works. If the Safeguarding of Industries Act is extended, a good many other firms will have to operate here. Our experience of the alteration in the Patents and Designs Act, 1909, which compelled the foreign holder of an English patent to manufacture it here, resulted in the establishment of some 100 new works in this country, in addition to the extension of English manufacturers' plants for manufacturing the patents on licence. These operations absorbed additional labour, helped to develop new areas, provided increased rates to local authorities and were of considerable financial benefit to the country as a whole."

The Shannon Scheme Dispute.—Our Dublin correspondent states that the return of Mr. McGilligan, the Free State Minister of Industry and Commerce, from the United States, will probably lead to the adoption of stern measures to end the dispute which is holding up the Shannon hydro-electric scheme. A number of members of the National Ex-Servicemen's Organisations have accepted employment at Limerick with the contractors, Messrs. Siemens, Schuckert & Co., while it is stated that the firm has in hand over 5,000 applications from men who are willing to work on the scheme if permitted to do so. A further 60 German engineers and mechanics recently arrived at Limerick and a German vessel which was unable to discharge its cargo for some time has now been unloaded and has returned.

Football.—On Saturday last the Dussek Bitumen Co., Ltd., defeated the Union Cable Co., Ltd., at Dagenham, in the third round of the London Junior Cup.

Metropolitan-Vickers Colliery Winders.—The Metropolitan-Vickers Electrical Co., Ltd., recently claimed that it had supplied 78 per cent. of the electric winders installed in the Northumberland and Durham coalfields. Since then further orders have been received from this area, other British coalfields, and a number of South African mines.

An Important Canadian Contract.—The *Electrical News* (Toronto) reports that the Canadian Westinghouse Co., Ltd., has received a contract for the electrical equipment of a pulp and paper mill at Peribonca, Quebec, the construction of which is estimated to cost 3½ million dollars.

Commercial Electrical Travellers.—A well-attended meeting of the Electrical Trades Commercial Travellers' Association was held on October 30th at the E.L.M.A. Rooms, Savoy Hill. The subject under discussion was "Salesmanship," and Mr. V. Dale's paper, to which we refer more fully on another page, was much appreciated. Mr. A. E. Joyce presided, and Mr. H. Whynn Roberts, vice-president, opened the discussion. The next social event will be held on Saturday, November 21st, at the Manchester Hotel, and will take the form of a whist drive and concert.

The E.L.M.A. Design Course.—A number of contractors who attended the last illumination design course arranged by the Electric Lamp Manufacturers' Association have, through the secretary of the Electrical Contractors' Association (Mr. L. G. Tate), expressed their thanks to the Lighting Service Bureau for the full and useful information put before them at the course.

Shop-window Lighting.—The accompanying illustration is a night view of the window of Messrs. Walker Bros., electrical engineers, Temple Row, Birmingham, and, as the picture



A "Siemens" Window.

shows, is a very dignified display. The lighting was carried out with "Siemens" shop-window reflectors and gasfilled lamps, and all the electrical domestic appliances displayed are "Siemens-Xcel" apparatus.

City Electricity Charges.—At last week's meeting of the Corporation of the City of London, Mr. Deputy Sandle stated that while the Charing Cross Electricity Co. had reduced the price of energy for heating and cooking, there was also room for a reduction in the charges for lighting and power. The reductions made in response to representations by influential City bodies only affected a small proportion of the consumers in the City. Although the company stated that the high prices were due to increased rates on its premises, it was now paying £11,146 as against £16,118 in 1921. The maximum price of 6d. per kWh for lighting compared unfavourably with the charge in other parts of London and the larger provincial cities. Mr. Sandle quoted Cape Town as an example of a provider of cheap electricity in spite of the difficulties with which the Municipality had to contend. He regretted that the Corporation had abandoned its option to purchase the undertaking. If justice could not be got for City consumers, Parliament should be asked to pass a Bill allowing the City to run an undertaking of its own, or to obtain supplies from some other authority. Mr. J. R. Pakeman said that it had been considered that it would be unwise for the Corporation to exercise its right to purchase the undertaking. There were explanations in several respects of some of the statements made by Mr. Deputy Sandle.

Eventually the Corporation passed Mr. Deputy Sandle's motion, and it was decided to send copies of the resolution to the two electricity supply companies, the Minister of Transport, and the Electricity Commissioners.

The Timber Market.—Our timber trade correspondent informs us that the market for wood for general utility work is much firmer than when we reported on it a few weeks ago. Stocks are still fairly large, but the consumption continues to steadily increase, and the general improvement of trade will have much to do in still further enlarging the demand for wood for all building construction, and for box and packing case work. A further influence on the steadiness of prices is that the meteorological conditions in the north of Europe foretell an early close of navigation. If such prove true, much of the timber that would otherwise have come forward to this country will over-winter at the shipping ports, and the fairly large stocks would thus be only moderate to carry us through the winter months. In poles for wireless work the market is fairly reasonable, and now that we have arrived at what must be considered the busiest time for the wireless form of entertainment and study, the demand for poles should increase. Those firms who manufacture woodwork from hardwoods will also find that the market is steadily firming up. This is especially so for teak, as well as hardwoods from the United States, such as mahogany, ash, oak, maple, walnut, and satin-walnut, for all of which shippers are asking firm rates. Mahogany from British Honduras, Central Europe, and West Indies and West Coast of Africa is also a very strong market, of which those firms who are manufacturing woodwork in that material should take note.

The British Industries Fair.—Over 50,000 invitations from the Department of Overseas Trade for the forthcoming British Industries Fair at the White City, London, and Castle Bromwich, Birmingham, are being issued to overseas buyers in all parts of the world, apart from the very large number of invitations which will shortly be addressed to home buyers. The Department of Overseas Trade has compiled, within recent years, an exhaustive index of buyers of all classes of goods exhibited at the Fair. This index, to which additions are constantly being made, comprises at present some 50,000 names of overseas buyers. Of the more important markets there are some 2,000 firms in Australia and New Zealand on the list of the Department, 2,168 in Canada and Newfoundland, over 3,000 in South America, and 5,000 in the United States. To all firms on this list and to any other firms that the exhibitor may indicate, a series of two letters is sent in the appropriate language. Further, the overseas officers of the Department, who are stationed in every country of the world, and who have in their possession a list of the buyers in their particular districts, have been requested to notify the Department of all buyers who intend visiting the Fair, and, if possible, the date of their arrival in England, so that, as far as possible, arrangements may be made for their reception and entertainment. All who do not receive their invitations within the next few days should apply direct to the nearest British representative, Trade Commissioners in the Dominions and Colonies, and Commercial Secretaries or Consuls in other countries, or the Exhibition Branch, Department of Overseas Trade, 35, Old Queen Street, S.W.1.

Local Exhibition.—Hebden Bridge.—An exhibition of electric lighting and domestic labour-saving appliances, held under the auspices of the local electricity department, was opened on October 26th, at the Co-operative Hall, by Mr. E. Hartley, chairman of the Electricity Committee of the District Council, with the Chairman of the Council (Mr. A. Sutcliffe) presiding. The exhibition was held in connection with the celebration of the "coming-of-age" year of the local electricity undertaking, and the opener made reference to the great progress in electricity for domestic purposes and in that undertaking particularly.

Patent Application.—Application has been made for the restoration of Patent 173,529 of 1921, granted to Quarz-Lampen-Gesellschaft m-b-H. for "Mercury Vapour Apparatus and more especially Quartz Lamps."

More Electric Locomotives for South Africa.—As was briefly stated in our last issue, a contract for 17 locomotives, with spares, totalling upwards of £250,000 in value, has been placed by the South African State Railways with the Metropolitan-Vickers Electrical Co., Ltd. The new locomotives will be duplicates of 78 locomotives originally ordered from the same company in 1922 and put into commission during the last two years. The locomotives are of the "AA+AA" type, each weighing 66½ tons, having been equipped with four 300-h.p. motors, and giving 40,000 lb. maximum and 16,400 lb. continuous tractive effort. The track is a very difficult one. The gauge is only 3 ft. 6 in., and the gradients are heavy, since the altitude of the line varies between 2,200 and 5,000 ft. above sea level, and the track winds with many sharp curves. For these reasons, and as the loads to be hauled are very heavy,



Metropolitan-Vickers Locomotives in South Africa.

provision is made for three locomotives to be attached to each train. The locomotives are arranged for multiple-unit control from a single cab, and also with this system of control regenerative braking is provided for the first time in large-scale operation. We understand that the design has proved entirely satisfactory both in the special tests to which the locomotives were submitted and in actual service. Power is supplied to the locomotives at 3,000 V direct current from overhead contact wires, and the standard track return is used. The supply of direct current is obtained from a number of sub-stations placed along the line, which convert to direct current from a 3-phase overhead transmission system at 88,000 V. The total length of the Glencoe-Pietermaritzburg section of the railways to be electrically equipped is 171 miles, and of this the electrification of over 100 miles is now completed.

Trade Announcements.—MESSRS. C. W. BURKILL & Co., wireless engineers, Station Road, Castleford, have opened a new branch business at 2, Albion Street, in that town.

MR. JOSEPH SHAW, electrical engineer, has opened new showroom premises at Stamford Street, Ashton-under-Lyne.

MESSRS. L. MCMICHAEL have now become installed in their new works and offices at Wexham Road, Slough. Their telephone Nos. are: "Slough 441 and 442," and their telegraphic and cable address is "Radiether, Slough."

The FOSTER ENGINEERING CO., LTD., has opened a new branch at 140b, Victoria Street, Bristol, with Mr. W. J. Murphy as manager.

Catalogues and Lists.—MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester.—Radio catalogue No. 113, containing illustrations and prices of complete sets, components, and accessories. Also an illustrated pamphlet dealing with the "Goltone" 8-valve super-heterodyne receiver.

MESSRS. A. REYROLLE & Co., LTD., Hebburn-on-Tyne.—Brochure No. 521/9-25, containing fully-illustrated details of the "Peebles-Reyrolle" automatic motor-converter sub-station equipment.

MESSRS. L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, W.C.2.—A folder advertising the "Millerette" totally-enclosed lighting unit.

THE POWER EQUIPMENT CO., LTD., Kingsbury Works, The Hyde, Hendon, N.W.9.—Illustrated pamphlets describing "Powquip" radio transformers and coils.

MESSRS. SIEMENS BROS. & Co., LTD., Woolwich, S.E.18.—Pamphlet 820A, illustrating and describing the company's thermo-electric pyrometers for use up to 1,400 deg. C.

THE MIDLAND ELECTRIC MANUFACTURING CO., LTD., Barford Street, Birmingham.—An illustrated and priced catalogue of the company's ironclad switch- and fuse-gear.

THE SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, W.C.2.—A comprehensive illustrated catalogue of radio apparatus of many makes, and separate pamphlets dealing with "Marconiphone" variometers, receivers, and amplifiers.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Leaflet No. O.S. 3406, containing illustrations and prices of "Osram" colour-sprayed gasfilled lamps.

PHILIPS LAMPS, LTD., 60, Wilson Street, Finsbury Square, E.C.2.—A booklet entitled "Light on Lamps," describing the production of "Philips" lamps.

MESSRS. JAMES GORDON & Co., LTD., Windsor House, Kingsway, W.C.2.—Catalogue "H," describing complete plant for the development of water power, including turbines, Pelton wheels, governors and pipe lines. A great deal of hydro-electric data is embodied in the publication.

VENNER TIME SWITCHES, LTD., 45, Horseferry Road, S.W.1.—List No. 26, describing the "Venner" stop watch for use in testing.

PYREX ENGINEERING CO., Adelaide Buildings, Docks, Cardiff.—Two illustrated booklets dealing respectively with "Mema" electric drilling machines and "Wex" a.c. welders and rivet heaters.

MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—Pamphlet Wa401, showing the amplification ratio of the "Ferranti" intervalve transformer, type "A.F.3," throughout the whole of the musical scale, and explaining the correct use of the component.

KLAXON, LTD., 36, Blandford Street, Marylebone, W.1.—A booklet describing examples of "Klaxon" apparatus for factories, mines, and other industrial purposes.

THE MICA MANUFACTURING CO., LTD., Volta Works, Bromley, S.E.—A price list of various classes and quantities of mica which the company has for disposal.

HERBERT MORRIS, LTD., Loughborough.—A folder advertising "Morris" electric hoist blocks.

STANDARD TELEPHONES AND CABLES, LTD. (formerly Western Electric Co., Ltd.), Connaught House, Aldwych, W.C.2.—A handsome coloured showcard advertising the "Kone" loudspeaker.

MR. N. W. J. GORRILL, 40, Bromar Road, Camberwell, S.E.5.—A price list of wiring materials and accessories, including some radio apparatus.

Bankruptcy Proceedings.—W. K. COXON and E. R. WEARE, trading as the Western Manufacturing Co., Nurshill, Lydney, Glos., radio apparatus manufacturers.—The first meeting of creditors was held on November 4th at 34, Park Place, Cardiff. The statement of affairs showed ranking liabilities of £2,028, against net assets of £1,427, leaving a deficiency of £601. Debtors attributed their failure to over-advertising, over-purchasing, and the slump in trade. The matter was left in the hands of the Official Receiver (Mr. Ellis Owen) as trustee of the estate.

J. WILSON, electrical engineer, 70, Ebrington Street, Plymouth.—Receiving order made October 30th on debtor's own petition.

C. W. A. ASHWORTH, electrical engineer, West Street, Oundle.—First and final dividend of 8¾d. in the £ payable at the Official Receiver's office, 5, Petty Cury, Cambridge.

V. REED, electrical engineer, 10, Chapel Road, Eastville, Bristol.—Receiving order made November 4th on creditor's petition.

B. UTTLEY, electrician, Tower Street, Bacup.—First meeting November 13th, at the Official Receiver's offices, Byrom Street, Manchester. Public examination November 27th, at the County Police Court, Rochdale.

W. P. YOUNG (W. P. Young & Co. and Leicester Tanning Machinery Co.), mechanical and electrical engineer, 40 and 42, Sanvey Gate, Leicester.—Application for discharge to be heard on December 3rd at The Castle, Leicester.

P. L. SYMONDS, electrician, 4, Victoria Road, Great Yarmouth.—First and final dividend of 4s. 7½d. in £ payable at the Official Receiver's office, 9, Queen Street Chambers, Norwich.

A. THOMPSON (Arnold Electrical Co.), electrical and mechanical engineer, 38, Lucy Street, Hulme, Manchester.—First and final dividend of 1s. 2¼d. in the £ payable November 16th at the Official Receiver's office, Byrom Street, Manchester.

Company Liquidations.—MERCHANTS & AGENCIES, LTD., importers and wholesale dealers in radio apparatus, 38, Great Russell Street, W.C.1, late of Basinghall Street, E.C.—A meeting of creditors was held on November 5th, when an approximate statement of affairs was presented showing the position as at October 16th last, on which date a resolution for voluntary liquidation was passed by the shareholders. The statement disclosed ranking liabilities of £7,825 and net assets of £2,889, leaving a deficiency as regarded the creditors of £4,936. Mr. J. S. B. Hole (Messrs. Oscar Berry & Co.), stated that the company was registered on September 15th, 1923, with a nominal capital of £3,000 in £1 shares. The primary object of the company was to enter into, and carry into effect, an agreement with Mr. H. S. Leben, and at the date of the liquidation Mr. H. S. Leben was the sole director. After allowing for all the expenses the company had carried on business throughout at a net loss of £4,024. The deficiency as regarded the shareholders was £6,984. In answer to a question, Mr. HOLE stated that at the date of the liquidation there were a number of contracts running for the supply of goods, and articles were arriving in London almost daily. The liquidator had been able to take up some small parcels and had arranged for others to be taken up, with the result that the contracts had been continued. At the moment there was only one contingent claim for breach of contract. A resolution was passed in favour of an application being made to the Court for the appointment of Mr. Charles Lathan, of 78, New Oxford Street, W., as liquidator. The following are creditors:—

	£		£
Berliner & Co.	2,725	Inland Revenue	45
Zeiler	2,588	Woolland & Co.	37
Ahemo	664	Youels, Chant & Co.	31
Marleco	426	Lawrence, W. P.	28
Titania	322	Sankey, W. A., & Co.	26
Kurz, E., & Co.	274	Sponholz, Ltd.	25
Cotzin Bros.	250	Leben, Henry	25
Albion Co.	148	Leben, Mrs. H. S.	20
Frelat, N. V.	52		

CLEVELAND ELECTRICAL ENGINEERING CO., LTD.—Meeting of creditors November 16th, at 29, Grange Road West, Middlesborough. Liquidator, Mr. M. McGilligan.

ANGLO-POLISH ELECTRICAL DEVELOPMENT CORPORATION, LTD.—A meeting of members is called for December 9th, at 603, Australia House, Strand, W.C., to hear an account of the winding up from the liquidator, Mr. E. N. Humphreys.

METRODES, LTD.—Winding up voluntarily. Liquidator, Mr. J. Henderson, 6, East Parade, Sheffield. A meeting of creditors was called for November 11th. Particulars of claims to the liquidator by November 30th.

TOPSHAM ELECTRICITY SUPPLY CO., LTD.—Meeting of creditors, November 18th, at 23, Catherine Street, Exeter.

SUTHERLANDS (ELECTRICAL ENGINEERS), LTD.—A meeting of members is called for December 10th at 20, Acresfield, Bolton, to hear an account of the winding up from the liquidators, Mr. A. Greenhalgh and Mr. J. O. Young.

NEW ROTTINGDEAN ELECTRICITY CO., LTD.—A meeting of members is called for December 12th, at Union Bank Chambers, 8, North Street, Brighton, to hear an account of the winding up from the liquidator, Mr. H. B. C. Baldwin.

Dissolution of Partnership.—HUNTER, OGLE & Co., electrical engineers and manufacturers' agents, 174, Corporation Street, Birmingham.—Mr. T. H. Hunter and Mr. J. G. Ogle have dissolved partnership. Mr. Ogle will attend to debts and continue the business under the same style.

Swiss Financing of Foreign Undertakings.—The directors of the Bank for Electrical Undertakings of Zurich, in the course of their annual report for 1924-25, state that a circumstance which still suggests the adoption of increased caution, especially in connection with the financing of electrical undertakings in other countries, lies in the constant tendency of State and municipal authorities to consider the supply of electricity as if it were a public benevolent institution, thus causing electricity producing and distributing companies the greatest difficulty in the fixing of sufficiently high tariffs. Among the numerous transactions submitted to examination in the past year the bank restricted itself chiefly to further participation in Austrian electricity companies. Further satisfactory results attended the efforts to combine financial operations abroad with contracts for the delivery of plant to be allotted to Swiss firms.

New French Company.—La Société des Véhicules et Tracteurs Electriques (Vetra) has lately been formed in Paris (186, Rue du Faubourg St. Honoré) with a capital of 300,000 fr., to manufacture electric vehicles and tractors.

Belgian Congo Company.—A new company is in course of formation in Brussels with a capital of 75 million francs and the title La Société Générale des Forces Hydro-Electriques de Katanga, to develop the water power resources of the Belgian Congo.

Removal of Foreign Loan Embargo.—In the course of a speech at Sheffield last week, the Chancellor of the Exchequer stated that the Government intended to remove forthwith the embargo upon the flotation of Dominion and foreign loans in the London money market. It is generally considered that the removal of the embargo will have a beneficial effect upon British trade and industry. In an interview with the *Financial News*, Mr. R. T. Nugent, director of the Federation of British Industries, said that the Federation was delighted to see the removal of the embargo. "An increase in foreign investment will inevitably result sooner or later in the export of British goods. The lifting of the embargo marks the final step in the return to more normal conditions, removing as it does the last artificial barrier to a free gold market." Asked if he considered that we should have waited until the import season was over, Mr. Nugent replied that he did not expect any immediate rush for loans, and that he did not consider the removal premature. He emphasised the fact that all foreign investments must help our export industries—some more quickly than others. In any case, the ultimate effect would be beneficial to all our industries. There were grounds for anticipating a marked improvement in trade within the next twelve months —not a boom—but a steady recovery.

Brighter London.—Four 5,000-W Philips lamps, hung on the Holborn Empire, have made the High Holborn district the lightest spot in the Metropolis. Each of the lamps is of 10,000 candle power.

South African Tariff Decision.—The South African Commissioner of Customs has recently ruled that lamps and self-starters imported into the Union attached to motor chassis are not classifiable as parts of the chassis but are dutiable separately under their appropriate tariff items.

Sales to Receivers and Managers.—Suppliers of goods are frequently in doubt as to the execution of orders given by receivers and managers appointed by the debenture-holders of companies. To assist its members the Wireless and Radio Trades Guardian Association has sent them a circular which helps to clarify the situation. It is pointed out that receivers and managers are of two classes—those appointed by the Court and those appointed by the debenture holders themselves. A receiver of the first class is virtually a Court official and cannot be absolved from personal liability for goods ordered under his direction, although in some cases attempts have been made to evade personal responsibility. The second class of receiver is usually the agent of the company and is not personally liable, nor are the creditors for goods entitled to look to the assets in his possession for payment of their accounts, for these assets are the property of the debenture holders. It is considered that in the case of a receiver not appointed by the Court the safest plan is to have all orders signed by him personally and not as receiver and manager, and invoices, &c., should be made out to him personally, or his personal guarantee obtained.

A Battery Calculator.—Messrs. Pritchett & Gold and E.P.S. Co., Ltd., have produced a handy little device by means of which the type and size of accumulator to order to give required results when made up into 100, 50, or 25-V batteries can be ascertained. It consists of a celluloid slip in a case of the same material. The appropriate sets of figures appear in perforations at the edge of the case when the slide is adjusted.

Book Notices.—"Charles Letts's Engineering Diary, 1926." London: Charles Letts & Co. Price 3s.—This is the fourth publication of this useful and interesting pocket-book, which has been brought up to date with many improvements and additions. Many valuable data are contained therein, including electrical, mechanical, chemical, relating to the distinctions and abbreviations of the professional institutions, &c. The usual mathematical and decimal and metric tables, together with conversion tables, are also included, while much general information, including foreign currency particulars, train and postal rates, &c., adds greatly to the value of the book. It is bound in a neat leather cover.

"Scientific Papers of the Bureau of Standards, No. 510 (Part of Vol 20)."—Effect of Wear on the Magnetic Properties and Tensile Strength of Steel Wire. Price, 5 cents.

"*Journal* and Record of Transactions of the Junior Institution of Engineers." Vol. XXXVI. Part II. November, 1925. Price, 2s.

A Tall Order.—Messrs. Hoover, Ltd., in response to their offer to give a free demonstration with their cleaner to Burnley people, have received a coupon signed by a gentleman in Nigeria. An accompanying letter said:—"I thank you very much in advance. Kindly let me have it with the next coming mail."

German Contract for Harbin.—It is reported from Berlin that the Siemens-Schuckert Works Co. has concluded an agreement with the holders of the tramway concession in Harbin for the delivery of tramway equipment, including motors, cars, rails, and other material, special guarantees having been assumed on both sides for the fulfilment of the agreement. Banks at Harbin have played the part of intermediaries in the transaction, and emphasis is laid upon the fact that the agreement has an exclusively commercial character. The financial side of the matter lies in the hands of the concessionnaires. On the other hand, it is stated that the Japanese Harbin Co. for Electrical Undertakings in North Manchuria has raised objections to the prolongation of the concession for the Harbin tramway and against the allocation of the order without competition.

Irish Free State Electrical Imports.—The official returns just issued show that the imports of electrical goods (excluding machinery) into the Irish Free State during July last, amounted to £23,358, as compared with £27,173 in July, 1924. The figures for the first seven months also show a marked shrinkage in electrical imports—from £244,075 in 1924 to £182,502 this year.

The Italian Cable Industry.—An interesting report on the production and sale of insulated wire and cable in Italy has been furnished to the French Government by its Commercial Attaché. The Italian manufacture of insulated wire and cable had its origin in Milan in 1879, the year in which the house of Pirelli established in that city a small factory of modest proportions. For many years the history of the industry was merely the story of the progress of this works and the branch establishment created in 1886 for the production of submarine telephone and telegraph cables. At the present time there are seven installations of this kind in Italy; two being situated at Milan, and one each at Turin, Genoa, Spezia, Leghorn and Naples. The industry has advanced greatly in importance during the past 20 years. Although it employs a total of not more than 5,000 workpeople, it is one of the most important manufacturing industries in the country, and is in a position to cover practically all the requirements of home consumers and also to carry on a considerable export trade. This latter branch of activity is the more remarkable, inasmuch as the greater part of the raw material employed in the industry must be imported. Practically all descriptions of wires and cables are produced from flexible cords up to high-pressure power cables and submarine telegraph and telephone lines. Whilst in recent years exports have been maintained at a high level imports are only about half as large as they were before the war; figures in quintals being as follows:—Exports: 1914, 33,727; 1920, 44,929; 1921, 20,392; 1922, 11,149; 1923, 25,112; 1924, 24,279. Imports: 1914, 8,375; 1920, 617; 1921, 2,428; 1922, 2,814; 1923, 891; 1924, 4,760. Insulated wire and flexible cord of Italian manufacture are exported to practically every country in Europe, whilst cables find their most important markets in South America, notably Argentina, Uruguay, and Brazil. Nearly all Italy's imports of these classes come from Great Britain.

Belgian Import Requirements.—The *Board of Trade Journal* states that in consequence of the conclusion of a commercial agreement between Germany and Belgium, the list of goods in respect of which certificates of origin are required in order to obtain "minimum" tariff treatment on importation into Belgium has been considerably reduced. The published list, however, shows that many classes of electrical goods are still subject to the requirement.

United States Electrical Exports.—According to *Commerce Reports* exports of electrical machinery and equipment from the United States during August were valued at $8,074,352—an increase of $885,982 over the corresponding month of 1924, being the highest total reached in any month since May, 1921. As compared with the same month of 1924 there was a considerable decrease in shipments of power-generating and distributing equipment during August, except in the cases of power transformers, which were practically doubled, and switchboards and switchgear, in which there was a large increase. The rises in these items more than counterbalanced the losses in generating plant. Motors of all classes, together with equipment and accessories, showed a satisfactory increase, especially in the case of railway motors, the value of which rose from $24,634 in August, 1924, to $192,211 in August, 1925. In the latter month no electric railway locomotives were exported. In the case of domestic electrical appliances, an all-round increase of small dimensions occurred, although there was a decrease in the exports of house-wiring material. Radio apparatus again showed a very large increase, the figure rising from $541,238 to $844,379—an increase which more than offset the decreases in other communication equipment. Batteries also showed a remarkable rise, no doubt consequent upon the increase in exports of radio apparatus. Industrial and electric furnaces and ovens, carbon products, flash lights and therapeutic apparatus, all showed satisfactory increases in quantity and value. Decreases included telephone and telegraph equipment, signalling apparatus, and insulating material.

Unemployment.—The registers of the Employment Exchanges for the week ended October 26th showed a fall of 5,758 in the number of unemployed, the total at that date being 1,232,400.

The Tientsin Electrical Market.—In a recent article upon the growth of the electrical undertaking of the British Municipal Council at Tientsin, the *Peking and Tientsin Times* gave several indications of openings for electrical apparatus. It was stated that refrigerators were likely to be in great demand shortly, but only American firms were taking advantage of the opportunity. Cooking appliances, especially those adapted to the preparation of rice, were becoming popular, and electro-medical apparatus for personal use had a large sale in the Far East. The demand for washing machines (from American sources) threatened to exceed the supply. The article complained that British manufacturers did not seem to realise the potential market which the Far East offered with regard to what was "obviously going to provide big business," although Germans and Americans were constantly pursuing inquiries in furtherance of their chances in so fast-growing a trade.

For Sale.—Edinburgh Corporation electricity supply department invites offers for 20 tons of clean scrap copper wire. (See our advertisement pages to-day.)

American Mine Locomotives for Russia.—It is reported from New York that the Westinghouse Electric International Company announces that the Amtorg, which represents the Soviet Government, has placed an order for the delivery of 25 electric locomotives for use in connection with the electrification of the Donetz coal mines. This is the first order of the kind which has been allotted to the United States.

The German Cable Industry.—According to a report issued at the end of last month, the German cable manufacturing industry shows signs of becoming worse. This is attributed to the lack of private orders, particularly from abroad. As is known, the contracts placed by the postal and telegraph administration represent the most important orders for the industry, but as the latter possesses plant in excess of that necessary to execute the orders given by the State departments, it depends to a large extent upon private orders. These have been practically lacking for some time past, and the cable factories have therefore executed the State orders quickly with the object of avoiding an increase in the costs of production which would have resulted from running at "part load." It thus happens that the State orders, which at the beginning of the financial year are allotted to the cable factories in accordance with the Budget estimates, are now being delivered, although, under the contracts, they are not due for delivery for some three to six months. The post and telegraph authorities, however, are unable to pay for the cables before the pre-determined time, to say nothing of placing fresh orders for the year 1926-27. Proposals which were recently made in this direction by the cable manufacturing interests to the ministries concerned met with a negative reply, although the official departments know that difficulties will consequently arise for the cable industry, which will lead to dismissals of workmen. In this connection it is mentioned that restrictions in the number of workmen have already taken place at the works of the Felten & Guilleaume Company, of Cologne-Mulheim, although this company is probably one of the best occupied owing to the manufacture of the Azores submarine cable. The other cable factories will also presumably have to have recourse to discharges, as the working capital is tied up in the orders executed for the State and not yet paid for, and further working for stock is out of the question in consequence of the scarcity of capital, as was, for instance, referred to in the recent annual report of the Rheydt Cable Co. These difficulties are not individual, but apply to the cable industry without exception. Nevertheless, the hope is still entertained that the negotiations with the authorities for premature payment for the deliveries may yet lead to the adoption of an accommodating attitude so that the discharge of workmen will be avoided.

Suspension of Nicaraguan Import Duty.—The Nicaraguan Government has recently suspended the import duty on dynamos, generators, motors, and similar machinery.

Lighting and Power Notes.

Ashton-under-Lyne.—NEW ELECTRICITY CHARGE.—With a view to encouraging the greater use of electricity by householders the Corporation Electricity Department is to sell electricity on the basis of 15 per cent. on the assessment of the house, plus ½d. per kWh against the existing price of 5d. per kWh. It is hoped later to extend the scheme to houses attached to business premises.

Audenshaw.—STREET LIGHTING.—The Urban District Council is to approach the Manchester Corporation with a view to obtaining a quotation for lighting the main thoroughfares by electricity.

Australia.—COLLIE (W.A.).—According to the *Electrical Engineer of Australia and New Zealand*, a deputation which waited on the Premier of Western Australia recently urged the erection of a power station on the Collie coalfield to supply energy to Collie, Bunbury and the intermediate districts. The scheme is estimated to cost £216,650, and such a station would form the nucleus of a plant that might be expanded to 150,000 kW capacity as the demand arose. The Government is being asked to contribute half the cost.

WESTERN AUSTRALIA.—The accounts of the Government electricity undertaking for the year ended June 30th last show a total income of £185,190, as compared with £166,210 in 1923-24. Operating expenses increased from £116,150 to £133,805, and there was a gross profit of £51,385 (£50,058). After providing for capital and other charges there was a net deficit of £2,125, as compared with a surplus of £430 in the preceding year. The sales of electrical energy increased from 39,100,707 to 44,112,862 kWh, and the maximum supply demanded from 11,500 to 12,400 kW. Contracts were placed during the year for a 12,500-kW turbo-alternator and two 65,000-lb. boilers. These additions, together with other extensions, will, it is estimated, cost £239,950.

Barking Town.—ELECTRICITY IN BULK.—The Urban District Council has come to an agreement with the County of London Electric Supply Co., Ltd., for a temporary bulk supply at the rate of 9s. 2d. per month per kW of maximum demand, plus ½ per kWh, the terms to be operative until such time as the main bulk supply is available.

Bethesda.—ELECTRICITY SUPPLY.—The Urban District Council has obtained an Order authorising it to supply electricity in the district. The maximum charges are:—Summer months: Up to 10 kWh, 7s. 6d.; all energy in excess of this amount 9d. per kWh. Winter months: Up to 15 kWh, 11s. 3d.; all energy above this amount 9d. per kWh.

Burnham (Essex).—ELECTRICITY SCHEME.—The Urban District Council has accepted the offer of Mr. Purves to carry out an electric lighting scheme for the district.

Continental.—GERMANY.—It is reported that work is about to be commenced on the construction of two new hydro-electric stations to utilise the water power of the Rhine at Niederschwoistadt and Rekingen respectively. The current will be utilised for traction purposes on the Baden State railways.

CZECHO-SLOVAKIA.—According to a recent Government report, there were 385 electric power stations in operation in Czecho-Slovakia at the end of 1924, the total installed capacity being 290,182 kW. The average annual consumption of electricity per head of population was 31.8 kWh, but the completion of the Rechenberg distribution system, which extends over a wide area, is expected to raise this to 180 kWh in the near future.

FRANCE.—According to the recently-issued annual report of the Société de l'Union d'Electricité, of Paris, the sixteenth turbo-generator (40,000 kW) is now in operation at the Gennevilliers power station, and work is in hand on the installation of the seventeenth and eighteenth sets, which, when completed, will bring the capacity of the station up to 340,000 kW. In addition, the Vitry station of the company has an output of 90,000 kW. As a result of these extensions it has been found possible to close down the old station at Asnieres, near Paris; that at Puteaux is, however, being retained for the present as an emergency plant for power supply in the winter months.

BELGIUM.—The Société Intercommunale Belge d'Electricité, in its report for the year ended June 30th last, states that, in view of the increasing demand for electricity, it is arranging for further plant extensions. A new 8,200-kVA turbo-generator is being installed at its Paturages power station, one of 15,500-kVA capacity is being erected at the Malines station, a fourth set of 11,500 kVA has been ordered for the Alost station, and a fourth set for the Bressoux station.

Deal.—ELECTRICITY IN BULK.—The Deal and Walmer Gas Co. is negotiating with the Dover Corporation for a bulk supply of electricity.

Doncaster.—ELECTRICITY SUPPLY.—The Corporation is supplying electricity to householders in Bentley at a flat rate of 1s. per week.

Earby (Yorks.).—ELECTRICITY SCHEME.—The Urban District Council is canvassing residents to ascertain the number who would be willing to take an electricity supply. The charge for lighting is not expected to exceed 7d. per kWh and to small consumers of power it is expected to be 2½d. to 3d. per kWh.

At a recent meeting of the Colne Town Council, the engineer submitted draft terms for the supply of electricity in bulk to Earby and these were approved.

East Ham.—ELECTRICITY AGREEMENT.—At a recent meeting of the Electricity Committee the engineer reported that the West Ham Corporation was willing to lay at its own cost a new feeder cable from its works to the East Ham generating station, subject to the amount of the maximum demand set forth in the agreement being increased, and that, in accordance with clause 12 of the agreement, he had notified the West Ham Corporation that the maximum demand will be increased from 600 to 1,500 kW in respect of the current year.

Harpenden.—PRICE REDUCTIONS.—The North Metropolitan Electric Power Supply Co. has reduced the charges for electricity for lighting on the flat rate from 7d. to 6d. per kWh; on the maximum demand rate from 10d. and 2d. to 10d. and 1½d per kWh; for heating from 2½d. to 2d. per kWh; on the annual service rate the meter rent of 2s. 6d. per quarter is abolished.

Ilford.—LOAN.—The Electricity Committee is applying for sanction to a further loan of £2,000 for the purchase of domestic apparatus to be let out on hire.

Irish Free State.—KINGSTOWN (Co. DUBLIN).—The Urban District Council has entered into an agreement with the Blackrock Urban District Council whereby Kingstown will supply electricity in a specified area of the Blackrock urban district. It is provided that the cost of electricity to consumers in the Blackrock district shall not exceed the charge made to residents of Kingstown.

Japan.—HYDRO-ELECTRIC DEVELOPMENT.—It is reported that the Daido Denryoku Kaisha has decided to establish the Shokawa Hydro-Electric Co. with a capital of 30,000,000 yen. Two power stations, each with a capacity of 38,000 kW, are to be erected on the Shokawa river.

Kendal.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £4,000 for extensions of plant and buildings.

ELECTRICITY IN BULK.—The promoters of a manufacturing company who propose establishing works in the town and installing electrical plant, have inquired whether the Corporation would be disposed to take a bulk supply of electricity from the company.

London.—Hackney.—*Year's Working.*—We have received from Mr. L. L. Robinson, borough electrical engineer, a copy of his report together with the statement of accounts on the working of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £177,275, and the working expenditure was £87,125, leaving a gross surplus of £90,150. The corresponding figures for the preceding year were £176,903, £83,453, and £93,450 respectively. To the gross surplus was added interest on investments and profit from the sale of funding loan stock, making a total of £95,000 available. Capital and other charges absorbed £68,732, and there was a net surplus of £26,268, which with a surplus of £342 on the Sales Department, was transferred to appropriation account. This was disposed of as follows:—Capital expenditure defrayed from revenue, £15,898, borough fund, £10,712. The previous year's working resulted in a net profit of £30,798. The amount spent on capital account during the year was £75,989, the largest items being £21,637 for machinery and plant, and £24,457 for mains and services. The sales of energy increased from 22,199,398 to 24,763,274 kWh, and the average price obtained fell from 1.83d. to 1.64d. per kWh. The maximum supply demanded rose from 12,200 to 13,439 kW.

Hampstead.—The Borough Council is to expend an additional £3,000 on "free wiring" during the current year, making a total of £6,000 in all. Mr. J. Leadbeater, the borough electrical engineer, informs us that as the result of the introduction of this scheme 1,000 new consumers have been added to the system.

New Zealand.—Dunedin.—The accounts of the City Council's electricity undertaking (engineer, Mr. M. C. Henderson) for the year ended March 31st last, show a total revenue of £130,186, as compared with £120,886 in the preceding year. Working expenses amounted to £47,328, as against £46,346, leaving a gross profit of £82,858 (£74,541). After deducting capital charges there was a net surplus of £20,888, as compared with £17,636 in 1923-24. A total of 23,120,680 kWh was sold, as against 21,701,942 kWh in the preceding year, and the connections increased from 26,698 to 29,463 kW. A 5,500-h.p. turbine coupled to a 3,000 kW alternator was put into service during the year, and work on the installation of a 3,000-kW set was commenced. When this is completed the station will have a capacity of 11,000 kW.

Portsmouth.—Loan.—The Town Council is applying for sanction to the borrowing of £35,000 for mains.

Preston.—Extension of Supply.—The electricity supply from Preston to Leyland was recently formally inaugurated by the chairman of the Electricity Committee. The industrial load already contracted for in Leyland includes 1,200 kW to one undertaking, and negotiations are proceeding with other concerns.

Sheffield.—Electricity Extensions.—The Electric Supply Committee has approved extensions of mains and works, at an estimated cost of £5,105, and extensions of mains for general distribution purposes costing £12,475.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them amending the Pontypool Electric Lighting Order, 1895, granted to the Pontypool Electric Light and Power Co., Ltd., and suspending the power of the local authority to purchase the undertaking authorised by that Order.

Application has been made to the Commissioners by the Whitchurch (Salop) Gas Co., Ltd., for an Order authorising it to supply electricity in the urban and rural districts of Whitchurch and the rural district of Malpas.

Torquay.—Electricity Supply.—At a recent meeting of the Electricity Committee the engineer reported that in order to provide for the increasing use of electricity in the Newton Abbot district, further provision would have to be made in the power station, either in the form of an additional rotary converter or by the installation of transformers to convert a portion of the Newton Abbot distributing network from d.c. to a.c. He recommended the latter scheme, and the Committee instructed him to proceed with the work subject to his submitting estimates of the cost in due course, with a view to application being made for sanction to the necessary loan.

Loans Sanctioned.—The Electricity Commissioners have given their sanction to loans of £1,700 for mains and £1,950 for plant in connection with the supply to Stoneycombe Quarry.

United States.—Electrical Development.—The *Financial Times* states that plans have been completed for the financing and carrying out of a hydro-electric scheme in the heart of the Ozark Mountains in Missouri. The project will be one of the largest in America. The recently-formed Missouri Hydro-Electric Company will undertake the work, which calls for harnessing the Osage River and tributaries and for the construction of several large lakes, one of which will be the largest artificial lake in the world, having a shore line of 260 miles. The cost of the scheme is estimated at $50,000,000.

According to *Power*, work is to commence immediately on the installation of additional plant at the Long Beach steam power station of the Southern California Edison Co. The additions will comprise a G.E.C. single-cylinder-type turbine rated at 50,000 kW, 50 cycles, 3 phase, 11,000 V, seven 375-lb. Stirling-type Connelly boilers, and Westinghouse condensers. The estimated cost of the additions is $6,000,000, and it is expected that the work will be completed by July, 1926.

Winchester.—Year's Working.—The accounts of the city electricity undertaking (engineer: Mr. R. Ayton) for the year ended March 31st last record a total income of £32,989, as compared with £31,971 in the preceding year. Working expenses amounted to £21,678, as against £19,680, leaving a gross profit of £11,311 (£12,291), to which was added bank interest, making a total of £11,472 available. After providing for capital and other charges, a net surplus of £2,212 remained, as compared with £2,781 in 1923-24. The energy sold increased from 1,950,208 to 2,009,986 kWh.

Tramway and Railway Notes.

Australia.—New South Wales.—According to the *Industrial Australian and Mining Standard*, after meeting interest charges amounting to £5,343,318, there was a total deficiency of £69,142 on the transactions of the New South Wales railways and tramways for the year ended June 30th last. The deficiency was made up as follows:—Railways, surplus, £32,937; tramways, deficiency, £102,079. The report of the Commissioners states that the net earnings were adversely affected by further reductions in freight rates during the year, increases in wages and salaries, and also by previous reductions in rates and fares. The report adds that the railway and tramway earnings amounted to £20,388,724, and working expenses to £15,114,548, leaving a balance of £5,274,176, which had been paid into consolidated revenue to meet interest charges. During the year 132 miles of new lines were added, and the total mileage now open for traffic is 5,655. As in the preceding report, special attention is drawn to the non-paying lines, on which there was a loss, after paying interest charges (amounting to £1,611,798), of £1,505,010. There were 55 of these lines, totalling 3,586 miles (more than 63 per cent. of the whole of the State's mileage), on which the capital expended was £32,015,994.

Barbados.—Tramway Service Discontinued.—The Bridgetown Tramways Co. has discontinued its service. The company has not been able to meet the increased competition from motor-omnibuses during the past three years, and its traffic has steadily declined.—*Commerce Reports.*

China.—Electrification Scheme Postponed.—It is reported that the scheme for the electrification of the Fushun line of the South Manchurian Railway has been postponed temporarily under the existing retrenchment policy, as the realisation of the scheme is estimated to cost 2,500,000 yen.

Continental.—Sweden.—Good progress is being made with the electrification of the railway between Stockholm and Gothenburg. Of the 50 electric locomotives ordered, 28 have already been delivered, and nine more will be completed in a few weeks. It is expected that the Hallsberg-Falkoeping section will be opened for goods traffic during the present month; passenger traffic will not begin until next year. The electrification of the whole line will probably be completed by May next year.—*Reuter's Trade Service* (Stockholm).

Switzerland.—Rapid progress is being made with the electrification of the Geneva-Lausanne section of the Swiss Federal Railways, and it is expected that the line will be completed for electrical operation by the commencement of the new year.

Austria.—The hydro-electric power station on Lake Spuller, which has been established by the Austrian State Railway authorities to supply part of the power required for the electrified Arlberg railway, has recently been completed and put in operation, the plant so far installed having a maximum capacity of 24,000 h.p. The Arlberg line between Innsbruck and Bludenz is now entirely run by electricity, and it is estimated that, in conjunction with the electrification of the Salzkammergut railway, not only will higher speed and lower maintenance costs be possible, but that there will be an economy in coal consumption of 130,000 tons per year.

Japan.—New Electric Railways.—Applications for licences from five promoters of schemes for new electric railways were recently laid before the Osaka Municipal Council. The proposed railways will serve the suburbs of Osaka and link up with the towns of Kyoto, Nara, Kobe, and Amagasaki.

India.—Calcutta.—A big scheme for the general reorganisation of the Calcutta tramway service, involving the lay-out of circular routes, a revision of the present fares and the adoption of a new system of regulating fares by stages, has been under the consideration of the Calcutta Tramways Co., Ltd., for some time past. Plans have now been completed for carrying out the proposed alterations, and it is expected that within a few months the remodelled service will be inaugurated.—*Indian Engineering.*

Leeds.—New Route.—It was reported at a recent meeting of the Tramways Committee that the new tramway to Middleton is nearly complete, and is expected to be available for service before the end of November.

Depot Extension.—The Committee has decided to enlarge the central tramway depôt in Swinegate. The present accommodation is for 55 cars, and it is proposed to extend it to accommodate 200 cars.

Liverpool.—Purchase of Undertakings.—A special meeting of the City Council has been called for December 2nd to consider a proposal to acquire from the Urban District Councils of Waterloo-with-Seaforth and Great Crosby their respective

tramway undertakings, authorised by the Waterloo-with-Seaforth Tramways Order, 1898, and the Great Crosby Tramways Order, 1898. The Council will be asked to apply for the sanction of the Minister of Transport to the scheme.

London.—TRAMWAY IMPROVEMENTS.—The Highways Committee of the London County Council has recommended the construction of a tramway junction line at Catford and Bromley Roads to provide a direct service between Downham and Central London, *via* Catford, Forest Hill, and Dulwich, when the tramway extension to Downham is completed. The estimated cost of the scheme is £5,500.

New Zealand.—DUNEDIN.—The report of the manager of the city tramway undertaking (Mr. W. H. Mackenzie) for the year ended March 31st last shows a total revenue of £129,714, and working expenditure of £85,170, leaving a gross profit of £44,544. The figures for the preceding year were: Income, £126,407; working expenses, £85,906; gross profit, £40,501. After deducting capital charges, a net profit of £9,511 remained, as compared with £6,830 in the preceding year. The number of passengers carried increased from 19,482,997 to 19,729,985, and the car-miles run from 1,536,573 to 1,546,910.

Southern Railway Electrification.—The Southern Railway has issued a report stating that the suburban electrification scheme—from Charing Cross and Cannon Street to Orpington, *via* Chislehurst, Bromley North, Elmers End, and Addiscombe—scheduled for December 1st next, has had to be postponed for at least two months. This is due to the fact that the electricity supply contractors have informed the company that it is not possible for them to have the necessary supply ready by December 1st.

United States.—NEW ELECTRIC RAILWAY.—Surveys have been made by the Pacific Electric Railway for a line to be constructed between San Bernardino and Lake Arrowhead, Cal. If the line is built it will be under a joint arrangement between the Lake Arrowhead Company and the Pacific Electric Railway and operated by the latter company.—*Electric Traction.*

Telegraph and Telephone Notes.

Automatic Telephony.—LEEDS.—The change-over to automatic telephone services at the suburban district exchanges at Stanningley, Roundhay, Chapeltown, and Headingley took place on November 7th. This is an extension of the automatic system which has been in operation at the Leeds central exchange for some considerable time, and its extension to the suburbs gives Leeds the largest automatic telephone exchange in the country. The extension to these suburban stations adds upwards of 4,000 lines to the 7,000 already on the dial system. Curiously enough, Leeds, signally favoured in telephone service in this direction, is considerably later than most towns of West Yorkshire in adopting the street telephone kiosk, the first having only just been provided at Roundhay. The kiosks are provided by the Post Office on application by the local authorities. Morley, Rothwell, Crossgates, and Horsforth sub-exchanges are still on the old system, and their change-over is not at present contemplated.

Belgium.—TELEPHONE SERVICE.—According to a recent report, there are now 347 telephone exchanges in operation in Belgium, with a total of 105,026 subscribers. Brussels has six exchanges, three of which are automatically worked; the other three are being converted to automatic operation, and the work is expected to be completed by the end of the year.

CABLE DEVELOPMENT.—The first tenders for the supply of the new telephone and telegraph cables from Brussels to Herbesthal and from the French frontier to the Dutch frontier were submitted on November 4th. A Belgian company made the lowest quotation for the first contract, while for the second, third, and fourth contracts German firms offered the lowest terms.—*Reuter* (Brussels).

Colombia.—TELEPHONE SERVICE.—Evidence of the growing use of the telephone in the South American Republic of Colombia is afforded by the fact that no less than 90 small towns in the Department of Boyaca are now provided with exchanges.

Hull.—TELEPHONE TARIFF.—The Corporation Telephone Committee has instructed the manager to report on the question of reducing the telephone charges.

Telegraphists' Strike.—SETTLEMENT REACHED.—At a meeting of the Association of Wireless and Cable Telegraphists in London on November 4th, it was officially announced that a settlement had been reached in the dispute with Marconi's Co., and that the nine dismissed men and the operatives on strike would resume duty forthwith.

Radio Notes.

Anniversaries.—CANADA.—The Moncton, New Brunswick (CNRA) station celebrated its first anniversary by broadcasting a special programme to this country on the night of November 6th-7th. The wave-length was 291 metres and the power 750 watts. The station, one of the ten owned by the Canadian National Railways, is 3,300 miles from London.

LONDON.—November 14th being the third birthday of the British Broadcasting Co., Ltd., the event was celebrated this week.

Empire Broadcasting.—A NEW SCHEME.—Major Gladstone Murray, of the British Broadcasting Co., in a lecture at the Overseas Club, is reported by *The Times* to have said it was important that there should be an early adoption of some general scheme which would enable programmes to be exchanged regularly and re-broadcast across all parts of the British Empire. He regarded 5XX (Daventry) as the first link in a new Empire chain. Under existing conditions for British programmes to be re-broadcast in Canada, New Zealand, and Australia it was necessary for them to go through the United States, but in a real Empire chain they would be transmitted from 5XX to a listening post in the Maritime Provinces of Canada (say, in Newfoundland), whence they would be carried by land-line and wireless link to Winnipeg, and there be radiated by a central Canadian high-power station. These signals would be collected again by a British Pacific high-power station in British Columbia, which would reach New Zealand and Australia. Another high-power station in Australia would enable the messages to go forward to the Straits Settlements and thence be relayed from Rangoon to Colombo, in Ceylon, and India.

Irish Free State.—DUBLIN BROADCASTING STATION.—The first broadcasting station in the Irish Free State has been erected by Marconi's Wireless Telegraph Co., Ltd., in the McKee Barracks on the outskirts of Dublin. The studio will be in Denmark Street, off Henry Street. The transmitter, which will operate on a wave-length of 390 metres and will use the call sign 2 RN, is a 6-kW type Q set, the same type as the majority at the British main stations. It is expected that tests will begin shortly, and that the service will be inaugurated during December.

South Africa.—LICENCES.—Owing to the non-payment of licence fees, the three broadcasting stations in the Union are said to be in financial straits, and the Government is being pressed to introduce legislation to make the payment of fees compulsory.

Switzerland.—RADIO LABORATORY.—With the object of enabling manufacturers and importers of radio sets and components to offer their goods for sale in Switzerland with a Swiss certificate of merit, the Jean Noelting Wireless Testing Laboratory has recently been established at Meilen, Switzerland, under the patronage of the Swiss Radio Club.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia. — MELBOURNE. — December 15th. Postmaster-General's Department. Junction apparatus for manual exchanges.*

December 29th. Magnet and resistance wire.*

SYDNEY.—February 1st. Municipal Council. Bunnerong power house equipment. Six 25,000-kW turbo-alternators, 18 100,000 lb. per hour boilers, &c., and 33,000-V switchgear. (See this issue.)

Barking.—January 1st. County of London Electric Supply Co., Ltd. Water-tube boilers with mechanical stokers or powdered fuel equipment, steam turbo-alternators, condensing plant, and auxiliary apparatus for the Barking power station. (October 30th.)

Belgium.—BRUSSELS.—November 25th. Belgian Post and Telegraph authorities. Telephone cables for Tamise, Malines, Willebroeck, and Gheel. Particulars (Cahier des Charges Special No. 3-158) for 6¼ fr.

Birkenshaw (Yorkshire).—November 17th. Installation of electric light in 22 houses in the District Council's housing estate at Old Lane. Mr. Ralph Brooks, Council Offices.

Bridlington.—December 7th. Electricity Department. One oil engine, direct coupled to a 275-kW d.c. generator, fuel storage tank, cooling tower, pipework, and pumps. (See this issue.)

Carlisle.—November 19th. Electricity Department. L.p. cast-iron piping for condensing water system. (October 30th.)

Dublin.—December 10th. Great Southern Railways Co. Stores for six months, including electric lamps, &c. Stores Superintendent, Inchicore, Dublin.

Dundee.—Town Council. Electric lighting installation at huts, King's Cross Hospital. Schedules from Mr. G. Baxter, city engineer.

November 20th. Electricity Department. Two-core and three-core l.p. cable. (See this issue.)

Egypt.—December 30th. Inspecting Engineer in London. Queen Anne's Chambers, S.W. Telegraph and telephone material and motor generator and telegraph apparatus.—*Reuter's Trade Service* (Cairo).

ALEXANDRIA.—December 10th. Ministry of the Interior. Machinery in connection with the waterworks scheme at Mellawi, consisting of electric motors and centrifugal pumps, control panels, l.p. armoured cable, &c. (C.X. 1,796.)*

India.—DELHI.—November 30th. Indian Stores Department. Sub-station equipment for Jaipur (comprising insulators, wire, l.p. cable, switchgear, transformer, &c.).*

Kingston-upon-Hull.—November 16th. Electricity Department. Two natural draught cooling towers. (October 30th.)

London.—LONDON COUNTY COUNCIL.—November 16th. Reconstruction of electrical switchgear at Shoreditch sub-station. (October 30th.)

METROPOLITAN ASYLUMS BOARD. December 2nd. Renewal of electric cables, &c., at the Brook (Fever) Hospital, Shooters Hill, Woolwich, S.E.

Madagascar.—January 1st, 1926. Administrateur-Maire, Diego-Suarez, Madagascar. Establishment of a central power station and electricity distribution system for public and private lighting and power purposes in the district. Particulars from the Agence Economique de Madagascar, 40, Rue de General Foy, Paris.

Manchester.—November 23rd. Tramways Committee. Iron and steelwork required at tramcar depôt, Birchfields Road, Fallowfield. Particulars from City Architect, Town Hall.

New Zealand.—WELLINGTON.—December 15th. Post Office Stores Department. Key switches.*

Public Works Department. January 19th, 1926. 50,000- and 110,000-V switchgear and steelwork for the Waikato electric power scheme. (B.X. 2157).*

GISBORNE.—Borough Council. Diesel engine, alternators, and auxiliary plant, rotary converter, and switchboard. (See this issue.)

Oldham.—November 21st. Electricity Department. Three 12,500-kW turbo-generators and auxiliary plant. (October 30th.)

December 5th. Eight water-tube boilers, with superheaters, chain-grate stokers, steel chimneys, and induced draught plant. (November 6th.)

Pentre (Glam.).—November 16th. Rhondda Urban District Council Electricity Department. Two 35-h.p. and one 20-h.p., 400-V, squirrel-cage induction motors. (November 6th.)

Peterborough.—November 30th. Electricity Department. Buildings and civil engineering work, pulverised fuel equipment, two boilers and boiler-house equipment, one 6,000-kW turbo-alternator and turbine-room equipment, e.h.p. and l.p. switchgear, &c. (See this issue.)

Southall.—November 24th. Southall-Norwood U.D.C. Overhauling and maintaining the fire-alarm system. (See this issue.)

South Africa.—JOHANNESBURG.—December 14th. Electricity Supply Commission. Plant and material for transmission lines and sub-stations in connection with the supply of electricity in the Cape area rural districts.*

December 23rd. Union Tender Board. Telephone apparatus and supply of telegraph material for the Department of Posts and Telegraphs.*

December 17th. Municipal Council. 2,000-kW motor converter. (B.X. 2,142.)*

CAPE TOWN.—December 3rd. Electricity Department. Three-phase induction voltage regulators.*

Sub-station plant and transmission lines. (B.X. 2,139.)*

FORT BEAUFORT.—December 10th. Municipal Council. Generating plant and materials for electric lighting.*

QUEENSTOWN.—January 7th, 1926. Municipal Council. Extensions to the electricity undertaking.*

Uruguay.—MONTEVIDEO.—January 18th. State Electricity Supply Works. 170,000 metres of r.i. cords.*

January 29th. Fuse wire, enamelled lamp shades, cut-outs, switches, lampholders, sockets, &c. (B.X. 2,126.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Kirkcaldy.—Messrs. Yarrow & Co. (1922), Ltd., have secured a contract for Yarrow water-tube boilers, superheaters, and air heaters from Messrs. Michael Nairn & Co. (consulting engineers, Messrs. Kennedy & Donkin).

Hull.—Telephone Committee. Accepted:—
Insulators (£106).—W. F. Dennis & Co., Ltd.
Bell sets (£499).—Peel-Conner Telephone Works, Ltd.
Twin twisted wire (£156).—General Electric Co., Ltd.

Leeds.—Tramways Committee. Accepted:—
75 tramcar bodies (£1,390 each).—English Electric Co., Ltd.
75 tramcar bodies (£1,397 each).—Brush Electrical Engineering Co., Ltd.
190 pivotal trucks (£290 each).—Electro-Mechanical Brake Co., Ltd.

Electricity Committee. Accepted:—
Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£5,362); Enfield Cable Works, Ltd. (£2,163); Macintosh Cable Co., Ltd. (£1,160).

London.—LONDON COUNTY COUNCIL.—
Six months' supply of portable accumulators.—Edison Swan Electric Co., Ltd.

H.M. Office of Works. Accepted:—
Switchboard for Royal Courts of Justice.—Park Royal Engineering Co., Ltd.

Maidstone.—Town Council. Accepted:—
Transformer (£187).—Johnson & Phillips, Ltd.
Air ducts for a new turbine (£60).—Jacksons, Ltd.

Notts.—County Education Committee. Accepted:—
Installation of non-automatic electric lighting set at Hopwell Hall (£429).—H. Barker, Ltd.

Sheffield.—Tramways Committee. Accepted:—
50 car bodies on trucks (£69,500); 50 trucks, complete (£10,700); 50 Maley's electro-pneumatic air-brake sets (£8,750).—Cravens, Ltd.
110 traction motors (£18,315).—Metropolitan-Vickers Electrical Co., Ltd.
100 tramcar controllers suitable for electro-pneumatic brakes (£8,745); 10 ditto, with standard fittings (£854).—British Thomson-Houston Co., Ltd.
50 rheostats (£550).—Electro-Mechanical Brake Co., Ltd.
100 automatic circuit breakers (£485).—Metropolitan-Vickers Electrical Co., Ltd.
50 trolley base boom and head sets (£973).—Brecknell, Munro & Rogers, Ltd.
50 sets e.l. fittings, switches, and fuses (£456).—General Electric Co., Ltd.
50 "Numa" air signal sets (£222).—Equipment & Engineering Co., Ltd.
50 traction-type lightning arresters (£137).—British Thomson-Houston Co., Ltd.

Winchester.—Education Committee. Accepted:—
Installing electric lighting at the Girls' County School.—Dicks, Ltd.

Forthcoming Events.

Faraday Society.—Monday, November 16th. At Burlington House, Piccadilly, W.1. At 8 p.m. Ordinary meeting.

Derby Society of Engineers.—Monday, November 16th. At Derby. Paper, "Notes on Starters for a.c. Motors," by Mr. O. C. Dinerman.

Institution of Civil Engineers.—Tuesday, November 17th. At the Institution, Great George Street, S.W. At 6 p.m. Paper on "The Mechanical Properties of Steel," by Mr. W. E. Dalby.

Paisley Association of Electrical Engineers.—Tuesday, November 17th. At Gibson's Tea Rooms, 16, High Street. At 7.30 p.m. Paper on "Individual Motor Driving," by Messrs. G. S. Young and C. E. Downer.

Association of Engineering and Shipbuilding Draughtsmen (Birmingham Area Technical Committee).—Wednesday, November 18th. At the Birmingham Chamber of Commerce. At 7.30 p.m Lecture on "The Design of Shafts for Bending and Torsion," by Mr. F. H. Boden.

Edinburgh Electrical Society.—Wednesday, November 18th. At the Royal Scottish Society of Art. At 8 p.m. Paper on "Stationary Batteries for Country House Lighting and Power Station Work Generally," by Mr. E. C. McKinnon.

Electrical Power Engineers' Association (West Yorkshire Section).—Thursday, November 19th. At the Cinema Exchange Theatre, Leeds. At 7 p.m. Lecture on "Modern Switchgear and Protective Devices," by Mr. W. A. A. Burgess.

British Electrical and Allied Manufacturers' Association.—Thursday, November 19th. At the Connaught Rooms. Annual dinner. 7 for 7.30 p.m.

Institution of Electrical Engineers.—Thursday, November 19th. At the Institution, Victoria Embankment, W.C. Lecture on "The Engineer: His Due and His Duty in Life," by Mr. T. Carter.

(Mersey and North Wales (Liverpool) Centre).—Monday, November 16th. At the University, Liverpool. At 7 p.m. Lecture on "The Engineer: His Due and His Duty in Life." by Mr. T. Carter.

(North-Western Centre).—Tuesday, November 17th. At the Engineers' Club, Manchester. At 7 p.m. Paper on "Dielectric Problems in High-voltage Cables," by Mr. P. Dunsheath.

(East Midland Sub-Centre).—Tuesday, November 17th. At Leicester. At 6.45 p.m. Paper on "Steam Pipes for Extra-high-pressure and Temperature," by Mr. J. A. Aiton.

(Sheffield Sub-Centre).—Wednesday, November 18th. At the Royal Victoria Hotel, Sheffield. At 7.30 p.m. Paper on "The Application of Electro-Pneumatic Machinery to Colliery Surface Plants," by Mr. A. R. Cooper.

Institution of Mechanical Engineers.—Friday, November 20th. At the Institution, Storey's Gate, S.W. At 6 p.m. Paper on "Characteristics and Uses of Ground Gears," by Mr. H. F. L. Orcutt.

Diesel Engine Users' Association.—Friday, November 20th. At the Caxton Hall, Westminster, S.W. Discussion on "Heavy-Oil Engine Working Costs."

Junior Institution of Engineers.—Friday, November 20th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "De-Hydration of Tar," by Mr. G. E. Wills.

Manchester Electro-Harmonic Society.—Friday, November 20th. At the Albion Hotel, Piccadilly, W. Concert.

E.D.A. Conferences.—Friday, November 20th. At Caxton Hall, S.W. Address on "Assisted Wiring Schemes," by Mr. J. Edgar.

Electrical Trades Commercial Travellers' Association.—Saturday, November 21st. At the Manchester Hotel, E.C. At 7.30 p.m. Whist drive and social.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, November 21st. At the South Wales Institute of Engineers, Park Place, Cardiff. At 6 p.m. Paper on "The Education and Training of Mining Electrical Engineers," by Mr. T. J. Nelson.

Notes.

Salaries of Disabled Men.—The following letter is to hand at the moment of going to press:—

"On Wednesday we celebrate the 7th anniversary of Armistice Day, and our thoughts will be with those men who fought and died in the service of their country. Many men fought also, who, though escaping with their lives, paid the price for their patriotism in the maiming of their bodies.

"A number of these disabled men, by dint of hard study and, in some cases, the expenditure of considerable money, have attempted to overcome their infirmities and fit themselves for responsible positions in the electrical engineering industry. Notwithstanding all this, many of them find themselves to-day engaged in a hand-to-hand fight with poverty owing to the meagre salaries being doled out to them by their employers. Cases are known to the writer, of men with good technical qualifications who are receiving salaries of between £2 2s. and £2 10s. per week while engaged on the staffs of large successful companies.

"May I appeal to all employers to give kinder consideration to the claims of disabled men in their employ, and so recompense them to a small extent for sacrifices they have made?

November 9th, 1925. ARCO."

Train Collision Report.—We have received a copy of the report of the official inquiry into the circumstances attending the collision between an electric locomotive and a passenger train, which occurred at the Baker Street extension station on the Metropolitan Railway on June 14th. The evidence given was contradictory and it was concluded that the locomotive must have passed a signal in the danger position.

Appointments Vacant.—Junior charge engineer, for the Gloucester Corporation electricity works; carpenter and electrical wireman, for the Hastings Corporation electricity department; electrical engineer, for the Aldershot Gas, Water and District Lighting Co.; assistant electrical engineer (Rs. 700 per mensem), for the Madras Electric Supply Corporation, Ltd.; lecturer in electrical engineering, for the Bradford Technical College; testing assistant (£200), for the Borough of Derby electricity department; assistant electrical engineer (temporary), for the Ealing Corporation electricity supply department; consumer's engineer (£300), for the West Gloucestershire Power Co., Ltd. (See our advertisement pages to-day.)

Local Societies.—The EDINBURGH ELECTRICAL SOCIETY recently paid a visit to the automatic telephone exchange which is being installed for Edinburgh and district, and on November 4th the visit was followed up by a lecture given by Mr. W. J. H. Piper in the Post Office classroom, where a model exchange had been erected for demonstration.

YORKSHIRE ASSOCIATION OF CIVIL ENGINEERS.—Speaking at the opening meeting of the session of the Association, at Sheffield, Colonel H. Rhodes, mining engineer, this year's president, dealt with the coal industry, and said, generally, it might be said that at 90 per cent. of the collieries in this country electricity had been adopted as the motive power for the bulk of the subsidiary operations, the chief use to which steam was applied direct being for driving the winding engines. The indirect advantages to be derived from the adoption of electric winding would bring it more and more to the front. One of the most expensive items in modern winding plants was ropes, and he believed it was becoming increasingly recognised that the even turning movement and steady acceleration and deceleration of electric winding plants added to the useful life of the ropes.

Fatality.—Grasping a portable electric lamp with one hand and placing the other on a steel girder, James Glover, of Nottingham, was killed recently at the Colwick Beet Sugar Factory.

Research in New Zealand.—According to the *Daily Mail's* Christchurch correspondent, the New Zealand Government has referred to Professor Sir Ernest Rutherford, who has recently been visiting that country, for his advice on the question of the relationship of science and industry there, with special reference to the report of the Special Committee set up to consider the needs of New Zealand manufacturers with regard to scientific industrial research.

Railway Fog Signals.—The Southern Railway Co. is introducing a new signalling system on its suburban lines. The signals will be provided with four lights, which will indicate various instructions to the drivers of trains; the important point about these lights is that they will be on a level with the driver's eyes and will be far more powerful than any used hitherto, so that they will be able to penetrate through fog to a much greater extent.

St. Dunstan's.—The tenth annual report of this institution reminds us that although the Great War is passing into history, the good work of helping those of the Services who lost their sight to help themselves is still being carried on. The list of successes in aiding these men to surmount their serious handicap is gradually growing, and St. Dunstan's men are now making headway in a number of fields of activity.

Reinforced Concrete Pipes.—In a lecturette delivered to the Junior Institution of Engineers, on October 23rd, Mr. H. S. Bower described the construction and laying of reinforced concrete pipes. He said that the method recently adopted in the laying of a pipe line for carrying water in Spain was to use for the principal reinforcement thin steel sheets formed into cylindrical sections and welded together at all joints, about four of these sections making one twelve-foot length of pipe. A wire reinforcement was wound on to the outside of the steel shell, and a spiral wire cage was made on a former and then removed to the inside of the pipe to form a key to keep the concrete in place. The internal lining of concrete, which consisted of a two to one mixture of cement and sand, was spun into position by mounting the pipe on rollers and rotating it at a peripheral speed of about 37 feet per second after the proper quantity of concrete had been poured in. The concrete thus obtained was extremely hard and much denser than cast concrete. To receive its exterior coat of three to one concrete the pipe was placed in a split mould. Bends and special pipes were plastered by hand.

Each pipe was provided with a socket at one end for jointing purposes, joints being made by a rough bonding from the inside with quick-setting cement and then caulking from the outside between the socket of one pipe and the spigot end of the next with lead pipe filled with hemp. An additional short collar of the same steel section as the pipe was then slipped over the joint, a mould put round, and the whole grouted in to form a homogeneous joint. The interior of the pipe was finished off smoothly by a man who moved along inside on a small flat trolley.

A Solid Smokeless Fuel Conference.—Under the joint auspices of the Chemical Engineering Group and the Yorkshire Section of the Society of Chemical Industry, and the Institutions of Chemical Engineers, Gas Engineers, and Mining Engineers (Midland), a conference on "Solid Smokeless Fuel" will be held at the Mappin Hall, Sheffield University, on November 20th, under the chairmanship of Sir Arthur Duckham, K.C.B. The conference will be a continuation of the joint meeting of the Chemical Engineering Group and the Institution of Chemical Engineers, which was held in the University, Leeds, in July last. The Department of Fuel Technology of the University has arranged exhibits of the results of its research work. Tickets for admission to the meetings may also be obtained from the hon. secretary, Chemical Engineering Group.

Street Flood Lighting Experiment.—Flood lighting is to be used for illuminating Fitzalan Square, Sheffield. A 750-c.p. lamp has been fixed at each of the four corners and fitted with lenses and mirrors to enable the beam to be directed towards any desired place.

The North Wales Dam Accident.—The accompanying illustrations show respectively the wash-out beneath the concrete dam at Llyn Eigiau, which was the initial cause of the



Fig. 1.—The Wash-out beneath the Eigiau Dam.

trouble, and the breach in the dam at Coedty Reservoir, which resulted from the overflow consequent upon the former. For

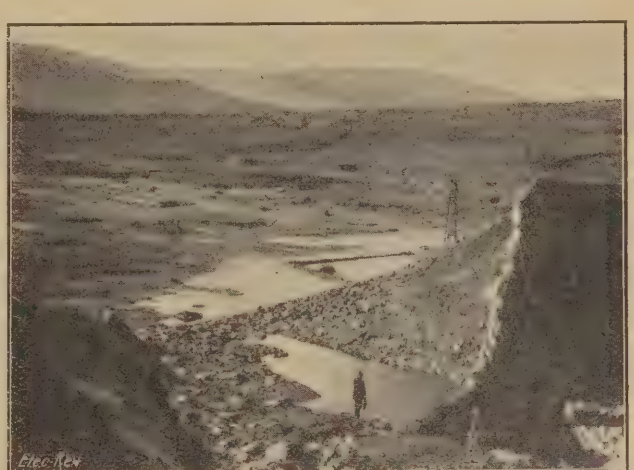


Fig. 2.—View through the Breach at Coedty.

the photographs, taken by Mr. J. W. Griffith, M.Inst.C.E., we are indebted to Mr. Theodore Stevens, whose account of his investigations will be found on p. 772 of this issue.

Faraday House Old Students' Association.—ANNUAL DINNER.—On Friday last the annual dinner of the Association was held at the Piccadilly Hotel, London; the president, Mr. H. W. H. Richards, M.I.E.E., was in the chair, and amongst the 180 present were many distinguished guests, including Mr. R. A. Chattock, Sir John Snell, Sir R. A. Hadfield, Dr. S. Z. de Ferranti, Sir James Devonshire, Sir Benjamin Longbottom, Mr. W. W. Lackie, Mr. S. L. Pearce, Col. Purves, Mr. C. P. Sparks, Sir Charles Morgan, and Mr. W. O. Smith.

After the loyal toasts, Mr. R. A. Chattock, president I.E.E., proposed "Faraday House and its Old Students," remarking that the number of students had doubled in ten years, and that the testing department was of great value to the industry. The high positions attained by the old students should encourage those now attending—he had found the old Faradians good men. Doctor Russell, their beloved principal, added to great scientific abilities a geniality and helpfulness which instilled into his students the desire to be of service to others, which was so necessary but so often wanting nowadays. Dr. Alex. Russell, F.R.S., responding, referred to the many distinctions gained by old Faradians during the past year, including 143 appointments, to the completion of the new laboratories, and to the increase in the teaching staff.

Mr. G. W. Partridge, M.I.E.E., proposed "The Guests," pointing out that amongst the many eminent engineers present were seven past-presidents of the I.E.E., and three of the Electricity Commissioners. Sir John Snell, G.B.E., responded, remarking that no other educationalist had so much personal influence over his students as Dr. Russell. He confidently anticipated a great extension of railway electrifica

tion both at home and in the Dominions, and of hydro-electric development, which he hoped to see in British hands. Dr. S. Z. de Ferranti also responded to the toast, referring to the great help he had received in the early difficult days from the most capable men. Great electrical developments were in prospect, calling for the services of many qualified electrical engineers, and Faraday House was doing splendid work in providing just the right sort of men, in quite the best way, thanks to the influence of Dr. Russell. Sir Charles Morgan, C.B.E., proposed the health of the chairman, whose success, he said, was due to character and personality, backed by hard work, and Mr. Richards briefly replied, expressing his indebtedness to Dr. Russell.

An excellent entertainment was provided, and the proceedings closed with "Auld Lang Syne."

Cable Ship in Distress.—A S.O.S. message was received at Valentia on November 6th, says *The Times*, from the cable-ship *Lord Kelvin*, stating that she had met with heavy weather in Lat. 49.40 N., Long. 29.43 W., and that part of her superstructure had been carried away, but that she was out of immediate danger and still under control. According to a later message, she was running before a heavy gale from the south-west in a seaworthy condition. The *Lord Kelvin* is a vessel of 2,641 tons, built in 1916 by Swan, Hunter and Wigham Richardson, Ltd., and owned by the Anglo-American Telegraph Co. She was last reported at Halifax in the middle of September.

Institution Notes.

Institution of Electrical Engineers.—Programmes.—The arrangements for the new session include the following provincial items:—

Scottish Centre.

December 2nd.—Annual dinner.
December 8th.—Major E. I. David. "Electricity in Mines."
January 12th, 1926.—Mr. H. M. Sayers. "Electricity Supply Tariffs."

South-Midland Centre.

November 27th.—Annual dinner.
December 2nd.—Prof. S. P. Smith. "An All-Electric House."
January 13th, 1926.—Mr. C. E. Webb. "The Power Losses in Magnetic Sheet Material at High Flux Densities."

Western Centre.

November 30th.—Mr. J. H. Thomas. Lecture on "Switchgear Developments during the Past 20 Years."
January 11th, 1926.—Address by the President, Mr. R. A. Chattock, and annual dinner.

Dundee Sub-Centre.

December 10th.—Mr. J. K. Murray. "Some Features of Telegraph Engineering."
January 14th, 1926.—Mr. W. M. Mackay. "Atmospheric Electricity."

East-Midland Sub-Centre.

November 17th.—Mr. J. A. Aiton, C.B.E. "Steam Pipes for Extra-High-Pressure and Temperature."
December 8th.—Mr. F. J. Moffett, B.A. (chairman of South-Midland Centre). Address.
January 19th, 1926.—Mr. A. B. Mallinson. "Justifiable Small Power Plant."

Hon. Member.—In opening the meeting of the Institution on November 5th, the president announced that the Council had that day elected Dr. S. Z. de Ferranti an honorary member of the Institution. A past president, Dr. Ferranti has been a full member since 1891.

Western Centre.—At a meeting of the Western Centre of the Institution at Bristol on November 2nd, under the chairmanship of Mr. J. W. Burr, Mr. J. W. Beauchamp (director of the British Electrical Development Association) lectured on "Domestic Electrification." He thought the Institution should have at least one meeting each year dealing with electricity in the home. He asked for the assistance of women to introduce it into their homes. They were the greatest buyers in the world.

By means of lantern slides, Mr. Beauchamp demonstrated suitable methods of lighting drawing-rooms and bedrooms, and stressed the importance of having a light behind the head when reading or writing. England was a mass producer of electric cooking stoves. Electricity also played a big part in feeding the train-travelling public, and in the kitchens of most of the large London restaurants it was in use. One of the latest uses to which electricity had been put was baking bread. It had been found that one ounce of dough less was required in a loaf cooked by electricity, and 10 per cent. was saved by cooking meat electrically.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Mr. A. G. Ellis, the Chairman of the North-Western Centre of the Institution of Electrical Engineers, whose portrait appears herewith, was a student under the late Prof. S. P. Thompson at the City and Guilds Technical College, Finsbury, from 1899 to 1901. Later he was at the Central Technical College under the late Prof. W. E. Ayrton and Prof. T. Mather. In 1903 he joined the Fuller-Wenstrom Electric Manufacturing Co., and in the following year went to the Northampton Institute as assistant to Dr. C. V. Drysdale. In 1905 Mr. Ellis became assistant to Mr. H. M. Hobart, eventually becoming his chief assistant. He went to Switzerland in 1909, joining the Société d'Electricité, Alioth, Basle, as designing engineer for a.c. generators, transformers, relays, &c., and after the amalgamation, in 1911, of the company with Messrs. Brown, Boveri & Co., he was placed in charge



J. Ingham & Sons [*Bowdon, Cheshire*

Mr. A. G. Ellis,
Chairman of the N.W. Centre, I.E.E.

of the transformer department at the Alioth works. From 1913 to 1916 he acted as vice-chief of the transformer department of Messrs. Brown, Boveri's Baden works. He left Switzerland in 1916 to join the Metropolitan-Vickers Electrical Co., as chief engineer of the company's transformer department, and he still occupies that position.

While he has been with the Metropolitan-Vickers concern he has been responsible for the design and construction of the largest and highest-voltage transformers yet built in this country, including the 19,500-kVA, 33,000-V, 3-phase units for Barton, Manchester, and the 25,000-kVA, 132,000-V outdoor 3-phase groups for the Victoria Falls Power Co. Mr. Ellis's principal work of late years has been an endeavour to establish the British competitive position in the world's markets in large transformers, especially for outdoor sub-station work. He is also interested in standardisation, being a member of the Transformer and Insulating Oils Committee of the B.E.S.A., and the chairman of the Transformer Technical Committee of the B.E.A.M.A. In his earlier days Mr. Ellis was successively hon. secretary and chairman of the London Students' Section, and from 1920 to 1923 was hon. secretary of the North-Western Centre, on whose committee he has been since 1918.

Mr. Ellis has written three technical books—"Alternating Current Dynamo Design," "Armature Construction," and (with Mr. Hobart) "High-speed Dynamo-Electric Machinery." Two papers by him have been published in the I.E.E. *Journal*—one on "Steam Turbine Dynamos" and the other (with Mr. Thompson) on "Large Power Transformers." Mr. Ellis is a member of the Society of Technical Engineers, the Decimal Association, and Engineers' Clubs of London and Manchester.

Mr. Wilfrid S. Taylor has resigned his position as managing director of the Liverpool Electric Cable Co., Ltd., and has severed his connection with it. Mr. Taylor was one of the founders of the business, along with his father, 24 years ago, and during the last 14 or 15 years he has been mainly responsible for the company's progress and advancement. Mr. Taylor is leaving at the end of the week for a holiday in the South of England, but we are asked to say that any communications may be sent to him at his private address, 9, Caithness Drive, Wallasey.

Senor Gustavo Lira, manager of the Electrical Department of the Chilean Ministry of Public Works, has been appointed Minister of Public Works.

Messrs. Henry Lea & Son, of Birmingham, have been appointed consulting engineers for the new Naval School, which the Admiralty is about to build near Ipswich.

Col. O. C. Armstrong, chairman of Messrs. Greenwood and Batley, Ltd., has been appointed a member of the Credit Insurance Committee by the Parliamentary Secretary to the Department of Overseas Trade.

We regret to learn that Capt. R. J. Wallis-Jones, M.I.E.E., who is so deservedly popular in electrical circles, has been seriously ill; his many friends will join with us in wishing him speedy recovery.

Mr. E. J. Walsh, A.M.I.E.E., who prior to opening business on his own account, was engineer and manager of the Musselburgh E.L. & Tramway Co., has been elected a member (Moderate) of the Musselburgh Town Council.

At Day's Café, Dewsbury, recently, a gathering took place of members of the staff of the Yorkshire Electric Power Company, to make presentations of a canteen of cutlery to Mr. J. S. Pickles, and a set of oxidised silver vases to Mr. Arnold Pickles, and their wives. Both gentlemen are members of the mains construction staff, and have been recently married.

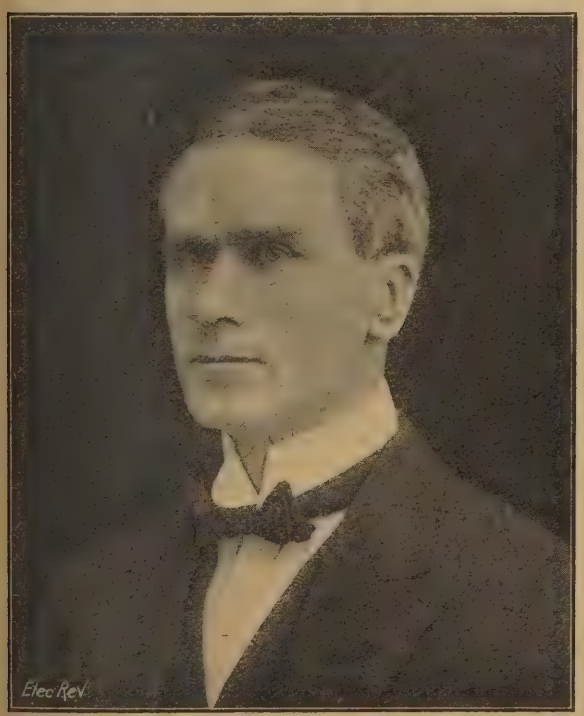
The Beckenham Urban Council is increasing the salary of the electrical engineer from £600 basic salary, plus £189 bonus, to £800, rising by annual increments of £25 to £1,000.

Messrs. Walker Vehicles, Ltd., have appointed Mr. Raymond E. Mitchell, M.I.E.E., M.I.Mech.E., M.I.A.E., to the position of development engineer at the headquarters at Clare House, Kingsway, W.C.2.

Professor F. W. Burstall, M.Sc., M.A. (Cantab.), M.I.Mech.E., head of the Mechanical Engineering Department of the University of Birmingham, and sometime Dean of the Faculty of Science, has been appointed Vice-Principal of the University, in succession to Sir William Ashley.

Mr. H. M. Sayers, M.I.E.E., informs us that his telephone number is "Streatham 5577."

The accompanying portrait is of Alderman Duncan Watson, the first chairman of the new Joint Electricity Authority for the London and Home Counties Electricity District, a report of the inaugural meeting of which appears in this issue, page 793. Mr. Watson is proprietor of Messrs. Duncan Watson and Co., electrical engineers. He graduated in Glasgow, and many of his friends in Scotland will not be surprised to learn that he has gained the confidence of his colleagues in London to the extent of placing him at the head of the biggest electrical authority in the country. Alderman Watson has a record of service which may be envied by many public spirited men. He was elected borough councillor at St. Marylebone in 1909, in which capacity he remained till 1915, when he was honoured with his aldermanship. He was Mayor of the Borough for the year 1919-20. He has been a member of the Electricity Committee since 1912, and was chairman during the years 1914-1917, and vice-chairman from 1921 to 1923. The Alderman has also served and is still serving on several other Committees of the Council. He was appointed a Justice of the



Vana] **Ald Duncan Watson,** [London.
Chairman of the London Electricity Authority.

Peace in 1923. In 1918 he was given the chairmanship of the Conference of Local Authorities Owning Electricity Undertakings in Greater London, and this position he has held until now.

Mr. F. Morley Ward, M.I.E.E., whose photograph accompanies these notes, and who was appointed general manager of the Relay Automatic Telephone Co., Ltd., in 1920, has severed his long connection with the Relay system, and proposes taking a rest before engaging in future activities. Mr. Ward (with Col. C. B. Clay, who resigned early last year) was engaged by the Marconi Co. to develop world-wide patents for the Betulander automatic (electro-mechanical) telephone system, and in 1913 demonstrated the apparatus in Paris on the occasion of the visit of the Institution of Electrical Engineers to the Société des Ingénieurs Electriciens, afterwards taking another demonstration plant to Italy. Later Mr. Ward spent several months in Sweden in investigating developments, which eventually led to Betulander's invention of the Relay system. This new system was only brought to England a few months before the war. We understand that Mr. Ward, as chief engineer of the company, was



Elliott & Fry] [*London.*
Mr. F. Morley Ward, M.I.E.E.

responsible for developing and improving the Relay system to meet British requirements, and in this connection took out numerous patents.

Obituary.—Mr. G. Duthie Smith.—We regret to record the death of Mr. Geo. Duthie Smith, chief assistant with the Chiswick Electricity Supply Co., Ltd. Mr. Smith was a son of the late Mr. Alex. Smith, gas engineer, Aberdeen. He served his apprenticeship with Messrs. McKinnon & Co., Ltd., engineers, Spring Gardens, and spent several years in Glasgow, Halifax, and New Southgate, London, before entering the service of the Chiswick Electricity Supply Co., Ltd., where he had been for the past 20 years.

Will.—Mr. R. Grant, of Prestwich, branch manager of Messrs. Stewart & Lloyds, Ltd., left £16,168 net and £17,784 gross personalty.

New Companies Registered.

Fluor Light, Ltd. (209,430).—Private company. Registered November 4th. Capital, £1,000 in 10s. shares. Objects:—To adopt an agreement with H. A. Wolfe and G. A. Williamson to develop and turn to account the several inventions described in certain agreements entered into by them and referred to in the above agreement, and to carry on business as manufacturers of luminous electrical signs, devices, ornamental and decorative work, electrical, mechanical, and other advertising signs, material for electrical and other illumination work, electrical transformers, &c. The first directors are:—J. I. McCaa, "Sarnia," East Sheen, Surrey, medical practitioner; H. A. Wolfe, 33, Basnett Road, W.10, inventor; J. H. Mendoza, 22, Bellingham Road, S.E.6, legal agents' manager; G. A. Williamson, 12, Holmesdale Avenue, East Sheen, legal agents' manager. The last two named are joint managing directors. Qualification, 1 share. Remuneration of the above £100 per annum. Secretary: G. W. Williamson. Registered office: Thanet House, 231-232, Strand, W.C.2.

Crosby (Liverpool), Ltd. (209,492).—Private company. Registered November 5th. Capital, £500 in £1 shares. Objects:—To carry on the business of electric light and general electrical engineers, manufacturers of, and dealers in electric light and other electrical apparatus, &c. The first directors are:—H. E. Fillingham, "The Homestead," Hightown, Liverpool, electrical factor (permanent); J. Bennett, 76, Chester Road, Chester, traveller; E. W. Jones, 3, Fairholme Road, Crosby, traveller. Qualification, 25 ordinary shares. Remuneration as fixed by the company. Solicitors: W. & J. Cooper, Preston. Registered office: 63, Tithebarn Street, Liverpool.

W. Mackie & Co., Ltd. (209,490).—Private company. Registered November 5th. Capital, £12,000 in £1 shares. Objects:—To acquire the business of electrical and mechanical engineers lately carried on by the late M. W. W. Mackie, and to carry on this and the business of wireless engineers, &c. The first directors are:—E. Mackie (chairman), "Willowmay," Hythe End, Wraysbury, Bucks.; J. Rook (managing director), 45, Broomfield Avenue, Palmer's Green, N.13; G. A. Butt, 20, Vincent Road, West Green, N.15, accountant. Qualification, 1,000 shares. Solicitor: E. Mackie, 51, The Mall, Ealing. Registered office: Palace Engineering Works, 129-133, Lambeth Road, S.E.1.

Western Electric Co., Ltd. (209,405).—Private company. Registered November 2nd. Capital, £100 in £1 shares. Objects:—To carry on business connected with the purchase and sale of telephones, telephonic, telegraphic, and electric lighting apparatus, instruments, and machinery, electric cables and wires, and electrical goods of all kinds, &c. The first directors are:—H. A. P. Disney, "Uphanger," Chorley Wood, Herts., secretary; G. D. Colclough, 73, Burton Court, Sloane Square, S.W.1, solicitor. Solicitors: Johnson, Jecks & Colclough, 24, Austin Friars, E.C.2.

Official Returns of Electrical Companies.

East Anglian Electric Supply Co., Ltd.—Particulars filed of £20,000 debentures authorised by resolutions of June 10th and October 9th, and covered by trust deed dated October 23rd, 1925, constituting a specific charge on certain freehold properties at Stowmarket, Felixstowe, Sudbury, Framlingham, and Needham Market, with appurtenances thereto, and buildings, plant, and machinery, and a floating charge on the remainder of the undertaking and assets, including uncalled capital, the whole amount being now issued. Trustees: Lt.-Col. H. W. Woodall, C.I.E., M.I.C.E., and Mrs. E. N. Woodall, Stinsford House, Dorchester; and C. W. Woodall, 34, Great Tower Street, E.C.2.

Telephone Co. of Pernambuco, Ltd.—Particulars filed of £150,000 8 per cent. registered debentures authorised October 20th, 1925, and covered by trust deed of the same date, charged on the company's undertaking and property, present and future, including uncalled capital, and all existing and future concessions and contracts relating to the provision and operation of telephone services. None issued. Trustees: Witan Investment Co., Ltd., 28, Austin Friars, E.C.

Willesden Electric, Ltd.—W. R. Clemens, of Alderman's Walk, Bishopsgate, E.C.2, ceased to act as receiver on June 5th, 1925. (Notice filed on October 30th.)

A. Lippold, Ltd.—G. J. Davey, of 267, Mitcham Lane, Streatham, S.W.16, ceased to act as receiver or manager on October 28th, 1925.

Direct West India Cable Co., Ltd. (53,956).—Capital, £120,000 in £5 shares. Return dated October 8th, 1925. 120,000 shares taken up. £60,000 paid. Mortgages and charges: Nil.

W. R. Sykes Interlocking Signal Co., Ltd. (93,078).—Capital, £50,000 in 87,500 "A" and 12,500 "B" shares of 10s. each. Return dated October 28th, 1925. 42,297 "A" and 12,500 "B" shares taken up. £10,513 12s. 6d. paid, being 5s. per share on 42,297 "A" shares, less £60 12s. 6d. calls unpaid. £16,824 5s. considered as paid, being 10s. per share on 12,500 "B" and 5s. per share on 42,297 "A" shares. Mortgages and charges: £17,526.

Marconi's Wireless Telegraph Co., Ltd. (53,403).—Capital, £4,000,000 in 3,750,000 ordinary and 250,000 7 per cent. cumulative participating preference shares of £1 each. Return dated August 14th, 1925. 3,249,913 ordinary and 250,000 preference shares taken up. £3,383,888 paid on 3,133,888 ordinary and 250,000 preference shares. £116,025 considered as paid on 116,025 ordinary shares. Mortgages and charges: £1,373,906 12s. 4d.

Coniston and District Electric Supply Co., Ltd. (138 478).—Capital, £2,000 in 1,500 6 per cent. preference and 500 ordinary shares of £1 each. Return dated October 10th, 1925. 1,440 preference and 500 ordinary shares taken up. £1,660 paid on 1,440 preference and 220 ordinary shares. £280 considered as paid on 280 preference shares. Mortgages and charges: Nil.

B.N.B. Wireless, Ltd.—Satisfaction in full on September 10th, 1925, of debentures dated November 22nd, 1925, securing £100.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Southern Brazil Electric Co., Ltd.

The annual meeting was held on November 4th, Mr. E. H. Tootal (chairman) presiding. In presenting the report and accounts, which were abstracted in our last issue (p. 749), the chairman said that the loss had risen from £18,900 in the previous year to £20,860 in the year under review. The directors, having reduced the arrears of income tax by £17,500, hoped that by the end of next year that indebtedness would have been entirely cleared off. The drought of which he spoke at the last meeting had continued well into September last, and had had a serious effect upon the company's business. The supply of current for industrial purposes had to be cut down to two days per week, the tramways ran reduced services, and private consumers were restricted to 60 per cent. of their normal requirements. Towards the end of September rains were experienced which enabled the supply to be slightly increased. During the drought period the supply had been maintained, and the Companhia Campineira was even able to supply excess current to other parties. Steps were being taken to raise the level of the Jaguary dam to ensure an increased volume of water for the future. During the past year the exchange at one time fell to below 5d., but it had improved to 7½d. gradually and remained steady. A great deal of building activity was going on in the city of Sao Paulo, which should lead to increased demands for electricity. The demand from the coffee planters was steadily growing.

Aluminium Corporation, Ltd.

The annual meeting was held under the chairmanship of Mr. K. M. Clark on November 4th. Prior to presenting the report for the past year, the chairman made reference to the calamity which had occurred a day or two before. He stated that a big breach had been made in the long leg of the Eigiau dam, and the low-level dam had given way. A temporary supply was being given from Cwm Dyli, and it was expected to have a machine at work on that day (November 4th). The Cowlyd dam and the 3-ft. pipe were in good order. It was expected that a full supply of power from the company's own machines would be resumed in a week; in the meantime connections had been made to other steam stations in the eastern area. The chairman said that this was the second unfortunate set-back within the space of a year. In November last year a new and large pipe line gave out, rendering the entire installation useless. Prompt action had been taken, however, and a supply to the various towns was maintained without interruptions. It had been necessary practically to rebuild the pipe line, and it was only during the last month that it had been returned to active operation. Following the loss of the stored water, the past summer had been a dry one. In the circumstances the shareholders could not be surprised that the directors were unable to pay a dividend on the preference shares. Sales of metal during the past year had increased by about one-third, and the sale of energy by about 24 per cent. Prices were satisfactory and the demand for their products was in excess of their ability to supply. Before the latest calamity they had more furnaces at work than ever before in the company's history, and the recent rain had made their water position satisfactory. He thought that the company was about to secure the benefit of the very heavy constructional work which it had carried out. The report and accounts were adopted, and an expression of sympathy with the bereaved relatives of those killed in the bursting of the dam was made.

A. J. Stevens and Co. (1914), Ltd.

Speaking at the annual meeting on November 4th, the chairman (Mr. E. E. Lamb) said that the net result for the past year had been a profit of £42,116, to which was added £26,092 brought forward, making a total of £68,209. A dividend of 12½ per cent. was being paid on the ordinary shares for the sixth successive year. Referring to the Wireless Department, Mr. Lamb said that the re-built factory had been equipped with the latest machinery and plant for the economical production of apparatus, and the number of employés had been nearly doubled. The business had so increased that further accommodation was becoming a matter of urgency. The company had opened a large radio showroom in London.

German Companies.

The *Hanover Power Works Company*, which is owned by the State of Prussia, states that the output increased from 2.52 million kWh in 1923-24 to 41.41 millions in 1924-25. The accounts show a net profit of 210,000 marks, which has been carried forward.

The *Rheydt Çable Works Company* states that the works were well occupied in 1924. After writing off 558,000 marks for depreciation, the accounts show net profits of 1,058,000 marks, permitting of the payment of a dividend at the rate of 15 per cent.

The *Energy Industry Company*, of Berlin, which is associated with the Rhenish-Westphalian Electricity Works Company, has closed the year 1924-25 with a slight loss. The directors state that the general credit crisis practically stopped the construction of electricity works and extensions. On the other hand, more favourable results were obtained from the management of electricity supply and tramway undertakings.

French Companies.

The *Société de Constructions Electriques de Nancy* reports a profit of 326,000 fr. for 1924-25; this has been applied to depreciation and reserve funds, while 112,000 fr. has been carried forward.

The *Société d'Electro-Métallurgie de Dives* reports that the complementary installations for rolling and for the manufacture of tubes were finished and placed in operation in 1924-25. With the balance brought forward, the net profits amount to 12,047,000 fr., permitting of the payment of a dividend at the rate of 80 fr. per share.

Swiss Companies.

The *Electro Values Company*, of Basle, proposes to pay a dividend at the rate of 7 per cent. for 1924-25 on share capital of 20,000,000 fr., as compared with 4½ per cent. in the previous year.

The *Motor-Columbus Company for Electrical Undertakings*, of Baden, proposes to pay a dividend at the rate of 9 per cent. for 1924, out of net profits of 5,860,000 fr., as in the preceding year.

The *Watt Electrical Undertakings Company*, of Glarus, reports that the deficiency of 2.89 millions of francs brought forward has been reduced to 2.87 millions in 1924-25, and the directors propose a scheme of reorganisation under which the share capital will be reduced from 10,000,000 to 3,500,000 fr.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Consolidated Gas, Electric Light and Power of Baltimore.—140,257 shares of no par value, issued at $35, partly and fully paid, and fractional warrants.

Dubilier Condenser (1925).—15,000 ordinary shares of 10s. each, fully paid, Nos. 400,001 to 415,000.

Pettigrew and Merriman (1925).—435,600 ordinary shares of 5s. each, fully paid, Nos. 125,001 to 560,600.

Shawinigan Water and Power.—12,798 new shares of $100 each, fully paid.

The undermentioned securities have been ordered to be officially quoted:—

Callender's Cable and Construction Co., Ltd.—100,000 ordinary shares of £1 each, fully paid, Nos. 500,001 to 600,000.

Shropshire, Worcestershire and Staffordshire Electric Power Co.—32,625 six per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,127,376 to 1,160,000.

Prospectuses.—*Melbourne and Metropolitan Tramways Board.*—An issue of £300,000 5 per cent. stock, 1944, has been offered at £96 per cent. The proceeds will be used for the conversion of cable trams to electric, and in connection with the general scheme for the development of the Melbourne tramway system.

British Monomarks, Ltd.—This company, whose scheme was outlined in our issue of July 17th (p. 92), has now been formed and has issued a prospectus offering 150,000 ordinary shares of £1 each at par. The nominal capital consists of £20,000 in founders' shares and £230,000 in ordinary shares. The directors include Col. O. C. Armstrong, D.S.O. (Greenwood and Batley, Ltd.) and Lord Meston (English Electric Co., Ltd., and Calcutta Electric Supply Corporation, Ltd.).

Norwich Electric Tramways Co.—The report for the year ended June 30th last shows that the net profit increased by £4,304 to £20,916, the receipts having risen and the expenses decreased. The sum of £1,248 from the previous year was added to the net profit, making £22,165. It was proposed to transfer £10,000 to reserve, to pay a dividend of 4 per cent., and to carry forward £1,605. The number of car-miles run increased from 1,017,575 to 1,078,592, and the number of passengers carried from 12,386,659 to 13,529,680. The company inaugurated a motor-omnibus service in April last, and it is proposed to substitute 'buses for the trams on other routes where the returns are of a low order.

Kaministiquia Power Co.—An offer was made in Montreal last week of first mortgage, 25-year, 5½ per cent. sinking fund gold bonds, series "A," to the extent of $2,000,000. The *Financial Times* states that an amount of £205,000 5½ per cent. first mortgage debenture stock, series "A," ranking *pari passu* with the above bonds, will be placed in London shortly. The transfer of the undertaking to the new company is stated to be completed, and the proceeds are being distributed in the form of cash and preferred stock to the holders of the old company's common shares. No distribution is being made on the common shares in respect of the quarter just ended.

Amazon Telegraph Co., Ltd.—The report for the year ended June 30th last states that the gross revenue amounted to £52,980 and the working expenses to £27,256. After providing for taxation and debenture interest and transferring £15,305 to the sinking fund and £2,000 to general reserve, there remains a balance of £372, to which is added £3,066 brought forward, making £3,438. The directors propose to carry this balance forward. The report mentions the death of Mr. Ellice-Clark, who had been a director since 1901. The meeting is to be held on November 17th.

Agar, Cross & Co., Ltd.—The available balance at the close of the past financial year (including £39,441 brought forward) was £351,391. The allocations include £120,000 to general reserve, £10,000 to income tax reserve, and a final dividend and bonus on the ordinary shares, making 16 per cent. for the year, free of tax. It is proposed to capitalise £225,000 of the reserve and distribute it in £1 shares to the ordinary shareholders in the proportion of one new share to each two held.

Radio Corporation of America.—For the second quarter in succession the returns for the three months ended September 30th showed a deficit of $358,275, although for the first nine months of the year there was a surplus of $1,179,001. The adverse result is stated to be due to the drastic price-cutting resorted to by competitors.

Guest, Keen & Nettlefolds, Ltd.—Interim dividends at the rate of 5 per cent. per annum on the first and second preference shares, and of 1s. per ordinary share, all free of tax, have been declared in respect of the six months to September 30th last. These dividends are similar to those paid last year.

Electric Construction Co., Ltd.—The following interim dividends have been declared in respect of the year ending March 31st next:—Preference shares: At the rate of 7 per cent. per annum; ordinary shares: At the rate of 6 per cent. per annum.

German Loan in America.—Debentures of the Hamburg Electrical Works to the extent of $4,000,000 were offered in New York recently. The bonds, which mature in 1935, bear interest at the rate of 7½ per cent. and were offered at 95½.

Para Electric Railways and Lighting Co., Ltd.—The interest on the 5 per cent. first debenture stock in respect of the half year ending November 30th is being paid on December 1st.

National Telewriter Co.—The first distribution made by the company since its inception in 1909 is announced. This is a dividend of one per cent. on the 7 per cent. cumulative participating preferred ordinary shares.

Siemens Bros. & Co., Ltd.—An interim dividend of 2½ per cent., less tax, has been declared on the ordinary shares, as in 1924.

Cawnpore Electric Supply Corporation, Ltd.—An interim dividend of 3 per cent. has been declared on the ordinary shares, as in 1925.

Madras Electric Supply Corporation, Ltd.—The directors have declared an interim dividend of 2½ per cent., free of tax, as last year.

W. T. Henley's Telegraph Works Co., Ltd.—The directors have declared an interim dividend on the ordinary shares of one shilling per share, less tax.

Johnson & Phillips, Ltd.—An interim dividend of 7½ per cent. has been declared on the ordinary shares. The dividend for the whole of 1924 was 10 per cent.

Anderston Foundry Co., Ltd.—The directors state that they do not propose to pay an interim dividend.

Stocks and Shares.

Monday Evening.

Comment upon movements in prices, and upon the causes that produce them, occupy a second place of importance nowadays. The prices themselves are the centre of interest and of attraction. The remarkable rises that occur, every week, in shares of manufacturing companies are watched with the liveliest interest by people who know that the advances are due to the knowledge of the companies' profitable activities. Speculation has entered the field, thrusting its orders into the press of others that originate with investment pure and simple. Together, the two species of demand have led to the market developing what would be a condition of buoyant activity if there were a sufficiency of supply for all who desire to buy shares. But, as things are, stock is in short supply, and this forces a restriction upon business.

Johnson & Phillips at 59s. 3d. are 4s. 6d. up. Siemens have risen 3s. 6d. Enfield ordinary strengthened to 3¾. Automatic Telephones at 50s. are 2s. 6d. better. Prices seemed to be rampant at the end of last week. A slightly easier tone evidenced willingness to take profits a few days later. Prices held most of their ground, but a few people began to ask whether the boomlet had not already proceeded quite far enough. Therefore the quotations are not at the highest recently reached.

Edisons eased off to 9s. and General Electrics to 28s. 6d. English Electrics continue to be a good market, ordinary and preference both showing improvements. The engineering section retained most of its strength, though Babcocks reacted to 51s. 3d. Shares connected with the "heavy" trades of the country were bought in advance of what was anticipated would prove an optimistic speech from the Premier at the Guildhall banquet this, Monday, night.

Cable stocks and shares have thrown off all their previous dulness and prices have materially improved. Eastern ordinary stock rose 4; Eastern Extensions, Globe ordinary and Westerns are all 5s. to the good. Rumours of a possible increase in the Bank Rate hold no terrors for this department. Indo-Europeans are £2 up: Anglo-Americans show modest gains. Foreign telephones are equally good. United River Plates have put on 6s. 3d.: Chile and Cuba shares, while nominally unchanged, are not easy to buy. Marconis have become quiescent. Canadian Marconis are easier at 6s. 9d. Burndept Wireless maintain their strength, the preferred at 24s., the deferred at 5s. 9d. Anglo-Portuguese Telephones have gone up to 15s. and are still wanted.

Aluminium Corporation shares dropped to 30 upon news of the deplorable disaster in North Wales. The accident caused a melancholy death-roll, and considerable damage to the company's property. The Aluminium Corporation supplies the North Wales Power Company with energy, and the latter has been steadily increasing its demands. Lancashire Light and Power ordinary are 1s. up at 26s. 6d. Electric Supply Corporation hardened to 32s. 6d. Bournemouth and Poole ordinary have again reached 3.

London electricity prices are hard. St. James' and Pall Mall have risen to 15; County new preference to 2s. 3d. premium buyers. There are on offer 1,000 Westminsters at 44s. 6d., 500 Charing Cross at 50s. 6d., and 500 City "Lights" at 46s. 9d.

Southern Brazil Electric bonds have been so freely "tipped" for some time past that widespread disappointment is felt at the accounts for 1924, showing a deficiency after payment of the debenture interest. The report states that the outlook is now brighter, owing to the improvement in the exchange, &c. The price of the bonds is about 54. British Columbia Electric Railway stocks are irregular, a rise of 2 in the preferred being balanced by a decline of similar amount in the deferred. Anglo-Argentine first preference have hardened to 3 7/16. The Mexican group affords no feature of interest.

The Madras Electric Supply interim dividend of 2½ per cent., tax free, is at the same rate as that of last year and the price of the shares remains at 24s. 6d. The company's 5½ per cent. preferred shares stand at 20s. and the 7 per cent. second debentures at 101½. Cawnpore Electric's interim dividend of 3 per cent. is less tax, as before; the ordinary are quoted at 25s., the 7 per cent. preference at a guinea and the 5 per cent. tax-free debentures at 95s. 2d. Brazilian Tractions have regained the deducted dividend of a dollar, at 80.

Home Railway steam stocks are depressed by the opposition offered to wage-reductions, on the part of the N.U.R. The Undergrounds have not been affected: Metropolitan Consolidated is a point higher on the week, and the rest of the list is unchanged. The general volume of business throughout Stock Exchange markets shows appreciable diminution from the high tide it reached last month, and everyone who benefited from the rush is thankful for the breathing space that the bull provides.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Nov. 9, 1925.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	13	14	3	+ 1/16	4 13 4
Brompton Ordinary	1	10	10	1⅞	—	*5 14 8
Charing Cross Ordinary	1	14½	15	50/-	—	6 2 5
do. do. 4½ Pref....	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	1⅞	—	6 8 0
City of London	1	15	15	47/-	—	6 7 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	27/6	—	5 16 4
County of London	1	15	15	57/-	—	5 5 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/6	+½d.	6 4 5
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation ...	1	10	10	32/6	+1/-	6 3 0
Kensington Ordinary	5	14	15	12⅞	—	5 16 8
Lancs. Light and Power	1	7½	7½	26/6	+1/-	5 13 2
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.... ...	5	6	6	5⅝	—	5 6 8
Metropolitan	1	10	11	38/6	—	5 14 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/3	—	5 7 10
Newcastle-on-Tyne Ordinary ...	1	6	7	22/6	—	6 4 5
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref. ...	1	6	6	22/6xd	+6d.	5 6 8
St. James' and Pall Mall	5	17½	17½	15	+ ⅛	5 16 8
South London	1	15	15	2⅝	—	5 17 1
South Metropolitan Pref. ...	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref. ...	1	6	6	18/9	—	6 8 1
Westminster Ordinary	1	15	15	44/6	—	6 14 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6

Home Rails.

Central London Ord. Assented Stock	4	4	67	—	5 19 5
Metropolitan ... ... ,,	4	5	71	+1	7 0 10
do. District ... ... ,,	3½	3½	46	—	7 12 1
Underground Electric Ordinary	10	Nil	Nil	2¼	—	Nil
do. do. "A" ...	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds	6	6	97	—	*6 3 9

Telegraphs and Telephones.

Anglo-Am. Tel. Pref. ... ... Stock	6	6	103	+1	5 16 6
do. Def. ... ... ,,	1½	1½	24⅜	+ ⅜	6 3 1
Automatic Telephone 1	3	6	2½	+ ⅛	2 8 7
Chili Telephone	5	6	5	6 5/16	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6¾	—	7 8 2
Eastern Extension	10	10	10	18	+ ¼	*5 11 1
Eastern Tel. Ord.	Stock	10	10	178½	+4	*5 12 1
Globe Tel. and T. Ord.	10	10	10	18¼	+ ¼	*5 9 7
do. do. Pref.	10	6	6	11	—	5 8 1
Great Northern Tel.	10	22	22	35	—	6 5 9
Indo-European	25	7	8½	45½	+2	*4 13 5
Marconi	1	10	10	1⅜	—	7 5 6
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord. ...	1	12	12	2½	—	*5 13 4
United R. Plate Tel.	5	8	8	7⅝	+ 5/16	5 5 6
Western Telegraph	10	10	10	17¼	+ ¼	*5 16 0

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3 7/16	+ 1/16	8 0 0
do. do. 2nd Pref. ...	5	6	6	8⅜	—	8 17 10
do. do. 5% Deb. ...	Stock	5	5	78½	—	6 7 5
British Electric Traction Ord. ...	,,	6	6	123½	—	4 17 2
do. do. 6% Pref. ...	,,	6	6	107	—	5 12 2
Brazil Traction	100	4	4	80xd	+1	5 0 0
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	89½	—	5 11 9
do. do. Preferred ,,	96/-	96/-	98½	+2	*4 17 6
do. do. Deferred ,,	129/5	129/5	116½	—2	*5 11 0
do. do. Deb. ,,	4½	4½	77½	—	5 9 8
Lond. & Sub. Trac. 5% Pref. ...	1	2½	Nil	4/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	42½	—	9 8 —
Mexico Trams, 5% Bonds ...	—	5	5	63½	—	7 17 6
Mexican Light Common ...	100	Nil	Nil	32	—	Nil
do. Pref.	100	Nil	Nil	64	+ ½	Nil
do. 1st Bonds ...	—	5	5	70½	—	7 1 11
Yorkshire (West Riding) ...	1	5	—	18/9	—	5 6 8

Manufacturing Companies.

Babcock & Wilcox	1	12	12	2 5/16	—1/9	*4 13 7
British Aluminium Ord.	1	5	10	1⅛	—	5 6 8
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	8¾	—	4 0 0
Brush Ord.	1	10	10	24/6	—	8 8 5
Callenders	1	15	15	3⅜	—	4 9 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅝	—	... ...
Edison-Swan	4/-	10	10	9/-	—3d.	4 9 0
do. 5% Deb.	Stock	5	5	84	+ ½	5 19 1
Electric Construction	1	10	10	1 11/16	+ 1/16	5 18 6
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	19/3	+6d.	5 4 8
do. do. Pref.	1	6	6	21/-	+ 6d.	5 14 3
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	28/6	—6d.	5 5 3
Henley	1	15	16	3 1/16	—	4 10 5
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	1⅛	+2/-	*4 9 0
Johnson & Phillips	1	10	10	59/3	+4/6	3 7 7
Met-Vickers, Ord.	1	8	8	25/-	+6d.	6 8 0
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	35/6	+3/6	4 4 6
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only genera and they may vary according to quantities and other circumstances

CHEMICALS, &c.	Price November 10th.	Fortnight's Inc. or dec.
a Acid, Oxalic ... ... per lb.	5½d.	...
a Ammoniac, Sal ... ... per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£25	...
a Copper Sulphate ... ... ,,	£25 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a ,, Perchlorate ... ... ,,	5½d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Commercial ... ... ,,	£8 10s.	...
a ,, Roll ... ... ,,	£8 10s.	...
a Soda, Chlorate ... ... per lb.	3½d. to 3⅝d.	...
a ,, Crystals ... ... per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots ... ... per ton	£120 to £125	...
b ,, Wire ... ... per lb.	1/9 to 2/6*	...
b ,, Sheet ... ... ,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		...
Grade I ... ... per ton net	£250	£5 dec.
Grade II ... ... ,, ,,	£178	£4 dec.
Grade III ... ... ,, ,,	£99	£3 dec.
c Brass (rolled metal 2" to 12" basis) per lb.	10¼d.	...
c ,, Tubes (solid drawn) ... ,,	1/- to 1/0¼	...
c ,, Wire, basis ... ... ,,	10⅜d.	...
c Copper Tubes (solid drawn) ... ,,	1/1½	...
c ,, Bars (best selected) ... per ton	£92	...
c ,, Sheet ... ... ,,	£92	...
c ,, Rod ... ... ,,	£92	...
d ,, (Electrolytic) Bars ... ,,	£69 5s.	5s. dec.
d ,, ,, Sheets ... ,,	£143 10s.	...
d ,, ,, Wire Rods ,,	£78 5s.	5s. dec.
d ,, ,, H.C. Wire per lb.	9 1/16d.	½d. inc.
f Ebonite Rod ... ... ,,	2/3 to 2/6	...
f Sheet ... ... ,,	2 3to 2/6	...
n German Silver Wire ... ... ,,	2/3	...
h Gutta-percha, fine ... ... ,,	3/9	...
h India-rubber, Para fine ... ... ,,	3/9½	½d. inc
l Iron Pig (Cleveland Warrants) ... per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g Lead, English Pig ... ... ,,	£38 15s.	£2 dec.
g Mercury ... ... per bot.	£14 7s. 6d. to £14 10s.	10s. inc.
e Mica (in original cases) small ... per lb.	8d. to 8/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/9½	...
p ,, ,, wire ... ... ,,	1/8½	...
o Platinum ... ... per oz.	£26	...
d Silicium Bronze Wire ... ... per lb.	1/0½	...
r Steel, Magnet, in bars ... ... ,,	7½d.	...
n Tin, Block (English) ... ... per ton.	£280 to £280 5s.	£5 to £5 5s. dec.
p Wire, Nos. 1 to 16 ... ... per lb.	4/1	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
o C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Educational.—University of London, University College.—We have received a copy of the calendar for the current session, a volume of clxxviii+458 pages, which contains a vast amount of information regarding the College itself and the various Faculties, courses of study, scholarships, societies, &c., which are associated with it. Prof. E. G. Coker, F.R.S., is the Dean of the Faculty of Engineering, Prof. J. A. Fleming, F.R.S., Vice-Dean, and Mr. W. C. Clinton, B.Sc., Sub-Dean.

Transparent Steel.—A new method of making sheets of metal of unprecedented thinness, invented by Dr. Karl Müller, of the Physical Technical Institute of Berlin, seems likely to prove of considerable industrial as well as scientific importance. He has succeeded in producing sheets of steel so thin that they are as transparent as the clearest glass. The structure of the film is perfectly even and equal in all directions. The metal sheets are so thin that atoms will pass through them without impediment. Alpha rays from radium, which consist of streams of the stripped atoms of helium, and are completely blocked by a sheet of paper, are not perceptibly weakened in passing through such metal sheets. It is calculated from the specific gravity of the metal that these sheets are not more than thirty layers of atoms in thickness. Dr. Müller makes them by depositing an extremely fine film of the metal on a smooth surface by means of an electric current and afterwards separating the film from the foundation on which it was fixed. They seem likely to prove serviceable in metallurgical research, and in the making of galvanometers, radio receivers and apparatus for measuring the action of the heart.—*Science Supplement.*

United States Electrical Exports.

The following figures, showing the exports of electrical machinery and apparatus from the United States and the principal countries of destination in 1924, are taken from the recently-issued annual statistics of American trade. The comparative figures for 1923 have been added and notes of any increases or decreases given.

According to the official statistics the total values in thousands of dollars of the exports of electrical machinery and apparatus since 1910 have been as follows:—

Av. 1910-14	21,094	1921	88,931
Av. 1915-19	41,317	1922	53,147
		1923	59,927
1920	93,184	1924	69,828

Insulated wires and cables, although shown below, are not classed in the United States statistics as electrical goods.

	1923. $	1924. $	Inc. or dec. $
Generators, d.c., under 500 kW—			
Total	788,000	1,067,000	+ 279,000
To France	62,000	149,000	+ 87,000
,, Canada	258,000	273,000	+ 15,000
,, Mexico	57,000	100,000	+ 43,000
,, Columbia	26,000	36,000	+ 10,000
,, Venezuela	14,000	18,000	+ 4,000
,, China	21,000	14,000	– 7,000
,, Japan	38,000	77,000	+ 39,000
,, Australia	31,000	40,000	+ 9,000
,, Cuba	33,000	68,000	+ 35,000
Generators, d.c., 500 kW and over—			
Total	753,000	850,000	+ 97,000
To Spain	31,000	—	– 31,000
,, Canada	39,000	45,000	+ 6,000
,, Cuba	128,000	42,000	– 86,000
,, Brazil	29,000	24,000	– 5,000
,, Chile	12,000	67,000	+ 55,000
,, China	23,000	—	– 23,000
,, Japan	163,000	159,000	– 4,000
,, Italy	—	53,000	+ 53,000
,, Mexico	63,000	161,000	+ 98,000
,, Dutch East Indies	2,000	50,000	+ 48,000
,, Philippine Islands	30,000	56,000	+ 26,000
Generators, a.c., under 2,000 kW—			
Total	127,000	169,000	+ 42,000
To Canada	17,000	26,000	+ 9,000
,, Mexico	4,000	9,000	+ 5,000
,, Argentina	8,000	—	– 8,000
,, Colombia	14,000	15,000	+ 1,000
,, Cuba	11,000	23,000	+ 12,000
,, Japan	12,000	30,000	+ 18,000
Generators, a.c., 2,000 kW and over—			
Total	1,284,000	1,157,000	– 127,000
To Italy	—	34,000	+ 34,000
,, Spain	19,000	54,000	+ 35,000
,, Canada	2,000	27,000	+ 25,000
,, Mexico	2,000	26,000	+ 24,000
,, Cuba	22,000	23,000	+ 1,000
,, Brazil	44,000	3,000	– 41,000
,, China	95,000	20,000	– 75,000
,, Japan	817,000	843,000	+ 26,000
,, India	124,000	71,000	– 53,000
Steam turbine generator sets—			
Total	*	75,000	—
To Mexico	—	23,000	—
,, Cuba	—	26,000	—
Accessories and parts for generators—			
Total	1,025,000	1,270,000	+ 145,000
Self-contained lighting outfits—			
Total	610,000	780,000	+ 170,000
To Spain	25,000	17,000	– 8,000
,, Great Britain	61,000	83,000	+ 22,000
,, Mexico	41,000	23,000	– 18,000
,, Argentina	62,000	140,000	+ 78,000
,, Colombia	14,000	7,000	– 7,000
,, Cuba	49,000	52,000	+ 3,000
,, Uruguay	14,000	45,000	+ 31,000
,, India	2,000	5,000	+ 3,000
,, Australia	142,000	144,000	+ 2,000
,, British South Africa	38,000	42,000	+ 4,000
Power transformers—			
Total	3,195,000	3,286,000	+ 91,000
To Cuba	54,000	260,000	+ 206,000
,, France	516,000	26,000	– 490,000
,, Canada	45,000	46,000	+ 1,000
,, Mexico	104,000	224,000	+ 120,000
,, Brazil	188,000	204,000	+ 16,000
,, Chile	112,000	67,000	– 45,000
,, India	62,000	62,000	—
,, China	112,000	8,000	– 104,000
,, Japan	1,490,000	1,696,000	+ 206,000
,, Australia	42,000	40,000	– 2,000
,, Spain	116,000	65,000	– 51,000
Other transformers—			
Total	760,000	2,368,000	+1,608,000
Rectifiers, double current, and motor generators, dynamotors, synchronous and other converters—			
Total	999,000	1,157,000	+ 158,000
To France	318,000	206,000	– 112,000
,, Great Britain	41,000	53,000	+ 12,000
,, Canada	116,000	146,000	+ 30,000
,, Mexico	30,000	37,000	+ 7,000
,, Chile	11,000	13,000	+ 2,000
,, Uruguay	5,000	2,000	– 3,000
,, India	45,000	22,000	– 23,000
,, Japan	171,000	347,000	+ 176,000
,, Australia	33,000	54,000	+ 21,000
,, Spain	30,000	43,000	+ 13,000
,, Brazil	42,000	79,000	+ 37,000
Switchboard panels, except telephone—			
Total	1,668,000	2,163,000	+ 495,000
Switches and circuit breakers over 10 amps.—			
Total	1,796,000	2,245,000	+ 449,000
Fuses and fuse blocks—			
Total	311,000	282,000	– 29,000
Watt-hour and other measuring instruments—			
Total	519,000	624,000	+ 105,000
To Canada	94,000	44,000	– 50,000
,, Mexico	59,000	55,000	– 4,000
,, Cuba	71,000	65,000	– 6,000
,, Brazil	50,000	100,000	+ 50,000
,, China	48,000	57,000	+ 9,000
,, Japan	56,000	183,000	+ 127,000
Volt, watt-, ampere-, and other recording, &c., apparatus—			
Total	1,027,000	1,367,000	+ 340,000
Lightning arresters, choke coils, &c.—			
Total	616,000	920,000	+ 304,000
Motors, under 1 h.p.—			
Total	1,728,000	1,687,000	– 41,000
To Holland	15,000	32,000	+ 17,000
,, Spain	64,000	42,000	– 22,000
,, Great Britain	647,000	286,000	– 361,000
,, New Zealand	47,000	36,000	– 11,000
,, Canada	459,000	537,000	+ 78,000
,, Mexico	21,000	30,000	+ 9,000
,, Argentina	25,000	41,000	+ 16,000
,, Japan	98,000	194,000	+ 96,000
,, Australia	84,000	101,000	+ 17,000
Stationary motors, 1 to 200 h.p.—			
Total	3,088,000	2,392,000	– 696,000
To Spain	106,000	93,000	– 13,000
,, Great Britain	132,000	88,000	– 44,000
,, Canada	562,000	428,000	– 134,000
,, Mexico	155,000	199,000	+ 44,000
,, Cuba	121,000	144,000	+ 23,000
,, Brazil	65,000	70,000	+ 5,000
,, Chile	46,000	77,000	+ 31,000
,, China	92,000	36,000	– 56,000
,, Japan	454,000	383,000	– 71,000
,, Australia	406,000	172,000	– 234,000
,, British South Africa	157,000	81,000	– 76,000
Railway motors—			
Total	660,000	1,328,000	+ 668,000
To Canada	12,000	25,000	+ 13,000
,, France	26,000	307,000	+ 281,000
,, Spain	4,000	201,000	+ 197,000
,, Mexico	27,000	245,000	+ 218,000
,, Brazil	66,000	117,000	+ 51,000
,, Chile	136,000	—	– 136,000
,, Japan	249,000	82,000	– 167,000
Motors, over 200 h.p.—			
Total	813,000	576,000	– 237,000
To Mexico	32,000	44,000	+ 12,000
,, Chile	74,000	65,000	– 9,000
,, Japan	46,000	126,000	+ 80,000
,, British S. Africa	43,000	21,000	– 22,000
Starting and controlling equipment—			
Total	1,752,000	1,536,000	– 216,000
For industrial motors	*	1,429,000	—
For electric railway and vehicle motors	*	107,000	—
Accessories and parts for motors—			
Total	1,659,000	1,998,000	+ 339,000
Railway signals, switches, and attachments—			
Total	734,000	964,000	+ 230,000
To Canada	213,000	160,000	– 53,000
,, Japan	185,000	109,000	– 76,000

* Not separately distinguished.

	1923. $	1924. $	Inc. or dec. $
Insulating material—			
Total	1,436,000	1,536,000	+ 100,000
To France	60,000	58,000	− 2,000
,, Great Britain ...	345,000	492,000	+ 147,000
,, Canada	357,000	254,000	− 103,000
,, Japan	241,000	199,000	− 42,000
,, Australia	56,000	65,000	+ 9,000
Fans—			
Total	859,000	1,028,000	+ 169,000
To Canada	60,000	51,000	− 9,000
,, Argentina	66,000	61,000	− 5,000
,, China	169,000	76,000	− 93,000
,, British India ...	136,000	59,000	− 77,000
,, Australia	60,000	54,000	− 6,000
,, Cuba	21,000	71,000	+ 50,000
,, Mexico	47,000	68,000	+ 21,000
,, Great Britain ...	86,000	58,000	− 28,000
,, Japan	39,000	272,000	+ 233,000
,, Hong-Kong	51,000	93,000	+ 42,000
Heating and cooking apparatus—			
Total	984,000	1,104,000	+ 120,000
To Norway	6,000	6,000	—
,, Great Britain ...	128,000	114,000	− 14,000
,, Canada	224,000	235,000	+ 11,000
,, Japan	59,000	127,000	+ 68,000
,, Argentina	44,000	54,000	+ 10,000
,, Australia	199,000	176,000	− 23,000
,, Mexico	46,000	63,000	+ 17,000
,, Brazil	10,000	13,000	+ 3,000
Motor-driven household devices—			
Total	866,000	888,000	+ 22,000
To Holland	79,000	100,000	+ 21,000
,, Great Britain ...	265,000	303,000	+ 38,000
,, Canada	144,000	151,000	+ 7,000
,, Japan	15,000	22,000	+ 7,000
,, Australia	101,000	59,000	− 42,000
,, Belgium	76,000	67,000	− 9,000
Industrial electric furnaces and ovens—			
Total	214,000	240,000	+ 26,000
Metal filament lamps—			
Total	1,131,000	1,070,000	− 61,000
To Canada	37,000	70,000	+ 33,000
,, Peru	21,000	31,000	+ 10,000
,, Mexico	255,000	171,000	− 84,000
,, Cuba	185,000	183,000	− 2,000
,, Argentina	95,000	98,000	+ 3,000
,, Brazil	22,000	30,000	+ 8,000
,, Australia	101,000	130,000	+ 29,000
,, British South Africa ...	49,000	38,000	− 11,000
,, Chile	57,000	48,000	− 9,000
Magnetos, spark plugs, &c.—			
Total	1,695,000	1,911,000	+ 216,000
To Italy	26,000	82,000	+ 56,000
,, Great Britain ...	50,000	113,000	+ 63,000
,, Canada	616,000	443,000	− 173,000
,, Argentina	90,000	95,000	+ 5,000
,, India	12,000	23,000	+ 11,000
,, Japan	117,000	151,000	+ 34,000
,, Australia	93,000	68,000	− 25,000
,, New Zealand ...	24,000	31,000	+ 7,000
,, British South Africa ...	12,000	18,000	+ 6,000
,, Mexico	29,000	34,000	+ 5,000
Insulated wire and cable, iron or steel—			
Total	687,000	398,000	− 289,000
To Canada	17,000	11,000	− 6,000
,, Mexico	95,000	60,000	− 35,000
,, Cuba	122,000	45,000	− 77,000
,, Brazil	18,000	11,000	− 7,000
,, Japan	95,000	4,000	− 91,000
,, Venezuela	6,000	34,000	+ 28,000
,, Philippine Islands ...	36,000	37,000	+ 1,000
Insulated wire and cable, copper—			
Total	3,140,000	3,896,000	+ 756,000
To Great Britain	274,000	456,000	+ 182,000
,, Canada	404,000	405,000	+ 1,000
,, Mexico	414,000	306,000	− 108,000
,, Cuba	502,000	942,000	+ 440,000
,, Brazil	306,000	360,000	+ 54,000
,, Chile	121,000	267,000	+ 146,000
,, China	59,000	36,000	− 23,000
,, Japan	168,000	35,000	− 133,000
,, Philippine Islands ...	72,000	169,000	+ 97,000
,, Australia	34,000	101,000	+ 67,000
,, Colombia	66,000	86,000	+ 20,000
,, New Zealand ...	27,000	68,000	+ 41,000
Batteries, storage—			
Total	2,344,000	2,883,000	+ 539,000
To Denmark	118,000	135,000	+ 17,000
,, France	59,000	8,000	− 51,000
,, Great Britain	202,000	197,000	− 5,000
,, Canada	220,000	327,000	+ 107,000
,, Mexico	111,000	99,000	− 12,000
,, Argentina	255,000	348,000	+ 93,000
,, Brazil	92,000	225,000	+ 133,000
,, India	57,000	117,000	+ 60,000
,, Australia	235,000	238,000	+ 3,000

	1923. $	1924. $	Inc. or dec. $
Batteries, primary—			
Total	1,273,000	1,711,000	+ 438,000
To Norway	15,000	8,000	− 7,000
,, Great Britain	24,000	83,000	+ 59,000
,, Canada	18,000	18,000	—
,, Argentina	310,000	327,000	+ 17,000
,, Chile	22,000	35,000	+ 13,000
,, China	29,000	37,000	+ 8,000
,, Australia	71,000	103,000	+ 32,000
,, New Zealand	87,000	102,000	+ 15,000
,, British India	42,000	86,000	+ 44,000
,, Brazil	27,000	56,000	+ 29,000
,, Mexico	158,000	234,000	+ 76,000
,, Spain	13,000	22,000	+ 9,000
Metal conduit, outlet and switch boxes—			
Total	478,000	574,000	+ 96,000
Sundry wiring supplies and fixtures—			
Total	1,891,000	1,149,000	− 742,000
Telegraph apparatus—			
Total	1,891,000	516,000	−1,375,000
To Great Britain	66,000	43,000	− 23,000
,, Cuba	20,000	15,000	− 5,000
,, Canada	87,000	156,000	+ 69,000
,, Japan	66,000	140,000	+ 74,000
,, Argentina	362,000	5,000	− 357,000
Radio apparatus—			
Total	3,448,000	6,031,000	+2,583,000
To Poland	11,000	6,000	− 5,000
,, Great Britain	200,000	142,000	− 58,000
,, Canada	796,000	2,414,000	+1,618,000
,, Argentina	647,000	292,000	− 355,000
,, Cuba	212,000	103,000	− 109,000
,, Mexico	281,000	394,000	+ 113,000
,, Sweden	459,000	132,000	− 327,000
,, Australia	210,000	1,053,000	+ 843,000
Telephones, magneto—			
Total	196,000	183,000	− 13,000
To Great Britain	11,000	1,000	− 10,000
,, Canada	44,000	6,000	− 38,000
,, Cuba	42,000	23,000	− 19,000
,, Colombia	14,000	9,000	− 5,000
,, Australia	18,000	41,000	+ 23,000
,, Brazil	4,000	25,000	+ 21,000
Telephones, other—			
Total	406,000	543,000	+ 137,000
To Canada	85,000	112,000	+ 27,000
,, Mexico	10,000	17,000	+ 7,000
,, Cuba	34,000	41,000	+ 7,000
,, Brazil	76,000	39,000	− 37,000
,, Australia	71,000	91,000	+ 20,000
,, New Zealand	47,000	5,000	− 42,000
Magneto switchboards—			
Total	119,000	14,000	− 105,000
Other telephone switchboards—			
Total	403,000	1,147,000	+ 744,000
Locomotives, electric railway—			
Total	3,037,000	1,923,000	−1,114,000
To France	224,000	14,000	− 210,000
,, Spain	484,000	—	− 484,000
,, Chile	2,092,000	—	−2,092,000
,, Japan	118,000	167,000	+ 49,000
,, Mexico	4,000	1,425,000	+1,421,000
,, Brazil	66,000	268,000	+ 202,000
Locomotives, electric, mining and industrial—			
Total	277,000	320,000	+ 43,000
To Chile	34,000	45,000	+ 11,000
,, Japan	147,000	62,000	− 85,000
,, Mexico	47,000	27,000	− 20,000
,, Australia	—	22,000	+ 22,000
,, British South Africa ...	22,000	68,000	+ 46,000
,, Canada	7,000	33,000	+ 26,000

A Patent Law for the Straits Settlements.—By a recent amendment to Sections 14 and 15 of the Straits Settlements Ordinance, it is now possible for British patentees to obtain protection in the Straits Settlements corresponding to their British patents. Messrs. Hughes & Young, Patent Agents, state that a patent can be registered in the Colony by applying within three years from the date of the issue of the British patent, the application, if the British patent is assigned, being made by the assignee. Normally, the patent expires with the expiration of the corresponding British patent, but applications for extension of the term of the patent can be lodged before the last three years of the full duration of the British patent. The Act provides against any action for infringement which occurred before the issue of the certificate or registration in the Colony, although the registration has a priority date corresponding to the date of the British patent. The Federated Malay States and Johore have introduced similar amendments in their Patent Laws.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

An Aerial Protector.

Considering the number of broadcast radio-telephone receivers now in use, the instances which have been reported of such apparatus having been damaged by lightning striking the aerials are remarkably few. The extent to which an aerial may be affected by a lightning discharge and the results likely to arise therefrom are of practical importance, and the subject is now receiving more attention than hitherto.

For the benefit of those users of outdoor aerials who consider it desirable to provide some form of protection against the risk of fire or damage to the receiving apparatus which may arise in the above-mentioned way (remote though the risk is), MESSRS. SIEMENS BROS. & CO., LTD., have developed what would appear to be an efficient protector. This compact

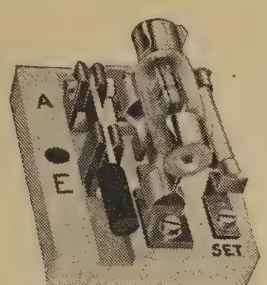
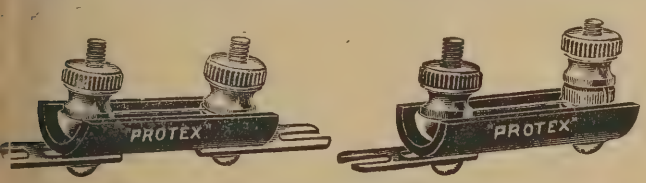


Fig. 1.—A Siemens Aerial Protector.

little device embodies the firm's well-known vacuum arrester, a fuse, and an earthing switch all mounted on a porcelain base, as shown in fig. 1. It has the advantage of ensuring protection at all times, whether the set is in use or not, and it is capable of functioning many times before renewal becomes necessary. Simpler types of both vacuum and carbon-block arresters, but without earthing switches, are available, and the company also supplies porcelain-base fuses for protecting l.p. and h.p. batteries in the event of a short circuit.

The "Protex" Fuse.

Another accumulator safety device is shown in figs. 2 and 3; it is a simple attachment, a product of Messrs. WARD & GOLDSTONE, LTD., capable of being fitted in a few seconds, and consists of suitable terminals to hold the fuse wire, mounted in a channel which protects the instrument panel in the case of the fuse blowing. A supply of fuse wire is provided with each "Protex," which may be used for protection against short



Figs. 2 & 3.—"Protex" Accumulator Fuses.

circuit or over-charging of the accumulator, or (with finer fuse wire) in circuit with the valves, or as an ordinary fuse, &c. The simplest method of attachment is to place the slotted end of the fuse under the battery terminal, the circuit being continued from the terminal at the opposite end of the "Protex"; for bridging two accumulator cells two slotted connector plates are provided, as shown above.

The "Goltone" Receptor.

In order to obviate the use of loading coils for tuning-in the Daventry station (1,600 m.) on "short-wave" crystal sets, the receptor shown in fig. 4 has been placed on the market by Messrs. WARD & GOLDSTONE, LTD. This device affords a simple method of adapting existing crystal sets, it being



Fig. 4.—"Goltone" Receptor.

a capacity device, complete in itself, and is connected across the aerial and earth terminals by means of the flexible cords shown in the illustration. On valve sets which do not employ high-frequency amplification, the "Goltone" receptor is said to permit the tuning-in of 5 XX.

A New Loud-speaker.

The design of the BRITISH THOMSON-HOUSTON CO.'S new type C2 loud-speaker has been given careful attention, as is indicated in figs. 5 and 6. The body containing the whole magnetic pole-piece assembly is embedded in Fabrolite, a synthetic moulded insulating compound having high insulating properties. This construction ensures rigidity and freedom from vibration, as the number of separate parts is reduced to a minimum. The diaphragm is clamped rigidly at its periphery by means of moulded threads on the body and base, which are both made of Fabrolite. The small end of the horn is held rigidly in position by means of a nut which co-operates with an internal thread moulded in the base. Permanent cobalt-steel magnets are used in the magnetic circuit, which is

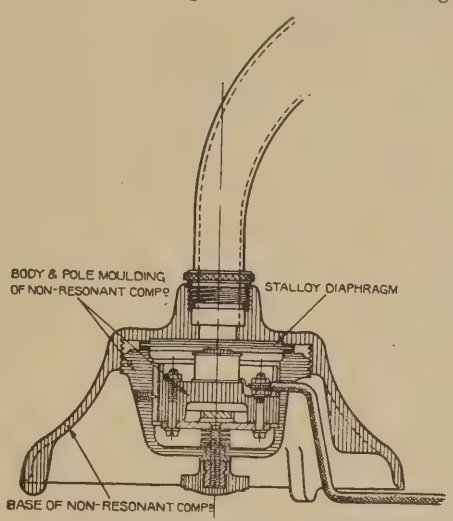


Fig. 5.—Section Through Base of B.T.-H. "C2" Loud-speaker.

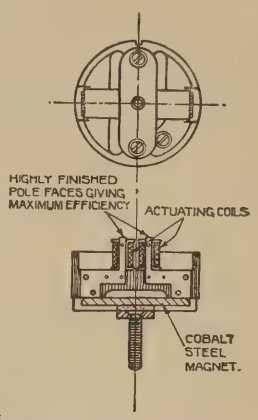


Fig. 6.—Plan and Elevation of "C2" B.T.-H. Loud-speaker.

short and direct so as to produce a field of high intensity, and a special construction is adopted to secure good contact between the pole pieces and the ends of the magnet. The magnetic field of each pole piece is measured on each unit to ensure that a certain intensity is produced, and the spools are very thin, so that the turns of wire, being very close to the magnet, exert the maximum effect. Each and every coil is tested to ensure uniformity, and the flexible lead is attached to terminals inside the magnetic unit. The moulded base and the flare of the horn are of the usual B.T.-H. chocolate brown, while the neck is polished aluminium, the appearance being enhanced by a decorative grille in the mouth of the horn.

The Hanging "Mellovox" Loud Speaker.

The hornless loud-speaker shows a tendency to become the most popular model of the season, and in order to meet further public requirements the hanging "Mellovox" has been introduced to meet the wishes of those who prefer a loud-speaker which can be hung in any part of a room. We are informed by the MARCONIPHONE CO., LTD., that the general constructional



Fig. 7.—Hanging "Mellovox" Loud-speaker.

details are identical to those of the ordinary type of "Mellovox," with the exception that the base has been removed and a ring attached to the adjustment screw as a means of suspension, see fig. 7. A lead, 16 ft. long, has been fitted in order that the loud-speaker may be placed in any position of advantage within reasonable distance of the set. Regarding performance, a full rich tone is maintained, with sufficient volume to meet the requirements of the listener, and the instrument gives less directional effect than is usually experienced in most loud speakers.

The Electrical Trades Benevolent Institution.

Annual Festival Dinner.

Yet another successful annual festival of the E.T.B.I. has to be recorded to the credit of those responsible for the conduct of this very deserving organisation. It was held at the Trocadero Restaurant, London, on November 4th, when Mr. Edgar S. Barralet presided over some 150 members of the Institution and their ladies and guests—good support it might be thought, but why is it not an even bigger affair, especially as such good entertainment is the rule? Under the able hon. secretaryship of Mr. F. B. O. Hawes, the fund should be better supported in the provincial industrial centres. If employers would acquaint their staffs with the advantages of membership, common-sense would soon show what an extraordinary investment a modest annual subscription of 10s. is. The splendid yield, in case of necessity, to those who make themselves eligible needs to be brought more persistently before the notice of the rank and file. The insurance offered only needs to be known to be appreciated.

The Chairman proposed the "E.T.B.I.," and reminded his hearers that the electrical industry was one of the greatest and had a vast capital invested in it; numbers of people employed in it were afflicted with misfortune from time to time, and an Institution such as theirs was needed to take care of them. There were two ways of assisting the fund:—One was to subscribe that evening as liberally as they could, and the other was to do propaganda work elsewhere. It was very necessary that the inadequate pension fund should be built up to a reasonable figure, and it needed very little arithmetic to show how many subscribers at 10s. per annum would suffice to make that fund self-supporting.

Mr. F. G. Kellaway, in echoing the president's remarks, pointed out that he had been connected with the electrical industry for probably a shorter period than anyone in the room. Three years ago he was a politician pure and simple, and now he was a business man pure and simple—so far as business men were simple and pure. When his constituents tired of returning him to Parliament he looked round for something to do in an atmosphere of calm, naturally turning to the electrical industry, and again, naturally, to the Marconi Co. Everyone connected with the electrical industry must be very proud of it; the characteristics of Englishmen were shown no better than in the way the electrical industry had been built up. It had changed the character of the country. The country also had a right to be proud of the progress made in radio broadcasting, particularly on the technical side. Technically they had nothing to learn from other countries, but he was not so sure whether they were making the most of the business from the programme point of view. English people did not like a censorship, whatever form it might take, and he hoped that the Government Committee which was to consider the subject of broadcasting very shortly would take into serious consideration whether the present procedure with regard to programmes was best. He feared that it would not be so, so long as programmes were determined by one body alone. In supporting the fund, he remarked that the worst tragedies were not always found in mean streets and poor homes, but in the "black coat" classes, whose pride prompted them to maintain appearances regardless of cost. It was that class of poverty with which the Institution dealt, and it did so without allowing those helped to suffer in self-respect. One result of the war was that the people now were quicker to sympathise with the sufferings of others, and he asked all those present to express their feeling in a practical manner.

Mr. J. Snow Huddleston toasted the ladies, remarking that they did not often have that toast nowadays, but it was on the list that night because ladies were now eligible for membership and the benefits of the Institution. Amongst the ladies' duties the oldest was benevolence, and in that sphere they always surpassed mere man. With the toast he coupled the name of Mrs. A. J. Wilson, and hoped that the E.T.B.I. fund would in time be as adequate as the one for which she performed the secretarial duties.

Mrs. A. J. Wilson, secretary of the Motor Trades Benevolent Fund, in an excellent reply to the toast, said that not so long ago people would have been horrified to know that ladies had attended such a function, but she took it as a sign of grace that they had been invited that night. Born together about 1905, and both attaining their majority next year, the two funds had grown side by side, each hardly knowing that the other existed. In the case of the motor trade, the fund had met with amazing generosity, due to the large and active support of the rank and file of the trade, who, initially, were very hard to enrol as members. Gradually their efforts had borne fruit, and to-day the "black coats" formed the backbone of the fund. What was the good of employers giving generous donations if employés—the very people who would benefit—did not make themselves eligible? The royal road to success was undoubtedly live membership of the rank and file.

Mr. J. Y. Fletcher (chairman, E.T.B.I. Committee) proposed the health of the chairman, and thanked him for coming forward and fulfilling the onerous duties of the chairman's post. He had not spoken with a gloomy face, but had departed from custom somewhat and had "varnished" his face into a smile and had been "pinching" money everywhere. In the past they had been able to assist every applicant, but many people would sooner starve than ask for assistance, and the Committee was very much more worried about ferreting out deserving cases than it was about granting help. The size of their funds compelled them to go slowly, and they had no adequate means of discovering deserving cases as they should have. He was not quite sure of the figures, but about five years ago the motor trade fund stood at something like £100,000, which fact was a reflection on the electrical industry. Some names appeared on the list of donors year after year, and others gave generously, but they had failed to enlist the active assistance of the rank and file. Those were the people who would actually benefit, and it was therefore obvious that they were the members required.

The Chairman, in his brief reply, announced that the amount collected this year was £1,326 15s. 2d., and there was more to come. The sum collected at the table was £161 17s. 6d.

Between the speeches the company was entertained to an excellent (thanks to the assistance of Major H. Clifford Palmer) selection of music and song.

The Salesman's Art.

Some Desirable Qualifications.

At a meeting of the Electrical Trades Commercial Travellers' Association, at the E.L.M.A. Lighting Bureau, on October 30th, Mr. V. W. Dale, of the British Electrical Development Association, delivered an address containing a great deal of useful advice for electrical salesmen.

In his opening remarks Mr. Dale made the interesting statement that during the next year upwards of five million books, posters and leaflets would be circulated by his Association, each one going straight to the ultimate user.

The speaker stated that the salesman's task was to secure the utmost business from the largest number of customers at fair and economic prices. Efficient production was a great deal, but the creation of markets at home and overseas, and efficient selling, were equally as important. It was of no use producing more goods, even at a lower cost, unless the market for them was existent. If manufacturers founded a good organisation and produced satisfactory articles it was the duty of the salesmen to present in themselves as perfect a reflection of those meritorious conditions as they possibly could. The personal equipment of a salesman must include enthusiasm, optimism, courtesy, cheerfulness, sincerity, honesty, self-confidence, and good health. This looked a formidable list of virtues, but practically all of them were attainable by the right men. It was often debated whether salesmanship was a gift at birth or an acquired art; the principal element of successful salesmanship—self-confidence—most certainly had to be acquired.

A salesman's time was very valuable, and every available moment should be spent profitably. The speaker had heard of travellers who always drew up in advance a plan of the area which they intended to cover, marking it with railway stations, &c. It had to be borne in mind that customers' time was important, too; therefore, expositions and demonstrations should be brief, though thorough. Time could also be saved by definitely avoiding entirely and absolutely fruitless calls. A place should never be left until somebody had been seen, for generally the proprietor or the buyer had an assistant, to whom due respect should be given, for he might be the buyer or proprietor of the future.

An important part of the salesman's business was the revealing to the public of their needs, for in many directions, *e.g.*, lighting, the public were woefully ignorant concerning the full and proper usage. The average person could be told with regard to lighting that he needed extra lamps for the bed, the dressing table, &c., reading lights and better switch controls, and the same was true of small power and heating applications. When producing the influence of oral suggestion the salesman should not fall into the error of imagining that "highbrow facts" and sonorous words were necessary. More often than not something quite simple and human would provide the best starting point. It had to be remembered that when people bought electrical appliances they were really buying comfort, convenience, service and better health, and, moreover, something better than their neighbours and friends possessed. All these impulses and emotions were well worth studying and analysing, and countless avenues for the exploitation of fresh markets would be discovered as a result. Salesmen should keep themselves up to date with the whole of their principals' advertising, and should read very carefully at least one or two trade papers regularly, including a journal published by gas competitors.

A great deal of service could be rendered by salesmen to their trade customers; for instance, it was possible to convey suggestions for improving the attractiveness of windows, utilising showroom space to greater advantage, arranging periodical demonstrations, &c. This information should be imparted in a tactful manner so as not to cause the customer to feel that he did not know how to run his own business. It was necessary for a salesman to be adaptable, within reason, to the moods and peculiarities of his customers. Some buyers preferred familiarity; others did not. A sales manager should have an intimate knowledge of the temperaments of his out-door force, for it had been proved that men who

were the very best salesmen in one part of the country could ...e total failures in another district. A salesman could not ...ford to be over-sensitive; he certainly had to be long-...uffering and able to keep his temper in the very difficult ...ircumstances. In spite of every effort, failure was bound ...o come sometimes, for reasons known or unknown; the ...alesman could not afford to allow himself to be discouraged. ...n many cases failure could sometimes be more valuable than ...uccess, if only because a man did not waste his time ...ragging about it.

It was a great mistake for a salesman to load a customer ...ith material when his expert knowledge of the peculiarities ...f the local demand distinctly pointed to the fact that a ...arket for this material did not exist. Such over-selling came ...ff only once, and the policy was fatal, both to the salesman ...nd to the firm which he represented. Where, however, it ...as found that in spite of the existence of a market, retailers' ...helves were still loaded with unsold goods, the retailer ...hould be tactfully told that he was failing to make proper ...se of his opportunities, and he should be offered assistance. ...n investigating market possibilities the salesman should seek ...he aid of local directories, census returns, and supply under-...aking records, and a visit should be paid to the Town Clerk's ...ffice. In this way a great deal of valuable information could ...e obtained to make prospective sale efforts much more clearly ...efined, promising far better results than could be obtained ...y working almost entirely in the dark.

In concluding his address, Mr. Dale said that there was very indication that an immense volume of business was ...aiting and would be obtained as soon as the country really ...ettled down.

The Distribution of Electricity.

I.E.E. Discussion on Cost Reduction.

...T the opening meeting of the Informal Meetings Section of ...he Institution of Electrical Engineers, Mr. R. A. Chattock ...ook the chair and opened a discussion, in which some 15 ...peakers took part, on the subject of "How Can the Cost of ...istribution be Cheapened?"

According to the official *résumé* of the proceedings, the ...resident pointed out the facts that areas of supply were tend-...ng to become larger, and densely-populated districts were ...eing extended to cater for residential demands situated at ...onsiderable distances. Existing methods of distribution were ...ot applicable to these new areas, and rural districts were also ...eing developed which required still different treatment. A ...omparison between the costs of the networks in Birmingham ...as as follows:—

	L.p., d.c.	*E.h.p., a.c.*
Total cost	£1,052,520	£408,790
kWh sold, year ending March 31st, 1925	60,200,000	100,735,740
Revenue from kWh sold ...	£546,838	£426,691
Annual return per £1 capital	10s. 5d.	£1 0s. 10d.

Most large towns had d.c. distributing networks fed from ...ub-stations and when the feeders supplying those networks ...ecame fully loaded it became necessary to lay additional ...eeders, or arrange to boost the pressure on the fringe of the ...etworks by means of automatic converting plant. At a point ...n Birmingham 1,200 yards from a sub-station where the net-...work was overloaded, the cost of a 1.0 sq. in. feeder cable, with ...dditional rotary converter plant and switchgear in the main ...ub-station would amount to £9,400; the annual losses in con-...ersion, boosting, and cables at ½d. per kWh amounted to ...£1,380; and the interest and sinking fund charges on the ...apital outlay at 8 per cent. amounted to £752; the total annual ...harge being £2,132.

The cost of an automatic 550-kW mercury-arc rectifier equip-...ment with building would be £8,200; annual losses at ½d. per ...kWh would be £270; capital charges would be £660; and the ...otal annual charge £930. The cost of an automatic 500-kW ...otary converter equipment, with building, would be £6,500, ...nd the total annual charges £790.

Another way of relieving the d.c. network was to transfer ...ower consumers to the e.h.p. system. Hitherto, consumers ...f less than 100 h.p. had been connected to the d.c. system, but ...ow that the e.h.p. mains covered practically the whole of the ...ndustrial section of the city, arrangements were being made ...o connect power users of 30 h.p. and upwards to the a.c. ...nains, and to employ a simple form of e.h.p. switchgear with ...a "tee" off the main. The saving in cost for a consumer ...,000 yards from the nearest source of supply and requiring ...00 h.p. installed was as follows:—

	D.c.	*A.c.*
Capital cost of transforming plant and cable	£1,950	£1,040
Annual cost of maintenance losses and capital charges at 10 per cent. ...	£277	£140
If cables were available close to consumer's premises and a proportion of them was allocated for his load, the comparison was as follows:—	£157	£33

For an outlying residential district, a d.c. network fed by ...eeders from a central rotary-converter sub-station was not ...uitable, as the density of loading would not justify the ex-...enditure. The cheapest form of distribution was a four-wire network fed by three-phase transformers with a pressure of 400 volts between phases.

For rural supplies, overhead distribution must be used, and a system must be designed as simply as possible with the details standardised. The Shropshire, Worcestershire, and Staffordshire E.P. Co. had developed a system for the large number of villages in its area, and the chief engineer, Mr. J. T. H. Legge, had furnished the following particulars:—

Overhead four-wire distributors were fed by transformers at frequent intervals, strung on poles. Wires strung in the same horizontal plane had a tendency to swing together, so they were placed vertically close to the poles, which arrangement enabled service wires to be taken off in a very simple manner and a cheap form of bracket to be standardised. Wires of different potential need never be crossed.

The cost of four-wire 0.05-sq. in. lines with an earthed neutral was as follows:—

Length of line.	*Cost per mile.*
2½ miles along roads	£399
1½ " " "	£411
Short lengths	£447
Poles in meadows.	
1 mile	£382
Short lengths	£395 to £448

The comparison between overhead and underground work was as follows:—

E.h.p. lines. *Size.*	*Cost per mile.* *Overhead.*	*Underground.*
3 × 0.1	£931	£1,804
3 × 0.06	£792	£1,628
L.p. lines.		
4 × 0.1	£572	£1,731

London and Home Counties Electricity District.

Inaugural Meeting of the Joint Electricity Authority.

On Wednesday, November 4th, the first meeting of the Joint Electricity Authority for the London and Home Counties Electricity District was held at the Institution of Electrical Engineers, London. Sir John Snell, G.B.E., chairman of the Electricity Commissioners, opened the proceedings as acting chairman, with a review of the history of electricity supply in London since the time, 20 years ago, when a Bill for the supply of the area was passed by both Houses of Parliament and only failed to become law by mischance. He had been concerned with the problem since 1905, in connection with the London County Council, and was familiar with the various schemes which had been put forward but had not matured. The District was provisionally determined by the Commissioners on July 17th, 1920, and local inquiries were held on the schemes submitted to them; the Order constituting the District and establishing the Joint Electricity Authority of 33 members was approved by Parliament and came into operation on July 29th, 1925, whilst the London Electricity Acts, Nos. 1 and 2, with which the scheme was closely bound up, became law two days later, empowering the company undertakers to amalgamate, extending their tenure till 1971, and making them subject to a sliding scale of price and dividend.

The area of the District was 1,785 square miles* and the population was nearly 8¼ millions; the assessable value was about £73,000,000. There were 43 local authority undertakers and 44 companies authorised to supply electricity in the District. The total capital expended on the electrical undertakings at the end of March last was £51,000,000. Since 1919-20 the maximum load (excluding traction) had grown from 320,000 to 535,000 kW, and the energy generated from 715 to 1,238 million kWh, an average growth of 15 per cent. per annum; the load factor remained at 26.7 per cent. Including the traction stations, the maximum load last year was 632,840 kW and the energy generated 1,950 million kWh, at a load factor of 35.8 per cent. In 15 years the load would probably be 1,682,000 kW and the output 4,000 million kWh.

It was clear that the Joint Electricity Authority would have duties involving great responsibilities. It would be able to assist the Commissioners in bringing about a reduction of the number of pressures and systems now extant and in simplyfying the tariffs in vogue; it would have to consider any unoccupied areas in the District with a view to providing a supply of electricity; it could borrow money up to a limit of £7,000,000, and issue stock. The Commissioners had always taken the view that in the performance of their own duties they must not be actuated by any other than technical considerations consistent with their legislative powers in seeking to secure for all an adequate supply of electricity at the lowest possible cost. He hoped that a similar objective with regard to the District would commend itself to the members of the Authority, and that all concerned would work together for the development of a great public utility service, and he concluded with an expression of appreciation of their public spirit in undertaking their great responsibilities.

Sir John Snell then invited nominations for the office of Chairman, and Ald. Vorley, J.P., of Islington, proposed the

* See page 764.—Eds.

name of Ald. Duncan Watson, J.P., M.I.E.E., as a man of outstanding ability, of wide municipal and administrative experience, a successful business man, and a technical man of high standing; he had been chairman of the Committee of Local Authorities for the past nine years, and it was largely due to his tact and experience that all parties were brought into accord. Sir HARRY RENWICK, K.B.E., cordially supported the proposal, remarking that amongst Mr. Duncan Watson's many qualities were personality, impartiality, and vision, which were most important for the post. Councillor ODELL, of Ilford, supporting the nomination, added to these qualities firmness and courage. There was no other nomination, and the motion was carried unanimously with enthusiasm.

On taking the chair, Mr. DUNCAN WATSON expressed his keen appreciation of the honour accorded him, and his sense of the great responsibilities imposed upon the Authority, whose duty it would be to place London in the van of electrical progress. In future all barriers must be swept aside, and all must work together in harmony. He would devote his whole energy to the maintenance of goodwill between all parties, to hasten the victory over inefficiency and retrogression.

The Authority then proceeded to deal with the agenda that awaited its attention. Major C. R. Attlee, M.P., vice-chairman of the Conference of Local Authorities, was elected as vice-chairman of the Authority, and Mr. Gardner, of the staff of St. Marylebone M.B.C., undertook the duties of temporary clerk, until a permanent official should be appointed.

MEMBERS OF THE JOINT ELECTRICITY AUTHORITY.

Appointing Bodies.	Members Appointed.

SECTION 1.

Corporation of West Ham: Alderman G. Croot.

Company undertakers:—

(1) Committee Company (10 companies): Mr. W. F. Fladgate, M.V.O., J.P. (Charing Cross Co.).

(2) The Four Companies: Sir Harry Renwick, K.B.E. (County of London Co.).

County Councils:—

(1) London County Council: Mr. A. Emil Davies; Mr. E. M. Dence; Sir G. Hume, M.P., J.P.; Mr. W. F. Marchant, O.B.E.; Mr. Herbert Morrison; Mr. R. C. Norman.

(2) Middlesex County Council.

City of London Corporation: Mr. A. Thomas Snell, M.Inst.C.E., M.I.E.E.

Railway Companies Association: Lt.-Col. F. A. Cortez-Leigh, M.Inst.C.E., M.I.E.E., M.I.Mech.E (L.M. & S. Railway); Mr. Herbert Jones, M.I.E.E. (Southern Railway).

SECTION 2.

Metropolitan Borough Councils: Alderman Major C. R. Attlee, M.A., M.P.; Alderman J. R. Chesterman; Councillor C. W. Key; Councillor B. J. Samels, L.C.C.; Councillor W. J. Stapleton; Alderman H. B. Vorley, J.P.; Alderman Duncan Watson, J.P., M.I.E.E.; Alderman T. Watt.

SECTION 3.

Other Local Authority Undertakers: Councillor A. H. Dykes, M.Inst.C.E., M.I.E.E.; Alderman R. Moritz, K.C.; Councillor H. G. Odell; Alderman W. B. Robarts; Alderman Dudley Stuart, M.I.E.E.

SECTION 4.

The Four Power Companies: Sir James Devonshire, K.B.E., M.I.E.E. (North Met. Co., &c.).

SECTION 5.

Other Companies: Mr. K. A. Scott Moncrieff, M.I.E.E. (Hendon Electric Supply Co., &c.); Mr. P. D. Tuckett (Edmundsons, &c.).

SECTION 6.

Other County Councils.

SUPPLEMENTARY SECTION.

Employés' Organisations: Mr. I. J. Hayward (National Union of Enginemen, Firemen and Electrical Workers); Mr. W. J. Webb (Electrical Trades Union).

Mines Department Testing Station.—Col. G. R. Lane-Fox, M.P., Secretary for Mines, announces that the Mines Department testing station will shortly be transferred from Eskmeals, Cumberland, to more convenient and accessible premises which are being fitted for the purpose at 42, Arundel Street, Sheffield. A short interruption of the official testing of safety lamps and electric bells and relays will occur during the erection of a new testing gallery and the removal of apparatus from Eskmeals, and manufacturers will assist the Mines Department if, so far as is possible, they will arrange to hold over until the New Year any testing work which is not put in the testing officer's hands by the middle of November. The other work of the testing station—including the analysis of mine air and mine dust samples—will, it is expected, be carried on without interruption.

Correspondence.

Correspondents should forward their communications **at th earliest possible moment.** *No letter can be publishe unless we have the writer's name and address in ou possession.*

Rural Electricity Supply.

I have been following, with much interest, the above corre spondence, and whilst not proposing to enter the fray on th particular point at issue, I think it is to be regretted that Mr Fennell has weakened his case by trying to side-track th matter on to the I.E.E. Regulations. It gives the impressio that he felt he was losing his case and, like an astute lawyer looked for some other point on which to fasten his argument

Now it appears that Mr. Fennell, being very keen on rura development, finds two obstacles: (1) The Post Office, (2) th 1924 I.E.E. Regulations.

I only propose to deal with the latter, and would first of al refer Mr. Fennell to my article in the REVIEW of February 27th, wherein I pointed out that the Ontario Government i so anxious to develop the rural supply that it pays 50 pe cent. of the cost of rural lines, but it nevertheless finds i necessary to enforce a higher standard for installation work than that of the I.E.E. Regulations. Experience has no doub driven it to this necessity.

Then Mr. Fennell says he accepts the 1917 Edition, but not the 1924 Edition; the former contains 131 Rules and the latter 128, but a difference in the style of publication makes the 1924 Edition appear more formidable.

Mr. Fennell complains that the 1924 Edition is far too elaborate, but there, like all the other critics, he stops.

We can all put forward destructive criticism, but when it comes to sitting down and carefully thinking out something to replace that which is objected to, and which will not be open to other objections, then it is realised how difficult is the task.

When Mr. Fennell says he prefers the 1917 Edition to the 1924 Edition he is not fair to himself and has evidently not made a careful comparison between the two editions, or he would have realised that the last edition does allow greater latitude than the former editions.

I will quote one instance, *viz.*, "Testing." The 1924 Edition, as amplified in the leaflet issued this year, allows a lower standard of insulation than formerly, but Mr. Fennell evidently objects to this.

I will not occupy your space by quoting further instances, but can say that every grievance I have heard, when properly thrashed out, has proved to be that one or two regulations cut across some pet theory of the critic, and in consequence he condemns the regulations root and branch.

Let me repeat what I have said many times before: If anyone who takes exception to the 1924 Edition will send his carefully considered criticisms together with his carefully considered suggestions to the Institution, I know, as a member of the Wiring Rules Committee, that they will receive the same careful consideration.

Fredk. W. Purse,
Engineer and Manager.

Electricity Dept., West Ham, *November 6th*, 1925.

Under the above heading your correspondent, Mr. E. O. Walker, asks: "Is not the whole industry suffering from rules and regulations?" I should say emphatically, No! The rules drawn up by the I.E.E. are (in my opinion) very necessary, and the industry is suffering by these rules not being carried into effect. The fact that Mr. Walker has installed thousands of ordinary switches in places with stone floors does not prove that the rules are in error, even although Mr. Walker has not heard of any accident brought about by the use of such switches.

A great deal in your correspondent's letter is sound reasoning, but his first question and his later comment about electricity being hedged with regulations are (to my mind) unfair to a competent body like the I.E.E.

Although I am not a member of the I.E.E., I shall always give support to the rules where possible, and it is to be hoped that some day they will be carried fully into effect. Does Mr. Walker think that if there were no rules and regulations our industry would cease to suffer? I think not.

Polyphase.

November 2nd, 1925.

I am sorry that I have again to intervene in this correspondence, but the implication in Mr. Fennell's letter in your issue of November 6th that I have not written the truth compels a reply. It is indeed a novelty to me to have statements of fact which are within my knowledge referred to in such terms, but as presumably a simple and flat contradiction would not suffice in correspondence of this character, I must content myself with a more lengthy communication.

It will be necessary again to call attention to my original complaint against Mr. Fennell, which was a statement reflecting on Post Office engineers contained in the words "their talk of efficiency limits is a device to save themselves trouble." The point at issue is a simple one—are Post Office engineers lazy? Mr. Fennell has said, in effect, that Post Office engineers are so lazy that, to avoid having to place certain overhead lines underground, they invent an excuse which has no technical warrant. In reply to this charge of laziness I instanced the

fact that in the case of a power line projected by Mr. Fennell, the Post Office has offered to place its lines underground at 23 out of 29 crossings! Does this indicate laziness?

Speech efficiency of a circuit is not a myth, and, moreover, it cannot be arrived at in the manner adopted by Mr. Fennell, that is, by comparing the size of the overhead telephone wire with a 35,000-volt power line crossing a roadway. I sincerely hope that Mr. Fennell does not adopt similar reasoning as the technical basis for carrying out his distribution schemes.

The ease with which Mr. Fennell assumes that he knows all about other people's business is illustrated by his reference to his "Winsford calls," as though the function of the circuit was confined to operations between Northwich and that town. The circuit in question is one of a chain of links which may be required at any moment to make up circuits to any part of the United Kingdom, and to do this each link must have a minimum speech efficiency which is laid down, and which cannot be reduced without the possibility of long-distance calls being made difficult and unreliable. Because of the possibilities of being employed for such calls, say to John-o'-Groat's or Cork, "Z" junction circuits have an importance which cannot be appreciated by the narrow outlook envisaged by Mr. Fennell; all such circuits have their speech efficiency figures and there are no grounds for Mr. Fennell's "suspicion" "that there are no figures." I might well stop here but for the following in Mr. Fennell's letter:—

"The order was made, I suggest, on the ground that the line is too paltry to put underground in the country on the score of cost, and that as we are prepared to pay, it is merely inertia and indifference which stands in our way. I suggest that Mr. Bartholomew makes too much of the generosity of the Post Office in putting subscribers' lines underground *at our cost*. It is their well-known policy to get them underground even at their own cost as soon as they can. I expect they would be glad if we asked and paid for them all to be put underground forthwith!"

Was there ever such a farrago put forward by an engineer in a technical paper? First the Post Office will not put lines underground because of inertia and indifference, even though the power company offers to pay the cost; next it is the Post Office's well-known policy to put lines underground, even at their own cost; and, finally, Mr. Fennell expects we should be glad if we were asked and paid for them all to be put underground! This, after saying that the placing of Post Office lines underground is refused because of the "trouble" involved in carrying out such work, to say nothing of "inertia and indifference" which stand in the way. I am afraid that Mr. Fennell will make a very illogical St. George! Perhaps, after all, he is more like a Don Quixote.

Mr. Borlase Matthews, in his letter in your issue of October 23rd, said: "Difficulties are made to be overcome, so I trust others of your readers will help in the solution of the problem how best to reduce the cost of overhead construction in this country. It is no use slanging the Electricity Commissioners or telephone engineers, but rather, as Mr. Fennell has done, draw attention to definite points that require modification or suggest how they can be countered, there being more ways of killing a cat than by hanging it." If the words "but rather" be placed after "as Mr. Fennell has done" instead of before, then I think this advice is very sound.

S. C. Bartholomew.

G.P.O., London, *November 9th*, 1925.

P.S.—As regards the photograph showing the North Wales Power Company's 135-kV line, I am afraid the "innocent and hitherto smiling country side" would not be much relieved even if the cradle were removed at the road crossing.

Motor Converters versus Rotary Converters.

As a designer of both motor converters and rotary converters, I am particularly interested in Mr. Wuthrich's letter in your last issue. Although, in my opinion, the rotary converter is on the whole slightly superior to the motor converter, I do not think Mr. Wuthrich has been quite fair to the latter.

One great advantage of the motor converter is its superior stability on fluctuating loads, but Mr. Wuthrich does not mention this important fact. Operating engineers with experience in this class of plant have decided opinions on this point.

May I further comment on the seven claims which Mr. Wuthrich discusses?

1. *Possibility of connecting the plant direct to the h.p. supply without transformer up to* 11,000 *volts.*—The rotary converter certainly has the advantage stated, but, on the other hand, many engineers object to the presence of the large quantity of transformer oil in the station with its risk of leakage and fire. The fact that the transformer acts as a choking coil would appear to be offset by the fact that the motor acts in the same way.

2. *Simple starting and nearly immediate synchronising.*—The rotary converter is usually more simple in this respect than the motor converter, especially with the method of self-synchronising in which separate chokers are used.

3. *High efficiency and possibility of maintaining a power factor always in the neighbourhood of unity.*—The full-load efficiency of the rotary converter is certainly higher than that of the motor converter, but the difference given by Mr. Wuthrich hardly represents modern practice. The full-load efficiency of a 1,000-kW motor converter with two bearings is not more than 1 per cent. less than that of a rotary converter and transformer. Further, on three-quarter load the difference is less and the efficiencies are approximately equal, while on half load the motor converter may have a slight advantage. Since machines usually work at about three-quarter load in service, it will be seen that the difference in practical efficiency is quite small. For the same range of voltage, the power factor of the motor converter is slightly higher than that of the rotary, owing to the higher reactance.

4. *Large range of regulation on the d.c. side.*—I cannot follow Mr. Wuthrich's explanation of why the motor converter has a greater range than the rotary, but it is a fact that the range is greater, for the same range of power factors, on account of the higher reactance of the motor. The rotary, however, has a great advantage when two ranges of d.c. voltage are required for lighting and traction. In this case, tappings may be provided on the transformer, one set for lighting and one for traction, so that unity power factor may be obtained at the mean voltage of either range. This can also be accomplished in the case of the motor converter by providing tappings on the stator winding, but it is by no means such a practical proposition as providing tappings on the transformer. Without tappings, the motor converter gives unity power factor at the mean voltage of the total range. It does not seem fair in this comparison to introduce the induction regulator, since it must be remembered that, although its use extends the permissible voltage range, it also introduces considerable complications by adding a piece of apparatus which requires artificial cooling and additional regulating gear.

5. *Perfect balancing in the case of three-wire systems.*—The rotary has a slight advantage, in that the out-of-balance current has to be carried through brushes and slip-rings in the case of the motor converter.

6. *Small peripheral speed.*—Large modern motor converters operate at the same peripheral speeds as rotaries.

7. *Safe operation without highly trained staff.*—I agree that the operation of a rotary is as simple as that of a motor converter, and the design of the two types can be made equally simple. The weak point mentioned by Mr. Wuthrich is eliminated by building motor converters with two bearings only, so that the leads do not have to pass through a hollow shaft. Motor converters up to 2,500 kW have been constructed in this way quite satisfactorily. This method has the further advantage of reducing the overall length of the set. The fact that the position of the transformer can be chosen independently is not such an advantage as would appear at first sight, in that the transformer must be placed as close as possible to the rotary, in order to save in the length of the heavy-current leads.

As I stated before, it is my opinion that, generally speaking, the rotary holds a slight advantage, but many engineers may hold the contrary opinion. Apart from general opinions, it is only by attaching appropriate weights to the various claims in each specific case that a correct decision can be made. Each case must be judged on its merits.

The price of the motor converter is not disproportionate, being practically identical with that of the rotary and transformer, so that it is quite reasonable that engineers who have had satisfactory service in the past with motor converters should hesitate to install a different type of machine to obtain a doubtful advantage.

There seems to be no question of "encouraging the present fad" for motor converters, since manufacturers who have built satisfactory 50-cycle rotaries for many years are now building both types of machine.

Robert G. Jakeman.

Birmingham, *November 3rd*, 1925.

The two communications which appear in your issue of November 6th entirely vindicate my contention that practically in every respect rotary converters are far superior to motor converters. Although Mr. Sieveking states that he is in favour of motor converters, he has made a clear case for rotary converters, and it is only necessary to make the following comments regarding his remarks:—

1. As a transformer is indispensable even with motor converters in installations with a higher supply pressure than 11,000 volts, surely rotary converters are a far cheaper proposition.

2. Mr. Sieveking appears to have been unfortunate with the rotary converters he has had to deal with. With properly designed gear the starting-up of rotary converters should be as easy as in the case of motor converters.

3. In modern sub-stations where a number of units are installed it is usual to arrange that the rotary converters in service work at full load and consequently with best efficiency.

4. It is quite erroneous to think that an induction regulator for a large machine is too big and too costly. If the induction regulator is merely required to secure for the rotary converter the same voltage regulation as a motor converter, the internal capacity of the regulator is very small. The cost of an induction regulator for use in conjunction with a 500-kW rotary-converter equipment for a 6,000-volt, 50-cycle supply, giving a pressure range of 380/460 volts on the d.c. side, would not exceed £200.

6. The only question that matters here is whether the necessary factor of safety can be obtained at the given peripheral speed, and whether the commutation is satisfactory. These conditions are, I contend, entirely fulfilled with modern rotary converters. The fact that 50-cycle traction rotary converters for 1,500 volts, 1,500 r.p.m., are not built in this country is no argument, as such equipment works on the Continent with perfect commutation and remarkable absence of the "ploughed field" appearance of commutator alluded to by Mr. Sieveking.

7. The contention that if an induction regulator is inserted into the rotary-converter circuit, the motor converter is easier to handle, is a perfect fallacy. An induction regulator can be operated by handwheel or remote controlled by servo-motor and push button from the switchboard; it can also be arranged to deal with the whole pressure regulation of the rotary converter with as much ease as a shunt regulator.

As regards Mr. Bunting's remarks, I agree that the efficiency figures I gave may not apply to the very latest design of motor converter or rotary converter, but as both types of plant are being continually improved in this respect, the difference in favour of the rotary converter still remains, though perhaps not quite so pronounced.

Regarding the question of design, the use of two bearings in the case of motor converters removes, it is true, the necessity of leading the rotor connections through the shaft. This means, however, that either the two armatures are connected together by means of a rigid coupling, which is an undesirable feature in my opinion, or that the shaft is in one piece, an arrangement which renders repairs on the two armatures more difficult, while the fact that leads have to be run along the shaft is not wholly satisfactory.

It would appear to me that the writers of the letters I have referred to have been guided too much by their own personal experience with particular designs of rotary converters, and though they may have been fortunate in handling very up-to-date motor converters, they have overlooked the fact that considerable strides have also been made in the construction of rotary converters. That a manufacturer who can build satisfactory 50-cycle rotary converters should choose to devote also his attention to the construction of motor converters, appears to me merely to demonstrate that he chooses the path of least resistance in a conservative market, overlooking, perhaps, the fact that he is thereby unnecessarily crowding his pattern shops.

G. Wüthrich.

London, *November 7th*, 1925.

Two-way Pendant Switch Flexibles.

In your issue of October 30th, page 717, are some remarks on the part of one of your correspondents on the use of one- and two-way flexibles, for pendant switch wiring.

He states that "there is no 2-way ratchet action ceiling switch on the market." He undoubtedly is in error, because we manufacture ceiling switches, including 2-way actions. We have pleasure in handing you a leaflet out of our accessories catalogue, illustrating and dealing with these ceiling switches. This is a line which has a large sale in countries abroad, but has only a relatively small sale in this country.

The General Accessories Co., Ltd.

London, *November 4th*, 1925.

The Cost of House Wiring.

The cutting of prices for house wiring, which has been the subject of correspondence in your columns, is one which all contractors feel at times. If the wireman is working for himself he naturally can afford to cut his "profits," as his labour alone will provide him with his week's wages.

It, however, is very noticeable that, in such cases, the wiring is done in very quick time—much quicker than when the wireman is working for a contractor.

It would be very interesting if your readers would let you know what the average hours per point for a wireman and mate work out at on an average installation of, say, from ten to fifteen lights, including the fixing of all switches, plain pendants, lamps, shades, main switch and distribution board, twin lead-covered wiring.

If you would then publish a summary of the replies it would be very helpful.

In our case the average is 4½ to 5 hours per point complete for a man and his mate.

Inquirer.

November 5th, 1925.

The Metering of Three-phase Power.

The article entitled "The Metering of Three-Phase Power" by Mr. George D. Malcolm which appeared in the issue of your valuable paper for October 30th, greatly interested me and will, no doubt, be of considerable interest to a large number of supply engineers in this country.

I have, for a great number of years, given this subject special consideration and, being in touch with most of the supply authorities in this country, I have had a unique opportunity of seeing the various forms of metering employed by them. Many undertakings keep a special staff for dealing with this important part of a supply undertaking, but I have often seen not only inadequate, but frequently inaccurate, systems of metering employed. Many, I regret to say, prove unfair to the consumer.

There is no doubt in my mind that the metering of electricity supply is a subject which should receive greater attention by the Government authorities or Electricity Commissioners.

Turning to the article appearing in your columns—I was disappointed that the author confined himself to so small a part of this subject. There are really many more important points to be considered in the metering of three-phase power, and I feel sure that further investigation on this subject would interest many of your readers.

May I suggest that the problem of the correct meter for a three-phase four-wire supply be a further development to this excellent article.

This is a subject on which a great difference of opinion seems to exist. I have, for a great many years, advocated the type of meter which employs three separate elements *and* rotors as being the only true meter for such a supply. The more usual method of splitting the three current windings between two elements (or where current transformers are used, they are connected in delta and the third phase is thus superimposed on the other two) is not one which will meet all the conditions which can occur on a three-phase, four-wire supply. Large errors may occur with this meter. I have in mind one case where as much as 15 per cent. was found and this against the supply authority.

There are many other important points on this subject of three-phase metering, but space forbids entering into them here. I hope to complete a manual on "Correct Metering" one day, but unfortunately lack of time has made progress slow.

May I, in conclusion, suggest a slogan for the meter engineer: "Always install a meter which will register accurately under *all* of the conditions of load which *can* occur on the system to be metered."

H. Hugh Jaques.

London, *November 4th*, 1925.

Broadcasting Power.

I wish to express complete agreement with the remarks of Mr. H. P. Amphlett on the above subject. The matter seems rather beneath the serious notice of the technical Press, although some weeks ago I offered a protest to one of the Sunday papers against a similar article by Prof. Low. Rather than attempt to forecast the problematic miracles of a thousand years hence it is our immediate business to apply ourselves to improve the lot of the present generation, and to make such contribution to progress as lies in our power. Fiction is a thing apart. No doubt Mr. Stephen Leacock keeps his entertaining stories in a separate compartment from his University lectures—an example to be commended.

A fantastic flight of fancy coming from a member of a scientific profession and containing such emphatic phrases (from memory) as "both Sir Oliver Lodge and myself are agreed" is apt to carry conviction and to create a wrong impression among the general non-technical public.

E. W. Ashby.

Wallasey, *November 2nd*, 1925.

Is the Contracting Business Degenerating?

I was looking forward to reading in your last issue a word of commendation to "Hard-working Ex-service Electrical Contractor," but the only contribution to the discussion under the above heading was one from Mr. Barlow, which certainly was not intended to be cheerful reading for the gentleman who helped to win the war. The latter distinctly stated that he could carry out work on new buildings at 10s. 6d. per point, using all-British materials and within a radius of 20 miles of London—tested and fully guaranteed. This statement is clear enough, but in the letters which it evoked it is suggested that he is using Continental and other rubbish and that he will come to grief. This is not very complimentary to the gentleman who so recently was fighting for our existence. However, I do not suppose such innuendoes will worry him much: he has probably learned by now that the people who make them would not help him if he were down. Even if he were using material other than British, why should one describe it as rubbish? It is not necessarily rubbish because it is cheap: one might as well suggest that English cables were rubbish when they were being sold cheaper than they are to-day. I buy electric lamps cheaper from abroad than from the lamp-makers here because I prefer to have the difference between the price of them and the English in my pocket rather than in that of the English makers, and I have not found them rubbish. It is for the buyer to find out his best market, and in the case of our friend he is satisfied with the English for his materials, so what has one to cavil at? Surely he can sell his labour at whatever he likes to accept for it? Do not the majority of your advertisements read "State salary required"? In buying he possibly has an advantage over the buyers of some firms who could more correctly be described as "Order Clerks," as they are told where to place their orders by their employers, and if the employers are satisfied the buyers need not worry. But when one reads your "Correspondence" column one wonders whether they are wise in tying the hands of their buyers. When employing labour they have to pay the Union rate whether the man knows Ohm's law or has read "Chitty on Contracts," so that their only means of cutting costs is in material. "Ex-service man" buys British, but who could blame him if he bought foreign? By doing so he might miss the smile of the £1,000 (or more) a year politician who is advocating Communistic principles as far as they serve his purpose, but when down and out and the politician has retired on a pension will it matter? As one of your correspondents suggested that such people as "Ex-service man" figured among the unfortunate folk who appear in your weekly columns under bankruptcies, &c., I looked through these columns since his letter appeared and only found one wireman, 12 electrical engineers, 15 merchants, five manufacturers, and three agents. I do not know what class of business the electrical engineers carried on, but if we suppose they were

nothing more than wiremen, they were not so numerous as the merchants and agents. "Ex-service man" may reach Carey Street, but not at his present rate of progress. I see no reason why he should not develop a big business, and I have no doubt that as a practical man he will manage it just as well as his present. I can tell him for his encouragement that I had my house wired about 13 years ago at 10s. per point and that I have not yet had the slightest trouble over the work: the gentleman who did the work has now a very fine showroom in the principal street of the district and is doing a good business. I hope "Ex-service man" will succeed as well, but in the meantime he is bringing the light into many humble homes, making business for the supply companies and manufacturers, and laying the foundation of further business. He could no doubt do better abroad, but that is his business. In the meantime I think England retains a cheerful and an industrious worker.

Fairplay.

November 2nd, 1925.

Do Small Manufacturers Lack Ambition?

Talking to a business man the other day upon this subject, he said: "Small firms are such because they have little or no ambition or enterprise," but I am sure he was wrong.

In the majority of cases the reason is, I think, because they are manufacturers only, and do not fully appreciate the importance of salesmanship. It is one thing to make goods and another to sell them, and a manufacturer is rarely a salesman. An American writer has it—

> "He who whispers down a well
> About the goods he has to sell,
> Will never reap the pounds and dollars
> Like he who climbs a tree and 'hollers.'"

Every factory needs three sorts of ability to make it successful—the financier, the manufacturer, and the salesman—three entirely different aptitudes. The financier has to be the "Shylock"—to think of profit—to watch the money coming in and that going out. He need know little or nothing about the manufacturing or the sales sides of the business. The manufacturer has to look after the actual production of the goods from the raw material to the finished article. He must know how to control labour; he must be a good buyer, but need not concern himself about the finance or the sales. The salesman must know the buyers—must know how to make people desire the goods—must be able to create demand. He need not greatly concern himself about either of the other two men.

The war taught the manufacturers of this country what could be done by specialisation in the making of a small variety of articles on mass production lines. No manufacturer had to concern himself about sales, for the Government, either directly or indirectly, bought all his goods. He could devote all his time and energies to devising new methods of production and to getting the greatest output.

At the present time the larger and more wealthy firms have established selling organisations with ramifications extending all over the world, and the smaller firms find themselves severely handicapped in competition with them, for just as the specialisation in the production of goods helps to cut manufacturing costs by reducing "overheads," so specialisation in the selling of the goods helps to cut selling costs, and the lower these costs are, the greater amount of publicity which can be put out. This additional publicity brings more sales, increases production still more, and thus helps to cut manufacturing costs still lower, and so on.

I think, therefore, that it is owing to the smaller firms being unable to afford such sales organisation that they are unable to reap the advantages which publicity brings, and hence must remain small or succumb to their more wealthy competitors.

Bromley. **A. M. W.**

[It is not clear what our correspondent means by "small firms." There are many of the smaller electrical companies whose selling organisations operate with greater efficiency than do those of some "larger and more wealthy" concerns. They show no lack of ambition and enterprise. At various times there have been grouped schemes for co-operative salesmanship enabling associated firms to compete more successfully in export markets. But much depends upon what the "small firm" has to sell—whether it is a speciality or is only a standard product in which it comes up against the competition of large-scale production.—EDS. ELEC. REV.]

Firemen's Risks.

In reference to your excellent notice of the recent inquest held before me under the provisions of the local City of London Fire Inquests Act, 1888, concerning (*a*) Sub Fire Officer Sinden, deceased, and (*b*) the fire at Byron House, Finsbury Street, City, E.C., at the fire inquest and in my statutory report, I particularly called attention to my fire card and poster published by the City Corporation for distribution throughout the City, namely (see enclosed):—

In all cases of fire in buildings, cut off the gas at the meter without a moment's loss of time.

It is also important when a fire occurs to cut off the electric current at the meter.

The Fire Brigade, apparently, prefer to take the risk of electrocution rather than be deprived of the use of the electric lighting at a fire. In enclosed cutting, if correct, the Fire Brigade say:—"The risk of electrocution is inseparable from the duties of a fireman."

In my summing-up and statutory report, I put the compulsory adoption of the new regulations of the Institution of Electrical Engineers, *re* electrical wiring, second to the radical cutting-off at once of the electric current.

F. J. Waldo.

Coroner's Office,
London, *November 2nd*, 1925.

P.S.—So far as I have seen, the posters only appear in the streets and a few public buildings, *e.g.*, police stations. I think they ought to be displayed in all factories, workshops, and warehouses in preference to the fire cards.—F. J. W.

[The quotation is from a report of the Fire Brigade Committee of the L.C.C., mentioned in the *Daily Graphic* of November 2nd.

Dr. Waldo's admirable poster giving instructions for use in the event of fire, and hints for the prevention of fire, to which we have previously drawn attention, is issued by the authority of the Court of Common Council, Guildhall, E.C., and ought to be exhibited in every factory, workshop, and warehouse.—EDS. ELEC. REV.]

Legal.

Brown, Douglas & Co. v. Enfield Ediswan Cable Works, Ltd.

The hearing of this case (see our last issue, p. 759) was continued by Mr. Justice Finlay, on November 2nd.

Mr. JOHN CAMERON RENNIE, electrical engineer, said that 600-megohm cable in a contract of the kind involved was intended to be used for pressures up to 250 V. He had examined some coils of the cable and saw no sign of their having been heated by being stored too close to boilers.

Cross-examined by Mr. Barrington Ward, witness said the Cable Makers' Association rules provided that the tests should be carried out at the makers' works. He would expect the cable to be tested at the works, but would not be surprised if tests were made elsewhere because he knew it was done.

In further answers to Mr. Ward, witness said he should not expect two journeys through the tropics to have a great effect on the condition of the cable. If subjected to excessive heat the cable would be adversely affected. In reply to Mr. Wingate Saul, witness said the insulation test was an important factor. Four failures out of fifteen tests of the "Non Association" cable was a high proportion of failures.

Mr. WILLIAM H. BALLANTYNE, B.Sc., recalled, said that if the cable had been put into a place of high temperature near the boilers on board ship as suggested, he would have seen signs on the wrapping.

Mr. ALFRED T. MORRIS, superintendent of the Faraday House test laboratory, gave evidence of the tests applied to the cable. Of the "Non Association" cable which he tested, four coils were below the figure of 2,000 megohms per mile, which was the standard necessary. He thought the defects were generally due to poor rubber. Of twelve coils of "Association" cable examined, six were below the standard of 2,000 megohms per mile.

Mr. BARRINGTON WARD, for the defence, said that he submitted that as to the "Non Association" cable the plaintiffs had no claim in law. Under the Sale of Goods Act, the plaintiffs having resold and passed the cable on, had no right to reject.

Mr. WINGATE SAUL said he did not dispute that.

Mr. WARD said that would affect the "Non Association" cable, and make a considerable difference in the damage, supposing his Lordship was against him in other respects. In his submission, as to the "Non Association" cable, the position was that when the users in New Zealand, who had been in the habit of using only "Association" cable, saw that it was not "Association," they would not use it, and hence the complaints. They, therefore, made a perfunctory test, and returned it. Defendants had made thousands of miles of cable for the Admiralty, War Office, and public bodies, and it was almost inconceivable that they could have turned out such a quantity of cable which would fail. It was part of a lot of 290 miles made, and no complaint had been received from anyone else. His case was that the cable, both "Association" and "Non Association," was correct when supplied.

Mr. LL. B. ATKINSON, director of the Cable Makers' Association, said that under the Association's rules all tests had to be made before the cable left the works. They had a mutual understanding not to guarantee cable after it left the works. Bad handling would greatly depreciate cable.

Mr. A. V. DOWNTON, technical director of the defendants' Enfield works, said that the present name of the defendant company was Enfield Cable Works, Ltd. The company sent a large amount of cable to New Zealand and other countries. It had a separate testing staff, and no cable was allowed to leave the works without being tested. They had no complaints from any other customer of any "Association" cable supplied during the last three months of 1920 and the first three months of 1921. "Association" cable was known in the trade and outside the trade to have a higher percentage of rubber than "Non-Association" cable. Witness further said that when some of the cases were opened this year, he found that the coils had been improperly packed for the return journey from New Zealand.

Mr. FRANK RICHARDS, chief electrician at defendants' Enfield works, said that no cable was allowed to go from the factory into stock without a test. Tests of the cable in dispute showed that the insulation resistance was over 2,000 megohms.

Mr. G. DANIA, mechanical and electrical engineer, said that he had close upon forty years' experience of testing cable. He saw the cable said to have been returned from New Zealand. He picked up coils and found the rubber was good on some of them, while on other coils the rubber was harsh and short. Knowing that a manufacturer could not manufacture two classes of rubber at one and the same time, he was convinced that something had gone wrong and that there had been overheating somewhere, and the most likely place to have heating would be close up against the engine room or the boilers on board ship. The cable was not well packed. Rough handling and bad packing would destroy cable of the class in question, and would break down the insulation. He took three coils of the "Non Association" and of the "Association" cable and tested them. The insulation of the "Non Association" came out well, all three coils being over 2,000 megohms, and of the "Association" coils two were under and one over. In the coils under the standard the rubber was harsh and short. The cause would not be bad manufacture.

The hearing was adjourned and resumed on November 4th, when Mr. Wingate Saul applied to the Judge for leave to amend the pleadings in the plaintiffs' case. He admitted now the contention that there was no right to reject the whole consignment in New Zealand, and desired to base the claim instead on the ground of damages. He said the plaintiffs would be entitled to damages for the difference in the price of the cable as good and merchantable and its price in a defective state. In the latter condition it could be sold as bell wire.

Mr. BARRINGTON WARD objected on the ground that it would be an injustice to the defendants in that the amendment was only asked for when the case was over, and they had had no opportunity to give evidence as to the value of bell wire, &c., in New Zealand.

His LORDSHIP said that in view of the opinion he had formed, he thought it would be better to allow the amendment.

After counsel's final arguments, his Lordship gave judgment. He said that the first contract, made in July, 1920, was for the sale of fifty miles of "non-Association" 600-megohm cable, and the second contract, made in December and January, 1920-21, was for ten miles of 600-megohm "Association" cable. It was common ground between the parties that the defendants, who were people of the highest reputation in the trade and had a very extensive business in the sale and manufacture of cable, knew that both consignments were for shipment to New Zealand, and further, that they would be wanted for wiring houses or buildings for the purpose of electric lighting. Both the fifty and ten miles of cable were duly shipped and duly got to New Zealand, and there plaintiffs' correspondent rejected them, and the question with regard to the ten miles was whether they were justified in rejecting that cable. The question with regard to the fifty miles of cable was not whether they were justified in rejecting, because Mr. Wingate Saul conceded that, when it appeared that some fourteen miles out of the fifty had been sold, he could not maintain the claim that he was entitled to reject. The question with regard to the fifty miles was, it being conceded there was no right to reject, whether there was any damage, and what it should be, by reason of the fact that the cable did not come up to the standard required by the contract. When that cable got to New Zealand, one coil was tested, and that coil failed to answer the insulation test. It was common ground between the parties that the 600-megohm grade meant that there was a minimum insulation resistance of 2,000 megohms per mile. There was no doubt that the defendants undertook to supply cable which would stand that test. The question was whether it was made out, with regard to the fifty miles of cable, that, when it reached New Zealand, it failed to meet the test. He was unable to attach weight to the test which took place there. It was a test of only one coil, and was thus not a sufficient test. One coil having been tested, the rest of the fifty miles was kept in store for a rather long period. But, before the test, about fourteen miles had been sold, and there had been no complaint. He was satisfied no sufficient test was made as to the fifty miles in New Zealand. That being so, the rejection and the return were not justified. But, no doubt, the plaintiffs were entitled to say that, granted the tests there were insufficient, none the less they were entitled to go into the matter to show that, if they had tested thoroughly, the tests would have revealed the fact that the insulation resistance did not come up to the contract. Accepting that, one must look at what happened when the balance of the fifty miles got to England. The plaintiffs had got to satisfy him that by reason of what then took place that the "non-Association" cable was, when it got to New Zealand, unable to stand the test. The way they proposed to do that was to put in a report by Faraday House of a test made of a number of coils, fifteen in all. He noticed that two coils were of a very low insulation resistance indeed. With regard to one of those two coils, it was practically conceded that that must be due to some defect, a pin-hole, and that in coils such defects might occasionally arise. With regard to the other coil, on the evidence he arrived at the same conclusion that there was some mechanical defect of some sort. There were only two other coils which were below 2,000 megohms, and they were slightly below, so slightly that the view of Faraday House was at the time that the coils were satisfactory. In addition to that, he had got the fact that in 1922 a further test was made by Mr. Dania, who took three coils of the "non-Association" cable, and all the three coils answered the test. On those materials he (his Lordship) could not possibly say that it was made out to his satisfaction that when the plaintiffs, or their correspondent, rejected the cable, the cable was in such a state that rejection was justified. He could not hold that that "non-Association" cable—more especially having regard to the fact that, in addition to the two voyages, it had lain for a long period, fourteen months, in a warehouse—was in such a state when it reached New Zealand as to fail to answer to the test. He must, therefore, hold that, with regard to the "non-Association" cable, the plaintiffs' case failed. He had now to deal with a different and more difficult part of the case, that which related to the "Association" cable. It was shipped in March, 1921, and it returned in March, 1922. It was, therefore, away for about a year, and, of course, the two voyages had to be taken out of that. With regard to the tests in New Zealand, which were much more satisfactory than the tests of the "non-Association" cable because two coils were tested, he thought it might well have been wise if, when the two coils failed to answer the test, some more had been tested. When the cable returned to this country it was subjected to a test at Faraday House, and that test substantially showed that half of the coils failed to answer the test. There was further the circumstance that Mr. Dania subjected three coils to a test in April, 1922, about a month after the cable had got back, and one coil showed an insulation resistance of 3,860 megohms, and the two other coils fell much below 2,000 megohms. He saw no reason why he should not accept the Faraday House test as being substantially accurate. He saw no more reason why he should refuse to accept the rather striking figures which Mr. Dania gave him as to the three coils which he tested. He had come to the conclusion that the ten miles of cable failed to answer the contract terms, and plaintiffs must have judgment in respect of it. There would be judgment for the plaintiffs for £164, but, having regard to the fact that plaintiffs had failed with regard to the fifty miles of cable, in the exercise of his discretion judgment would be without costs.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

THE opening of this appeal of the plaintiffs against a judgment of Mr. Justice Lawrence, holding that the defendants had not infringed a patent owned by the plaintiffs relating to rotary converters, was reported in our last issue (p. 759). On November 4th, Sir DUNCAN KERLY, continuing his address on behalf of the appellants, dealing with the alleged anticipation of Tesla's publication, said that the synchronous motor which Tesla was working on would not start itself. He arranged his motor with a series of projections, each of which was wound with wire. He could not get the operation of magnetising and de-magnetising, and so get the thing off. What was a large synchronous motor in Tesla's day was probably a 1-h.p. one. Tesla had only done a part of what Rosenberg had done. A limit must be put on an alleged paper anticipation. They were not to assume that a paper anticipation of an early date had taught the world anything which it did not describe, and fairly describe. He contended that when the problem to be solved was appreciated, one did not find in Tesla the arrangement as described by Rosenberg.

The hearing was adjourned, and upon the resumption on November 5th, Mr. Whitehead, K.C., followed Sir Duncan Kerly, K.C., on behalf of the appellants, and at the close of their case, Sir Arthur Colefax, K.C., supported the judgment of Mr. Justice Lawrence on the issue as to the validity of Rosenberg's patent on behalf of the respondents. He said that the question of validity was in reality a matter of construction and what appeared in Tesla's prior publication. Mr. Justice Lawrence had only dealt with Claim I of Rosenberg's specification, and therefore he thought there was only one claim to be considered by that Court. The respondents denied that the alleged invention of Rosenberg was one of outstanding merit as had been suggested.

Brown Bros., Ltd., v. Bell & Pugh.

IN the Chancery Division on November 4th, Mr. Justice Romer heard an application by Brown Brothers, Ltd., Great Eastern Street, E.C., for an injunction restraining Thomas William Bell and Alfred Pugh, of Liverpool, from carrying on business as makers or dealers in radio apparatus under the name "Brown Brothers."

Mr. FARWELL, K.C., said that the plaintiffs started wireless business in 1922 and their name had acquired a reputation. Last November the defendants began to trade at Liverpool as "Brown Brothers," and had a stall at a Liverpool radio exhibition in that name. Confusion had arisen owing to the similarity of the names, and the plaintiffs were likely to suffer harm from it.

For the defendants, Mr. STONE said their trade was solely in the Liverpool district and they submitted that the plaintiffs' reputation applied only to their motor and cycle business. The defendants took the name because Mr. Pugh was for some years a traveller for a firm of Brown & Co. and he was known in the Liverpool district as Mr. Brown. There was no evidence that they had interfered with the plaintiffs' business.

His LORDSHIP held that the defendants, in taking the name had not acted honestly, but with a desire to obtain some of the plaintiffs' business. He found that in the radio trade the words "Brown Bros." meant the plaintiffs' goods and the use

them by others would cause confusion. He granted the junction.

Mr. FARWELL later said it had been agreed to treat the otion as the trial of the action, there would be a perpetual junction in the terms of the notice of motion, with costs, id the plaintiffs would waive all questions of damage.

Marconi's Wireless Telegraph Co., Ltd., v. International Wireless Manufacturers, Ltd.

A PETITION by the first-named company for an order for the ompulsory winding-up of International Wireless Manufacrers, Ltd., came before Mr. Justice Romer in the Companies' Winding-up Court on November 3rd, the petitioners being reditors for £230 for royalties on radio instruments.

Counsel for petitioners said the company was formed with capital of £100, of which £80 was paid up, but it had issued debentures for £4,000, and the debenture holders had appointed a receiver and manager.

Counsel for the respondent company asked for an adjournment to allow evidence to be filed by creditors opposing the petition. The business, he said, was growing rapidly and if the company was wound up now there would not be enough to satisfy the debenture holders. They had had to take on extra hands to cope with orders.

His Lordship adjourned the petition for a month.

Mullings v. British Thomson-Houston Co., Ltd.

MR. THOMAS MULLINGS, of Merton, on November 3rd was awarded £1,150 damages for personal injuries against the British Thomson-Houston Company, Ltd., by Mr. Justice Horridge and a special jury.

Mr. Mullings, an advertisement manager, was walking along Seacoal Lane, Farringdon Street, E.C., on November 14th, 1924, while the servants of the defendant company were moving some plant into the sub-station of the Charing Cross City and West End Electricity Supply Company, and owing, as Mr. Mullings alleged, to the negligence of the defendants' servants, a large piece of timber was allowed to fall on his head, causing concussion, laceration of the brain, and shock.

London Electric Supply Corporation Summoned.

AT the Greenwich Police Court on November 9th, the London Electric Supply Corporation, Ltd., was summoned for neglecting to protect as far as possible all parts of an e.h.p. transformer at its Deptford station to guard against danger to employés. It was stated that a man in the company's employment (Mr. C. H. Harwood) was killed recently by coming into contact with a "live" part of the transformer, receiving a shock at 10,000 V. After hearing evidence the magistrates adjourned the summons.

Theft of Radio Apparatus.

AT Nottingham on November 7th, G. E. Morris, a clerk in the employment of the General Electric Co., Ltd., was sentenced to six months' imprisonment in the second division for stealing radio apparatus from his employers. F. S. Freeman, trading as the Super Radio Co., and C. Baker, a traveller, received similar sentences for receiving the goods.

Millet v. Kaplan.

IN the Mayor's and City of London Court, before Judge Shewell Cooper on November 6th. Mr. J. Millet, 22, Farringdon Avenue, wireless material merchant, sued Mr. H. Kaplan, trading as H. Arnold, 35, Euston Arcade, St. Pancras, for £37 8s. 6d. for goods supplied. The delivery of the goods was admitted, but the defendant contended that the goods were supplied to a company called the Standard Accessories Co., Ltd., of which he was the managing director, and not to him personally. Evidence was given by Mr. Millet and a traveller in his employment that they had had an interview with the defendant at the offices of the Standard Accessories Co., Ltd., in the course of which Mr. Millet asked Mr. Kaplan to be responsible for the goods which had been ordered. Although Mr. Kaplan refused to give a written guarantee, he said that he would guarantee payment. Mr. KAPLAN said that the goods were ordered on behalf of the Standard Accessories Co., Ltd., and he had refused to give a personal guarantee. He admitted that the Standard Accessories Co., Ltd., shortly afterwards went into voluntary liquidation.—Judge SHEWELL COOPER said that the defence was of the most flimsy description. He gave judgment for the plaintiff for the amount claimed, with costs.

Hydleman v. Goding.

IN the Mayor's and City of London Court on November 5th, before Mr. Registrar Dell, Mr. L. J. Hydleman, trading as L. J. Hydleman & Co., Queen Victoria Street, E.C., claimed £3 11s. 9d., the balance of the amount due for the supply of H.P. radio batteries to the defendant, Mr. R. R. Goding, trading as the National Wireless & Electrical Co., Gray's Inn Road, W.C. For the plaintiff it was stated that the bulk of the money due had been paid, and upon making the last payment the defendant apologised for the delay which, he said, was due to slackness of trade. Eventually, however, he refused to pay the balance now sued for and returned a number of batteries as defective. The plaintiffs refused to accept them, alleging that they had been maltreated. The defendant maintained that the batteries were defective and had not been improperly treated by him. Delay had occurred in returning them because he had waited until a number were proved defective.

The REGISTRAR said that such delay in returning goods alleged to be defective was always viewed with suspicion. The fact that defendant had paid part of the cost of the batteries without complaint led him to conclude that the defence failed. Judgment was given for the plaintiff for the amount claimed, with costs, and an order for payment within 14 days was made.

German-American "Bosch" Litigation.

MR. JUSTICE ASTBURY, in the Chancery Division, on November 4th, gave judgment in this case, which was reported in our issues of October 30th (p. 719) and November 6th (p. 758). His Lordship said that the Robert Bosch Aktiengesellschaft, of Stuttgart, was formed by Robert Bosch, who was the originator of the well-known Bosch magneto and other electrical apparatus. A name mark, unless represented in some special manner, could only be registered under the provisions of subsection 5, section 9, of the Trade Marks Act, 1905, and it was one of the most difficult classes of marks to be placed on the register. The real question which he had to decide was whether the word "Bosch" in the circumstances proved in evidence was distinctive of the products of the Stuttgart firm within the meaning of the statute. In order to succeed the applicants must prove that substantially all people in this country dealing in this class of goods at the date of the applications recognised Bosch as meaning and only meaning the goods of the Stuttgart firm. It was not disputed that up to the outbreak of the war "Bosch," applied to electrical apparatus, meant and was distinctive of the goods of the Stuttgart firm; but it was contended that from the date of the commencement of the war circumstances had entirely changed in this country and that Robert Bosch himself had recognised that change. He thought it was accurate to say that from 1914 to 1922 the date of the applications in this case, there were as many, if not a great deal more, American Bosch units in this country than there were Stuttgart units. In these circumstances it seemed to him hopeless to suppose that the people who handled the enormous bulk of the American Bosch property could have all or mostly supposed that it was property coming from the German firm marked as it was with American indications. Nor did he believe, having regard to the evidence, that anything like the whole of the people who dealt with these matters believed that they were made by the American branch of the Stuttgart firm. Even if they did they would still be the products of an independent Corporation in America in which the Stuttgart firm might, or might not, have been interested. From 1914 to the present date there had been as many Bosch units in this country coming from America as from Stuttgart. It was absolutely impossible to say that the surname Bosch meant Robert Bosch's goods, and his only. If this registration were allowed his Lordship could see no end to the litigation that might be caused to innocent people who had purchased and were using those American goods. His Lordship allowed the appeal and directed the applicants to pay the costs.

Reviews.

Oscillographs. By J. T. IRWIN, M.I.E.E. Pp. xii+164; figs. 81. London: Sir Isaac Pitman & Sons. Price 7s. 6d. net.

Till recently, the comparative paucity of English books dealing with electrical instruments was rather remarkable. During the last few years, however, a number of excellent works on this subject have been published, and the literature is now fairly complete. The work before us will undoubtedly fill one of the few gaps still remaining, and on general grounds a treatise on oscillographs is welcome. The fact that the author of the book is so distinguished an authority on this subject gives additional interest to its appearance, and we are not surprised that, in a relatively small space, Mr. Irwin has presented a thorough and readable account of the various types of oscillograph now available. The work is generally theoretical in treatment, and a sound knowledge of elementary mathematics is necessary for intelligent reading.

The opening chapter deals with the elementary theory of a vibrating wire carrying a current in a magnetic field; and the student will do well to master this thoroughly before proceeding to the main contents of the work. The various types of oscillograph are each considered fully, the theory being worked out in each case. The consideration of the cathode ray instrument is deferred till the end of the book, when the principles are briefly considered and the principal types described. The lengthy chapter on errors of indication and methods of damping is a most important one, and considers fully the numerical interpretation of oscillograph records. The author, using the vector method of representing the various forces acting on the vibrating wire, shows clearly the effect f

damping on the indications of amplitude and phase of the harmonics of the wave under consideration.

Working out a particular case, it is shown that at a frequency of 0.2 of that of the resonant frequency of the wire, the amplitude is 4 per cent. too high and the phase error is 0.57 deg. without damping, whilst with critical damping the amplitude error is 4 per cent. low, and the phase error is 22.5 deg. The author also points out that with oil damping the resonant frequency is reduced to a greater extent than that caused by damping alone owing to the increased effective mass of the wire due to movement of the oil. The theory of the author's resonant shunt is then dealt with and it is shown that, with this method, not only is the amount of damping adjustable and definite, but that for any given value, the magnification and phase displacement are such as would be given by a massless viscous damping fluid. This interesting chapter embodies a large amount of the author's original work on the subject.

It is somewhat ungracious to offer a word of criticism on so able a book as the one under review. We wish, however, that Mr. Irwin had given a little space to practical directions in the use of the oscillograph. This instrument is no longer confined to the research laboratory, but forms part of the testing equipment of even moderate sized electricity undertakings. A little space devoted to details of manipulation would, we feel sure, have been very acceptable to occasional users of the instrument. Otherwise, we can cordially recommend the book. It is well written and produced, the illustrations are of a high order, and a bibliography is appended, giving references to the most important papers, for the use of those wishing to pursue the subject.

Phases of Modern Science. Pp. viii + 232. London: A. & F. Denny, Ltd. Price 3s. 6d.

This is the second edition of a volume published in connection with the excellent science exhibit, arranged by a Committee of the Royal Society in the Pavilion of H.M. Government at the British Empire Exhibition; a large number of distinguished authors have contributed to its contents in the form of short articles, which have been revised; some of those which appeared in the former edition have been omitted, and others relating to the exhibits in their altered arrangement have been added. These articles occupy 158 pages, the rest of the book being a guide to the exhibits, many of which are demonstrated in operation.

We cannot speak too highly either of the exhibits or of this volume. The authors of the 23 articles are pre-eminent in their respective subjects, and have succeeded in compressing into small space a wonderful amount of up-to-date information, in a form suitable for the digestion not only of the scientific reader, but also of the inquiring layman. An interesting feature is the frontispiece—a reproduction of a large wall diagram forming one of the exhibits, which shows the whole range of electromagnetic waves, covering 62 octaves, from a wave-length of 0.01 Angstrom unit to one of 852,000,000 cm.—all of which waves travel with a uniform velocity of 30,000,000,000 cm. per second. The general use of radio telephony has gone far to familiarise the public with the idea of "waves," and to awaken an interest in science which will be further stimulated by the Science Exhibit and such works as the one under review.

Trade-mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 4th :—

Noris-Chromo. No. 456,466; Noris-Excello, No. 456,447; and Noris, No. 456,448. Class 4. Electric and galvanic carbons; and Noris-Tubus, No. 462,367. All goods in Class 4.—The firm trading as C. Conradty, 9, Spittlertorgrab, Nuremberg, Germany. (British representative: S. Sokal, 1, Great James Street, Bedford Row, W.C.1.)

Silex. No. 459,348. Class 6. Electric drills, hammers, grinders, and parts thereof.—B. E. N. Patents, Ltd., 100, Victoria Street, S.W.1.

Verniometer. No. 460,625 All goods in Class 8.—India Rubber, Gutta Percha & Telegraph Works Co., Ltd., 106, Cannon Street, E.C.4.

Dumetohm. No. 462,245. Class 8. Electrical resistances.—The Dubilier Condenser Co. (1925), Ltd., Victoria Road, North Acton, W.3.

Somnium. No. 462,650. Class 11. Electrical apparatus for use in light therapy.—John Bell & Croyden, Ltd., 50-52, Wigmore Street, W.1.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

9,417. "Starting apparatus for electric motors." R. W. Cousins. April 14th, 1924. (241,241.)

13,984. "Electric switches." R. W. Bill and H. Heath. June 10th, 1924. (241,247.)

14,270. "Apparatus for detecting and determining the position of stretches of underground of different electric conductivity." Piepmeyer & Co. Kommandit-Ges. and N. Gella. June 12th, 1924. (241,251.)

16,079. "High-temperature resistance furnaces." W. E. Prytherch. April 3rd, 1925. (241,256.)

16,442. "Low-frequency thermionic amplifiers." H. Green. July 9th, 1924. (241,257.)

16,629. "Electric means for indicating and/or recording the movement bodies." G. Campos and B. Usigli. July 10th, 1924. (241,259.)

16,899. "Impulse transmitters for use in telephone or like systen Automatic Telephone Manufacturing Co., Ltd. May 15th, 1924. (234,036.)

17,060. "Diaphragms for acoustic instruments." H. J. Round. July 1 1924. (Cognate application 3,208/25.) (241,277.)

17,107. "Jointing compositions for use in jointing and connecting elec cables and conductors." G. H. Scholes, F. J. Pearce, and G. H. Scholes Co., Ltd. July 17th, 1924. (241,280.)

17,154. "Electric switches." F. B. Dehn (E. G. Budd Manufactu Co., Ltd.). July 17th, 1924. (241,284.)

17,192. "Automatic or semi-automatic telephone systems." Autom Telephone Manufacturing Co., Ltd., J. E. Ostline, and W. O. Passm July 17th, 1924. (241,287.)

17,195. "Valve generators of electrical oscillations." C. S. Franklin E. Green. July 17th, 1924. (241,289.)

17,347. "Coating of electrical conductors." A. D. Shuter. July 1 1924. (241,294.)

17,355. "Arrangements for increasing the frequency of electric current M. L. Touly. August 18th, 1923. (220,608.)

17,365. "Connections for three-phase current transformers." J. W. Ki land (Allgemeine Elektricitats-Ges.). July 19th, 1924. (241,296.)

17,561. "Testing arrangements for selector with self-drive used in a matic or semi-automatic telephone systems." Siemens Bros. & Co., Ltd., W. G. Patterson. July 22nd, 1924. (241,301.)

17,610. "Manufacture of coated metal filaments for use as electr emitting cathodes." General Electric Co., Ltd., and C. J. Smithells. 23rd, 1924. (241,304.)

17,885. "Electric switches, relays, and the like." Igranic Electric Ltd., and J. H. Abbink-Spaink. July 26th, 1924. (241,310.)

18,024. "Contact plugs." Naamlooze Vennootschap Philips Gloeilamp fabriken. August 2nd, 1923. (Addition to 217,220.) (219,979.)

18,238. "Mechanical relays for electric switchgear and other purpose British Thomson-Houston Co., Ltd., and H. C. Heath. July 30th, 19 (241,316.)

18,555. "Electrical fuses or cut-outs." Midland Electric Manufacturi Co., Ltd., and W. L. Barber. August 5th, 1924. (241,322.)

18,779. "Telegraph signalling systems." Western Electric Co., I (Western Electric Co. Inc.). August 7th, 1924. (241,327.)

20,389. "Devices for transmitting or reproducing sound." S. G. Brow August 28th, 1924. (241,343.)

21,609. "Blow-out arrangements for electric switches." English Elect Co., Ltd., and F. D. H. Bremner. September 12th, 1924. (241,356.)

22,792. "Carrier-wave working over high-tension lines." Western Elect Co., Ltd. (Western Electric Co. Inc.). September 3rd, 1924. (Divided app cation on 222,104.) (Patent of addition not granted.) (241,368.)

22,893. "Tuning coils used in connection with wireless telegraphy a telephony." R. E. Barbour. September 29th, 1924. (241,371.)

23,355. "Vacuum discharge tubes or bulbs for illuminating or advertisi purposes, and methods of mounting same." E. V. Hayes-Gratze. Octob 3rd, 1924. (241,375.)

23,481. "Electrical transformers." S. A. Stigant, A. E. Holliman, Johnson & Phillips, Ltd. October 4th, 1924. (241,376.)

23,937. "Electric switches." British Thomson-Houston Co., Ltd., and Rigg-Story. October 9th, 1924. (241,378.)

24,070. "Supports for electric resistances." H. H. Berry. October 10 1924. (241,379.)

24,623. "Electric inductance coils." D. Macadie. October 16th, 192 (241,383.)

25,059. "Starting devices for electric motors." British Thomson-Houst Co., Ltd., and G. O. Watson. October 21st, 1924. (241,390.)

25,131. "Direct-current dynamo-electric machine groups." English Electr Co., Ltd., and J. E. Calverley. October 22nd, 1924. (241,391.)

26,664. "Thermionic oscillation generators." Telefunken Ges für Drah lose Telegraphie. December 19th, 1923. (226,505.)

26,812. "Electric ignition indicators." A. V. La Due. November 10 1924. (241,397.)

27,537. "Means employed for repeating the condition of electric lamps E. W. Timmis. November 18th, 1924. (241,406.)

28,803. "Methods and apparatus for sounding and for locating submari obstacles by means of ultra-audible waves." P. Langevin and C. Florisson. December 27th, 1923. (226,795.)

30,380. "Electric signalling system." M. J. Huizinga. December 17t 1924. (241,417.)

1925.

2,593. "Construction for mounting pole-pieces on the rotors of electric machines." Maschinenfabrik Oerlikon. February 15th, 1924. (229,281.)

4,269. "Grid electrode for electron-discharge tubes." E. Schrack. Fe ruary 16th, 1925. (241,439.)

4,402. "Magnetic chucks and the like." Magnet-Werk Ges. Eisenac Spezialfabrik für Elektro-Magnet-Apparate. September 27th, 1924. (240,405

5,605. "Collapsible carrier for electric accumulators and the like." T. Loveland. March 2nd, 1925. (241,443.)

7,812. "Electric-iron plugs." B. G. C. Stephens. March 23rd, 192 (241,454.)

7,875. "Electric motor controllers." Singer Manufacturing Co. Novembe 19th, 1924. (241,456.)

8,706. "Safety devices for electrical circuits." Calor Elektrizitats-Ges. an O. Dreyer. April 1st, 1925. (241,458.)

9,833. "Furnace electrodes." C. W. Becker. April 15th, 1925. (241,461

9,983. "Method of and means for switching out portions of circuits wit wattless current commutators." Siemens-Schuckertwerke Ges. April 17t 1924. (232,619.)

11,583. "Electric heaters for boiling water and generating steam." Shrubsole. May 4th, 1925. (241,473.)

11,800. "Switches for mine railways." G. Kunstler. May 6th, 192 (241,476.)

11,819. "Electric steam generators." British Thomson-Houston Co., Ltd May 16th, 1924. (234,087.)

13,433. "Automatic reclosing circuit-breaker systems." British Thomson Houston Co., Ltd. May 24th, 1924. (234,510.)

13,434. "Electric protective arrangements." British Thomson-Houston Co. Ltd. (General Electric Co.). May 22nd, 1925. (241,484.)

15,089. "Manufacture of krarup conductors." E. Wollin. June 13th 1924. (235,570.)

17,983. "Sound amplifying and reproducing device for talking machine and other sound-reproducing instruments." A. Midence. July 18th, 1924 (237,255.)

18,509. "Impulse transmitters for use in telephone or like systems." Auto matic Telephone Manufacturing Co., Ltd. May 15th, 1924. (Divided appli cation on 234,036.) (237,290.)

21,495. "Electric incandescent devices." British Thomson-Houston Co. Ltd. August 30th, 1924. (239,221.)

The "Kennelly-Heaviside" Layer.—Writing to *Nature* of October 24th, Dr. Alexander Russell points out that "the hypothesis of an electrically conducting stratum in the upper air was clearly enunciated in an article by Prof. A. E. Kennelly, of Harvard University, published in the *Electrical World and Engineer* of New York on March 15th, 1902. The official date of Heaviside's disclosure of his hypothesis is December 19th, 1902. About the same date H. Poincaré, A. Blondel, and C. E. Guillaume made similar hypotheses. If names are to be attached to this hypothetical layer it should be called, in equity, the 'Kennelly-Heaviside' layer, a name which is beginning to be used in America."

The

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Rural Electricity Supply.

ALTHOUGH Parliament has resumed its sittings we fear that the long-promised statement of the Cabinet with regard to its electrical policy will not be made for some weeks to come. The report of Lord Weir's Committee was presented to the Minister of Transport on May 20th—exactly six months ago—and yet, apart from more or less intelligent forecasts on the part of an enterprising Press, followed by official denials from persons in authority, the subject has remained shrouded in mystery. Does the Government realise that the result has been to put a brake upon the wheels of progress? Uncertainty as to the future is fatal to enterprise; it is better to know the worst than to be tormented with doubt, and whilst we have serious misgivings as to the intentions of the Cabinet, anything would be better than continued suspense. It is generally assumed that the policy under consideration involves a heavy capital outlay, and that the delay is largely due to the difficulty of finding the money, a theory which certainly has an air of probability, and is accepted as fact by the gas companies, which lose no opportunity of vigorously protesting against the subsidising of electricity supply by the State. We sympathise with them, feeling that the benefit of such a subsidy would be outweighed by its accompanying disadvantages. But is there not plenty of scope for progress, without awaiting further legislation?

One of the most important subjects to which the Electricity Commissioners might usefully turn their attention is that of rural electricity supply. That development in this direction is more and more engaging the activities of supply station engineers in provincial centres is evidenced by the articles and letters which have appeared in our pages, by recent references in the proceedings of the Institution of Electrical Engineers, and by communications which have reached us from other sources. In this issue Major T. Rich tells us of the progress that is being made in France, and illustrates some of the overhead construction employed for that purpose, which is conspicuously free from costly and dangerous safeguards such as that to which Mr.

W. Fennell recently drew attention. We notice that our agricultural contemporaries devote a considerable amount of space to the subject, and call for cheaper methods of distribution as the first step towards the electrification of the farm. In his presidential address Mr. R. A. Chattock referred to the high cost of distribution, and opening a discussion at the Informal Meeting a few weeks ago he gave some particulars of the interesting methods adopted by Mr. J. T. H. Legge in the Shropshire area, which brought the cost of construction down to about £400 a mile. (But that is still too much.)

In his inaugural address to the North-Eastern Centre of the I.E.E., the chairman, Mr. R. W. Gregory, referred to the legal restrictions which hamper the electrical industry compared with the conditions abroad, and said our high ideals of service and public safety combined to make electrical distribution too costly for rural districts; rural electrification deserved the study of all supply engineers, and the essential to the solution of the problem was the reduction of the capital cost even at the expense of the service given—a 90 per cent. service was much cheaper to give than a 99.9 per cent. service, and the former was all that was necessary. Cheap h.p. distribution lines were necessary to supply farms and villages, and the existing regulations should be relaxed; the ice loading figures in particular were needlessly severe, and from £50 to £80 a mile could be saved in this respect. "The dangers of overhead lines to human life with modern methods of construction and protection are infinitesimal."

Mr. J. W. Burr, of Swansea, similarly addressing the Western Centre, emphasised the necessity of reducing the cost of distribution in rural districts; and Mr. J. P. Thompson, in his address to the Dundee Sub-Centre, said electricity should be brought within reach of as many farms as possible—it could not be done too soon. In his own area a supply was already given to some 50 farms, and he knew how greatly its advantages were appreciated by the farmers. Again, Mr. A. G. Ellis, chairman of the North-Western Centre of the Institution, said the development of rural electricity supply for agriculture was a subject which was at last receiving the attention it deserved. It presented an enormous new field with a possible demand of from 500 to 1,000 million units per annum. He devoted much attention to this subject, and pointed out that cheap power supply was largely dependent on the cost of transmission lines and of tapping them. The regulations for the construction of overhead lines should be simplified, and he hoped the Electricity Commissioners would exercise their influence in that direction. It could surely be left to the common sense of electricity undertakings to see that their lines were both safe and sightly.

We may remark that the addresses from which we quote are exceptionally interesting and well worthy of reading *in extenso* when they appear in the *Journal* of the Institution. That so many of them should dwell upon the importance of rural electricity supply and of less restrictive regulations cannot be a mere coincidence—it indicates an awakening to the needs of the rural population, which can only be met by cheaper distribution.

An Electrical Fair.

If the hopes and expectations of the Government and of the organisers of the British Industries Fair are realised, that event in February next in London and Birmingham will reach a record level. We profoundly trust that such will be the case, for we believe that the time has arrived when a truly representative effort of this kind, as distinct from the ordinary exhibition, will give a splendid boost to the sale of British-made goods in our export markets. To our minds it is not right that Fair after Fair should be allowed to pass without the electrical trade participating on a reasonable scale and in a more or less specialised way suited to a Market Fair rather than an Exhibition as it is generally understood by electrical men. We are not for a moment suggesting that there shall be an exhibition, either in London or in Birmingham, of large electrical manufactures, but there are many classes of electrical goods and apparatus which could appropriately and profitably be displayed when so many foreign and Colonial buyers are visiting these shores to find out what British manufacturers and traders have for sale. Some electrical manufacturers have applied for space already, but we urge many others seriously to consider their attitude and try to give the Fair, at any rate at Birmingham, an electrical reputation which will bring more electrical buyers. As we have already stated, special funds have been allocated by the Government to give the Fair full advertisement in the countries from which visitors are desired, and the electrical industry should, somehow or other, secure its share of the advantage accruing from such publicity. It has been hoped again and again that the British Industries Fair would become an event of such popularity and dimensions as to do for our trade what Leipzig has for years past done for Germany. We think that such an end is not only desirable, but is attainable, and we put it to electrical traders that they should make a strong feature of their products at Birmingham next year. We are not concerned so much with whether they have individual stands as they have had on some former occasions, or whether they have grouped and co-operative collections of electrical apparatus, devices, domestic appliances, switches and switchgear, fittings, materials, cables and wires, and so on, which can be more or less easily brought together and treated as a trade demonstration. An effort for export trade hardly falls within the scope of either the E.D.A. or the E.C.A., but possibly the Cable Makers' Association, the Electrical Accessories' Manufacturers' Association, or certain groups within the B.E.A.M.A., might consider it worth while to provide the funds for a moderate exhibit. The thing is, in our estimation, well worth trying. If the results proved satisfactory it would be easy to decide whether the Fair would have a permanent Electrical Section. That we can leave for the present, but so far as 1926 is concerned the buyers are being invited in their thousands. It is for us all to see that they find electrical products on sale—chiefly, of course, at Birmingham.

On Reading the "Electrical Review."

In the preparation of the Electrical Review we follow as far as is humanly possible a definite order and plan so that the regular reader will know just where to find any particular section or feature. It is our aim to facilitate reference to information collected by our elaborate organisation so that contents, whether of an advertising character or of new service, may be promptly used. Having finished this part of our work with efficiency plus due humility, we leave it to the usual organisations to see that the Review reaches the hands of those whose interests it is designed to serve. But have we not the right to inquire whether the mass of material thus prepared and distributed is made use of with the same efficiency as marks its production?

Much has been said about how to write for the Technical Press, but there is need for advice to be given how to read it. We refrain from a general homily and concentrate upon one aspect of the question which has been impressed upon us again and again.

Electrical companies, through their directorate and management, recognise the need for ordering a certain number of copies of a journal for circulation through so many departments, each copy being marked to pass through the hands of certain specified members of the staff. There is no better system of ensuring that every member is kept up to date in his study of technical, trade, and financial development if this wheel of service be kept in continuous revolution, but if it has to touch too many men in passing, it is subject to stoppages, delays, the journal receives only hurried glances—not even a casual study perhaps if one is pressed for time, and sometimes it happens that the man whose name is at the bottom of the list receives the copy after other and later issues have begun the round. Two points at least emerge from a study of this matter. One is that

no circulating arrangement can expect to be efficient which requires a single copy to cover too many members of the staff; the expense is so slight in proportion to the value of the service that no concern zealous for the up-to-date mental equipment of its officers can afford to economise here. The other point is the need for staff men to have their own copies of their technical paper to read in the train, or at home. We urge a more general personal use of the ELECTRICAL REVIEW; the regular personal possession of his own copy by every man anxious to succeed in his electrical calling; and the more generous provision of office and departmental copies. The main thought that is in our minds in setting down these observations is the desire that the publication that we produce shall be utilised to its maximum efficiency for the benefit of the industry and those engaged therein.

Radio Wave-lengths.

THE practice of publishing nominal wave-lengths which are not utilised by radio-broadcasting stations and varying from time to time those actually in use, by accident or design, is a very questionable policy. When one station varies its wave-length, several others very soon do likewise in order to mitigate interference; such proceedings cause endless inconvenience and annoyance, and no sooner is the trouble settled in one locality than it is restarted from another source, as was forcibly demonstrated in the tests carried out last summer by the Geneva International Broadcasting Bureau in connection with the unenviable task it set itself of readjusting European wave-lengths. It would seem to be very desirable that it should be made obligatory that each and every station shall adhere strictly to its particular wave.

Moreover, a few metres must be left free on either side of every wave-length used, because a station swings when modulating. The swing increases as the wave is lengthened, and it therefore appears that much shorter waves than those in present use will have to be sanctioned for broadcasting purposes sooner or later so as to make it possible to accommodate the largest number of stations with maximum free zones between them.

Elsewhere in this issue Mr. W. Moon suggests that when selecting wave-lengths for new stations, reference should be made to a schedule in which the wave-lengths are arranged in geometrical proportion, so that they may be equally spaced as regards interference with each other. It would seem that the habit of measuring wave-lengths in metres will have to be abandoned. Because the amount of separation between short-wave stations need not be nearly so great as that necessary between long-wave stations, the requisite "free-space" to eliminate jamming cannot be simply expressed in metres of wave-length. If, however, the kilocycle definition were adopted generally, the estimation of interference reduction would be much simplified, for wave-lengths could then be allocated in exact multiples of 10 kilocycles.

The Coal Trade Inquiry.

ON Wednesday last week the Coal Commission heard the evidence of Sir John Snell, chairman of the Electricity Commissioners, on the relations between the development of electricity supply and the nation's consumption of coal. Anticipating, no doubt, the report of the Commission for the past year, the issue of which has been awaited for some weeks but is, we believe, now pending, Sir John said that at the end of 1924 the consumption of electricity per head of population in this country, including both public and private generating plant, was estimated at 220 kWh. It is interesting to observe that even to-day it is believed that the output of private plant is not much less than that of the public supply systems; had it been wholly provided by the latter, their load factor would have been much better and electricity would have been cheaper all round. Sir John expects that in 15 years the consumption will have reached 500 kWh per head per annum, the total being increased from 7,000 to 21,000 million kWh per annum. However, the amount of coal consumed by the electricity supply industry will increase only from 8 to 17 million tons, owing to the greater efficiency of the modern generating plant concentrated in large power stations, and the coal consumption of the whole country will diminish as the result of improved efficiency on the one hand, and the replacement of the open domestic fireplace by gas and electrical heating systems on the other, together with the electrification of the railways. The reduced demand for coal will be offset by the development of other British industries resulting from the cheapening of power.

Apart from the actual figures, all these points were dealt with in the Ministry of Reconstruction's report, the recommendations of which are being carried into effect by the Electricity Commissioners; that the progress made during the past seven years has been so slow is largely due to the limitations imposed upon the powers of the Commissioners by Parliament, the removal of which, as they hinted in last year's report, may be necessary if they are to fulfil their primary mission. Even now their hands are tied by the Government's delay in dealing with the report of Lord Weir's Committee.

With regard to the lack of success in bringing about comprehensive amalgamations, Sir John said there was a tendency to try to retain the local generating station in the face of a cheaper alternative, and whilst he would not express an opinion as to whether the Commissioners should be armed with further powers of control, he stated that his estimate of the consumption 15 years hence was not based on normal development without legislation, for he assumed that further powers would be given to them. Taking this admission in conjunction with the fourth report of the Commission, and his remark in reply to the chairman that the matter was under the consideration of the Government, we need not be at a loss regarding the opinion which he withheld.

Finsbury Technical College.

THE very successful dinner of the Old Students' Association of Finsbury Technical College that was held at the Engineers' Club on Saturday last, afforded no symptom of approaching dissolution, so far as the Association was concerned; unfortunately the College itself is not in so happy a position. Failing something in the nature of a miracle, we fear its doom is sealed; owing to the financial stringency resulting from the war, the City and Guilds of London Institute, the London County Council, and the Board of Education are unable to continue the contributions to the funds which they guaranteed for five years in 1921, and consequently the doors will close next summer.

Thus will come to an end a career of over 40 years, during which, by the genius and capacity of its teaching staff, including such men as Ayrton, Perry, Silvanus Thompson, Armstrong, Meldola, and their distinguished successors, the College has earned world-wide renown.

We are glad of this opportunity to draw attention to the efforts exerted by the Council of the O.S.A. to avert the impending fate of the College—especially by the special Committee appointed for the purpose, comprising Messrs. E. S. Conradi, A. J. Chapman, and H. D. Symons. The self-sacrificing industry and resourcefulness of these gentlemen has been beyond praise; they have left no stone unturned in their endeavours to obtain the financial support and personal influence necessary to attain their object, and if the result has been failure, it has not been for want of trying. The lovers of Finsbury owe them a debt of gratitude.

We believe the situation could still be saved if some public-spirited person would come to the rescue with substantial funds. Failing that, the only gleam of hope lay in a suggestion put forward by Prof. Hale, that the College might become a centre for the promotion of chemical engineering. The Department of Applied Chemistry has a distinguished record of achievement, and might possibly be extended to fill the need for such an institution as that mentioned above. We trust that this, at least, may be accomplished.

Recovering Fuel from Ash and Clinker.

Some Modern Methods of Separation.

By C. H. S. TUPHOLME.

To the majority of power-house engineers and fuel technologists the term "fuel economy" generally conveys the impression of burning fuel more efficiently, by the employment of correctly-designed furnaces, and attention to draught regulation, fuel firing and fuel-bed thickness. Vital though these considerations are, there is another aspect of fuel conservation which is only too often overlooked; that is the recovery of combustible matter from ash and clinker normally discharged as worthless. Considerable success in this direction has already been achieved in Britain, and there is now available a number of separators and fuel-recovery machines which have proved well worth their initial outlay. Not only tests, but every-day operation, have shown astonishing results in separating combustible material from real waste. There is no doubt that in all industrial plants the enormous quantity of valuable combustible matter present in the ashes and clinker discharged from the fires is a source of waste seldom fully realised. In the ashes removed from boiler furnaces the proportion of combustible sometimes approaches 20 per cent., equivalent to a loss of some 3 to 5 per cent. of the original fuel. Obviously here is a direction in which a definite contribution to the conservation of fuel can be made. For the recovery of fuel from ash, two systems have been developed in Europe: (1) Physical; (2) electrical. In Britain attention has been paid chiefly to the physical methods of recovery, while in other countries considerable progress has been made with other methods. These processes make use of the fact that when two solids, the one heavy and the other light, are mixed, their separation may be effected by immersion in water, when the heavier will sink more rapidly than the lighter; or, if one substance be lighter than water, then this will float on the surface, while the heavier will sink to the bottom. Coke is heavier than water, but, owing to its porosity, its apparent specific gravity is nearly identical with that of water, with the result that until it becomes saturated it sinks very slowly.

Regarding the specific gravities of the substances in the mixture, considerable variation is found, but the average of a number of tests shows the following:—Clinker 2.05, shale 2.50, and coke 1.25.

In each of these separating methods the breeze is screened out from the material before it is passed on to the separating apparatus proper.

The systems usually employed in Britain operate on the flotation principle. One of these is the froth-flotation method. The principle of operation here is as follows: When certain reagents are added in small quantities to water, and the whole is agitated violently, a large number of minute air bubbles is formed. On allowing the liquid to stand, the bubbles do not coalesce, but remain separated from each other and rise slowly to the surface, where a more or less permanent froth is formed. The reagents which may be used for this purpose are many and various, and include certain oils such as turpentine, soluble organic substances such as creosol, certain alcohols like amylalcohol, and sund soaps. The proportion of the reagent to the mater treated is small, amounting in most cases to a fracti of a pound of the reagent to a ton of water.

If solid particles are suspended in the water, th may or may not become attached to the bubbl If they do become attached, on allowing the liquid stand, the bubbles rise to the surface and form an e tremely stable froth, by which the solid particles a supported. Particles of coal can readily be floated this method, while, on the other hand, ash and eart substances will not be floated. It follows then that co may be separated from its incombustible constituen This froth-flotation method has already demonstrated i efficiency as a separator of combustibles and inco bustibles.

In the Waller washer, water is oscillated by co pressed air, and a screen plate upon which the m terial is deposited is also oscillated by eccentrics fro which the plate is suspended, so arranged that, wi the downward motion of the plate, the water is forc upwards through the bed of coke and ash. This acti separates the coke from the waste, the coke being carri forward by the stream of water, while the clinker ar ash remain on the screen plate and fall through t holes to the bottom of the tank.

The Blackett washer, as will be seen from fig. 1, co sists of a cylinder to the interior periphery of which

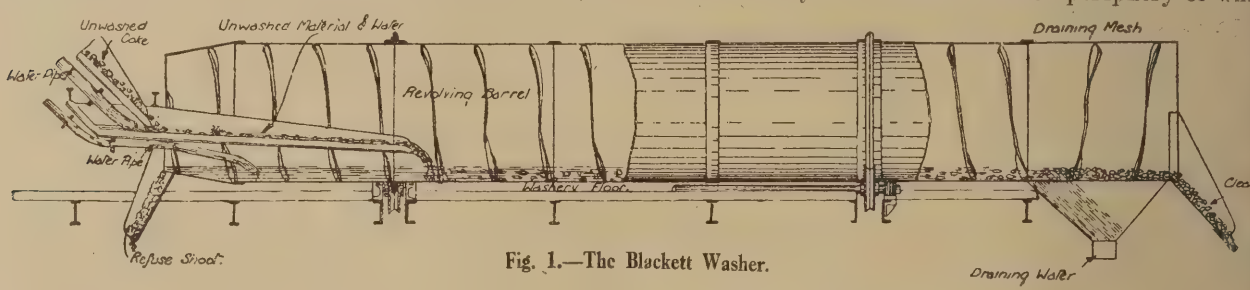


Fig. 1.—The Blackett Washer.

attached a coil made in the form of an Archimedea screw. The cylinder is at a slight incline, the inl being at the higher end, and rotates at a speed of abou nine r.p.m. The screw is arranged to operate in opp sition to the incline, so that a heavy material lik clinker, thrown in at either end, is taken up by th screw and discharged at the higher end. When th Blackett machine is operating, the cylinder is rotate by friction gear, while at the same time a stream water is injected at the upper end. The water, flow ing over each successive weir formed by the screw, run away at the lower end. The coke floats on the surfac of the water, flows over the weirs, and is discharged the lower end of the cylinder. The heavy clinker sink to the bottom and is conveyed by the screw to the highe end of the cylinder, where it also is discharged. In thi way clinker and coke, or shale and coke, are separated

A study of fig. 2 will readily assist engineers to com prehend the simple principle upon which the Columbu separator operates. The machine consists essentially o two main sections: a revolving drum sieve, into whic the waste material is fed, either by hand in small ma chines or by a continuous conveyor in the larger types and the separator proper. The process is briefly as fol lows: The material is passed through a revolving small mesh sieve drum, which rejects the fine dust, and throug a revolving large-mesh grid, which ejects any occasiona oversize lumps of slag, the elimination of which experi ence has proved to be desirable, as they consist mainl of pure slag of no calorific value. From the grid th material drops into the separator chamber, consisting o an inclined sheet-iron container within which revolves

separate chambers, two superimposed conveyor orms. The container is half-full of water, the specific ravity of which has been increased to about 25 deg. 30 deg. Beaumé, by any of the numerous means adily available, such as, for instance, by admixture of ommon clay, loam, chalk, carbide-slime, salt-lye, or any milar suitable substance. Upon falling into this liquid e heavy slag immediately sinks to the bottom, while

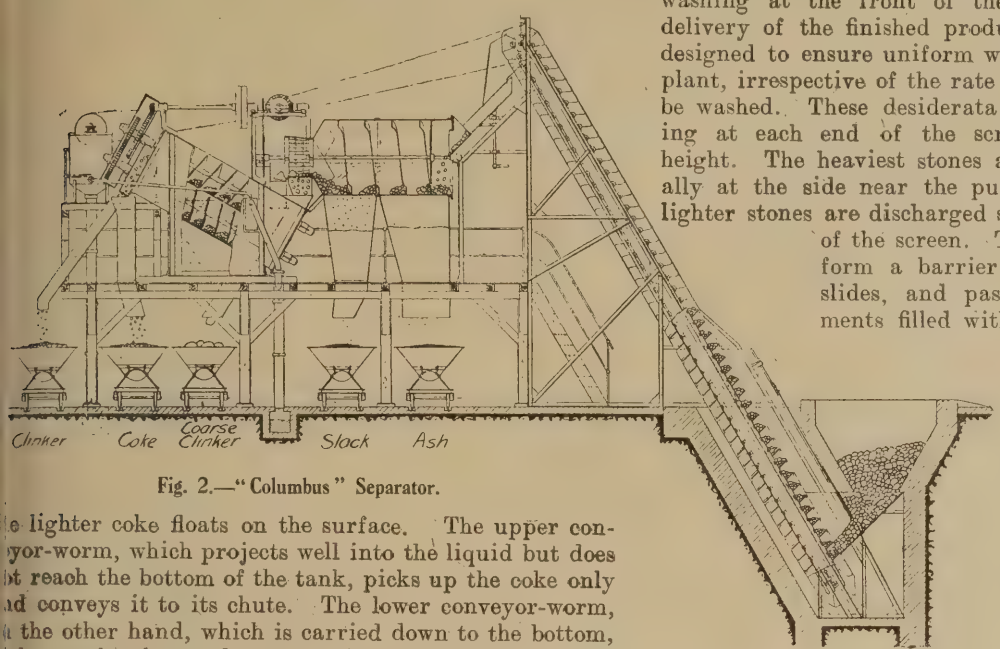


Fig. 2.—"Columbus" Separator.

e lighter coke floats on the surface. The upper conyor-worm, which projects well into the liquid but does ot reach the bottom of the tank, picks up the coke only nd conveys it to its chute. The lower conveyor-worm, n the other hand, which is carried down to the bottom, cks up the slag and stones only, and passes them out rough a separate chute. Tip wagons, into which the parated coke and slag fall, are usually placed directly nderneath these chutes. Large installations are generly arranged to feed the separated materials into railay wagons or into bunkers either directly by mounting e apparatus on a raised platform or by means of conyors.

The separator requires very little power, *i.e.*, from to 4 h.p., according to size and output. The water nsumption is only about 20-50 gallons per hour, and most any waste water, fresh or salt, can be used. Both e coke and the slag are immediately available for use; e coke, having become only superficially moistened, n at once be re-fed into the furnace. The slag is freently used for the manufacture of slag-bricks, after ing crushed and mixed with a small proportion of nd and cement. These bricks are easy to make, inpensive and, requiring no firing, can be prepared on e actual site on which they are required. One unilled labourer only is required to attend the machine, en for the largest type. In big installations additional labour is, however, required to transport the marial to and from the machine, or elevators and conyors can be arranged for this purpose. The smaller pes can be mounted on a trolley, so that they may be oved from place to place or up to the existing slag

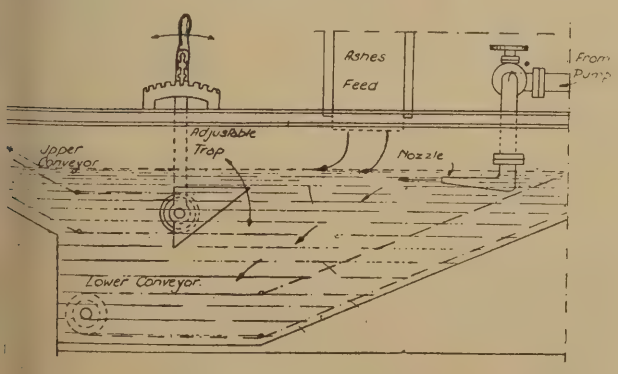


Fig. 3.—Water Separator.

ap. The standard machine is supplied with an overad shaft fitted with fast and loose pulleys for belt-drive om any convenient shafting. When required, an indendent drive by a small electric motor or petrol engine, ted inside the base of the machine, is arranged for. In this case a small counter-shaft is fitted to a bracket on the side of the machine.

A separator recently developed in Belgium is of the pulsating piston type, in which a single screen is spaced away from both the front and rear walls of the body of the washer; and its object is to introduce into these washers improvements, for the purpose of securing the regular discharge of the lighter pieces or stones (for re-washing at the front of the screen, and a regular delivery of the finished products. The washer is also designed to ensure uniform working and output of the plant, irrespective of the rate of feed of the material to be washed. These desiderata are obtained by providing at each end of the screen a slide of adjustable height. The heaviest stones are discharged automatically at the side near the pulsating plunger; and the lighter stones are discharged similarly at the other side of the screen. These two classes of stones form a barrier in front of each of the slides, and pass into separate compartments filled with water to the same level as that of the water in the screen compartment, so that the washer will never run dry. The finished material is discharged over the barrier of lighter stones. The heavy stones (final stones) being thus discharged on entering the washer, the following conditions are established for the latter: A more homogeneous washing bed, a more uniform water-stroke, and an improved yield.

Since the slides extend across the full width of the washer, there is no longer a risk of the washer becoming obstructed by the presence of a foreign body. The screenings, *i.e.*, the material passing through the screen, are discharged at the bottom of the washer by way of a pipe connection. The lightest stones (for re-washing) are discharged at the front end of the screen by means

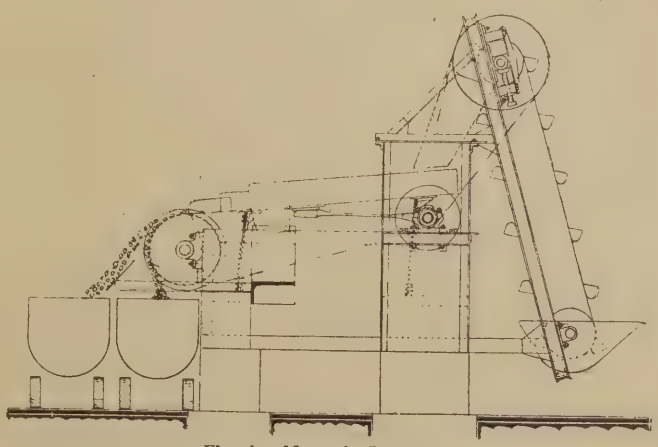


Fig. 4.—Magnetic Separator.

of a slide, identical with that at the rear end, and by a pipe and a bucket elevator. Since the products are discharged into separate compartments, also filled with water to the same level, the washer cannot be emptied of water as in the case of certain other washers.

An interesting German method is that in which the water bath is kept under pressure and in constant motion. The feature of the process is the addition to the water bath of some sand mixed with cement. The porous coke absorbs a little of this mixture, but the coarser pores of the clinker fill up completely with the sand-cement mass, their weight being in consequence considerably increased. The separation of clinker and coke is then readily accomplished by deposition or centrifuging.

An apparatus recently introduced is illustrated in fig. 3, from which the principle will be easily understood. The separation of the combustible matter from

ashes and clinker takes place directly upon the surface of the water before the coke has had time to absorb the latter. This result is obtained by producing upon the water a surface current which draws the lighter material along with it and permits the heavier material to sink, the curves of movement of the two materials being widely separated. The separation is facilitated by a trap, which is mounted horizontally in the current produced by the nozzle-injector, the coke or the other light material falling from the trap upon an upper band-conveyor, while the clinker and heavier material fall upon a lower band-conveyor.

The magnetic process, developed largely in Germany, operates on the principle that all kinds of coal incorporate iron in the form of pyrites. Pyrites has no magnetic properties, but when the coal is burnt, the pyrites is converted into oxides of iron, which are magnetic. Thus in the burnt fuel the combustibles are non-magnetic, and the non-combustible are magnetic. In the Krupp magnetic process the ash is fed on to a brass drum rotating about a horizontal axis, and is exposed to the action of a stationary magnetic field, the strength of which increases from the top of the drum downwards afterwards decreasing to its least strength in the lower section of the drum (see fig. 4). The screened ashes are fed on to the periphery of the drum, so that the ash constituents containing the iron are held magnetically to the surface for a portion of a revolution, and then fall off into a separate receptable as they pass out of the magnetic field. The coal or coke does not adhere to the drum, but leaves its surface directly after contact with it, and is projected into its own receptacle. It is claimed that lumps of ash and clinker up to 3 in. mesh will adhere to the drum and be removed. The energy required varies from 0.6 to 2.4 kW-hours per ton of ashes treated.

An advantage of the electromagnetic process is the fact that all the combustible matter is recovered in the dry state; thus its value as a fuel is not impaired by a heavy percentage of water.

Rural Electricity Supply in France.

Some Examples of Overhead Line Construction.

By THEODORE RICH.

In France rapid progress is being made with the supply of electricity in rural areas; the demand for labour in some districts seems to exceed the supply, and farmers are beginning to look to electricity to help them to make good the deficiency. The regulations have been framed to aid, not to obstruct, and telephone crossings by pin-insulator lines do not cost £250 each there; if they did, there would be very few roadside lines in existence. It should be remembered that there are thousands of miles of rural lines in districts supplied from steam-power stations.

A poster, reproduced at the end of this article, issued by a firm of contractors in Paris, with a capital of six million francs, which specialises in the erection of lines, transformer posts, and gear generally in rural districts, is of interest as showing that electricity supply under such conditions is no mere fad or passing craze, but a commercial proposition. In the poster can be seen a farmer saying to himself: "Well! We can now get the labour we want by wire." He stands alongside a transformer post, from which a low-pressure line, on wooden poles, devoid of money-wasting so-called safety gadgets, runs to the village near by. In the distance is to be seen an electrically-driven thrashing machine at work.

In order to show that the poster is not merely some of the advertising eyewash so much in vogue to-day, photographs are reproduced of work done by the firm that issues this poster. Fig. 1 shows light steel posts crossing a ploughed field at 15,000 volts, in the departments of Charente and Dordogne. Fig. 2 shows a 15,000-V line alongside the high road in the department of La Vendée. This line has the "Cornez" type of galvanised steel bracket; the bracket is to some extent flexible so as to equalise the strain. If one remembers aright, this class of bracket is made by Messrs. Jacquemard, of La Ricamarie on the Loire, a firm that specialises in the manufacture of standardised steel brackets and ironwork generally for pin-insulator lines. A span of 40 metres is very usual for wooden pole lines; the conductor is often kept high to allow for trees and bushes. There must be several thousand miles of power lines alongside French roads, yet it is only on exceedingly rare occasions that one hears of accidents to members of the public through their existence.

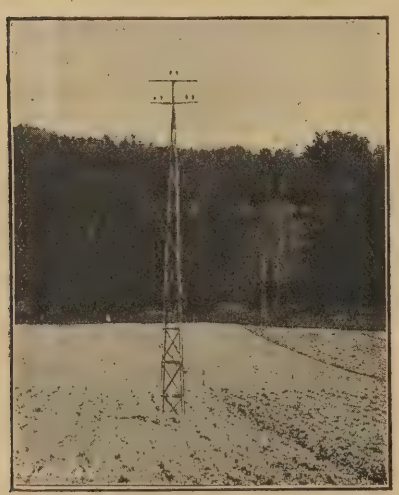


Fig. 1.—15,000-V Steel Pole Line.



Fig. 2.—15,000-V Roadside Line.

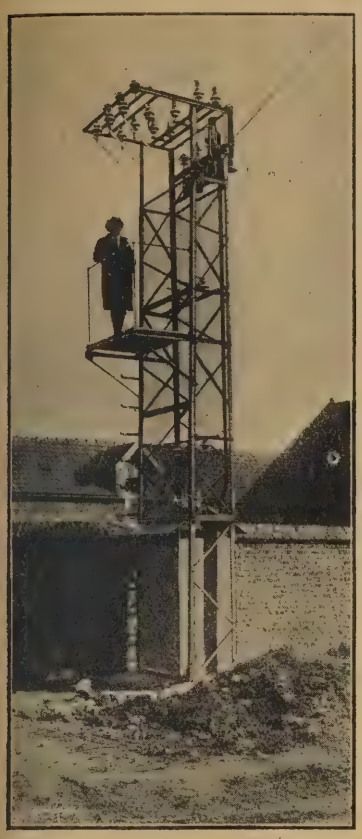


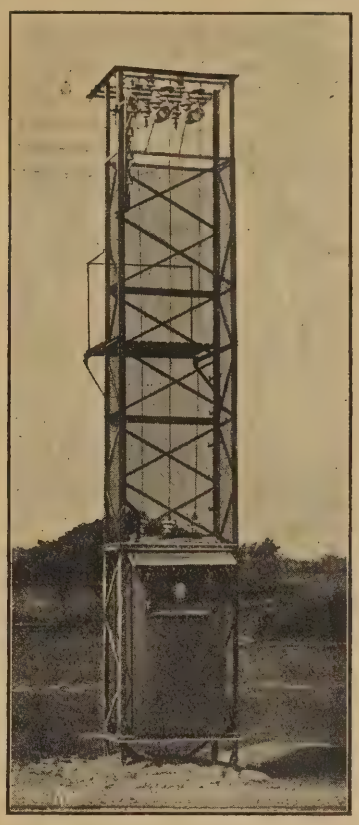
Fig. 3.—15,000-V Concrete Post Line.

Fig. 3 shows a 15,000-volt line with lightened-out concrete poles. These are usually made at some convenient depôt, so far as is possible where suitable aggregate is obtainable, and then shipped to the site, when hard, on motor lorries equipped with trailers arranged like timber or rails on a railway truck.

Some contractors for armoured concrete poles use rapid-setting cement so that the same moulds can be used over and over again without delay. In some cases the bases for concrete poles have been cast round a mould, so that, when hard, the pole itself can be dropped into the socket, wedged up and grouted, a job that only takes a few minutes. Owing to the weight it is, of course, much more easy to get concrete poles on to the site alongside a road than across ploughed fields.

The brackets are of the herring-bone Cornez type, of galvanised steel, and the three phase wires are arranged symmetrically. By this means, should it prove desirable, the phases can be easily transposed to neutralise any inductive effect on neighbouring telegraph and telephone lines. In fig. 3 a telephone line can be seen on the right-hand side of the road. Judging by the miles and miles of road where power lines are to be seen on one side of a road, and post office lines on the other, these administrations seem to rub along together somehow.





Figs. 4 & 5.—Steel Transformer Posts.



Fig. 6.—Transformer Posts.

It is interesting that there is no earth wire on many lines in France. In some districts it is found desirable, in other districts not; but it is usual to have them on lines of genuinely extra-high-pressure, say, 45,000 volts and upwards. In the U.S.A. it still seems to be a moot question regarding lowish pressure lines. Our Board of Trade, in times past, with its vast experience, knew more about the matter than the rest of the world combined, and insisted on an earth wire.

Fig. 8 shows a railway crossing with steel supports, at 15,000 volts. As a rule for these, doubled insulators and doubled conductors are used, and, where possible, a reduced span. Earthing guards can be seen on the near side, to earth a conductor if it breaks. French railway companies have found that it is futile to put up over their telegraph, telephone, and signal control wires elaborate guarding arrangements which so often, when loaded with snow in a gale, have a lower factor of safety than the conductor they are supposed to catch if broken. The Post Office officials in France have apparently also learned the same lesson. Only in very rare instances are telephone or telegraph wires put underground at crossings, and yet the French post office engineers have far more experience in such matters than their English *confrères*.

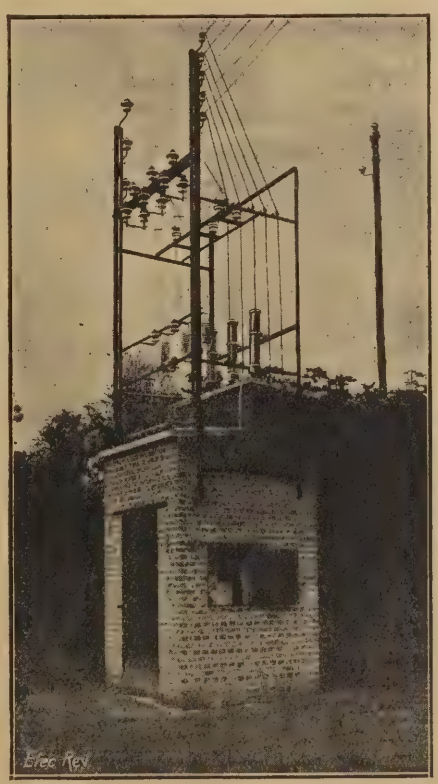


Fig. 7.—Transformer Cabin.

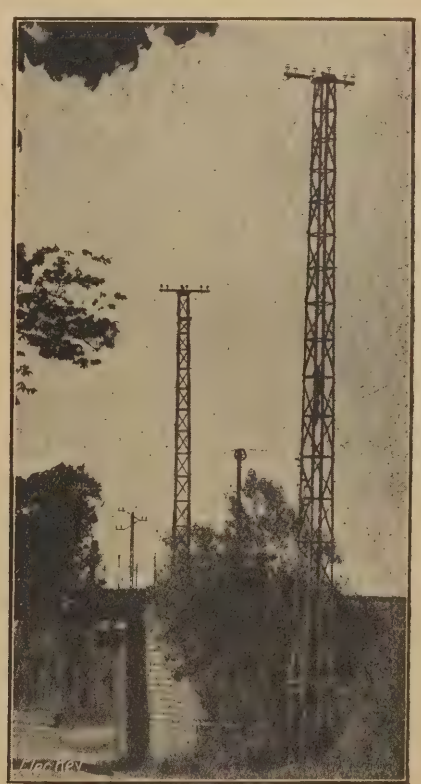


Fig. 8.—Railway Crossing.

Transformer Posts.

An angle-steel transformer post, 15,000/220/380 volts, is shown in fig. 4, of a type suitable for villages. The transformer is in the cabin below. The three pots seen on the top of the frame are the water and glycerine resistances in series with the horn arresters. After opening a low-pressure switch accessible through the little door below, leaving nothing circulating but the magnetising current, the high-pressure links can be opened in safety. In fig. 5 is seen a somewhat similar

post without dischargers, but with links, choking coils, and transformer below as before. Concrete is filled in round the base. The making of such steel cabins has become quite a business.



Fig. 9.—A French Poster.

A transformer post with a brickwork cabin is shown in fig. 7 for 15,000/220/380 volts. This class of construction is useful where transformers of 25 to 50 kW are used. Through the open shutter an l.p. meter can be seen. It is possible to arrange for some local handy man to keep the keys of this low-voltage side, so that a fuse could be replaced or even the low-pressure supply cut off pending the arrival of a skilled operative.

A farm transformer post for 15,000/110/190 volts is shown in fig. 6, quite simple and effective.

In France during the last 18 months for some of the more scattered villages a low-pressure network of 200/300 volts, in lieu of the usual 110/190 volts, has been developed, care being taken to have a higher class of low-voltage wiring in the houses to suit the case. The engineers of the different rural authorities have not, apparently, opposed the development.

15,000 Volts as Rural Pressure.

There is an idea prevalent that something like 3,300 volts (following perhaps the old American 2,200-volt system) is a desirable voltage for rural distribution. In wind-swept Flanders 15,000 volts has been in use since before the war. The extra cost per mile of line for insulators is very small; there is but little difference in the cost of transformers and switchgear, and with 15,000 volts, as the capacity for the same percentage drop is as the square of the voltage, about 20 times as much power can be carried as with 3,000 volts. In the North of France, to supply some farms and hamlets, iron wire has been used in some places at this voltage, with two wires single-phase off three-phase mains pending the development of the load. The writer is greatly indebted to the manager of the French company L'Electrification Industrielle for the above photographs of pole lines and transformer posts, and for permission to reproduce its interesting poster.

Modern Electric Cookers.

A Review of the Recent Improvements in Electric Cooking Stoves.

(*Continued from page* 767.)

Probably the most interesting departure from the usual construction of the electric cooking stove is found in the introduction of the table cooker. It is said that in the United States the electric table cooker is an even more popular item in the culinary equipment of the household than is the gas ring in Great Britain. The low oven to which the cook has to stoop each time she gives it her attention still predominates in this country, probably because the available space and the general structure in the majority of houses will not, on the whole, permit of another design. Our attention has been drawn to several designs of this type of cooker; we illustrated the No. 42 "Jackson" table cooking stove in our issue of April 24th last. In this model, it may be recalled, the makers have mounted the oven and hob of one of their ordinary cookers side by side upon a steel table, a ledge underneath the table affording convenient storage for cooking utensils, &c. This apparatus represents fairly the general trend in such introductions. Fig. 4 shows a particularly interesting design. It is a kitchen outfit manufactured by the Arora Company, and consists of an oven mounted on a 13-in. metal stand; beside this combination are three boiling plates and a grill mounted on a sheet-metal table at a suitable height. The whole suggests a very convenient equipment for cooking operations. Fig. 5 shows an "Xcel" cooking range constructed on the same principle, which incorporates another advantage in this type of cooker, in that it permits the provision of a hot cupboard over the oven in the usual position of the hob plate, and so utilises any heat rising from the oven which would otherwise be wasted. The table cooking feature has also been introduced into the "Universal" range of Messrs. L. G. Hawkins & Co., Ltd. This is a

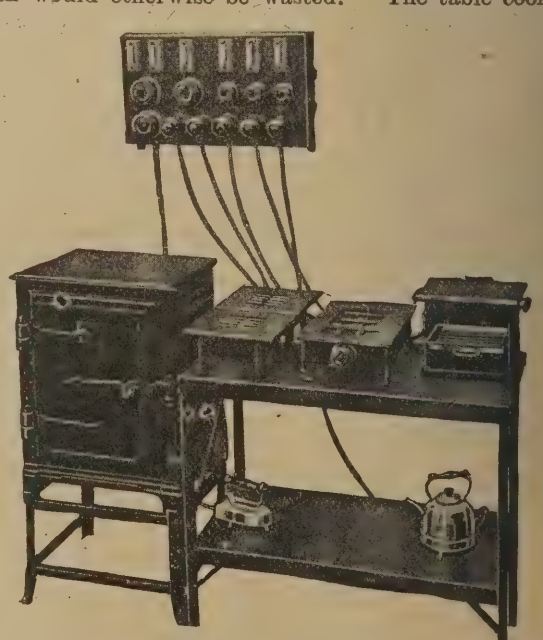


Fig. 4.—Table Cooking Outfit.

very effective and attractive oven and boiler combination, equipped with a damper, aluminium broiler pan and nickel plated wire racks. The total maximum wattage is 6,500 W, and the floor space dimensions are 27 by 43½ in. The crated weight is 320 lb.

Without a doubt the greatest strides made in the improvement of electric cookers have been in connection with the construction of the heating elements and

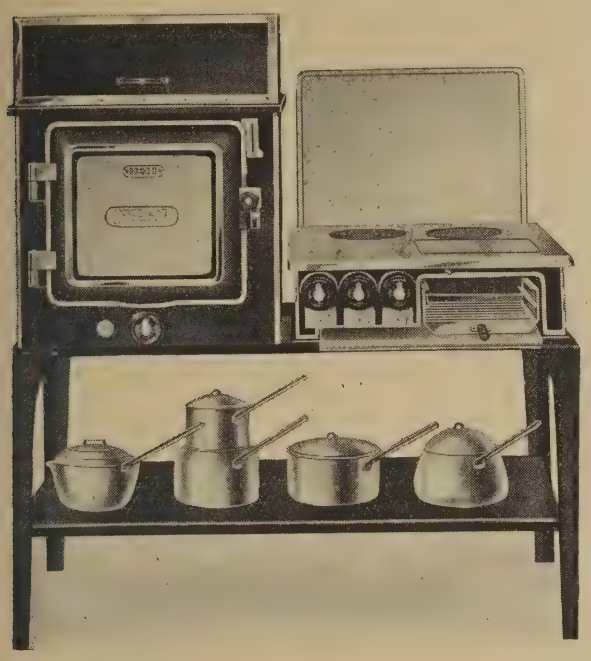


Fig. 5.—Typical Table Cooker.

in the methods adopted for their housing. The weakest point of any cooker at the present time is admittedly the boiling ring, and it is here that most of the difference of opinion as to the best construction lies. A 40 per cent. efficiency boiling plate represents a good standard. The boiling plates now generally adopted are the outcome of either or both of two schools of thought. One represents the enclosed boiling ring in which the elements are entirely covered as a protection against spilt liquids, &c.; the other represents the open type, which has the advantage that radiant heat is transmitted direct from the elements to the cooking receptacle, but also the disadvantage that the elements are exposed to the liquors, &c., which, it seems inevitable, boil over from time to time. Much is to be said

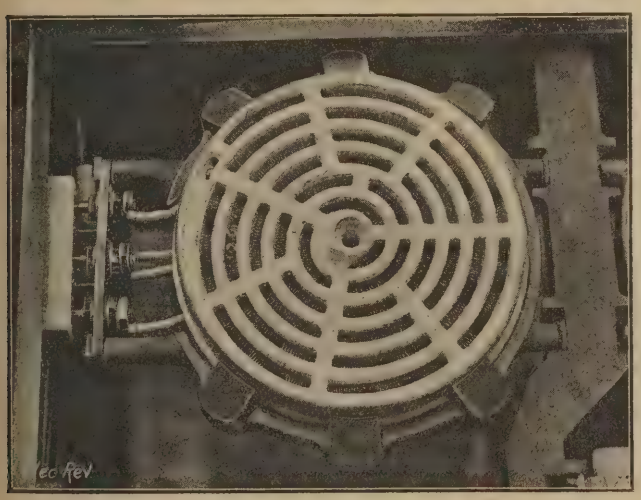


Fig. 6.—Open Plate.

for and against each case. In the enclosed type, of course, some heat is sacrificed for the sake of protection to the elements. One pattern favours efficiency as far as consumption is concerned, while in the other case the main attention is given to the question of efficiency in the direction of maintenance. Which gives the higher combined or total efficiency has probably yet to be proved. Another deciding factor is the consideration of the rate at which the boiling temperature is reached at the vital parts of the plate. It appears to be necessary to sacrifice to some degree the efficiency as regards rapid boiling time in favour of the constant temperature efficiency. The boiling plate of the "Xcel" cookers of the Automatic Telephone Manufacturing Co. is of the open type, the makers being desirous of obtaining the highest efficiency possible from the point of view of consumption. It consists of a fireclay circular slab 7 in. in diameter, with deep grooves retaining high-grade nickel-chrome spirals which are held in position by a special construction. The makers claim that

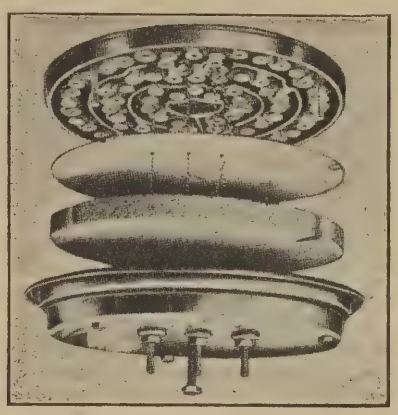


Fig. 7.—Fully-Protected Plate.

a considerable reduction of heat wastage results from the use of the circular plate. The slab is well perforated to provide for vessels boiling over, and is held in place by a novel cast-iron support provided with three plug-in terminals which engage with special sockets mounted on the side of the cooker; this is an important and interesting feature, it being desirous to have an element or element unit which can be easily replaced. As in several other well-known makes, the entire boiling plate is built in a frame so that it can be instantly removed for cleaning or repairing operations. The adjustment is simple, and the face of the

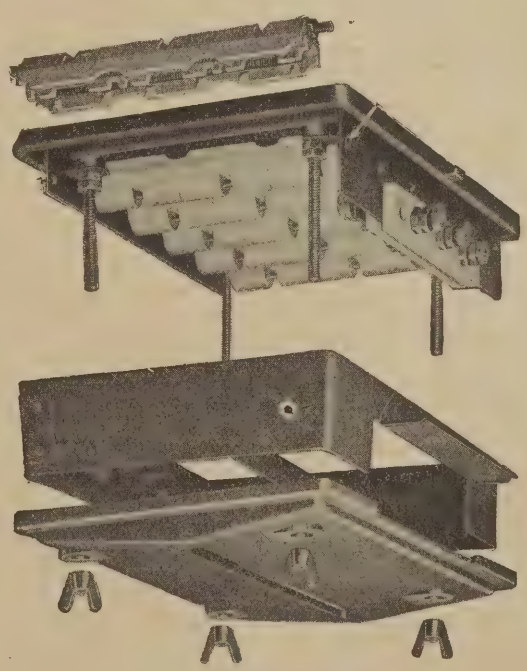


Fig. 8.—Semi-enclosed Plate.

plate is flush with the top of the hob plate. Fig. 6 shows the construction of the "Xcel" open plate. The average loading for the plates of this make is 1,500 W. In the "Universal" cookers, considerable improvement has been made on the enclosed type of boiling ring which, the makers claim, has resulted in a particularly efficient plate of that type. Fig. 7 illustrates the special construction of this boiler unit, which is claimed to prevent warping and cracking.

The element is wound on porcelain formers very near to the inner surface of the cast-iron protecting plate. An asbestos disk is placed immediately under the element, and beneath this is a thick insulating block. The steel casing underneath accommodates these, and the whole is clamped together by a central bolt. It seems that the Jackson Electric Stove Co., Ltd. has sought the happy mean with regard to the boiling plates on its latest cookers. The makers have adopted a semi-enclosed plate, which they claim carries the combined advantages of both the open and closed types. Radiant heat is distributed through slots in the top of the unit, while the elements are protected by bars or closed portions, immediately under which they are installed. Each boiling plate is arranged as a whole unit in an iron box, which can be lifted from the top of the hob complete. The box consists of the top slotted slab and the element container which is bolted to it by means of four bolts and wing nuts. The container holds six elements, two groups of three in series, in parallel. The element coils are wound on clay formers, and are so arranged that new coils can be easily wound. The formers are easily lifted out. The element connections are arranged by means of terminals attached to the inside of the frame or container. It is interesting to note that the complete boiling-plate units and also the separate elements in this design are interchangeable throughout 14 sizes of cookers with varying capacities for cooking for from 2 to 14 persons, also that the clay formers for the elements for all sizes are built up from standard sections upon which the individual element spirals are wound. Fig. 8 illustrates the construction of the "Jackson" plate, but we understand that this is about to be superseded by an improved one, also of the semi-enclosed pattern.

Metro-Vick Supplies, Ltd., is another firm which has adopted the semi-enclosed pattern of boiling plate. The coils are neatly and effectively protected from the unavoidable overflow of liquids, which have a free access through the plate on to the vitreous enamelled crown plate underneath. The protecting bars are of a special non-scaling and non-warping alloy. It is claimed that the watts rating per square inch can be raised to a very high figure ensuring a quick operation and a very high efficiency for this type of plate. The plate installed in the "Cosmos" cooker is made up as a separate circular unit, which is "slipped" into place in the hob plate, and it can be removed by simply lifting it out after disconnecting the leading-in wires. A simple adjusting arrangement is provided for regulating the level of the plates in relation to the hob. The boiling unit is made in two sizes, 8 in. and 6 in. in diameter, and the standard "Cosmos" cooker is provided with one of each size. Each is controlled by a 3-heat switch, for which the elements are suitably wired.

(To be continued.)

When Salesmen Sell the Business.

By A COST CONSULTANT.

There can be little need to emphasise the important place that the selling organisation now holds in modern industry. For many years the selling staff has always been large in certain trades, as, for instance, the garment industry, where the cost of selling is said to be greater than the cost of production, and it would now appear that in many other industries the staff required and the expenditure necessary in order to sell the product are steadily increasing. Very few goods now find their own market, or sell themselves, as it is said. The sales of everything have to be "pushed," either by attractive advertising, capable and persuasive salesmanship, or else by offering some inducement in the form of advantageous prices. When it is proposed to introduce some new article, either in competition with, or to save the expense of some article already on the market, its merit alone will avail its manufacturers little. They must perforce rely upon the skill and originality of their selling organisation to establish their innovation as a popular necessity. Innumerable articles in everyday use, which are regarded as indispensable to 20th Century civilisation would never be used at all had it not been for skilful advertising and selling in the first place; for who would now be without their fountain pen, their safety razor, their Fairisle jumper, or even their wireless?

It is this third weapon of the salesman that it is proposed to discuss in this article, namely, some inducement in the form of advantageous prices. There was a time when prices could be definitely fixed by the manufacturers at their own offices, and their products could only be bought at those prices. This has now become impossible in a large number of cases, and the final fixing of the price has often to be entrusted to the selling staff, with the result that the increased activities of the salesmen have been accompanied by increased responsibilities. It is, however, open to question whether the abuses to which this plant is subject are always guarded against as carefully as is necessary.

The principal charge of the sales staff is, of course, Turnover. It rests almost entirely in their hands to obtain orders for the firm. The whole livelihood of the sales staff depends on turnover, for their commission is based on it; but so does the prosperity of the whole firm, for without an adequate turnover, that is, without sufficient orders, of what avail are the men and machines in the factory? No wonder the entire sales staff, from the sales manager down to the youngest traveller, think and dream of little else but turnover, and regard it as the be-all and end-all of business. No wonder they are inclined to believe that nothing else but turnover really matters very much, and that everything should be sacrificed to attain that end. Some sales managers, in whose charge the final settling of the contract price now rests, are known to contend that even the price must be subservient to turnover. In fact, such is the point of view and the result of the whole training of a salesman, that he is unable to regard any of his responsibilities as greater than, or even as great as, that of obtaining an increased turnover.

Having regard to this outlook on business, it would appear doubtful whether it is wise to give the sales staff too free a hand as regards the price, without taking ample precautions. These are times when many businesses, particularly in the iron and steel trade, openly admit that they are bound to accept work "below the cost of production" in order to keep their staff and workmen together. It must, therefore, frequently be the experience of salesmen acting for firms in this trade to negotiate for work, and sometimes offer reductions without having an opportunity of referring to their head office, and finally to accept work at these reduced prices, even though they know that the firm's original quotation was already below the cost of production. It may at first sight appear strange that any firm can go on accepting orders and carrying out contracts at prices below the cost of production, without either dipping into its reserves, or else heading for the bankruptcy court. Nevertheless, it is being done quite regularly, and it is interesting to examine how such a course can be possible. The explanation is simply this. Every firm has certain establishment charges to meet. They may either be spread over a few orders at a high price, or else absorbed by a larger number of orders at a lower price, and it is the latter alternative which is the only possible one for some firms at the present time.

The broad connection between price and turnover made use of in this explanation is well known and understood, even by salesmen, and it sounds quite simple until it becomes necessary to examine it more closely and to attempt to express in figures the exact price level that corresponds to each rate of turnover. It is profitable to delve beneath the surface and try to find out what this relation is.

It stands to reason, in the first place, that if the price obtained for an order does not recompense the manufacturer for the material he has to buy for the purpose, he will do better to refuse the order. If it does not also pay the wages of the men he has to employ to carry it through, the same remark applies. Besides this the price must also make some contribution towards the establishment charges of the firm, but how much, in order that the order may be worth booking, is not so obvious.

An examination of the items of establishment charges will show that they are divisible into two groups. There is one group including the rent, rates, taxes of the factory, the salaries of the engineers and designers, the works manager's and the foremen's salaries, the cost of keeping the buildings in good repair, and a number of other items which have to be paid for in order to keep the factory in a fit state to accept work. But they will vary very little whether the business has one or a hundred orders in progress. These are known as standing charges. Then there is a group of expenses, such as power, light, small tools, grease, oil, repairs to machines, health and unemployment insurance, the new pensions' scheme, storekeeping, and so on. None of these are incurred until and unless work is being done in the shops. They are known as running expenses.

The running expenses are actually out-of-pocket expenses, in exactly the same way as the material and the wages, so that if the price will not also cover the running expenses, the order is better left alone. But the standing charges have to be paid by the manufacturer whether any orders are obtained or not. The fact that the shops must be ready to carry out orders as soon as received necessitates these expenses, and any contribution towards them will be better, from the manufacturer's point of view, than having to pay them himself.

Any order, therefore, at a price which covers material, wages, and running charges, and contributes something towards standing charges, is better than no order at all. This critical figure at which it begins to be worth a manufacturer's while to book orders is always extremely difficult to estimate accurately, and quite impossible without accurate and reliable costs. At the same time, it does seem most desirable that this critical figure should be worked out, especially for contracts which it is known beforehand are not likely to be let, except at a figure below the cost of production. It would also seem desirable that a salesman, if he has authority to cut prices, should be told this critical figure, as well as the price estimated and quoted by his firm.

Admittedly this is a difficult figure to calculate, and one which cannot be calculated at all without a thorough knowledge of accurate costs, but these are times when orders are difficult to obtain, and in certain trades impossible to book except at figures approaching this critical level, below which it can pay no firm to go. It is, therefore, not only a wise precaution, but a necessity for every manufacturer to provide himself with a method of working out his costs, capable of arriving at this critical figure with a degree of accuracy that can be relied upon.

Only this week one hears of a certain contract for cast-iron pipes, which a well-organised and up-to-date firm calculated could be made for 26s. per cwt., being the total cost of production, and 18s. per cwt. as the bed-rock figure below which it would be better without the order. The order was refused to this firm at 18s. per cwt., because its price was much too high!

Examples such as this, of which many can be cited, make it difficult to believe that firms really know their costs of production accurately, or even realise that there is a limiting figure below which it cannot pay them under any circumstances to cut their prices further. Is the reason of this wild price-cutting (for it is nothing else) simply that salesmen are given too free a hand as regards the price, with the result that they sometimes cut below the economic limit without knowing it, or is it the more serious possibility, that many manufacturers do not know where this limit lies?

In trades where prices below the cost of production are so frequently quoted that they are the rule rather than the exception, too much attention cannot be paid to the calculation of accurate costs (or if it is new work, to estimates based upon accurate costs) so as to be able to find this economic limit. In such circumstances, too, the anxiety of salesmen to increase turnover must be curbed. They should be informed what this limit is, on every contract where there is a possibility of their having to offer a lower price, and warned never to offer or accept a price which is below the economic limit.

Shop-Window Lighting.

Scientific versus Haphazard Methods.

By A. V. HYDE.

The factor that will influence business even more greatly in the future than it has done in the past is the proper illumination of the shop-window. There is a great deal of work to be done by the trade in this important division of lighting. The direct influence for good of scientific illumination upon turnover was proved long ago, and there is not a retailer in any of the variety of trades where goods are sold over the counter, who, if he would keep abreast of competition and see a constantly expanding business, can afford for a moment to ignore the question of correct and adequate light in the window. The average shop-keeper in other trades will dress his window—well, ill, or indifferently—and, after a fashion, light his window also. But, unless he has the benefit of expert advice, the installation will perform only a fraction of its true function—which is to sell the goods—and will fall far short of what it might have been. He must be convinced of the value of light in the window, before he is actually sold an installation.

The field for the further development of creative shop-window lighting is so great and so important from the point of view of revenue to the electrical trade, that the dealer and the contractor must decide upon some way of approach to the individual, rather than wait for the buyer to come to them.

Just as the private buyer will not be interested in the technical description of an electric fire, or an electric cooker, until he is persuaded of the *need* for it, it is not the description of a system of shop-window lighting that the shopkeeper wants so much as in the first place a conviction of its benefits. The rest will follow in due course, for the arguments that can be adduced in favour of modern ideals in window lighting cannot fail to impress any reasonably-minded and progressive retailer. It may be clarifying to see what these arguments are, and to have them at hand for use at any time. Let us call them "The case for more and better shop-window illumination," and list them as follows:—

1. Light is a never-failing source of attraction: to the public it is as the candle to the moth.

2. After sunset one of the favourite pastimes of the public is to "go and look at the shops."

3. People buy where the light is bright.

4. Anything bright is always cheering and stimulating; a well-lighted window puts the passer-by in a cheerful frame of mind. He is then receptive to suggestion and impression. He is in the mood to feel the "desire to possess"; that is a sale half-made.

5. Light, in that it draws the crowds to the window, and a percentage of the crowds inside, is a salesman.

6. It is a salesman that knows no regular hours of working. It will work from dusk to bedtime, and any time during the daylight hours that it is required, for the cost of the energy consumed. It is a silent salesman



Fig. 1.—A typical Shop-window Reflector.

that is worth ten extra ordinary salesmen inside, because it appeals to potential buyers in the place where they are most numerous—in the street.

7. It will work hours after the business is closed—the days when the business of the day had to cease when the shutters were put up are past, thanks to the boon of scientific window illumination. It is in the power of efficient window lighting to make subtle impressions for the morrow.

8. The public, because of the attraction of a centre of bright light to the individual, tends to memorise windows which have attracted it, and to look for the same windows again. Thus light creates goodwill and builds for the future.

9. Correct and sufficient light on the goods adds attractiveness and value to even the best-dressed window. It gives an impression of cleanliness, neatness, and enterprise, to the least discriminating shopper.

10. Window lighting is every whit as much salesmanship as window dressing. Be the selling effort ever so intense, it falls short of maximum productivity if it ignores the potentialities of the window as a creator of business.

11. The finest advertisement for efficient shop-window lighting and the best proof of all the claims made for it, is the use that is made of it by all the leading retail departmental stores, and by hundreds of retailers in various parts of the country. The best salesman for light is light itself.

Present-day shop-window lighting is based partly upon the avoidance of glare, the hiding of the light source, and the concentration of a maximum amount of light diffused upon the display. When the light source is visible, the eye is distracted from the main object and much of the value is lost.

One system of shop-window lighting that has been very widely installed is the "Gecoray" system, which has the reflector principle as a basis. The source of the light is hidden from exterior view by what is known as "top-lighting," by the installation of specially-designed reflectors (fig. 1), hidden by a valance or "pelmet," and placed in the front of the window ceiling. This system provides for the illumination of every size of shop-window—the small, the average, and the high and shallow window. The lamps for which each reflector is designed vary in power according to the space to be illuminated. The system can be adapted to any existing structural contour or type of window decoration, and to cover any area. It is installed quickly and easily, and brings no dislocation of business in the process of installation. It is economical to install and maintain. It includes, as part of the complete system, spotlights for throwing a concentrated beam of light upon any special feature in the window display, and floodlights for the floodlighting of an entire display. Coloured light in the window is in every way the equal of spotlighting and floodlighting; in some cases it may have greater value. Colour lighting has been proved to attract even larger crowds to a display than when ordinary methods of illumination are used. A colour screen equipment is included in this system, red, orange, green, and blue screens being provided for the reflector. A typical example of the use of the system is illustrated in fig. 2.

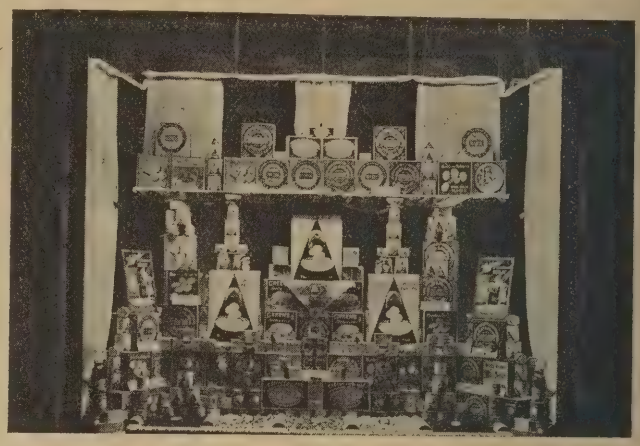


Fig. 2.—An Example of good Window Lighting.

With this description of a popular system, the reader will have received, we hope, some idea of the elements of scientific shop-window illumination, as it is in use to-day, and be in a position to pass over such information to the prospect who comes to him, or whom he himself approaches.

The importance of the trade helping itself towards obtaining the business that is to be done in this branch of more and better lighting is second only to the necessity for a full all-round appreciation of the great opportunities that exist. The fact that they do exist is all to the good of the electrical industry, and it is in the power of one and all to share in the business thus presented.

An Italian Peat-Operated Power Station.—In view of the high cost of coal in Italy, owing to the fact that this fuel has to be imported, much attention has within the past few years been devoted to methods of utilising the deposits of peat which abound in certain parts of the country, for the generation of electrical energy. One of the most recent and important installations of the kind is that which has been established at Torre del Lago, near Lucques, by the Società Torbiere d'Italia. From *Indurstria* we learn that the peat is treated in Mond-type gas producers, the gas being utilised for firing the boilers which supply steam for the turbo-generators. The peat is obtained from a deposit on the banks of Lake Massaciuccoli, where it is estimated that no fewer than 12 million tons are available. The peat, when extracted, contains as much as 85 per cent. of water; it is first allowed to dry in the open air until the humidity falls to about 35 per cent. The air-dried peat is then loaded into barges and transported to the gasification plant about 1¼ miles away. At present six gas producers are in operation, but a further two sets are being added. Each of the producers is capable of gasifying three tons of peat per hour under normal conditions, and four tons per hour when accelerated. When the whole eight sets are in operation it is expected that the plant will yield about 1,412,000 cu. ft. of gas per hour under normal conditions, and about 2,118,000 cu. ft. per hour when accelerated to meet the peak load demands. The gas is piped direct from the scrubbers to the eight Tosi vertical-tube boilers, no gas holder being employed as a measure of economy in installation cost. The electrical plant in which the gas is utilised will eventually consist of three sets of 5,000-kW turbo-generators producing 16⅔-period alternating current at 4,000 volts, 1,000 r.p.m. At present two generating sets are in operation, the output being utilised for traction purposes on the Spezzia-Pisa-Leghorn and Pisa-Florence electric railways. It is estimated that when fully completed the Torre del Lago installation will be able to supply 30 million kWh and produce by-products to the extent of 5,000 tons of tar and an equal quantity of sulphate of ammonia per year.

Electricity Supply in Great Britain.—VI.

Hampshire and the Isle of Wight.

No part of Hampshire has yet been included in an Electricity District, nor up to the present has the County been affected in any way by the Acts of Power Companies.

There are six Local Authorities owning electricity undertakings (excluding the Bournemouth Corporation, which is only authorised to supply for public purposes) and nine Company undertakers, whose areas of supply lie wholly or partly within the County.

COMPANIES.

Aldershot Gas, Water and District Lighting Co.
Andover & District Electricity Co., Ltd.
Bournemouth & Poole Electricity Supply Co., Ltd.
Gosport & Alverstoke Electric Lighting Co., Ltd.
Hindhead & District Electric Light Co., Ltd.
Lymington Electric Light & Power Co., Ltd.
Milford-on-Sea Electric Supply Co., Ltd.
Ringwood Electric Supply Co., Ltd.
York Town & Blackwater Gas Co.



Electricity Supply in the Counties of Hampshire and the Isle of Wight.

The following is the list:—

LOCAL AUTHORITIES.

Aldershot Corporation.
Basingstoke Corporation.
Fareham Urban District Council.
Portsmouth Corporation.
Southampton Corporation.
Winchester Corporation.

The number of units sold annually per head of population in any particular County is not always readily ascertainable, and the method to be used for estimating it is becoming somewhat complicated.

An undertaker who sells in bulk to another undertaker situated in a different County, as Portsmouth Corporation does to Chichester Corporation, is a typical example of the difficulty referred to above. The simplest way is to deduct the number of units sold in

bulk, which means in the case quoted that the County of Hampshire does not get any credit for supplying the energy (neglecting losses) bought by Chichester from Portsmouth.

Again, in the case of an undertaker like the York Town and Blackwater Gas Company, whose area of supply extends into Berkshire and Surrey, it would require a considerable amount of work to allocate the number of units sold per County (assuming that there are plenty of consumers all over the area in each of the three Counties), whilst the "kudos" for supplying the energy in this instance should really belong to the War Office. It should, however, be noted that the output of each of the undertakings owned by the Bournemouth and Poole Electricity Supply Co., Ltd., the Southampton Corporation, and the Portsmouth Corporation, respectively, is rapidly increasing.

With regard to the remaining undertakers, it has been estimated that the total number of units sold by these is less than half the total number of units used for traction at Bournemouth, Southampton and Portsmouth.

The map on the previous page is reproduced from the 1917 Boundary Commission map of Hampshire (by permission of the Controller of H.M. Stationery Office); a list of the topographical alterations since 1917 is added below to bring the map up to date.

The hatched parts which cover about one-third of the total area of Hampshire indicate that statutory powers for the supply of electricity are held or have been applied for in respect of them, leaving the remaining two-thirds of the county to be added to our list of "unoccupied areas." The 1921 Census gives the following particulars for the Administrative County of Hampshire and Associated County Boroughs:—

Acres.	Persons.	Resident families.	Buildings not containing dwellings.
958,896	910,252	206,274	11,220

(1) The Urban District of Aldershot has been created the Borough of Aldershot.

(2) The Urban District of Gosport and Alverstoke has been created the Borough of Gosport.

(3) In 1920 part of the Parish of Cosham was added to the Borough and Parish of Portsmouth.

(4) In 1921 the Parish of Cosham was re-named the Parish of Widley.

(5) The boundary between the Parishes of Headley and Grayshott has been altered.

(6) Part of the Parish of Hound has been transferred to the Parish of Hamble.

(7) The Urban District and Parish of Fleet have been enlarged by the inclusion of part of the Parish of Elvetham.

(8) and (9) The following were added to the Borough of Southampton in 1920:—The Urban District of Itchen, the Parish of Bitterne, and parts of the Parishes of North Stoneham and South Stoneham. The added parts of North Stoneham and South Stoneham Parishes were amalgamated to form the Parish of Saint Nicholas; and the part of South Stoneham not added to Southampton was merged into the Parish of West End. In April, 1925, the Parishes of Southampton, Itchen, Bitterne, and Saint Nicholas were united to form the new Parish of Southampton co-extensive with the County Borough.

Isle of Wight.

The 1921 Census gives the following particulars for the Administrative County of the Isle of Wight:—

Acres.	Persons.	Resident families.	Buildings not containing dwellings.
94,146	94,666	21,308	1,776

The Isle of Wight Electric Light and Power Co., Ltd., and the St. Helens (I.W.) Electric Lighting Co., Ltd., hold statutory powers in respect of all the Boroughs and Urban Districts and part of the Rural District. An application has been lodged by the Isle of Wight E.L. and P. Co., Ltd., to obtain statutory powers over the remaining part of the Rural District of the Isle of Wight, hence the whole of the County is shown hatched. In 1923 part of the Parish of Northwood was added to the Urban District and Parish of Cowes.

Radio Wave-Lengths.

Some Comments and Suggestions.

By W. MOON.

LISTENERS who live near the sea often find it difficult to hear a foreign station owing to ships signalling on the same wave-length as the station. It is therefore advisable to limit both ships and broadcasting stations to certain wave-lengths, or ranges of wave-lengths, so that neither of these forms of transmission shall interfere with the other.

Also in selecting wave-lengths for different stations it is advisable that none of them should be multiples by 3, 5, or 7 of those of other stations, so that harmonics of a near station shall not jam a more distant station.

Now that broadcasting has reached such proportions, it would be interesting to know to what percentage of selectivity the average listener can adjust his apparatus, and also what percentage of selectivity can be obtained as a practical proposition. While the apparatus of the average listener can perhaps select wave-lengths differing by 2 or 3 per cent. when they are of equal strengths, it is too often found that a near powerful station will jam a weak distant station when the difference between their wave-lengths is as much as 10 per cent.

When selecting the wave-length of a particular station reference should be made to a list in which the wave-lengths are arranged in geometrical proportion, so that the wave-lengths can be equally spaced as regards interference with each other.

If 1 to 10, or 10 to 100, or 100 to 1,000, and so on, be divided into 100 geometrical parts, each number will be 1.023293 times its predecessor. In the following list 1 to 10, &c., are divided into 100 geometrical parts, the decimal points being omitted. The numbers are given to four places of figures.

Referring to this list, it will be observed that, while there is duplication of stations on certain wave-lengths, there are other ranges of wave-lengths that are not used. But no doubt the committee now dealing with this matter will arrange to space out the stations evenly, so that there is the least possible clashing in wave-lengths between broadcasting stations; and also that a range of wave-lengths, say, 600 to 1,000 metres, shall be reserved for ships' signalling alone:—

Wavelengths in Geometrical Proportion to four places of figure.

1000	Moscow 1000	3243	Nottingham 324
1023		3311	Hull 335; Bremen 330
1047	Vossegat 1050	3389	Plymouth 338; Blumendaal 332
1072	Norddeich 1088	3467	Bradford 346; Nuremberg 340
1097	Brussels 1100	3548	Cardiff 353; Pic du Midi 350
1122		3630	London 365
1148	Kbely 1150	3715	
1175		3802	Manchester 378; WGY (U.S.A.) 379
1202	Ryvang 1190		
1230		3890	Bournemouth 386; Madrid 392
1259		3981	Newcastle 400; Hamburg 395
1288		4074	WOR (U.S.A.) 405; Munster 410; Haelsinkki 405
1318			
1346		4169	Glasgow 422; Breslau 418
1380		4266	Rome 425
1413	Moscow 1410	4365	Belfast 439; Stockholm 440
1446		4467	Stuttgart 443
1479		4571	Leipzig 454
1514	Toulouse 1525	4677	Frankfort 470
1549		4786	Birmingham 479; Swansea 482
1585	Daventry 1600	4898	Aberdeen 495; WEAF (U.S.A.) 491
1622			
1660			Munich 485
1698		5012	Berlin 505
1738		5129	Zurich 515
1778	Radio-Paris 1780	5248	Vienna 530
1820	Komarov 1800; Nauen 18050	5370	
1862		5483	
1905		5624	
1950		5754	
1995	Amsterdam 2000	5889	
2042		6026	
2094	Amsterdam 2100	6166	
2143		6310	
2193		6457	Milan 650
2239		6607	
2291		6761	
2344		6918	Graz 692
2399	Monsant 2450	7080	Gothenberg 700
2460	Koenigswusterhausen 2460	7244	
2512		7413	
2570		7586	
2630	Brussels 265; Eiffel Tower 2650	7763	
2692	Malmoe 270	7943	
2754		8128	
2818		8318	
2877	Cassel 288	8511	Lausanne 850
2951	Dresden 292	8710	
	Hanover 296; Koenigswusterhausen 2960	8913	
		9120	
3020	Sheffield 301; Stoke-on-Trent 306	9333	
3090	Leeds 310; KDKA (U.S.A.) 309	9550	Budapesth 950
3162	Liverpool 315	9772	

The Electro-Deposition of Cadmium and its Alloys.

Some Notes on the Processes Employed and the Results obtained.

By E. W. LEWIS.

Metals are now deposited by electrolytic processes on a commercial scale, large quantities of metals being produced for the various industries. Electrolytic deposition processes are also employed for covering the more easily corroded metals with films of metals which offer greater resistance to atmospheric conditions and are of a more permanent character, suffering much less oxidation. Some of these processes have found extensive commercial application, cadmium electrolytic deposits being used as the outer resistant film, as it offers protection to iron and steel surfaces, the properties of the cadmium film being intermediate between the metals zinc and nickel. The high resistance of cadmium to chemical action, compared with zinc, renders it suitable where zinc fails or is unsatisfactory; wire and wire ropes are cadmium-coated for resisting sea-water activity and corrosion, also for coating battery terminals and connections for primary and secondary batteries. The field of the electrolytic deposition of cadmium shows promise of considerable expansion.

The electrolytic deposition of the metals follows Faraday's laws of chemical equivalents, the ampere-hour being associated with the electrolytic deposition of a definite maximum amount of metal, which is only realised under the optimum conditions. With an insoluble anode a definite minimum e.m.f. is required to maintain electrolysis. In the case of the electrolytic deposition of cadmium, it has been found that the best results are obtained when the amount of metal deposited per ampere-hour approaches the theoretical, the deposit being white, firmly adherent, finely crystalline, and withstanding burnishing. When the amount of metal falls much below the theoretical, hydrogen gas becomes occluded, and forms crevices in the deposit, leading to a loose and often powdery film and rendering the product unsuitable for commercial purposes. Defective deposition may also be due to excessive current, or to simultaneously deposited hydrogen due to a weak electrolyte or to the deposition of basic cadmium compounds. With an efficient anode solution and a good conducting electrolyte, a p.d. of about 0.4 to 0.6 volt, will maintain a fair rate of cadmium deposition. The electrolytic deposition of cadmium is readily carried out under the same conditions as in the case of zinc. The *Chemical Trade Journal*, August 1st, 1924, states that Borcher found that current densities of 80 to 100 amperes per square metre yielded a good and useful deposit of cadmium. In America, cadmium plating is now being introduced under the patent name "Udylite," and it is found to protect iron and steel against sea-water or atmospheric corrosion in a far superior manner to hot or cold galvanising.

Electrolytically deposited cadmium forms a highly efficient protective covering for aluminium, the difficulties due to the porosity of the commercial aluminium metal having now been overcome by the application of sand-blasting. The aluminium surface is initially sand-blasted, coated with a thin film of iron, again sand-blasted, and then placed in the cadmium bath consisting of either cadmium sulphate and potassium cyanide or cadmium ammonium sulphate and a small percentage of peptone; electrolysis is carried out at 25 deg. C., using cadmium cast anodes, and a current density of 5 to 7 amperes per square foot. The "burning" of cadmium deposits is considerably lessened by the presence of substances in the electrolyte, which exert a solvent action on the basic compounds of cadmium; colloidal substances such as glue or gelatine are highly effective in this respect. Cadmium deposits take well on all metals, no "strike" solutions or intermediate coats being essential; they are superior to those of zinc for many purposes, due to the cadmium being more resistant to chemical action than zinc. Cadmium-plated aluminium has been subjected to the very severe "salt spray" and "water line" tests, with highly satisfactory results; perhaps the only derogatory feature acting against cadmium-coated aluminium is its increased weight. Cadmium-coated steel is becoming of first-rate importance; it gives a hard and pleasing surface, the final heat treatment causing the two metals to form an alloy on the surface. In commercial cadmium electroplating, close adhesion and compactness are of prime importance in order to obtain an article of good finish and receptive of a high polish.

Physical Properties of Cadmium and Cadmium Deposits.

Atomic radius	1.6 angstroms
Atomic volume	12.9
Coefficient of expansion ...	.0000306 at 0—100 deg. C.
Melting point	320 deg. C.
Specific resistance	6.2 to 7.0 microhm per cm. at 0 deg. C.
Specific heat	.05669
Temperature coefficient of resistance	424 at 0—100 deg. C.
Tensile strength	13,660 lb. per sq. inch
Elongation	44 per cent.
Thermal conductivity ...	0.22 gramme-calorie per cu. metre per degree per sec.
Electrochemical equivalent...	2.0955 grms. per amp. hr.
Boiling point	778 deg. C.

Electro-deposited cadmium takes a high polish and is highly resistant to tarnishing when exposed to atmospheric conditions. The colour of electro-deposited cadmium approaches that of silver, but it retains its polish without tarnishing longer than silver or silver alloys. It is superior to tin as a rust-proof agent for iron and steel.

Electro-deposition of Cadmium from Cyanide Solutions.

The electrolyte used for commercial cadmium deposition usually consists of a complex solution of cadmium carbonate in a potassium cyanide solution. The cadmium content may vary from 8 to 40 grammes per litre, with an excess of 5 per cent. of potassium cyanide. The anodes generally consist of pure cadmium, operated at an e.m.f. of 3 volts, and the solution is maintained at a temperature of 35 deg. C. Blaset (*Metal Industry*, January, 1912, p. 13) maintains that freshly precipitated cadmium carbonate should be used, as it gives better results; it is prepared by precipitating the cadmium sulphate with sodium carbonate and washing out the sodium sulphate by decantation, the cadmium carbonate being insoluble. The following quantities are suggested:—

Cadmium sulphate, 2 oz.
Potassium cyanide, 5 oz.
Water, 1 gallon.

All the metal is derived from the anode, which consists of pure cadmium sticks suspended in the electrolyte. The cyanide should be occasionally replenished by the addition of small quantities of cyanide solution. The electrolysis may be conducted in the cold at about 2 volts.

The Udylite Co., U.S.A., has recently patented a process for the cadmium electro-coating of steel and iron articles, edged tools, piano wires, and clock and watch springs, rendering them rust proof. According to the details given in the patent specification, the cadmium is electroplated on to the articles, which are then heat-treated and polished, an iron-cadmium alloy being produced on the surface. The bath used contains a 2.5 per

cent. solution of cadmium, prepared by dissolving the cadmium sulphate in water, just precipitating with caustic soda and re-dissolving in potassium cyanide solution, avoiding excess. The anode is pure cadmium, and a current density of 7 amperes per square foot is used. After deposition, the plated article is immersed in lime and heated at 250 deg. C. for four hours, a treatment which hardens the surface by forming a cadmium alloy, giving a highly desirable and superior surface.

Electro-deposition from Other Solutions.

Mathers and Marble (*Trans.*, Amer. Elect. Chem. Soc., 1914, Vol. 25, p. 297) claim that the properties which are peculiar to cyanide solutions of being able to give smooth cadmium deposits are due to the partial decomposition of the cyanide during electrolysis, forming colloidal substances which function as "additive" agents preventing the formation of rough crystalline deposits. The *rôle* of these "additive" agents has been but little studied, but they appear to play a very important part in electrolytic deposition processes.

Plating with solutions of cadmium other than in cyanides requires the addition of colloidal substances in order to produce a good deposit. The following solution has been found to give tolerable results in cadmium coating: 4 per cent. cadmium sulphate in 4 per cent. fluosilicic acid and 0.1 per cent. peptone at a current density of 3.6 amperes per square foot. Another electrolyte is 4 per cent. cadmium perchlorate in 7 per cent. perchloric acid, with 0.1 per cent. peptone; it gives a bright smooth deposit. Fluoborates or fluorides may also be used, substituting for peptone glue or clove oil.

Cowper-Coles (J.S.C.I., 1904, p. 446) states that cadmium-silver alloys have been deposited on a commercial scale, an alloy containing a small percentage of silver having been employed for coating the bright steel parts of machines, whilst domestic articles have been plated with a cadmium alloy containing 7.5 per cent. silver. Such alloys have been found to withstand tarnishing much better than pure silver or standard silver containing 7.5 per cent. of copper. Very careful adjustment of the concentration of the solutions and the current densities seems to be necessary in order to obtain a definite composition of the electro-deposited alloys, and, moreover, if the bath is to be maintained for any length of time in working condition, the anode must be of the same composition as the deposit required. Any change in composition of the deposit during electrolysis is immediately reflected in its colour and general appearance, both properties being excellent guides to the skilled and experienced operator. Budgen maintains that for every composition of the electrolyte, there is a definite current density to be used so as to produce a good and regular deposit. The ratio of the cadmium and silver in solution is dependent on the density of the solution, different proportions of the two metals being necessary if the solution is very dense. It is, however, desirable to use a strong solution, because a greater current density can be employed, and consequently the alloy can be deposited more quickly. The stirring of the solution permits the use of still higher current densities, but the proportion of the metal must be adjusted accordingly.

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Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Correction.—We regret that owing to an error in the preparation of the advertisement of the Qualitas Electric Co., Ltd., appearing on Supplement 19, the address of the company is incorrectly given. For Dashwood House, please read Fulwood House.

Anglo-German Trade.—A conference to discuss questions as to the interpretation and effect of certain provisions of the Anglo-German Treaty of Commerce and Navigation was commenced at the offices of the Board of Trade on November 9th.

Increasing the Lighting Load.—The Ohio Public Service Co. has by an intensive "home-lighting" campaign increased its annual revenue per customer by 20.6 per cent. According to the *Electrical World*, it was found that the average wattage used for lighting in consumers' kitchens was 50. It was calculated that a 150-W lamp in a suitable fitting was necessary to give adequate, glareless illumination. Assuming that the lamp in the kitchen was "on" for 1,000 hours—a conservative figure—it appeared that there was scope for the sale of an average of 100 kWh more to consumers. On this basis the increase in the net revenue was calculated at $7 per customer annually. By an intensive "drive," an enormous number of kitchen-lighting units were sold—over 14,000. The company next turned its attention to outlets and table lamps, and then to the improvement of the lighting in various rooms. In these directions more than 10,000 improved lighting fixtures were disposed of, most of which required larger lamps than had been previously used. Finally, the company conducted a "re-lamping" campaign, inducing the customers to fill all empty sockets and replace lamps of inadequate wattage. This, in four months, resulted in the sale of the equivalent of 2,000 kW of lamps.

The British Industries Fair.—Visitors to the British Industries Fair next February will again have the privilege of travelling to and from London or Birmingham at the cost of the single fare and one-third. The concession is the more valuable as there are none of the usual restrictions as to trains or time.

It is reported that the Air Ministry has purchased the buildings and 179 acres of land at Castle Bromwich (where the Fair is held) for £60,000. The place is to be used as an aerodrome—its original purpose.

The Fair authorities state that a large number of applications for space in the London section have been received from radio apparatus manufacturers, and it is hoped to have a very representative display of this equipment. It is further stated that the Fair has the wholehearted support of the National Association of Radio Manufacturers and Traders.

British Empire Exhibition.—The decision to voluntarily wind up the British Empire Exhibition was confirmed at a meeting of the Association held last week, and Mr. J. H. Thomas, Sir J. A. Cooper, and Sir A. E. Whinney, were appointed joint liquidators.

Unemployment Insurance Inquiry.—The Minister of Labour has appointed a committee "to consider, in the light of experience gained in the working of the Unemployment Insurance scheme, what changes in the scheme, if any, ought to be made." The following are the members of the Committee:—Lord Blanesburgh, G.B.E. (chairman), Sir Hugo Hirst, Bart. (chairman and managing director of the General Electric Co., Ltd.), Sir Glynn Hamilton West (chairman of Sir W. G. Armstrong, Whitworth & Co., Ltd.), Miss Margaret Bondfield, Sir James Curtis, K.B.E., Prof. Carless Davis, C.B.E., Mr. J. Hamilton, Mr. Frank Hodges, Mr. A. Holmes, Mr. Laurence Holt, Sir James Lithgow, Bart., Sir William McLintock, K.B.E., and Viscountess Milner. The secretary is Mr. J. A. Dale, of the Ministry of Labour, Queen Anne's Chambers, Broadway, S.W.1

Chinese Notes.—A number of cotton-ginning firms in Hanyang intend to install electrical machinery when the Hanyang electrical plant, now in course of erection, is completed.

The Yen Ming Electric Light Co. is being formed at Kutang, Kiangsu province, with a capital of $10,000.

Radio Traders' Associations.—The Bombay Presidency Radio Traders' Association is the name of a new body lately formed in India to protect the interest of the trade as well as to foster an interest amongst the public for radio by co-operating in making the broadcast programmes more interesting and also by conducting suitable propaganda. Increasing business is being done in wireless apparatus throughout Australia. The New South Wales Electrical Employers' Federation (radio section) which has almost every trader on its membership list, is appointing a high-salaried publicity manager, who is being given full authority to establish offices, and an efficient staff at an early date. His mission will be to "boost" broadcasting among the public, to supply daily and country papers with news on wireless subjects, and to benefit the radio trade in general. By an amendment to the Post and Telegraph Act which recently came into operation in New Zealand, dealers in radio equipment are required to take out a licence with the Minister of Telegraphs and to keep a full record of all sales and the names and addresses of purchasers. Power is given to revoke licences and the penalty for a breach of the provision is a sum not exceeding £50.

The E.L.M.A. Bureau at Glasgow.—At the Scottish Electric Lighting Service Bureau, Glasgow, on November 12th, Mr. H. E. Hughes, district engineer, gave an interesting demonstration and lecture to ladies. He pointed out that it was in Glasgow that Lord Kelvin lighted the first house with electricity, but said that Britain was now strangely far behind America and the Continent in the use of electrical appliances. The difficulty was to make people use light correctly. Examples were given of correct lighting installations for shops and the home.

Lead.—Reporting on November 14th, Messrs. James Forster & Co. stated:—"The present high price of lead, in our opinion, is entirely due to the support afforded to this market by the American position and, should conditions become easier again in that country, it would be quickly reflected in a lower price here." The Board of Trade returns for October were:—Imports, 25,758 tons; exports, 2,676 tons; leaving for home consumption, 23,082 tons.

Trade Announcements.—Mr. A. B. Blakey, A.M.I.E.E., electrical engineer and manufacturers' agent, informs us that his telephone number is "Midland (Birmingham) 3737."

Messrs. P. Adair, Ltd., of London, have opened a branch office and stores at 30A, Change Alley, Sheffield, in charge of Mr. A. Walkington, of Nottingham. Stocks of lamps, cables, &c., are carried. Telephone number: "5151 Central."

Messrs. Heughan & Gilmour, electrical and mechanical engineers, 79, Grant Road, Wellington, N.Z., require agencies for manufacturers of high-class electrical goods. They ask f r catalogues and shipping particulars.

The registered office of the British Aluminium Co., Ltd., is now: Adelaide House, King William Street, London, E.C.4.

Messrs. Robinson & Hands Electrical Co., Ltd., of Birmingham, have opened an office and stores at Station Road, Taunton, Somerset, for trade in the West of England. Supplies are available for electrical contractors and radio dealers. Telephone No.: "495 Taunton."

Messrs. May & Padmore, Ltd., have appointed Messrs. Markes, Ward & Co., Ltd., 30, High Street, Islington, N.1, as their sole electrical agents in London and district for "Maymore" electric fires and heating apparatus, &c., of which they are holding a stock.

Messrs. Electrical Devices, Ltd., have opened new offices, stores and showrooms for extension purposes at Powdene House, Pudding Chare, Newcastle-on-Tyne.

The London Electric Stores, Ltd., has moved to 9, St. Martin's Street, Leicester Square, London, W.C.2. Telephone No.: "Regent 7545."

Catalogues and Lists.—The Midland Accumulator Co., Ltd., 47, Newhall Hill Parade, Birmingham.—A leaflet containing descriptions and prices of high-pressure accumulator batteries for radio work.

Automatic & Electric Furnaces, Ltd., 173-175, Farringdon Road, E.C.1.—Catalogue Section C, describing the company's electrically-heated carburising furnaces. Illustrated.

Messrs. Smith & Ansell, Stockfield Works, Acocks Green, Birmingham.—A priced pamphlet illustrating electric lamps of classic design for suspension from a ceiling.

Messrs. F. A. Wilkinson & Partners, Ltd., Gretton, nr. Kettering.—A priced and illustrated leaflet describing automatic high-speed wind dynamos for battery charging.

Messrs. L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, W.C.2.—A well-illustrated catalogue of ornate domestic electrical appliances.

The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, W.1.—A coloured poster effectively advertising "Mellovox" loud speakers, and a coloured showcard advertising the company's "Ideal" and "Ideal Junior" radio transformers.

Messrs. R. A. Lister & Co., Ltd., Dursley, Glos.—An illustrated catalogue and price list of the company's electric lighting and power sets.

Messrs. Sydney Jones & Co. (London), Ltd., 28, Endell Street, W.C.2.—A trade price list of radio accessories and components.

Fuller's United Electric Works, Ltd., Woodland Works, Chadwell Heath, Essex.—An illustrated booklet dealing with "Sparta" loud speakers, anode supply filters, resistance-capacity and reaction couplings, &c. Priced.

The Wholesale Fittings Co., Ltd., 23-27, Commercial Street, E.1.—An illustrated and priced catalogue of "Supastone" lighting glassware, together with a supplementary list.

Tungsram Electric Lamp Works (Great Britain), Ltd., 72, Oxford Street, W.1.—An illustrated folder containing details and prices of the company's vacuum and gasfilled lamps.

Runbaken Magneto Co., 270, Deansgate, Manchester.—A "repairs and spares" price sheet, containing particulars of dynamos, parts, &c., for many makes of automobiles.

The Albert & J. M. Anderson Mfg. Co., 12, Moor Lane, E.C.2.—A leaflet describing self-aligning racks for power and telephone cables.

W. T. Henley's Telegraph Works Co., Ltd., 11, Holborn Viaduct, E.C.1.—Pamphlet "W.B.A.," advertising "Henley" link disconnecting boxes with teak frames. The prices of frames are given.

Higgs Motors, Witton, Birmingham.—November stock list of d.c. motors and dynamos and a.c. motors.

Caxton Name Plate Manufacturing Co., 11, 13, and 15, Rochester Row, S.W.1.—Pamphlets dealing with the firm's name plates and interchangeable stencils.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—November stock list of a.c. motors, and d.c. motors and dynamos.

Messrs. J. H. Taylor & Co., Macaulay Street, Huddersfield.—A comprehensive price list of radio apparatus of all makes.

Siemens & English Electric Co., Ltd., 39, Upper Thames Street, E.C.4.—November price sheet of electrical materials, appliances, and accessories.

Mr. Alan Wright, Sentinel House, Southampton Row, W.C.1.—A folder containing illustrations, details and prices of "Inventum" electric fires with plug-in elements.

Messrs. Newton & Wright, Ltd., 471-3, Hornsey Road, N.19.—A series of illustrated leaflets dealing with apparatus for ultra-violet therapy, and diathermy and X-ray equipment. Priced.

The Mullard Wireless Service Co., Ltd., Nightingale Lane, Balham, S.W.12.—A window poster in subdued colours advertising the "Mullard" radio valve.

Bankruptcy Proceedings.—W. G. Conway (Listron), wireless component dealer, 88-90, Chancery Lane, W.C.—Receiving order made November 9th on creditor's petition. First meeting November 26th. Public examination January 27th, both at Carey Street, W.C.

S. Purcell, The Arcade, Goole, Yorks., electrical contractor.—The public examination of this debtor was held recently at the Court House, Wakefield. The statement of affairs showed liabilities of £185, and there was a deficiency of £63. Debtor attributed his failure to bad trade and keen competition. The examination was closed.

W. A. A. C. Robinson (W. A. C. Robinson), electrical engineer, 10, Carnaby Street, Golden Square, W.—Application for discharge to be heard November 24th at Carey Street, W.C.

Griffiths & Hughes, electricians, Whitcombe Street, Aberdare.—Receiving order made November 6th on creditor's petition.

V. Reed, electrical engineer, 10, Chapel Road, Eastville, Bristol.—First meeting November 18th at the Official Receiver's offices, 26, Baldwin Street, Bristol. Public examination November 27th at the Guildhall, Bristol.

G. F. Neal, electrical engineer, 5, Smallgate, Beccles.—Trustee, Mr. H. P. Gould, Official Receiver, 8, Upper King Street, Norwich, released November 9th.

J. Wilson, electrical engineer, late of 70, Ebrington Street, Plymouth.—First meeting November 19th at 11, St. Aubyn Street, Devonport. Public examination December 18th at the Western Law Courts, Guildhall, Plymouth.

J. R. Charnock, cycle dealer and electrical engineer, late of 6, Stonegate Road, Leeds.—Re-opening of public examination November 24th at the Court House, Leeds.

C. F. Lindop (C. F. Lindop & Co.), electrician, late of 62, Dale Street, Liverpool, now of 135, Lark Hill Lane, Liverpool.—Bankrupt's discharge granted subject to consenting to judgment being entered against him by the Official Receiver, trustee, for the sum of £25.

G. A. Morley (A. Whale & Co.), electrician and wireless engineer, 201, Powis Street, Woolwich.—Trustee, Mr. T. Gourlay, Official Receiver, 29, Russell Square, W.C., released November 2nd.

L. Priday, plumber and electrician, 20-22, Somers Road, Southsea, Hants.—Trustee, Mr. C. Hoult, Official Receiver, 87, High Street, Portsmouth, released November 2nd.

M. Breingan, electrical manufacturers' agent, 57, Robertson Street, Glasgow.—Meeting of creditors November 23rd at the Faculty Hall, St. George's Place, Glasgow. Agent, Mr. A. E. Paterson, 180, Hope Street, Glasgow.

S. H. Bardwell, trading as Bennett, Bardwell & Co., 22, Church Street, Basingstoke, electrical engineer.—The public examination was held at the Winchester Bankruptcy Court on November 10th. The statement of affairs showed ranking liabilities of £616 and net assets valued at £266, leaving a deficiency of £350. Debtor attributed his failure to competition in business and heavy private expenses. The examination was concluded.

Company Liquidations.—A. C. Alexandra & Co., Ltd.—Mr. G. D. Pepys, Official Receiver, in a report shows that the total deficiency as regards creditors and contributories was £17,888. Mr. A. C. Alexandra offered a sum of £4,000 for the goodwill (if any) of the company, to procure the annulment of bankruptcy proceedings, and in settlement of all claims against him in the bankruptcy and liquidations, but Mr. Pepys states that only £600 has been received and this amount (of which a part is claimed by his trustee in bankruptcy) will be insufficient to pay the preferential creditors in full.

Middleton Electric Traction Co., Ltd.—Particulars of claims to the liquidators, Mr. T. Bower and Mr. T. H. Underhill, 88, Kingsway, W.C., by December 31st.

Diamond Wireless, Ltd.—A meeting of members is called for December 14th, at 442, Strand, W.C., to hear an account of the winding up from the liquidator, Mr. A. Hart.

Deed of Assignment.—P. R. Andrews, electrician, Town Green, Wymondham.—Particulars of claims were to be sent to the trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., by November 19th.

Dissolution of Partnership.—A. M. Young & Co., manufacturers of radio components and accessories and capstan press products, 52, Bordesley Street, Birmingham.—Mr. J. R. Whitehill and Mr. H. D. Kirk have dissolved partnership. Debts will be attended to by Mr. Kirk, who will continue the business under the same style.

Private Arrangements.—R. L. Johnson, electrician, 239, Rake Lane, Wallasey.—A meeting of creditors was held recently at Liverpool. A statement of affairs was submitted which disclosed liabilities of £405. The assets totalled £95, leaving a deficiency of £310. It was reported that the debtor commenced business at Seacombe about two years ago, with £40 capital. No books of account had been kept, with the exception of a day book, but it appeared that the turnover had been between £650 and £700 for the period. The debtor attributed his position to lack of capital and heavy expenses. It was decided that the deed of assignment already executed in favour of Mr. Parkin S. Booth should be confirmed. A committee of inspection was also appointed, consisting of a representative of the General Electric Co., Ltd., and Mr. John Airey. The following are creditors:—

	£		£
Electric Components Co., Ltd. ...	60	General Electric Co., Ltd. ...	210
Eaton, S., & Sons	30	Welsbach Light Co.	35
Electrolier Co.	25		

Peter Curtis, Ltd., 75a, Camden Road, N.W., manufacturing electrical and radio engineers.—A meeting of creditors was held on November 16th, when a statement was presented showing a deficiency. An offer of 4s. in the £ was made and accepted. Further details will appear in our next issue.

Book Notices.—"Molesworth's Pocket Book of Engineering Formulæ," 29th Edition. London: E. & F. N. Spon, Ltd. Price 6s.—This revised and enlarged edition contains a wealth of information concerning almost every branch of engineering. Commencing with many useful mathematical and mensuration tables, including the many conversion tables which are required at the least expected moments, it proceeds through data of every description, physical, chemical, &c., to the advanced calculus of engineering, civil, mechanical and electrical. Numerous tables of squares, cubes, powers and roots, reciprocals and logarithms, and also specially prepared tables for assistance in ascertaining the circumferences and areas of circles, &c., are included. The steam and hydraulic formulæ are another feature. In the electrical portion a brief explanation is given of most of the electrical terms. Of particular help to the electrical engineer should be the general information and tables concerning conductors and transmission lines and cables. Useful extracts from the I.E.E. regulations will no doubt prove a valuable addition. Several connection diagrams are also given. The contents are fully indexed.

"*Journal* and Record of Transactions of the Junior Institution of Engineers." Vol. XXXVI. Part II. November, 1925. Price, 2s.

"Memoirs of the College of Science, Kyoto Imperial University."—Series A, Vol. VIII, Nos. 5 and 6. August, 1925. Series A, Vol. IX, No. 1, July, 1925; No. 2, August, 1925.

"Transformers for Single and Multiphase Currents," by G. Kapp, revised by R. O. Kapp.—Third Edition. Pp. xi + 391; figs. 229. London: Sir Isaac Pitman & Sons, Ltd. Price, 15s. net.

"Scientific Papers of the U.S.A. Bureau of Standards."—Vol. 20, No. 512; 10 cents.

"Technologic Papers of the U.S.A. Bureau of Standards."—Vol. XIX, Nos. 291 and 293, 25 cents each; No. 294, 10 cents.

"Miscellaneous Publications of the U.S.A. Bureau of Standards."—No. 64, 15 cents.

German Activity in India.—The Berlin correspondent of the Exchange Telegraph Co. states that, following the example of the Siemens concern, the A.E.G. has established a branch in India at Bombay under the name Havero Trading Co. (A.E.G. Department). The Bergmann Electro-Works Co. also proposes to establish an Indian branch.—*Financial News.*

New Swiss Company.—A new company has lately been formed in Berne (22, Spitalgasse) under the style of the Gesellschaft für Radiotechnik, to manufacture radio apparatus.

Transport Cost Reduction.—In the course of a paper which he read recently before a meeting of the Wholesale Produce Merchants' Association, Mr. C. Holmes Waghorn, general manager of Walker Vehicles, Ltd., stated that most wholesale distributors of produce spent from 2 to 5 per cent. of their turnover on transport and delivery charges. It was therefore a sound principle to discover what means of carriage was best suited to each class of distribution. Nine-tenths of the tonnage in produce road-haulage in this country was intensive, *i.e.*, was borne on routes 20 or 30 miles in length with frequent stops. This demanded road vehicles of the largest possible carrying capacity commensurate with the smallest street encumbrance, and the highest possible manœuvring and convenience factors. In the author's opinion the latest developments of the electric vehicle afforded a solution. Although the maintenance of the petrol vehicle was a considerable item, in its own sphere—over distances of between 30 and 60 miles—the petrol lorry was irreplaceable. The economic field of the steam vehicle was now generally understood to be confined to loads of over 10 tons on journeys not requiring long loading or delivery stops or encountering excessive traffic density. The use of horses was on the wane, although for very frequent stops the horse was worth its keep. Only one form of vehicle really met the requirements of intensive transport—the electric vehicle. The author then briefly outlined the virtues of the battery vehicle, mentioning its reliability, ease of control, cleanliness, economy, &c. With modern types of accumulators little trouble was experienced and numerous charging facilities were available. As a proof that the electric vehicle was satisfactory in service Mr. Waghorn quoted the names of firms which employed it extensively.

Turbine Construction in Norway.—Some time ago great indignation was caused in Norway on account of the Government authorities having placed orders with a German firm for turbines for the State hydro-electric works at the Nore, because the German prices were considerably lower than those quoted by Norwegian engineering works. Now that two further turbines are required for the same power station the directors of the Water Power Department have unanimously resolved to recommend the acceptance of Norwegian tenders for the execution of the work, and this proposal has been adopted by the State Labour Department, which has decided that the turbines shall be made by the A.S. Kvaerner Bruk and the A.S. Myrens Verksted as joint contractors.

The French Electrical Market.—The United States Commercial Attaché in Paris, in the course of a recent report, stated that the demand in France for electrical equipment continued strong, with factories receiving a good volume of orders. Prices of electrical apparatus had, however, risen, and the same was the case with industrial machinery.

Russian Foreign Orders.—*Reuter's* representative recently interviewed M. Frumkin, Soviet Assistant Commissary for Foreign Trade, who during the past month has been visiting Berlin, Paris and London, with a view to inspecting the activities of Russian Trade Organisations in those cities and ascertaining the conditions for placing orders, chiefly for machinery, in this country and elsewhere. M. Frumkin said that orders would shortly be placed abroad for machinery for, *inter alia*, the oil, coal-mining, metallurgical, engineering, electrical, timber, paper-making, and chemical industries. The general impression he had gathered was that of the three countries France could offer very favourable conditions on account of her depreciated currency, and machinery could be got there very cheaply. "Germany," said M. Frumkin, "gives us much more favourable terms than Great Britain and, from a technical point of view, is very highly developed. It is, however, in my opinion of great importance that we should have our machinery from Great Britain and we are very keen on getting old British machinery replaced by new. . . . The whole amount at present in view to be spent in Great Britain is about £15,000,000, and for this and other orders we only want the same credit conditions as apply to other countries, such as France, Italy, Germany, Czecho-Slovakia, &c." M. Frumkin referred to the fact that the whole trade turnover with Great Britain had been raised from £15,000,000 in 1922 to £49,000,000 in the present financial year, and it was hoped that, owing to a good harvest and the general economic progress, this trade in the following year would be increased by about 80 per cent.

New French Company.—A new company has lately been formed in Paris (54, Rue de la Boetie) with a capital of 150,000 fr. and the title La Société de l'Energie Hydro-Electrique du Lot, to establish plant to utilise the water power of the River Lot.

American Co-operation in Building European Power Stations.—It is reported from New York that bankers and industrialists in the United States intend to form a syndicate with a capital of $26,000,000 under the title of the American Utilities Corporation, with the object of co-operating with European interests in the realisation of schemes for the establishment of power stations which have been brought forward in Poland, Czecho-Slovakia, and Roumania.

Keeping in Touch.—In the United States sellers of electrical appliances are realising more and more that an article is not finished with when it is sold. If it goes wrong the customer will most certainly return, but if it continues to give good service, which is generally the case, the sale can still be a link between the seller and the buyer. *Electrical Merchandising* quotes a case in this connection. The Nashville (Tennessee) Railway & Light Co. makes it a part of its selling policy to keep an eye on all electric cookers which it sells. Periodically a letter is sent out to the buyers of these appliances asking a number of questions about the customer's experience with her range. It is asked if any trouble has been experienced, whether the company's service has been found satisfactory, how the cooking compares with that done by other means, &c. The final question is: "Can you recommend the range to your friends?" The company finds that over 80 per cent. of these letters are answered in full, and, upon the average, two and a half new "prospects" are discovered with each answer. This is quite apart from the number of other appliances which are sold to satisfied owners of cookers.

The Committee on Industry and Trade.—It was announced last week that the period allotted by this Committee to the hearing of evidence from trade organisations and other bodies and individuals is drawing to a close. The prefatory memorandum which accompanied the Committee's recent "Survey of Overseas Markets" is being published by the Stationery Office in pamphlet form.

Copper, Lead, and Rubber Prices.—Messrs. F. Smith and Co. report, November 17th: Copper (electrolytic) bars, £68 15s., 10s. inc.; ditto, ditto sheets, no change; ditto, ditto wire rods, £77 10s., 5s. inc.; ditto, ditto h.c. wire, 10d., 1/16d. inc.

Messrs. James & Shakespeare report, November 17th: No change in the prices of copper bars (best selected), sheet and rod; English pig lead, £38, 15s. dec.

Messrs. Ed. Till & Co. report, November 17th: India-rubber, Para fine, 3s. 10d., ½d. inc.

One Way to Help Export Trade.—The employés of James Pender & Co., Ltd., a subsidiary of the British Empire Steel Corporation, manufacturing nails and wire, in St. John, N.B., have presented the management with a resolution, expressing their willingness to work overtime without pay, in order to permit the company to compete with foreign manufacturers in export markets. Mr. W. F. Knoll, manager of the company, said that a few weeks ago, word came to him that European firms were underbidding Canadian prices to a great extent on account of the low rates of exchange in some of the export fields, and that difficulty was experienced in marketing the products from this country. The matter was discussed at one of the council meetings between the management and employés of the Pender Company, and a suggestion made that if the cost of production were cut sufficiently by free overtime work, the local firm might be able to compete with the foreign manufacturers. The men asked for a few days to consider the proposition, and returned with the announcement that they were prepared to try the experiment, in order to hold the market for the company, and thus keep the wheels turning in the regular hours of work. The provision is made that should any profit accrue from the export business under this arrangement, it will be shared between the company and the employés on a 75-25 per cent. basis, the big end of the division going to the men. It is planned that for a start the men will put in three extra hours every other evening.—*Journal* of the British Empire Chamber of Commerce in the U.S.A.

The "Canning" Trade Mark.—MESSRS. W. CANNING AND CO., LTD., of Birmingham, have been successful in obtaining registration of the name "Canning" as a trade-mark relating to electro-plating, polishing and lacquering machinery, including the necessary equipment and materials. Some of our readers may be unaware that the House of Canning has been established 140 years. In future the name "Canning" will apply solely to goods manufactured by the company.

The Rating of Machinery.—The Government's new Rating and Valuation Bill, which contains provisions respecting the exemption of machinery from rating, which has been contended for by the Machinery Users' Association for many years, stands committed to the consideration stage and third reading in the House of Commons early in the Session which opened on Monday last.

Wages in the Australian Electrical Industry.—From statistics relating to the wages paid to Australian electrical workers during 1924, reproduced in the *Australasian Electrical Times*, it appears that the wages paid to armature winders, instrument makers, cable jointers and fitters, the highest-paid grades, ranged from £5 3s. per week in Perth to £5 15s. in Sydney. The wages of other grades ranged, in general, from £4 17s. in Perth to £5 7s. in Sydney.

For Sale.—Mr. H. J. Shaw will sell by auction on December 1st at 85, Newington Causeway, S.E., a quantity of wireless and electrical goods, &c. Fuller, Horsey, Sons & Cassell will sell by auction on December 2nd, at Church Wharf, Chiswick, electric motors, circuit breakers, and switchgear. (See our advertisement pages to-day.)

American Industrial Activity.—The *Electrical World* states that all authorities agree that the trend of United States business during September was very satisfactory and that the volume of trade this autumn will be perhaps the largest that the country has ever experienced. Several of the primary industries, however, which exert a large influence upon the operations of the electrical industry are still operating below normal. In September the iron and steel industry was operating at 15.2 per cent. and the textile industry at 2.3 per cent. below normal, but practically all primary industries reported increased operations over August. During September the electrical industry as a whole was operating at 4.1 per cent. below the estimated normal for the month. In August it was operating at 5.6 per cent. (revised), and in July at 4.5 per cent. below normal. Incomplete returns indicate that the electric light and power branch of the industry continued the upward swing which started in June and was operating at 2.8 per cent. above normal during September.

The Czecho-Slovakian Electrical Market.—A recent issue of *Commerce Reports* contained a review of the possibilities for the sale of domestic electrical appliances in Czecho-Slovakia. At the outset it is stated that gas is in the ascendancy owing to its cheapness as compared with electricity. Fans, owing to the mild climate, are not extensively used, but such as are found are of German or Italian make. Vacuum cleaners are gradually finding a market in the country; Swedish makes predominate, although German, English, and American patterns are also used. The only article of laundry equipment which sells well is the flat-iron; it is not thought that the market for washing machines is likely to develop. Electric cookers are not used, as the high price of energy prohibits them, but small cooking equipment, such as toasters, percolators, and kettles, are in fair demand; most of these appliances are German. "Headlight" (bowl) heaters are used quite extensively for incidental heating; the most popular appliances of this type are home products, but German heaters are imported. It is believed that the country presents a good potential market for electro-therapeutic appliances. Prague dealers usually buy direct from the foreign manufacturers, but sometimes they obtain goods from European general distributors. The importation of domestic electrical appliances is subject to import permits issued by the Ministry of Commerce; these, it is stated, are freely granted.

The Dunedin Exhibition.—The *Daily Mail* reports that the Dunedin Exhibition, which is one-third the size of Wembley, was opened on Tuesday last. Although an international display, it is almost purely British in character; the British Court provides a magnificent display.

Electricity in Tin Mining.—Speaking at the annual meeting of the Northern Nigeria (Bauchi) Tin Mines, Ltd., last week, the chairman (Mr. G. Temple Harris) said that the outstanding feature in the company's business during the past year was the completion of the Kwall Falls installation. This hydro-electric works was reported to be very successful and doing all that had been asked of it. Mr. A. R. Canning said that the institution of the Kwall Falls scheme opened up a new era for the company. An enormous amount of work had been put into the scheme since its conception nine or ten years ago. The chairman, in reply to a question, said that the production costs would be cheapened by means of the power now available.

The Parsons Plant at Chicago.—The 50,000-kW turbo-alternator and condensing plant for the Crawford Avenue power station of the Commonwealth Edison Co. of Chicago, which was manufactured in the works of Messrs. C. A. Parsons & Co., Ltd., at Heaton, Newcastle-on-Tyne, was shipped to Chicago in August, 1924. The erection was completed and the plant was ready for service on the day of the opening ceremony, May 26th, 1925. We understand that except for slight preliminary adjustments, which in a plant of this description and size are inevitable, the machine has run more or less continuously, carrying its full share of the load of the station. The pre-heaters for this machine have not yet been installed by the Commonwealth Edison Co., and so far no figures as to steam consumption are available.

Japanese Electrical Notes.—The electrification of the Imperial Steel Works, Mawata, Kyushu, is proceeding rapidly.

The Tenryugawa Electric Power Co. (capital 50 million yen) is to erect six power stations, with an aggregate capacity of 150,000 kW, on the Tenryu River. The work is expected to occupy seven years from next May.

The Keihan Electric Railway is doubling its power-station capacity by installing a 5,000-kW set, which has been ordered from a Japanese firm. Preliminary steps are being taken in connection with the erection of a 2,000-kW station by the Sendai municipality.

The Hamana Hydro-Electric Co. has been formed to erect a station to develop 10,000 kW from the Denoyu River, at a cost of 3½ million yen.

An application for permission to install an electric railway between Mishima and Hakone has been filed. A number of other electric railways are projected. One of the most important schemes is that of a group in Kyushu, which has a capital of 2 million yen.

Unemployment.—The total number of persons registered as unemployed on November 2nd was 1,207,700. This was a decrease of 24,696 on the week, and for the first time this year the figure was below that for the equivalent date of last year. During the following week there was a further decrease of 9,512.

Lighting and Power Notes.

Alston.—PROPOSED ELECTRICITY SCHEME.—A committee has been appointed to consider the question of obtaining an electricity supply for the town.

Ayrshire.—YEAR'S WORKING.—We have received from Mr. W. C. Bexon, engineer and general manager, a copy of his report, together with the statement of accounts, on the first year's working (year ended May 15th last) by the Ayrshire Electricity Board, of the Ayr and Kilmarnock electricity undertakings, formerly controlled by the Ayr and Kilmarnock Corporations respectively. The total revenue amounted to £168,968, and the working expenditure was £77,228, leaving a gross profit of £91,740, to which was added a balance from the previous year of £2,203, making a total of £93,990 available. This was disposed of as follows:—Capital and other charges, £88,598; transferred to appropriation account, £2,250; balance, being profit for the year, carried forward, £3,142. The capital expenditure during the year amounted to £148,879, the largest items being £88,598 for mains and £41,776 for machinery. The sales of electrical energy amounted to 25,780,564 kWh, and the average price obtained was 1.573*d*. per kWh. The maximum supply demanded was 12,500 kW. During the year two 50,000-lb. Babcock & Wilcox boilers were installed, and work was commenced on the installation of the second 12,500-kW turbo-alternator. Additional sub-stations were erected, and the number now in the area exceeds 100. Other work completed during the year included the interlinking of the power stations at Greenock, Paisley, and Kilmarnock.

Brandon and Byshottles (Co. Durham).—ELECTRICITY SUPPLY.—The Urban District Council has decided to support the Chamber of Trade in its endeavours to secure electricity for the lighting of private premises, and has also agreed that the surveyor shall obtain for submission to the next meeting of the Works Committee the scale of charges from Newcastle Electric Supply Co. for street lighting.

Bristol.—ELECTRICITY AGREEMENT.—The Electricity Committee has made a further agreement for a bulk supply of electricity to the North Somerset Electric Supply Co., Ltd., which involves the laying of mains and the construction of a sub-station at an estimated cost of £20,703.

ELECTRICITY SCHEME APPROVED.—The Electricity Committee's proposal to erect a new power station at Portishead, details of which were given in the ELECTRICAL REVIEW of October 23rd, p. 665, was passed by the City Council on November 9th. The Committee has already obtained provisional approval from the Electricity Commissioners to the scheme.

Burnley.—"ALL-ELECTRIC" HOUSES.—With a view to encouraging the use of electricity for domestic purposes, the Corporation is to erect four "all-electric" houses for demonstration purposes.

Cannock.—ELECTRICITY EXTENSION.—Mr. S. T. Allen, electrical engineer, has submitted a report to the Electricity and Omnibus Committee showing that the estimated cost of the proposed electricity extensions to Great Wyrley and Cheslyn Hay is £20,785.

Clayton (Yorks.).—ELECTRICITY SUPPLY.—At a recent meeting of the Urban District Council, a deputation reported having interviewed Bradford Corporation Electricity Committee with regard to the proposed supply of electricity to Clayton. The Corporation agreed to adhere to the charges and conditions laid down in an agreement formerly made between the two authorities, and stated that if there was no opposition to its application for an Order, a supply would probably be available within six months.

Continental.—FRANCE.—The Société de l'Energie Electrique de Rouergue, which owns a 6,000-kVA hydro-electric power station on the River Tarn, is preparing to establish a second plant of 32,000-kVA capacity to utilise the Pinet Falls on the same river.

BELGIUM.—According to the report for the year ended June 30th last, the Société d'Electricité de l'Ouest de Belgique, of Brussels, is now supplying electricity to 74 localities, while negotiations for supplying 24 other communal districts are in progress. During the year 168 miles of new h.p. and l.p. mains were laid, bringing the total up to 708 miles. Other work completed during the year includes the establishment of 50,000-V transmission lines between Renaix and Audenarde and between Swevelghem, Vive, and St. Bavon. The company's plant capacity is now 19,510 kW.

Darley Dale.—INQUIRY.—The opposition of the various local authorities and the residents of Darley Dale to the proposal of the Derbyshire and Nottinghamshire Electric Power Co., to erect overhead power cables from Matlock to Darley Dale was the subject of an inquiry on November 5th at Darley Dale by Sir W. F. Marwood. The company applied for wayleaves over property belonging to Mr. T. Wright and the Oaker Trust. The opposition contended that the cables would depreciate the value of that property and would ruin the beauties and amenities of the valley. Mr. A. D. Phillips, general manager of the company, said that the cable would be similar to those which were being erected in all parts of the country. To take the cable underground would cost an additional £1,750. The Ministry of Transport's decision will be announced in due course.

Glasgow.—PROGRESS DURING SEPTEMBER.—During September 107 houses were wired under the Corporation Electricity Department scheme, making the total to date 1,287 and 470 applications for the hire of fires, cookers, time switches and boilers were received, bringing the total to 7,903.

Gretna and Eastriggs.—ELECTRICITY SUPPLY.—The necessary capital (£4,000) has now been subscribed to enable a local company to take over the lighting of the townships of Gretna and Eastriggs from the Government.

Hastings.—LOANS.—The Electricity Committee is applying for sanction to loans of £7,000 for mains and £5,000 for meters.

ELECTRICITY EXTENSIONS.—The Committee is to extend the mains to supply electricity to Baldslow at a cost of £1,300, and to Grove Housing Estate at an estimated cost of £3,538.

Holbeach.—PROPOSED ELECTRICITY SUPPLY.—The Urban District Council has received a communication from the Boston and District Electric Co. inquiring whether the Council would entertain a proposal for a supply of electricity in bulk. The Council has decided to obtain further details of the proposal.

Iceland.—HYDRO-ELECTRIC DEVELOPMENT.—According to the *Board of Trade Journal*, during the last session the Icelandic Alting passed a law dealing with water power concessions. The law gives the right to private persons to exploit waterfalls within their own holdings of land provided that the power of the water-course does not exceed 500 h.p. The Government may grant concessions to Icelandic promoters for the exploitation of waterfalls where the power does not exceed 25,000 h.p. and where the district council in the area waives its right to make use of them. Concessions of 25,000 h.p. or more to foreign subjects and companies may only be granted by special Act of Parliament. Plants of less than 500 h.p. will pay no State charges. All others will pay to the State an annual sum, the minimum of which is 50 ore per h.p., and the maximum for the first twenty-five years 5 kroner per h.p. The Waterfalls Commission of 1917 estimated Iceland's water power at about 4 million h.p., of which practically none has been utilised.

Inverness.—PURCHASE OF UNDERTAKING.—At a meeting of the Town Council on November 9th it was decided to purchase the undertaking of the North of Scotland Electric Light and Power Co., Ltd., and to apply for a Special Order authorising the Council to supply electricity in its area.

King's Lynn.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer, Mr. C. W. Jackson) for the year ended March 31st last, shows a total revenue of £18,725, as compared with £16,625 in the preceding year. Working expenses amounted to £10,454, as against £8,580, leaving a gross profit of £8,271 (£8,046), to which was added a balance of £4,700 from the previous year, making a total of £12,971 available. This was distributed as follows: Contribution to capital expenditure, £4,057; interest and other charges, £5,291; balance carried forward, £3,623. The capital expenditure during the year amounted to £4,718, and the amount now spent on the undertaking stands at £107,381. The sales of electrical energy increased from 1,056,799 to 1,504,665 kWh, and the average price obtained fell from 3.70d. to 2.89d. The maximum supply demanded rose from 873 to 1,102 kW.

New Zealand.—AUCKLAND.—Preparations will shortly be made by the Auckland Electric Power Board to take electricity from the Arapuni hydro-electric power scheme. Under the agreement with the Government the board will take power by April 1st, 1928, and its officers have prepared a report on the works necessary on the change over from steam-generated power. The scheme most favoured provides for current being transmitted at 22,000 V by underground and overhead cables, and the total estimated cost is £238,100.—*Tenders.*

Northern Ireland.—LETTERKENNY (CO. DONEGAL).—The Urban District Council has decided to ask Mr. Macrory, city electrical engineer, Londonderry, to prepare a scheme for the installation of electric lighting in the town.

Special Orders.—Application has been made to the Electricity Commissioners by the Long Eaton Urban District Council for a Special Order authorising it to include in its area of supply the area recently added to the urban district, and the parish of Toton.

The Commissioners have submitted to the Minister of Transport for confirmation, Special Orders made by them authorising the Bethesda Urban District Council to supply electricity in its area, and the Spalding Urban District Council in the urban and rural districts of Spalding.

Stockton-on-Tees.—EXTENSION OF SUPPLY.—The Electricity Committee is to canvass the Ragworth estate with a view to ascertaining the probable number of consumers, prior to taking any further action on the proposed extension of the cable which it is estimated will cost £5,500.

Stretford.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £4,925 for the provision of mains.

Sunderland.—WIRING OF SMALL HOUSES.—The Town Council has adopted a scheme submitted by the Electricity Department for installing electric lighting installations in certain houses of three to six rooms. This decision follows the adoption of a street lighting programme for all streets in the borough. The Council will undertake the cost of wiring houses, which is estimated will range from £5 14s. 7d. for a three-roomed house to £9 16s. 2d. for a six-roomed house. The owner or tenant will have the option of purchasing the installation from the Corporation at any time. The charge to tenants for the hire and maintenance of the installation will be 1s. 6d. weekly for the summer quarters, and 2s. weekly for the winter quarters, and electricity will be charged for at the rate of ¾d. per kWh. The initial outlay is not to exceed £8,000.

PRICE REDUCTION.—The domestic rate is to be reduced to a fixed standing charge of 15 per cent., of the rateable value of all houses (instead of the scale of percentages now in force) and after allowing 4 kWh per quarter per £ of net rateable value, the charge for further energy will be ¾d. per kWh.

Truro.—ELECTRICITY AGREEMENT.—The Town Council has approved a draft agreement with the Cornwall Electric Power Co. for a supply of electricity for the city.

Twickenham.—INQUIRY.—According to the *Surrey Comet*, an inquiry was recently held at the offices of the Electricity Commissioners by Sir Harry Haward and Mr. S. L. Pearce into the electricity charges of the Twickenham and Teddington Electric Supply Co. The inquiry was held on the application of the local authorities who appealed for an Order to vary the present authorised prices charged by the company. Mr. R. M. Montgomery, K.C., who represented the authorities, compared the charges with those of neighbouring companies, and stated that the high rate was detrimental to the property in the area. The authorities suggested a reduction of 3d. per kWh in the charges for lighting, a reduction of from 2d. to 1d. per kWh for power, and of 1d. per kWh for heating. Mr. N. Staniland, borough electrical engineer of Hornsey, stated that the company's charges would have a serious effect in deterring factories and other works from being opened on account of the prohibitive cost of electricity. Protests were also made by business concerns in the area. Mr. Craig Henderson, K.C., for the company, stated that the reduction of the maximum charge to 8d. per kWh, as suggested by the local authorities, would mean a reduction in the gross profit of approximately £10,000, which he contended was not justified at present. The reduction would also limit the company to paying a dividend of 5 per cent., which would prevent any further capital being raised. The Commissioners will give their decision in due course.

Winchester.—LOAN.—The Town Council has applied for anction to a loan of £19,153 for the following purposes :—The nstallation of one 1,250-kW turbo-generator, with condensing lant and pipe-work, £8,100; foundations, £750; connecting ables and switchgear, £650; vee notch recorder, £100; boiler ith mechanical stoker, piping and extensions to economiser, 4,964; foundations, £400; buildings and contingencies, 4,189.

Woolwich.—LOAN.—In connection with the proposed supply f electricity in bulk to Bexley and Erith, the Town Council as decided to apply to the Electricity Commissioners for nction to a loan of £34,446 for transmission lines, switch anels, and transformers.

United States.—ELECTRICAL DEVELOPMENT.—According to *ower*, applications have been filed by the Los Angeles Muniipal Bureau of Power and Light with the California and rizona Water Commissioners and the Federal Power Comission for permission to divert the waters of the Colorado iver near the town of Parker, Ariz. It is planned to conruct a dam at this site which would make available approxiately 1,500,000 acre-feet of water for the City of Los Angeles nd would develop at least 100,000 h.p. of electrical energy.

Officials of the Southern Power Co. announced recently, the ward to the American General Electric Co. of a contract for wo 50,000-h.p. steam turbines for a plant to be built, to afeguard the company against recurrence of the drought of is year. The new plant will be rated at 100,000 h.p., instead f 80,000 h.p., as was originally planned.

Tramway and Railway Notes.

Continental.—SWITZERLAND.—Work is in hand on the elecrification of the remaining portion of the railway between urich and Basle, and it is expected that the Bozberg section ill be completed for electrical operation next month. The ections between Zurich and Brugg and between Basle and ratteln have been electrically operated for some time.

Irish Free State.—LUCAN (CO. DUBLIN).—As the result of a nference at the Government Buildings, Dublin, between the ity Administrative Commissioners and representatives of the ublin United (Electric) Tramways Co., it is understood that n agreement has been reached for the early taking over of the ublin and Lucan Electric Railway, closed down since the eginning of the year, and that the electricity supply to instiitions and residents along the route will be restored. The ne will be connected up at the main gate of Phœnix Park ith the city service, thus giving a through service to the entre of Dublin. The Commissioners have agreed to grant an xtension of the tramway company's lease. The terms of the greement will be published shortly.

Nelson.—NEW CARS.—The Town Council is applying to the linistry of Transport for sanction to a loan of £5,800 for the urchase of three new double-deck tramcars.

Sheffield.—PURCHASE OF TRAMWAY.—The Corporation will ake over from Rotherham on January 1st next 2¼ miles of ngle tramway track between Tinsley depôt and the city oundary at Templeborough. The sum agreed upon for the ack, overhead line work, and eight tramcars is £14,475.

Stockton.—TRAMWAY IMPROVEMENTS.—The Joint Tramways ommittee has under consideration the doubling of the tramay track in Middlesbrough Road at an estimated cost of 13,700.

Stretford.—LOAN.—The Urban District Council is applying or sanction to borrow £11,837 in connection with the Talbot oad and Warwick Road tramway.

United States.—RAILWAY ELECTRIFICATION.—The electrificaon of the southern division of the Pennsylvania Railway, xtending from Philadelphia to Wilmington, Del., a distance 28 miles, will be started soon. The company announced on ctober 29th that arrangements had been completed to begin ie preliminary work necessary in making the change from eam to electric operation.—*Electric Railway Journal.*

Worcester.—RAILLESS CARS.—The Streets Committee will ask ie City Council at its next meeting to apply to Parliament for owers to replace the present tramway by railless cars, which, is suggested, should be confined to the city, and that powers ould be sought to run omnibuses on any routes in the city that the Council may hereafter decide whether to adopt ailless cars or omnibuses, or both.

Telegraph and Telephone Notes.

Canada.—DIRECTIONAL WIRELESS.—The Radio-Telegraph ranch of the Department of Fisheries announces the opening a directional wireless station on Belle Isle, at the northern ntrance to the Gulf of St. Lawrence. The new station will perate continuously on a wave-length of 800 metres, with the all letters "VCM." Belle Isle is the first landfall for translantic vessels traversing the northern route. The station ill be equipped with its own generating plant.—*Reuter* Ottawa).

Germany.—WIRELESS IN AEROPLANES.—The Aero Lloyd announces that, beginning with the winter season, its aeroplanes will be equipped with radio apparatus, which will enable the pilots to maintain constant communication with the aeroplane and meterological stations, and will therefore greatly increase the safety of flying.—*Reuter* (Berlin).

Irish Free State.—SHIPS' RADIO STATIONS.—The Irish Free State is almost unique in more ways than one. There are only two wireless stations—at Malin Head and Valentia—on the Free State coasts to which ships can appeal for help or guidance. Prior to the Treaty of 1921 numerous stations were available for emergency work and effectively watched the coasts of Ireland. When the transition of government took place all these stations were handed over to the Free State, and the majority were dismantled. What a serious matter this is for shipping has been demonstrated by a recent occurrence in Dublin Bay, says the *Irish Times*. Every ship of 1,500 tons registered in the Port of Dublin is obliged to carry wireless, and yet, should she get into difficulties a few miles outside the port, she is compelled to depend on the nearest wireless station, which happens to be Liverpool, 120 miles across the Irish Sea.

Russia.—TELEPHONE CAMPAIGN.—The Soviet Government has started a campaign to familiarise the Russian people with the telephone and its uses. At present the telephone plays a very small part in Russian life, there being less than one telephone to every 1,500 people, but the Soviet Government is said to be prepared to spend ultimately £20,000,000 in bringing the system up to date.

South Africa.—LONG-DISTANCE TELEPHONY.—According to the *British and South African Export Gazette*, the desired linking of Lourenço Marques with Johannesburg and Pretoria by telephone would cost over £25,000.

Radio Notes.

Brazil.—BROADCASTING SERVICE.—The Department of Overseas Trade informs us that the commercial secretary at Rio de Janeiro (Mr. E. Hambloch) reports the following particulars regarding broadcasting : There are 20 broadcasting stations in Brazil, which send daily communications to about 50,000 receiving apparatus. The number of such sets of apparatus in the Federal Capital of Rio de Janeiro is estimated at 20,000. The Radio Sociadade do Rio de Janeiro, with 6 kilowatts, and the Radio Club do Brasil, with 500 watts, send daily messages relative to trade, exchange quotations, meteorological service, and concerts, scientific addresses, &c. The Radio Sociedade also possesses an experimental 10-watt station, and another uses short waves for radio-telegraphy, with 40 watts, which has already succeeded in communicating with Swedish stations. The Radio Club has an experimental 1-kW station, while Mayrink, Veiga & Co. has an experimental 10-watt station. Two stations are working in Sao Paulo—the Radio Club de Sao Paulo, with 10 watts, and the Sociedade Radio Educadora Paulista, also with 10 watts. The latter will, however, shortly use 1 kW. The Sociedade Radio Educadora Paulista daily broadcasts commercial and meteorological information, as well as concerts, &c. There are three stations in Pernambuco, the largest being that of the Radio Club de Pernambuco (in the capital, Recife) of 300 watts. The others are the Radio Sociedade de Garanhuns and the Radio Sociedade Jader de Andrede, at Timbauba. The Radio Sociedade de Minas Geraes, installed at Bello Horizonte, uses 500 watts.

In other states of the Union the following stations are in operation :—Radio Sociedade de Bahia, 50 watts; Radio Club de Petropolis (State of Rio de Janeiro); Escola de Radiotelegraphie do Maranhao; Radio Club Clearense (Cears); Radio Sociedade de Parahyba (Parahyba do Norte); Radio Sociedade Pelotense (Rio Grande do Sul; and Radio Club de Campo Grande (Matto Grosso). It is estimated that more than 200,000 persons receive radio-telephonic communications from such broadcasting stations.

Broadcasting Inquiry.—GOVERNMENT COMMITTEE MEETS.—It is reported that the first meeting of the Broadcasting Committee appointed by the Postmaster-General, Sir William Mitchell-Thomson, was to have been held on November 19th. The British Broadcasting Co. is not represented on the Committee. The management, control, and finance of broadcasting after the expiry of the existing licence on December 31st, 1926, will be the chief subjects discussed. There are ten members of the Committee, the chairman of which is the Earl of Crawford, and, according to *The Times*, its sittings will begin early in December. In order that the Radio Society of Great Britain may be acquainted with the feelings of its members and of those of about 200 affiliated societies, arrangements have been made to hold a mass meeting, representaing about 15,000 persons, on November 26th. After a demonstration of "Talking Motion Pictures," by Mr. C. F. Elwell, there will be a debate on a resolution "That the present system of broadcasting, as represented by a single monopoly, is the best for this country." Prof. W. H. Eccles, past president of the Radio Society, will preside.

Canada.—FIRE INSURANCE.—Fire insurance companies in Canada are endeavouring to ascertain the part played by wireless in homes as a factor in increasing fire losses. American fire insurance companies have already made a slight increase

in premium to offset the additional risk of lightning and short-circuiting household wiring through tampering. Canadian companies, it is believed, will shortly follow suit.—*Reuter* (Ottawa).

Germany.—LICENCES.—There are now 838,904 radio receiving licences in operation throughout Germany. The licences are issued by districts; that of Berlin heads the list with 353,229, followed by Hamburg with 116,263, Leipzig with 102,014, Munich with 88,155, Frankfort-am-Main, 64,271, Breslau, 46,503, Munster, 27,380, Stuttgart, 26,819, and Konigsberg, Prussia, 14,270.

India.—BROADCASTING SCHEME.—The probability that within five years India and Ceylon will be equipped with ten broadcasting stations was suggested by Captain John Eaton Monins, of Burndept, Ltd., in an interview with a *Daily News* representative before his departure for India in connection with a wireless project. "Behind the scheme are four famous English wireless companies," he said. "Indian capital will also be interested. Already application for the requisite licences has been made to the Indian Government. At present India possesses only two small private broadcasting stations, at Calcutta and Bombay. First steps in the scheme will be to convert those into standard stations, and to erect one at Madras. Local relay stations will be set up to serve the different speaking territories."

S.B. Relaying.—NEW SWITCHBOARD.—A new switchboard is being erected at the Savoy Hill headquarters of the British Broadcasting Co. to enable 2LO programmes to be supplied to any of the Company's studios that cares to insert a plug in a socket at its own studio. Between London and Leeds four special lines have been set apart by the Post Office for the use of the B.B.C. Thirty amplifiers, each using three valves, will automatically feed the lines with the London programmes, says the *Daily Mail*, and it will thus be possible for 20 stations to receive the programmes, cutting out when they wish to broadcast their own.

The Philippines.—AMATEUR'S FEAT.—Amongst the recent achievements of Mr. F. A. Mayer, the well-known Essex amateur, was the establishment of communication with the Philippine Islands on November 9th between 2.30 and 4 p.m. G.m.t. This was the first two-way communication between this country and those islands. Mr. Mayer (G 2LZ) worked with Pi-IHR at Manila, which was in charge of Sig. Officer Hayden P. Roberts at Fort McKinley, the operator being Master Sergt. Angel D. Maningas, 12th Sig. Co., of the U.S. Army. Mr. Mayer used about 400 watts at the time on two T/250-type Osram valves, and his signals were reported to be strong and very steady, pure c.w. note, and the Manila signals were also very strong on two valves. The remarkable fact is that the communication took place in broad daylight on the 40-metre band; the signals faded out at sunset.

United States.—NATIONAL RADIO CONFERENCE.—The fourth National Radio Conference, convened by the Secretary of Commerce, Mr. Hoover, met at Washington on November 9th. The prospect that the Conference will determine whether wireless broadcasting is to be brought under Federal regulations, on the grounds of being a public utility, attracted many who would otherwise have stayed away. In his opening address to the delegates, Mr. Hoover indicated how far he was prepared to go in urging Federal legislation, and members of the committees of the Senate and House of Representatives, which will deal with such legislation, have accordingly been invited to attend the conference. The experimental work of the last two years, it is stated, has shown definitely that the limit has been reached in the number of first-class broadcasting stations, and measures will be discussed with a view to the reduction of the number of stations.—*Reuter* (Washington).

According to *The Times*, Mr. Hoover said that there were 578 broadcasting stations in the United States, of which 197 used at least 500 watts. The construction of a good modern station cost over $150,000 (£30,000), while the annual cost of running it, including artists' fees, approached $100,000 (£20,000). Of the new stations constructed this year, 32 used 1,000 watts, 25 used 5,000 watts, two used still higher power. Thus the range of non-interference between stations using the same wave-length was decreasing. With only 89 wave-lengths available for broadcasting, and more than 175 applications pending for new licences, the time had clearly arrived to abandon the policy of freedom of the air. The policing of the ether traffic should obviously be a Federal responsibility, but he would prefer that local communities should decide who was to use the wireless channels, in order that the public might more easily secure the elimination of undesirable features from broadcast programmes. To-day advertising provided the broadcaster's principal revenue, but freedom of speech in the air should not mean licence to individuals and firms to monopolise a listener's set with details about their business and descriptions of their wares. It was in the public interest that the new art should be developed to national advantage.

At a previous gathering the National Broadcasters' Association, reversing completely its attitude of a year ago, adopted a resolution recommending that full authority over the issuing of licences should be vested in the Department of Commerce. It was also resolved that the Copyright Law should be amended so as to fix a reasonable fee to composers for the broadcasting of their compositions and that no limitation should be placed on advertising.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicate the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia. — MELBOURNE. — December 15th. Postmaster-General's Department. Junction apparatus for manual exchanges.*

December 29th. Magnet and resistance wire.*

SYDNEY.—February 1st. Municipal Council. Bunnerong power house equipment. Six 25,000-kW turbo-alternators, 1c 100,000 lb. per hour boilers, &c., and 33,000-V switchgear (November 10th.)

Belgium.—December 3rd. Municipal authorities of La Gileppe. Equipment of a small hydro-electric station. Specification may be inspected at the office of the Distribution d'Eau at Verviers.

December 11th. Belgian Ministry of the Colonies, 7, Place Royale, Brussels. Wireless telegraphy transmitting and receiving apparatus for the Belgian Congo stations. Particulars on application from Cahier des Charges No. 1,049.

Bridlington.—December 7th. Electricity Department. One oil engine, direct coupled to a 275-kW d.c. generator, fuel storage tank, cooling tower, pipework, and pumps. (November 10th.)

Bristol.—November 23rd. Port of Bristol Authority. Electric lighting installation, Dock office extensions. Mr. H. T. Sully, consulting engineer, 28, Baldwin Street (returnable deposit of £2 2s.).

Cheadle and Gatley.—November 23rd. Urban District Council. Switchgear cubicle and transformer and switchgear kiosk. Specification from Electrical Manager, 37, High Street, Cheadle.

Dublin.—December 10th. Great Southern Railways Co. Stores for six months, including electric lamps, &c. Stores Superintendent, Inchicore, Dublin.

Egypt.—December 30th. Inspecting Engineer in London. Queen Anne's Chambers, S.W. Telegraph and telephone material and motor generator and telegraph apparatus.

ALEXANDRIA.—December 10th. Ministry of the Interior. Machinery in connection with the waterworks scheme at Mellawi, consisting of electric motors and centrifugal pumps, control panels, l.p. armoured cable, &c. (C.X. 1,796.)*

Exeter.—December 11th. Electricity Department. One 3,000-kW steam turbo-alternator and accessories. (See this issue.)

Glasgow.—The Corporation Health Committee is inviting offers for the erection of an electrical power station at Bellefield Sanatorium.

Hull.—November 23rd. Supply of 250 or 500 tons of tramway rails, with fishplates, &c. Form of tender from Mr. F. W. Bricknell, city engineer.

Telephone Committee. Bronze wire. (See this issue.)

India.—DELHI.—November 30th. Indian Stores Department. Sub-station equipment for Jaipur (comprising insulators, wire, l.p. cable, switchgear, transformer, &c.).*

London.—METROPOLITAN ASYLUMS BOARD.—December 2nd. Renewal of electric cables, &c., at the Brook (Fever) Hospital, Shooters Hill, Woolwich, S.E.

ISLINGTON.—December 17th. Electricity Committee. One 75-kW a.c. motor and d.c. generator, with starters, switchgear, &c., and three 5,000-kVA Scott-connected transformers, &c. (See this issue.)

H.M. OFFICE OF WORKS.—December 3rd. Electrical accessories.*

Manchester.—November 23rd. Tramways Committee. Iron and steelwork required at tramcar depôt, Birchfields Road, Fallowfield. Particulars from City Architect, Town Hall.

November 25th. Electricity Committee. Constructional steelwork for garage, Polyon depôt, Tower Street, Ardwick. Specification (No. 130) and form of tender from Mr. H. C. Lamb, manager, Electricity Department, Town Hall.

November 30th. One electrical storage testing battery for testing depôt, Polyon, Ardwick. Specification from Mr. H. C. Lamb, manager, Electricity Department, Town Hall.

Marlborough.—Borough Council. Conversion of 62 street lamps from gas to electricity, including connecting up to existing mains. (See this issue.)

New Zealand.—WELLINGTON.—January 19th, 1926. Public Works Department. 50,000- and 110,000-V switchgear and steelwork for the Waikato electric power scheme. (B.X.2,157.)*

January 26th. 50,000-V switchgear for the Waikato electric power scheme; transformers for the Lake Coleridge power scheme.*.

GISBORNE.—Borough Council. Diesel engine, alternators, and auxiliary plant, rotary converter, and switchboard. (November 10th.)

Oldham.—December 5th. Electricity Department. Eight water-tube boilers, with superheaters, chain-grate stokers, steel chimneys, and induced draught plant. (November 6th.)

Peterborough.—November 30th. Electricity Department. Buildings and civil engineering work, pulverised fuel equipment, two boilers and boiler-house equipment, one 6,000-kW turbo-alternator and turbine-room equipment, e.h.p. and l.p. switchgear, &c. (November 10th.)

Southall.—November 24th. Southall-Norwood U.D.C. Overhauling and maintaining the fire-alarm system. (November 10th.)

South Africa.—JOHANNESBURG.—December 14th. Electricity Supply Commission. Plant and material for transmission lines and sub-stations in connection with the supply of electricity in the Cape area rural districts.*

December 23rd. Union Tender Board. Telephone apparatus and supply of telegraph material for the Department of Posts and Telegraphs.*

December 17th. Municipal Council. 2,000-kW motor converter. (B.X. 2,142.)*

CAPE TOWN.—December 3rd. Electricity Department. Three-phase induction voltage regulators.*

Sub-station plant and transmission lines. (B.X. 2,139.)*

FORT BEAUFORT.—December 10th. Municipal Council. Generating plant and materials for electric lighting.*

QUEENSTOWN.—January 7th, 1926. Municipal Council. Extensions to the electricity undertaking.*

Switzerland.—November 28th. Swiss Federal Railway Authorities, Berne. Two 3,000-kVA, 60/15-kV single-phase transformers and switchgear for the Mussaboden transformer station. Particulars for 5 fr. from the Abtheilung für Elektrifizierung, Zimmer No. 166, Dienstgebaude, 43, Mittelstrasse, Berne.

Thornton.—December 13th. Urban District Council Electricity Department. Supplying, laying, jointing, and coupling-up complete of an electricity supply system. (See this issue.)

Uruguay.—MONTEVIDEO.—January 18th. State Electricity Supply Works. 170,000 metres of r.i. cords.*

January 29th. Fuse wire, enamelled lamp shades, cut-outs, switches, lampholders, sockets, &c. (B.X. 2,126.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—MELBOURNE.—State Electricity Commission of Victoria.—The Commission has accepted the tender of Weymouths, Ltd., for 40 transformers of from 200 to 500 kVA. The value of the contract is approximately £30,000). It has also been decided that Messrs. Weymouths, Ltd., shall supply the Commission's requirements in transformers during the next two years. The accepted tender was 14 per cent. in excess of the next lowest tender—that of a Swedish firm—which was inclusive of 50 per cent. *ad valorem* duty.

Glasgow.—Tramways Committee. Accepted: —
Steel tubing for mains.—Stewarts & Lloyds and Scottish Tube Co., Ltd.
Lead-covered cable.—Western Electric Co., Ltd.
Special trackwork.—Titan Trackwork Co., Ltd.

Irish Free State.—Contracts placed by the Controller of Stores, Department of Posts and Telegraphs, during October, 1925 :—
Batteries.—Pritchett & Gold and E.P.S. Co., Ltd.
Switchboard clocks.—Grimshaw, Baxter, and J. J. Elliott, Ltd.
Conduit and fittings.—Eureka Conduit & Fittings Co., Ltd.
Earth plates.—J. C. McLoughlin.
Switchboard cable.—Peel-Conner Telephone Works, Ltd.
Telephone wires.—McMillan & Co.
—*Irish Electrician.*

Lepton (near Huddersfield).—Urban District Council. Accepted :—
Installing electric lighting, exclusive of two-way switches, in the Council houses (£4 per house).—Electrical Distribution of Yorkshire, Ltd.

London.—UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON.—The company has placed orders with Cammell, Laird & Co. and the Metropolitan Carriage, Wagon & Finance Co. for 78 new cars required for service on the Morden and Kennington extensions, which will be ready for service next midsummer.

METROPOLITAN ASYLUMS BOARD.—Works Committee.
Automatic telephone installation at the Downs Hospital for Children :—

Commercial Telephone & Electrical Co., Ltd. (Recommended.)	**£748**
E. Shipton & Co., Ltd.	945
V. G. Middleton & Co., Ltd.	1,020
Reliance Telephone Co., Ltd.	1,064
Electrical Contracts & Maintenance Co. (1925), Ltd.	1,334

The following tenders were received for X-ray apparatus for the North-Eastern Hospital :—

Medical Supply Association, Ltd.	£283
Schall & Son, Ltd.	294
Watson & Sons (Electro-Medical), Ltd.	298
A. E. Dean & Co.	316
X-Rays, Ltd.	340
Newton & Wright, Ltd.	387

Manchester.—Tramways Committee. Accepted:—
Tramcar meters.—Chamberlain & Hookham, Ltd.
6-h.p. motor.—Smith & Coventry, Ltd.
5-h.p. motor.—W. T. Ellison & Co., Ltd.
Sample set of motor suspension gear for car trucks.—Brush Electrical Engineering Co., Ltd.

Richmond (Yorks.).—Town Council. Accepted:—
H.p. transmission line, sub-station equipment, and high-pressure network (£6,433).—Johnson & Phillips, Ltd.

Southend-on-Sea.—Town Council. Accepted:—
1,232 electricity meters of varying capacity (£3,097).—Chamberlain & Hookham, Ltd.

Winchester.—Town Council. Accepted:—
New boiler plant for the electricity works (£5,188).—Babcock & Wilcox, Ltd.

Forthcoming Events.

Electrical Trades Commercial Travellers' Association.—Saturday, November 21st. At the Manchester Hotel, E.C. At 7.30 p.m. Whist drive and social.

Nottingham Society of Engineers.—Monday, November 23rd. At the Victoria Station Hotel. At 7.30 p.m. Lecture on "A Factory Equipment," by Mr. M. A. Crosbie.

Shipping and Engineering Exhibition.—At Olympia. November 23rd to December 5th.

Royal Society of Arts.—Monday, November 23rd. At John Street, Adelphi, W.C. At 8 p.m. Cantor Lecture, "Coal Ash and Clean Coal," by Dr. R. Lessing.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, November 23rd. At the Institution, Victoria Embankment, W.C.2. At 7 p.m. Discussion on "The Testing of Large Electric Plant," to be opened by Mr. E. E. Tasker.

(North-Eastern Centre).—Monday, November 23rd. At Armstrong College, Newcastle-on-Tyne. At 7 p.m. Paper on "The Engineer: His Due and His Duty in Life," by Mr. T. Carter.

(North Midland Centre).—Tuesday, November 24th. At the Hotel Metropole, King Street, Leeds. At 7 p.m. Paper on "The Engineer: His Due and His Duty in Life," by Mr. T. Carter.

(South Midland Centre).—Friday, November 27th. At the Grand Hotel, Birmingham. Annual dinner.

(London Students' Section).—Friday, November 27th. At the Institution, Victoria Embankment, W.C.2. At 6.15 p.m. Paper on "The Tungar Rectifier," by Mr. A. P. Hill.

(North-Western Centre, Students' Section).—Tuesday, November 24th. At Milton Hall, Deansgate, Manchester. At 7.30 p.m. Paper on "The Automatic Control of d.c. and a.c. Feeders," by Mr. C. Ryder.

Institute of Physics.—Wednesday, November 25th. At Burlington House, Piccadilly, W. At 5.30 p.m. Lecture on "The Physicist in Agriculture, with Special Reference to Soil Problems," by Mr. B. A. Keen.

South Wales Institute of Engineers.—Engineering exhibition at the Drill Hall, Cardiff. November 26th to December 3rd.

Junior Institution of Engineers.—Friday, November 27th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "The Engineer and His Relationship to the Tea Industry," by Mr. E. Granville-Smith.

Institution of Mechanical Engineers.—Friday, November 27th. At the Institution, Storey's Gate, S.W. At 7 p.m. Informal meeting. Discussion on "The Work of the Mechanical Engineer in Non-Engineering Industries," to be opened by Mr. W. P. F. Fanghanel.

Institution of Engineering Inspection (Inc.).—Friday, November 27th. At the Hyde Park Hotel, London. Annual reception and presidential address, followed by a dance and concert.

Physical Society of London.—Friday, November 27th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary scientific meeting.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of :—
SIGLIT signalling lamps.
VAMPYX vacuum cleaners.
LOEWE resistances.

Notes.

Parliamentary.—The autumn session of the House of Commons opened on November 16th. The Prime Minister, in reviewing the programme, stated that it would be impossible to proceed with the Merchandise Marks Bill, and Bills to amend the Factory and Workshop Acts.

Mr. Baldwin informed Mr. Crawford that although the examination of the electricity proposals was proceeding, it had not reached such a stage as to enable him to announce the Government's plans. He hoped that he would be able to make a statement before the House rose. The delay which had occurred was due to the complexity of the subject.

London Traffic Inquiry.—The inquiry into the travelling facilities of North London was continued at the Middlesex Guildhall, Westminster, on November 10th and subsequent days. Mr. C. J. Spencer, general manager of the Metropolitan Electric Tramways, stated that the competition of independent omnibuses had put a stop to schemes for further development in the area served by the company. Mr. E. Pick, assistant manager to the Underground Group, stated that the underground railway at Finsbury Park was not used to its full capacity, and that during the past four years there had been a falling off in the number of passengers carried due to independent buses. There could be no tube developments in London until the surface transport was controlled.

Fatality.—An inquest was held at Dolgarrog on November 12th into the death of Michael Riordan, who was killed, while three other men were seriously injured, during the boring of a tunnel between Eigiau and Cowlyd Valleys, Carnarvon, for the North Wales Electric Power Co. It was stated that a charge failed to explode, but when the men went to examine it an explosion occurred. A verdict of "Accidental death" was returned.

Shipping and Machinery Exhibition.—The committee of the Shipping, Engineering, and Machinery Exhibition invites all visitors from overseas associated with the shipping, engineering, and machinery industries who happen to be in England on December 1st next to apply to Mr. F. W. Bridges, Avenue Chambers, Southampton Row, London, W.C.1, for complimentary tickets for the dinner to be given at the exhibition on that date in honour of oversea guests. Although a great number of invitations has already been issued direct by mail, the management is very anxious that all visitors from the Dominions and other parts abroad who may not have received invitations may do so.

Educational.—French Electrical School.—The foundation stone of the new buildings of the Ecole Superieure d'Electricité was laid by M. Doumergue, president of the French Republic, at Malakoff on November 9th. The old school, which was built in 1893, has become too small for the accommodation of the growing number of French and foreign students, who now number 225, which is the maximum limit. Thanks to subscriptions of 5,000,000 fr. by electrical firms, 4,000,000 fr. by the State, and 2,000,000 fr. by the city of Paris and the Council of the Seine, a total of 11,000,000 fr. has been collected, but an amount of 4,000,000 fr. still remains to be raised so as to provide the school with modern equipment. It is intended to complete the new buildings in 1927.

Poplar School of Engineering.—An Old Boys' Society has been formed for the purpose of bringing together old day students of the Poplar School of Engineering. Further particulars are obtainable from Mr. Thos. L. Farnes, hon. secretary, 140, Mitcham Road, East Ham, London, E.6.

Automatic Control of Railway Engines.—A radio-operated safety device that checks running locomotives automatically when danger looms ahead was recently given a successful demonstration over a 10-mile stretch of Pere Marquette railroad, U.S.A. By means of a system of radio-controlled signal lights installed in the engine cab, it was demonstrated that if the engineer is disabled, the system of control checks the engine's speed and brings it to a halt at any danger point, at any time. The working depends on the propagation of electro-magnetic waves flowing in the track rails with varying wave-lengths which operate on the visual signal device in the engine cab. The Michigan Central railroad has equipped ten locomotives and ten miles of track between Jackson and Rives, Michigan, with the Clark radio control device.—*Reuter* (Detroit).

The Lord Mayor's Show.—One of the features of this year's show on November 9th was the telegraph cable companies' effort to express what communications mean to trade. The great cable companies were represented by two cars. In one a boy messenger lay upon a rock, taking with outstretched arm a message from Neptune emerging from the seas. The other car held a great pasteboard globe with the cable routes traced on it, and at the corners stood a Chinaman, a gold miner, a rancher, and a Colonial sheep farmer, emblematic of Asia, Africa, America, and Australasia. John Bull drove the four horses which pulled the car.

The Finsbury Technical College Old Students' Association.—Annual Dinner.—On Saturday last the annual dinner of the Finsbury Technical College Old Students' Association was held at the Engineers' Club, London; over 100 members and guests were present, including ladies for the first time. Mr. E. S. Conradi, President of the Association, was in the chair. After the loyal toast, Lt.-Col. K. Edgcumbe, M.I.E.E., proposed "The College," and remarking that there was a cloud over it at present, he reviewed the circumstances under which its work had been carried on during the past four years, and paid a tribute to the extraordinary efforts that had been made by the special committee of the Council to secure its continuance. Finsbury owed its greatness to the personality of its professors. The committee had done its utmost and owned itself beaten; but was it not for the best that a great institution should be cut off in its prime, instead of eking out a precarious existence to an inglorious end?

Prof. A. J. Hale, F.I.C., Dean of the College, responded, expressing the feeling that the closing of Finsbury would mean the loss of something well worth keeping. Finsbury had never given degrees, which were so much sought after nowadays, but had trained men to be useful in industry very successfully for forty years; 3,000 students had passed through the College, of whom 2,000 were engineers, and 700 chemists. The Meldola Memorial Fund had provided them with a most useful library, and like the Streatfield and Thompson Memorial Lectures, was due to the Old Students. In view of the threatened closing of the College in its present form there was a strong feeling that it should be converted into a college of chemical engineering and applied chemistry, for which undoubtedly there was scope. That proposal was under consideration and might possibly be put into effect.

Mr. E. R. Bolton, F.I.C., proposed the toast "F.T.C.O.S.A.," and said that the College was a live body with a soul; if it was shut up the Old Students' Association would go on.

Responding, Mr. Conradi, after referring to the severe illness of Captain Wallis-Jones, to whom a telegram of sympathy was sent, described the work done by the Council and Committee, which had brought forth plenty of sympathy but no money. Mr. C. E. Elcock had been of great assistance in putting the facts before the Educational Trusts. Finsbury was going down with its flag flying; it had gained a wonderful reputation, and the Old Students would carry on its traditions. It was proposed that a Finsbury Scholarship should be founded, and he hoped that the Old Students would help in this.

Mr. R. W. Paul, M.I.E.E., proposed "The Guests" in a humorous speech. He did not feel depressed, for if the College did no more work it would live in memory. The College was really the men who had passed through it, and its spirit would continue. They would all do their best to help the Old Students' Association.

Mr. C. E. Elcock, F.R.I.B.A., responded, remarking that that was the pleasantest "wake" he had ever attended. He described his negotiations with the Educational Trusts and urged that the O.S.A. should itself form a Trust to assist technical education. Mrs. Price also briefly responded to the toast.

A capital entertainment was provided, and the President, in conclusion, expressed the gratitude of the audience to the musical director, Mr. L. M. Clark, and the hon. secretary, Mr. Grant, for their arduous and successful labours.

The Streatfield Memorial Lecture will be delivered on December 3rd.

A French 150,000-volt Cable.—The Société Générale de Force et Lumière has just laid an underground cable on the line Moutiers-Lyons of a length of 18 miles and having a service pressure of 150,000 volts to earth and capable of reaching 300,000 volts between the positive and negative conductors.

British Cast Iron Research Association.—We have received copies of the Quarterly Bulletin, No. 10, October, 1925, and the fourth annual report for the year ended June 30th, 1925 of the above Association. An article on "The Influence of Aluminium on Cast Iron" contains some interesting information with reference to high-resistance alloys. The annual report shows that at the end of the year the total membership of the Association was 275, compared with 248 at the end of the previous year. The income for the year was higher than that of any previous year, and for the first time reached the minimum originally stipulated by the Department of Scientific and Industrial Research (£2,500 per annum), as a qualification for the Government grant. Mr. H. B. Weeks, F.I.C., has been re-elected chairman of the Association for the ensuing year.

B.E.S.A. Specification.—The British Engineering Standards Association has issued a specification (No. 215, 1925) for hard-drawn aluminium and steel-cored aluminium conductors for overhead power transmission purposes. It is very similar in general lines to that for hard-drawn copper solid and stranded circular conductors, and gives full details of the number of strands, weight, resistance, tensile strength, &c., of the standard sizes of aluminium and steel-cored aluminium conductors. The standard sizes are based upon the standard sizes of hard-drawn copper conductors, there being an aluminium or steel-cored aluminium conductor of equivalent resistance to each primary standard size given in B.E.S.A. specification 125-1924. Some useful notes are given, explaining how the values in the various tables have been arrived at. One of the most interesting features of the specification is the appendix which gives the British standards of resistance of aluminium for electrical conductors. These standards have been agreed upon by the National Physical Laboratory and the Laboratoire Central d'Electricité, Paris, and constitute the first authoritative data on the resistance of aluminium to be published in this country. They are also being submitted to the International Electrotechnical Commission for adoption as international standards. Copies of the new publication may be obtained from the B.E.S.A. Publication Department, 28, Victoria Street, London, S.W.1, price 1s. 2d., post free.

Lighting Service Bureau Lectures.—On November 9th, at the Lighting Service Bureau, 15, Savoy Street, Mr. Beauchamp, of E.D.A., gave the first of a series of educational lectures which have been specially arranged for women working in the electrical industry and a number of prospective lecturers for the Electrical Association for Women. Mr. Beauchamp traced the journey of 1¾ lb. of coal through its conversion into electricity and eventually into the house of the consumer. The next lecture was to be held on November 16th, and the third will be given on November 30th. All showroom assistants and other women working in the electrical industry are invited.

Illuminated "White Line."—The first illuminated "white line" for the guidance of traffic round dangerous corners was tested on the North Circular road at Hendon, where it joins Golders Green Road. According to the *Daily Mail*, it was visible 200 yards away to motorists, who slowed down when they saw it and kept well on the proper side of the road. The line, which is the invention of Mr. R. F. Brown, a surveyor, of Great Clacton, Essex, consists of alternate pieces of glass and white tile an inch wide inserted flush with the road surface. Beneath this is watertight iron casing through which runs a line of electric light bulbs. The power is supplied from the electric main at the side of the road. The lamps are lit automatically and put out at daybreak.

Cable Ship in Distress.—The cable ship *Lord Kelvin* reached Queenstown on November 10th after an ordeal in an Atlantic gale, as reported in our last issue.

Medical Colour Treatment.—Dr. J. Dodson Hessey, writing in a recent issue of the *Practitioner* on the subject of colour treatment for certain diseases, states that he has had successful results with such treatment. The three most useful colours are green, blue, and orange, and the treatment is given by means of a 1,000-candle-power lamp; the patient wears a minimum of clothing, preferably a white gown.

Fuel Research Board.—The report of the Fuel Research Board (Stationery Office, 3s. 6d. net) for the period ended December 31st, 1924, is the first to be presented since 1920, and it covers the work of the intervening five years. Signed by Mr. C. H. Lander, who succeeded the late Sir George Beilby as Director, the report indicates that, owing to the increased volume of work now undertaken at the Fuel Research Station at East Greenwich and elsewhere, it is intended in future to prepare an annual report to assist those who are interested in keeping in touch with the various developments.

Progress in Electrodeposition.—In the course of an address entitled "Recent Advances in Electrodeposition" to the members of the Sheffield Section of the Institute of Metals recently, Mr. S. Field said the processes of electrodeposition were permeating many industries. New and surprising methods had been introduced, and some remarkably skilful work had been achieved. Organised research work was in progress in a number of laboratories. The scope of this work in this country was, however, much more limited than in America, where organised research on a large scale was in progress. In this country, too, there had been a lack of organisation amongst those engaged in the processes of electrodeposition. Nearing, as we were, the centenary of the enunciation of the fundamental laws of electrolysis, there was at least some prospect of rectifying these omissions and of more rapidly building on the foundations which were so well and truly laid by Michael Faraday in 1833, the pioneer in the realm of scientific electrodeposition.

Steam Pan Explosion Report.—We have received a copy of the report of a preliminary inquiry into the explosion of a steam jacketed pan, which occurred at the works of Messrs. W. T. Henley's Telegraph Works Co., Ltd., in June last. The explosion was violent, but owing to the connecting pipe being well secured to the inner and outer bottoms the steam escaped from the jacket through the annular opening around the top of the jacket without completely ejecting the inner pan. The pan was originally fitted with three screwed stays at the bottom, but these were omitted when a repair was made. Grooving of the weld at the top flange was set up by panting owing to the omission of the stays, and the plate failed ultimately at the wasted part.

Continental Automatic Sub-Stations.—In our issue of October 23rd, in an article on automatic and remotely-controlled rotary converters manufactured by the Metropolitan-Vickers Company, two 1,000-kW automatic sets at Copenhagen were referred to as "the only automatic ones on the Continent of Europe." We are informed that a completely automatic rotary converter equipment was installed by the Swiss Brown, Boveri Co. at Riehen, near Basle, as far back as the autumn of 1919. This equipment, which supplies the local Basle-Lörrach tramways, has, we understand, operated continuously and faultlessly ever since.

World Power Conference.—All the nations which are members of the World Power Conference have been invited to be represented at a sectional meeting in September of next year, in connection with the International Waterways and Hydraulic Power Exhibition. The agenda includes discussions on the application of electricity to agriculture, the electrification of railways, and the exchange of electric power between different countries.—*Reuter* (Basle).

Particulars of the proposed meeting at Basle were given in the ELECTRICAL REVIEW of September 25th, p. 505.

Electroplaters' and Depositors' Technical Society.—A Society with this designation, the latest concerned with technical applications of electricity, was founded at an inaugural meeting held at the Northampton Polytechnic Institute, Clerkenwell, on November 11th, over which Mr. S. Field presided.

The Principal of the Institute having addressed a welcome to those present, the chairman stated that the need had long been felt for a society in London where electroplaters and electrodepositors could discuss their problems and where they could come into contact with those engaged in research work on electrodeposition. Such contact could not fail to benefit both parties. The skilled plater possessed a fund of experience and empirical knowledge with which the "scientific" electrochemist should be acquainted, while the methods and results of the laboratory research worker could not fail to be useful to the practical plater when put to him in language which he could understand. A society of this character already existed in America, and there were local societies in Birmingham and Sheffield where plating problems were discussed.

Mr. F. S. SPIERS, who spoke on behalf of the Faraday Society, said that Society was greatly interested in the movement which had culminated in the present meeting and it was at the instigation of its Council that a Committee had been formed to consider the best lines on which an electroplaters' society should be constituted. It was at first thought that a special plating section of the Faraday Society would serve the purpose, but there were many weighty objections against that course, and the conclusion was reached that the needs of the plater could only be met by the formation of an independent group or society. The Faraday Society was, however, desirous of associating itself with the new body and the Council had agreed to the proposal to nominate representatives on its Committee. The new Society would cover the whole field of electrodeposition, which now included not only metals such as gold, silver and nickel, which were usually associated with the term "electroplating," but also zinc, iron, copper, cobalt, chromium, lead, tin, and other metals, all of which were now being industrially deposited.

Mr. D. J. MACNAUGHTAN, of the Research Department, Woolwich, expressed his belief that the proposed Society would help to break down the barriers at present existing between the practical plater and the research worker, and Mr. W. JAMES, speaking on behalf of the plating industry, endorsed this view. Platers were fully alive to the need for adopting the latest scientific knowledge in the practice of their art. In particular they would respond very heartily to the inspiration which they would derive from association with the name of "Faraday."

The resolution, by which the Society was formally created, was moved by Mr. S. FIELD and seconded by Dr. R. S. HUTTON, director of the British Non-Ferrous Metals Research Association. A Provisional Committee to frame rules and inaugurate the work of the Society was then elected, consisting of Messrs. S. Field (chairman), W. James (treasurer), L. Goring, W. F. Pitcher, F. S. Spiers, J. S. Sunderland, who represents electrotyping interests, and W. E. Harris, honorary secretary. The representatives of the Faraday Society were Mr. Field, Mr. Spiers, and another, who would be nominated later.

The Society will probably hold two types of meetings; those at which papers will be read and discussed and which will be open to visitors, and informal discussions, of which no report will be published, open to members only. It is intended to offer the papers read for publication in a suitable trade journal and consequently a subscription of 5s. per annum, with a reduced subscription for learners and improvers, is likely to suffice to cover working expenses. The first ordinary meeting of the Society will be held on December 9th at 8.15 at the Northampton Polytechnic Institute, when an inaugural address will be given by Mr. S. Field, which is expected to deal with recent progress in electrodeposition.

Appointments Vacant.—Plumber-jointer, for the Great Yarmouth Corporation electricity and tramway departments; assistant sub-station attendant, for Stoke Newington Borough Council electricity department; charge engineer, for the Tunbridge Wells Corporation electricity department. (See our advertisement pages to-day.)

Institution Notes.

Institution of Electrical Engineers.—INFORMAL MEETING.—At the meeting of the Informal Section on Monday, November 9th, Mr. E. S. Ritter opened a discussion on "Modern Developments in Telephone Cables." He had spared no pains in the preparation of numerous charts and diagrams, and these were examined with great interest by a number of those present. His survey was not historical so much as a description of and summary of the results achieved to date, and an illustration of the difficult problems that telephone transmission offers in comparison with those of power transmission. He described the underground line from London to Glasgow, with its five repeater stations along the route, produced samples of the most recently constructed cables, describing their construction, and testified to the skill of British cable makers in attaining and even surpassing the rigorous standards of capacity and deviation prescribed by the Post Office. Fifteen speakers joined in the subsequent discussion and more than one urged the need to co-relate the terminology and adopt standard terms and definitions, now that interlinking with the Continent is in view.

SCOTTISH CENTRE.—Prof. Magnus Maclean, M.A., D.Sc., delivered his inaugural address as chairman of the Centre at Glasgow on November 10th. Dr. Maclean was largely instrumental in getting the Scottish Centre formed, and this is the second occasion on which he has acted as chairman. His address was devoted to the early history of the Centre and its activities.

Junior Institution of Engineers.—NEW OFFICERS.—At the annual general meeting held on November 13th, the following officers were declared elected:—Chairman, Mr. A. J. Simpson; vice-chairmen, Messrs. R. L. Kirlew and C. E. Atkinson; hon. treasurer, Mr. C. O. Hourant; hon. librarian, Mr. T. W. P. Mullings.

National Association of Supervising Electricians.—FORTHCOMING EVENTS.—On Tuesday, December 1st, at the Junior Institution of Engineers, 39, Victoria Street, S.W., Mr. F. Hope-Jones will deliver his lecture on "Electric Time Service," in place of the lecture on "Research in Cable Industry" by Capt. P. Dunsheath, who will give his lecture on April 6th, 1926.

Royal Institution.—CHRISTMAS LECTURES.—The hundredth annual course of Christmas lectures for juveniles will be delivered by Sir William Bragg, on "Old Trades and New Knowledge." "The Trade of the Sailor" is the title of the first lecture on Tuesday, December 29th, and the following five lectures will be on the trades of the smith, the weaver, the dyer, the potter, and the miner.

Institution of Structural Engineers.—EXAMINATION.—We have received a syllabus of the examination of the Institution, which comes into force from January 1st, 1926. It sets forth qualifications which exempt candidates from the examination for the various classes of membership. From January 1st, 1926, admission will be by examination or exempting examinations only, but applications for direct admission from candidates having practical experience can be accepted up to that time.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Captain A. Angers, A.M.I.E.E., F.R.M.S., of Messrs. A. Angers & Co., electrical, &c., engineers, Liverpool, who has been laid up for the past six months suffering from double pneumonia, has sufficiently recovered to be able to leave his room. He desires to thank many friends for their letters of sympathy. Mr. Angers, who has been a member of the Liverpool City Council for the past four years and a member of the Electric Light Committee, stood in the recent municipal election as Conservative candidate in a three-cornered fight and secured a large majority though unable to conduct the campaign personally owing to his illness.

Mr. J. Hillier French, who has for about four years been chairman of the Works Committee of the Maidstone Corporation Electricity Committee, has been presented by the members on his retirement from the Town Council with an inscribed barometer, and by the employés of the electricity works with a silver fruit dish.

Mr. C. E. Wood, who has for some years been chief of the accountancy department at the Stamford Electricity Works, has been appointed manager of the works in succession to Mr. C. L. Holman.

The *Daily Telegraph* states that Mr. Kenneth Belben Anderson, who died at Camberley on Friday last, was a director of the Exchange Telegraph Co. and a grandson of Sir James Anderson, formerly managing director of the Eastern Telegraph and allied companies, and was associated with Sir John Pender in the pioneer work of submarine telegraphy.

The presentation of a gold watch and fob to the general manager, Captain W. Vane-Morland, and of a case of afternoon tea knives to Mrs. Morland, prior to their departure for Walsall, was made by the staff of the St. Helens Corporation Tramways, last week.

Captain F. C. Burstall, of the Liverpool telephone service, has been appointed telephone traffic manager to the Egyptian Government, to whom he has been loaned by the Post Office authorities for a period of three years. Capt. Burstall entered the service of the National Telephone Co. in 1904 and was one of its divisional traffic superintendents.

Alderman Wilfred Turner, chairman of the Bradford Corporation Electricity Committee for many years past, has relinquished the chairmanship for the new municipal year owing to his appointment as Deputy Lord Mayor. The chairman of the Electricity Committee for this year is Councillor J. W. Longley, hitherto vice-chairman, and himself a consulting engineer.

Councillor H. Foulstone, who has been installed as Mayor of Barnsley, has, as chairman of the Electricity and Lighting Committee, done much to assist in the development of the electricity undertaking, and enthusiastic reference to this was made at last week's ceremony.

Councillor W. Tummon has been re-elected chairman of the Sheffield Electric Supply Committee, and Alderman Styring the deputy chairman.

Sir Charles J. Stewart and Mr. H. Morgan have resigned from the Board of Marconi's Wireless Telegraph Co., Ltd., and Sir Frederick J. Barthorpe, D.L., late chief joint general manager of the London County and Westminster Bank, Ltd., and Sir William Slingo have been appointed to fill the two vacancies.

Mr. H. K. Beale has been re-appointed chairman of the Birmingham Corporation Electric Supply Committee.

The South African Power Engineer states that Mr. H. M. S. Muller, of Lindley, O.F.S., has been appointed electrical engineer to the Municipality of Beaufort West, and that Mr. Stakesby Lewis, previously engineer of Frankfort, O.F.S., has been appointed engineer of Aliwal North.

Mr. P. S. G. Redfern has been appointed salesman on the staff of the Birmingham branch of Messrs. Johnson & Phillips, Ltd. For some three years he has been associated with the Telephone Manufacturing Co., Ltd., in the same district. Mr. A. L. Vine, who has for some time been associated with Messrs. W. T. Henley's Telegraph Works Co., Ltd., in North Wales, has been appointed salesman on the staff of the Portsmouth branch of Messrs. Johnson & Phillips, Ltd.

Alderman A. A. Thomson and Alderman G. J. Allen, J.P., have been elected chairman and vice-chairman, respectively, of the Croydon Corporation Tramways Committee.

Obituary.—Mr. A. C. Devey.—Our readers will learn with regret of the death of Mr. Arthur Charles Devey, which occurred about a month ago at Boulogne at the age of 58 years. Mr. Devey, who was the youngest son of Mr. C. H. Devey (late Master of the Vintners' Company and twice Master of the Founders' Company), was born on November 11th, 1866, and was educated at Westminster and Tonbridge Schools. He early became an electrical engineer, and it is said was one of the first to install electric light in a private house. After some time in France, Belgium, and Italy, Mr. Devey joined the British Insulated & Helsby Cables, Ltd., of Prescot, and was with the company for many years, making numerous friends in the electrical world. Ill-health compelled him to retire several years ago, a pension being granted as a token of esteem—a mark of appreciation which he highly valued. During the war he rendered splendid service to the cause in both France and England. Here he was a member of the National Guard, and as in so many other cases where men who had passed the period for most strenuous activity worked on Saturdays and Sundays as well as through the week; he paid the penalty in a complete breakdown of his health. It was while thus suffering that he was suddenly taken with appendicitis and peritonitis. Two operations were performed and he bore these with such fortitude that the Hospital authorities wrote of "*son courage et douce sérénité*," but on the third day he passed away at Boulogne-sur-Mer. His home was at Wimereux, where he had lived for seventeen years. Mr. Devey was a member of the Institution of Electrical Engineers and of the Founders' Company.

Mr. S. Dean.—The death occurred recently of Mr. Samuel Dean, who was the first electrician at Port Sunlight (Lever Bros., Ltd.), when the original installation was set up 35 years ago.

Mr. H. V. Higgins.—Mr. Harry Victor Higgins, who was one of the victims in the flood disaster at Dolgarrog, was an electrical engineer. He was 30 years of age, and served his apprenticeship with Messrs. J. B. Saunders & Co., of Cardiff and Welshpool. Subsequently he became a linesman with the North Wales Power Co., and about a year ago he was transferred to the Dolgarrog power station.

Brig.-Gen. R. Marr-Johnson.—We regret to announce the death of Brigadier-General R. Marr-Johnson, C.M.G., D.S.O., which occurred on November 15th, after a serious illness, following an operation. General Johnson was a director and deputy-chairman of the Radio Communication Co., Ltd. He joined the board of that company after the completion of a brilliant military career in the Royal Regiment of Artillery.

New Companies Registered.

Polar, Ltd. (209,561).—Private company. Registered November 9th. Capital, £100 in £1 shares. Objects are: To adopt an agreement with the Radio Communication Co., Ltd., to acquire the trade mark "Polar" (registered No. 460,152 at the British Patents Office, Trade Marks Branch), and to carry on the business of agents, concessionaires for general or radio engineers, manufacturers and suppliers of and dealers in radio apparatus, &c. The subscribers (each with one share) are:—B. Binyon, Harthorndene, Hayes, Kent, company director; G. D. Cyanue, A.M.I.E.E., Fordcombe, Tunbridge Wells. The first directors are to be appointed by the subscribers. Qualification, £1. Remuneration as fixed by the company. Solicitors: Amery, Parkes & Co., Effingham House, Arundel Street, W.C.2.

Cutting Bros. & Co., Ltd. (209,526).—Private company. Registered November 7th. Capital, £22,000 in £1 shares (10,000 7 per cent. first cumulative preference, 10,000 7 per cent. second non-cumulative preference, and 2,000 ordinary). Objects: To carry on the business of electrical engineers and contractors, electricians, manufacturers of and dealers in wireless apparatus of all kinds, &c., and to adopt an agreement with T. W. Jourdan, C. H. Cutting, and G. H. Cutting. The first directors are:—T. W. Jourdan, Alsabrook House, Tiverton, Devon; C. H. Cutting (managing director), Austin House, Stamford, Lincs.; G. H. Cutting, 8, Rutland Terrace, Stamford, Lincs. Qualification, £300 shares. Remuneration, £150 per annum, divided between them. Secretary: G. H. Cutting. Solicitors: W. A. G. Davidson & Co., Bank Buildings, Acton, W., and Wembley Hill, Middlesex. Registered office: Park Works, Stamford, Lincs.

Hiberian Gas and Electric Investment Co., Ltd. (209,536).—Registered as a private company November 7th with a nominal capital of £500 in £1 shares. The objects are:—To acquire and to receive and hold on deposit as nominees or trustees and deal with shares or interests in any gas or electrical undertaking in Spain, Portugal, and their respective colonies, protectorates and dependencies, &c. The subscribers (each with one share) are:—A. Santerne, 24, Eastlake Road, Camberwell, S.E.15, translator; J. A. Steemson, 35, Auckland Road, S.W.11, advocate's clerk. The first directors are to be appointed by the subscribers. Provision is made for notices to be sent to members (if necessary) at addresses supplied by them in the U.K., Holland, Belgium, Germany, Luxemburg, France, Switzerland, Austria, Italy, Spain or Portugal. Secretary (*pro. tem.*): A. Santerne. Solicitor: J. E. M Crowther, 23, Abingdon Street, Westminster.

Grant Merchant & Co., Ltd. (209,641).—Private company. Registered November 12th. Capital, £1,000 in £1 shares (700 preference and 300 ordinary). Objects: To acquire the businesses of advertising contractors and manufacturers of electrical signs carried on at Duke Street Adelphi, W.C., as Grant Merchant & Co.; to adopt an agreement with S. H. Grant and W. W. Rogers; and to carry on the said business and that of manufacturers of and dealers in electrical and mechanical motors and accessories, gramophones, wireless and radio-active appliances, &c. The subscribers (each with one ordinary share) are:—G. H. Jones, 159, Woolstone Road, Forest Hill, S.E.23, clerk; P. G. Wilson, 1, Bush Lane, E.C.4, clerk. The first directors are:—S. H. Grant, W. W. Rogers and W. G. S. Naunton, addresses not stated. Qualification, 100 ordinary shares. Remuneration as fixed by the company. Solicitors: Peter Thomas & Clark, 1, Bush Lane, E.C.4.

Official Returns of Electrical Companies.

Tees Power Station Co., Ltd.—Satisfaction to the extent of £19,900 on various dates between April 1st and June 24th, 1925, of trust deed dated May 7th, 1918, securing £600,000 debentures. Notice filed November 7th.)

Leatherhead and District Electricity Co., Ltd.—Satisfaction to the extent of £6,200 on September 30th, 1925, of trust deed dated December 28th, 1920, securing debentures for sums not exceeding the amount of the issued capital for the time being. Issue on October 19th, 1925, of £20,000 debentures, part of a series already registered.

Whitstable Electric Co., Ltd.—Particulars filed of £30,000 debentures authorised by resolutions of September 3rd and October 16th, and covered by trust deed dated October 20th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £10. Trustees: W. H. Reeves and A. Collar.

Astro Electric, Ltd.—F. Wilcock, of 1, Great Winchester Street, E.C.2, ceased to act as receiver and manager on November 3rd, 1925.

Humavox, Ltd.—First mortgage debenture dated November 6th, 1925, to secure £1,015, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: W. J. Jennings, 75, New Street, Birmingham.

Emerald Radio Co., Ltd.—Debenture dated October 28th, 925, to secure £200, charged on the company's undertaking and proper'y, resent and future, including uncalled capital. Holder: A. E. Pater, 1, rcade House, Hendon, N.W.1.

Rubon, Ltd. — Debenture dated October 27th, 1925, to ecure £500, charged on the company's property, present and future, includ- ig uncalled capital. Holders: T. Depries, M. Seelig and S. Harrison, trading s the S.D.H. Manufacturing Co., 24, Stoke Newington Road, N.

Arthur Raybould, Ltd.—Debenture charged on the com- any's undertaking and property, present and future, including uncalled apital, dated October 26th, 1925, to secure all moneys due or to become due om the company to Barclay's Bank, Ltd.

Beresford Bros., Ltd.—Mortgage dated October 30th, 925, to secure £4,000, charged on 108, Dale End, Birmingham. Holders: . P. Samuel, Pershore Road, Edgbaston, Birmingham; and F. J. Rogers, 67, Vake Green Road, Moseley, Birmingham.

Macintosh Cable Co., Ltd. (72,097.)—Capital, £100,000 n 75,000 ordinary and 25,000 preference shares of £1 each. Return dated October 6th, 1925. 51,008 ordinary and 23,997 preference shares taken up. 13,004 paid. £62,001 considered as paid. Mortgages and charges, £6,500.

British Electric Traction Co., Ltd. (49,855).—Capital, 2,998,397 15s. stock. Return dated June 29th, 1925. £2,039,007 15s. stock ssued and paid for in full. Mortgages and charges, £1,620,012.

Potteries Electric Traction Co., Ltd. (57,968).—Capital, 600,000 in 300,000 ordinary and 300,000 preference shares of £1 each. Return ated June 5th, 1925. 245,000 ordinary and 245,000 preference shares taken p. £423,340 paid on 178,340 ordinary and 245,000 preference shares. £66,660 onsidered as paid on 66,660 ordinary shares. Mortgages and charges, £245,000.

John Collier & Co. (Electrical Engineers), Ltd. (174,260). -Capital, £20,000 in 12,000 "A" and 8,000 "B" shares of £1 each. Return ated October 16th, 1925. All shares taken up. £2 paid. £19,998 considered s paid. Mortgages and charges, nil.

Baynes Electrical Co., Ltd. (176,835).—Capital, £2,000 n £1 shares. Return dated October 26th, 1925. 213 shares taken up. £213 aid. Mortgages and charges, nil.

Edward Dewhurst, Ltd. (177,199).—Capital, £20,000 in 1 shares. Return dated September 7th, 1925. 15,672 shares taken up. 1,502 paid. £14,170 considered as paid. Mortgages and charges, nil.

Ayling & Co., Ltd.—Debenture dated October 23rd, 1925, o secure £600, charged on the company's undertaking and property, present nd future, including uncalled capital. Holder: J. W. Heaps, 12, London Road, Clapton, E.5.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Electric Supply Co. of Victoria, Ltd.

The directors' report for the year ended March 31st last, shows a gross profit of £50,020 as compared with £42,999 in the preceding year. After providing for taxation and reserve for premium on debenture stock, there was a balance to the credit of the profit and loss account of £42,333. To this was added £59,142 brought forward, making £101,475. Debenture and note interest, &c., absorbed £25,105, and it was proposed to deal with the balance £76,370) as follows:—Writing off preliminary and formation expenses, £8,757; preference dividend for the year, £10,500; dividend of 10 per cent. on the ordinary capital, £12,500; carried forward, £44,613. The additional generating sets referred to in the last report have been installed at Ballarat and Benligo, but they only came into full operation in January last. The electricity department recorded a growth in business, but the tramway department showed a decrease in the number of passengers carried. The meeting was held on November 12th.

India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.

In their report for the year ended August 31st, 1925, the directors submit accounts showing, after making provision for doubtful debts and income tax, a net profit of £108,482, plus £21,975 brought forward, making £130,457. The preference dividend absorbs £12,500 and £60,000 is to be added to reserve fund, leaving a disposable balance of £57,957, out of which a dividend of 5 per cent., free of income tax, on the ordinary shares, is to be paid, leaving £20,457 to be carried forward. The improvement in the company's activities referred to in the last annual report continues, and the turnover of the year shows a steady and profitable increase. The work of the Submarine Cable Department and of the company's cable steamer, *Silvergray*, discloses a gratifying increase during the past year. The French factory, notwithstanding the difficulties referred to last year, has produced better results. There is reason for hoping that the improvement will continue. The reserve fund has been increased by £60,000 to £280,000. The directors have considered the desire expressed by shareholders at the last meeting, and have arranged that the warrants for the dividend on ordinary shares shall be payable on December 1st instead of January 1st. Annual meeting: November 26th.

New Issues.

Newcastle-upon-Tyne Electric Supply Co., Ltd.—The company is offering to its shareholders an issue of 550,000 ordinary shares of £1 each at par. The new shares are being allotted in the proportion of one to each six preference or ordinary shares held. They will rank for dividend as from January 1st, 1926. In the circular containing the offer, the company states that there has been a remarkable expansion in its domestic load. During 1924 3,200 new customers were added and a further 5,000 will be connected before the end of the current year. It is anticipated that no fewer than 12,000 new connections will be made next year. The same dividend as last year will no doubt be paid for 1925.

British Insulated and Helsby Cables, Ltd.—The directors propose to capitalise the sum of £333,333 from the reserves and distribute this in the form of ordinary shares to the present ordinary shareholders in the proportion of one new share to each three held. If this proposal is approved, the new shares will rank for the forthcoming final dividend.

Prospectuses.—*Auckland Electric Power Board.*—An issue of 2,500 debentures of £100 each was offered by the Board last week, and letters of allotment have been posted. The price of issue was £98 and the debentures bear interest at the rate of 5 per cent., and are redeemable in 1946 at par. Redemption will be provided for by a sinking fund, and the Board is empowered to raise a special rate, if necessary, to secure the debentures. The proceeds are, in the words of the prospectus, "to provide funds for water-power conversion and general extension purposes in connection with the Board's electricity undertaking in and around the City of Auckland."

Government of Tasmania.—An issue of £600,000 of 5 per cent. registered stock at £98 per cent. was offered early this week by the Government of Tasmania. The proceeds are required for hydro-electric and other public works. The principal is repayable at par in 1975, or, at the option of the Government, at three months' notice, in 1945. The interest will be free of Tasmanian taxes.

Lancashire Electric Light & Power Co., Ltd.—On Wednesday last this company issued a prospectus offering 187,500 seven per cent. cumulative participating preference shares of £1 each at 23s. 6d. per share, and 371,440 ordinary shares of £1 each at 22s. 6d. per share. The proceeds are to be devoted to the repayment of moneys borrowed and expended on the development of the company's system, including the Padiham station and the installation of transmission lines, &c.

Companies to be Struck off the Register.—The names of the undermentioned companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—

Anode, Ltd.
Boulton Magnetos, Ltd.
British East Africa Power Development Co., Ltd.
Central Electric (Handsworth), Ltd.
Christian Bergh Electric Co., Ltd.
Hightensite, Ltd.
Lightning Valve Co., Ltd.
Metallic Electrodes, Ltd.
Scott Electrical Co., Ltd.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

South-Eastern Power and Light Co.—$13,668,900 6 per cent. gold debentures, series "A" (bearer) (temporary certificates); 273,378 option warrants to purchase new common stock at $50 per share.

Application has been made to the Committee to allow the following to be officially quoted:—

Shawinigan Water and Power Co.—$2,000,000 capital stock.

German Loan in America.—Last week the Rhenish-Westphalian Electricity Works Co. offered in New York $10,000,000 of direct mortgage 7 per cent. gold bonds, due 1950, at 94. It is reported that the loan was immediately oversubscribed.

Dorman, Long & Co., Ltd.—In declaring a dividend on the 6 per cent. cumulative preference shares for the six months ending December 31st next, the directors state that no dividends are to be paid on the 8 per cent. non-cumulative preferred ordinary and the ordinary shares.

Associated Gas and Electric Co.—The report for 1924 shows a net income of $1,005,757, and after deducting preferred dividends, fixed charges, &c., there was a surplus of $186,079. Material extensions have been made in the areas in which the subsidiary companies operate.

Adelaide Electric Supply Co., Ltd.—A final dividend of 6 per cent., free of tax, has been declared on the ordinary shares, making 12 per cent., free of tax, for the year ended August 31st last, as in 1923-24.

British Electric Traction Co., Ltd.—Interim dividends of 3 per cent. on the 6 per cent. preference stock and of 3 per cent. on the ordinary stock have been declared. Last year's interim ordinary dividend was 2 per cent.

British Thomson-Houston Co., Ltd.—Dividend on the 7 per cent. cumulative preference share capital of this company for the half year ending December 15th, 1925, less income tax at 4s. in the £.

Stocks and Shares.

MONDAY EVENING.

IN most markets of the Stock Exchange, business is much quieter than it has been of late. The remarkable rush of new issues, not only of rubber companies, but in other sections as well, tends to absorb a good deal of the floating supply of capital, though it exercises at present but little effect upon prices of existing stocks and shares. In the electricity departments, material strength is shown by most of the leading shares, and the recent outburst of strength amongst the issues of the equipment companies, cable and electrical, has not caused any particular selling on behalf of shareholders who must now have very substantial profits.

The Bournemouth & Poole company is making a curious offer to its shareholders in the shape of shares in the Richmond Electric Supply Co., Ltd. The curiosity of the offer lies in the manner of its making, and it is obvious that very careful thought has been given to the manner of effecting a distribution of shares in a way that shall be the most economical to proprietors in the companies concerned. Holders of Bournemouth & Poole should on no account miss the opportunity thus offered them for acquiring shares in a go-ahead concern, and at a price which is decidedly tempting. Bournemouth & Poole have risen to 3 ex rights and no doubt the issue of the Richmond shares affords the explanation for the advancing tendency of Bournemouths which has been a feature for the past few weeks. The Richmonds are offered at 24s., and the price is 6s. 9d. premium on the top of this.

In the London group, Chelseas are better at 2 and Kensingtons at 13. Edmundsons ordinary strengthened to 23s. 6d. Midland Counties, which have been quiet for some time past, are better at 22s. 9d. The Lancashire Light & Power Company is making a new issue this week of 7 per cent. cumulative participating preference at 23s. 6d. and of ordinary at 22s. 6d. Here, again, shareholders should see to it that they take advantage of the offer made to them, for the senior shares command a higher price in the market than that at which the new shares are offered, and the latter will be saleable at a premium.

The Hendon Electricity Supply Company is reorganising its capital and offers three new ordinary shares, for every ten held, at 46s. each. The present price of the existing shares is nearly £3. After this offer is completed, the company will make a bonus share distribution of 30 per cent., and the fortunate proprietors are to be congratulated upon the manner in which their company has been conducted to such a high state of prosperity.

The railway market is better, with Districts a feature of strength at 48, being 2 points up on the week. Underground Electric shares have been in demand, and, although the ordinary slipped back to 2⅜ after touching 2⅝, the 1s. shares at 8s. show a gain of a shilling. There is talk, very vague at present, of the long-expected reorganisation of the company's capital. When this is taken in hand, it is expected that some scheme will be formulated whereby both classes of shares may be brought within reasonable sight of a dividend.

The Siemens announcement of an interim dividend of 2½ per cent. led to some disappointment, for many people had been expecting at least 3¾ per cent. The price dropped abruptly to 33s., recovering later, however, to 34s. 6d., at which it shows a shilling fall on balance. The India Rubber Company has declared a dividend of 5 per cent., which also comes as a disappointment, but the company's increased profit figures are good enough to justify the anticipation that next year's report will show improvement in the dividend. The directors could have paid more this time, but have elected to fortify reserves at the expense of immediate return to proprietors. Brush rose 1s. to 25s. 6d., and Cromptons are 1/16 up at 13s. 9d. Electric Construction advanced to 34s. 6d. English Electrics at 20s. 3d. have risen to a slight premium, and Metropolitan-Vickers are better at 26s. 3d., on the announcement of important new contracts having been secured by the company. British Insulated fell back to 3⅝, after their recent very sharp rise. The rest of the shares in this division hold their ground.

New issue success is not confined to rubber companies. Auckland Electric Power Board offered 5 per cent. 1946 stock at 98, and the lists closed in a couple of hours from their being opened. In New York, prompt subscription followed upon an issue of ten million dollars Rhine Westphalia Electric Power 7 per cent. gold bonds at 94 plus interest. In contradistinction to these, it may be mentioned that the irrepressible Southern Counties Electric Light & Power Supply Company announces that the "subscription list is now open" for its preference, ordinary and debentures. The ordinary shares, by the way, are of the nominal value of a shilling, but are offered at 6s. Presumably there must be some people so simple as to apply for Southern Counties Electric descriptions, otherwise the things would not be pushed so persistently.

British Electric Traction went back a point, to 122½, although the interim dividend of 3 per cent. is 1 per cent. better than that of a year ago. Anglo-Argentine Tramways are better: Brazilian Tractions reacted. Mexicans remain rather irregular.

Cable stocks of the Eastern group display a robust tendency. Eastern ordinary, Eastern Extensions, and Westerns have strengthened. Globes hold their rise. Automatic Telephones are better at 51s. 3d., and International Automatics enjoyed a brisk jump to 33s. 6d. On the other hand, wireless shares are dull. Marconis have weakened to 26s. 3d. Two directors resigned last week, and their places are taken by Sir Frederick Barthorpe, D.L., and Sir William Slingo. It will be remembered that Sir William was engineer-in-chief of the G.P.O. during 1912-1919. Radio common gave way to 9¾ and the preferred to 9¼, following upon sales of shares induced by publication of the financial results of last quarter. Canadian Marconis drooped to 6s. 3d. It is semi-officially stated that there is no question of an amalgamation between the Canadian Marconi and the Radio Corporation of America.

With a fresh jump, raw rubber soared to 4s. 6d. per lb., revitalising the rubber share market and drawing fresh attention to the dividend possibilities that this price presages for shares in well-managed rubber companies. Other industrial sections are steady in the main. Babcocks keep hard at 51s. 3d., being regarded as one member of the quartette of sound iron and steel companies which are bound to benefit from any revival in the country's heavy trade.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	1924.	Price Nov. 16. 1925.	Rise or fall.	Yield p.c.
Bournemouth and Poole	1	13	14	3xr	+ 5/16	4 13 4
Brompton Ordinary	1	10	10	1⅜	—	*5 14 3
Charing Cross Ordinary	1	14½	15	50/-	—	6 2 5
do. do. 4½ Pref....	1	4	4½	17/6	—	5 2 10
Chelsea	1	12	12	2	+ ⅛	6 0 0
City of London	1	15	15	47/-	—	6 7 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	27/6	—	5 16 4
County of London	1	15	15	57/-	—	5 5 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	23/6	+1/-	5 19 2
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation ...	1	10	10	32/6	—	6 3 0
Kensington Ordinary	5	14	15	13	+ ⅛	5 15 5
Lancs. Light and Power	1	7½	7½	26/6	—	5 13 2
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref....	5	6	6	5⅝	—	5 6 8
Metropolitan	1	10	11	38/6	—	5 14 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/9	+6d.	5 5 6
Newcastle-on-Tyne Ordinary ...	1	6	7	22/6	—	6 4 5
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref. ...	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	15	—	5 16 8
South London	1	15	15	2½	— 1/16	6 0 0
South Metropolitan Pref. ...	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref. ...	1	6	6	18/9	—	6 8 1
Westminster Ordinary	1	15	15	44/6	—	6 14 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6

HOME RAILS.

Central London Ord. Assented	Stock	4	4	67	—	5 19 5
Metropolitan	,,	4	5	71	—	7 0 10
do. District	,,	3½	3½	48	+2	7 5 10
Underground Electric Ordinary	10	Nil	Nil	2⅜	— ⅛	Nil
do. do. "A" ...	1/-	Nil	Nil	8/-	+1/-	Nil
do do. Income	Bonds	6	6	97	—	*6 3 9

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	103	— 5 15 6
do. Def.	,,	1½	1½	24⅜	— 6 3 1
Automatic Telephone	1	3	6	2 2/16	+ 1/16 2 6 10
Chili Telephone	5	6	5	6 5/16	— *¼ 7 0
Cuba Sub. Ord.	10	5	5	6⅜	— 7 8 2
Eastern Extension	10	10	10	18½	+ ¼ *5 9 7
Eastern Tel. Ord.	Stock	10	10	180	+1½ *5 11 1
Globe Tel. and T. Ord.	10	10	10	18½	— *5 9 7
do. do. Pref.	10	6	6	11	— 5 8 1
Great Northern Tel.	10	22	22	34½	— ½ 6 8 6
Indo-European	25	7	8½	45½	— *4 13 5
Marconi	1	10	10	1 5/16	— 1/16 7 12 4
Marconi Marine	1	10	7½	⅝	— 8 11 6
Oriental Telephone Ord. ...	1	12	12	42/-	—6d. *5 14 3
United R. Plate Tel.	5	8	8	7 2/16	— 1/16 5 5 10
Western Telegraph	10	10	10	17⅜	+ ⅛ *5 12 6

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3½	+ 1/16 7 17 2
do. do. 2nd Pref. ...	5	6	6	3 7/16	+ 1/16 8 14 6
do. do. 5% Deb. ...	Stock	5	5	77	—1½ 6 9 10
British Electric Traction Ord. ...	,,	6	6	122½	—1 4 18 0
do. do. 6% Pref.	,,	6	6	106	—1 5 13 2
Brazil Traction	100	4	4	79	—1 5 1 3
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	89½	— 5 11 9
do. do. Preferred	,,	96/-	96/-	98½	— *4 17 6
do. do. Deferred	,,	129/5	129/5	116½	— *5 11 0
do. do. Deb.	,,	4¼	4¼	77½	— 5 9 8
Lond. & Sub. Trac. 5% Pref. ...	1	2½	Nil	4/6	— Nil
London United Tram. Deb. ...	Stock	4	4	42½	— 9 8
Mexico Trams, 5% Bonds ...	—	5	5	63½	— 7 17 6
Mexican Light Common ...	100	Nil	Nil	3¼	+2 Nil
do. Pref.	100	Nil	Nil	6¼	— Nil
do. 1st Bonds ...	—	5	5	69½	—1 7 3 11
Yorkshire (West Riding) ...	1	5	—	18/9	— 5 6 8

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	12	2 2/16	— *4 13 7
British Aluminium Ord.	1	5	10	1⅛	— 5 6 8
British Elec. Transformer Pref.	1	Nil	7	1	— ... ...
British Insulated Ord.	1	15	15	3⅜	— ⅛ 4 2 9
Brush Ord.	1	10	10	25/6	+1/- 7 16 11
Callenders	1	15	15	3⅜	— 4 9 0
do. 6½% Pref.	1	6½	6½	23/9	— 5 9 5
Crompton Ord.	1	Nil	Nil	13/9	+1/16 ... ...
Edison-Swan	4/-	10	10	9/-	— 4 9 0
do. 5% Deb.	Stock	5	5	8¼	— 5 19 1
Electric Construction	1	10	10	34/6	+9d. 5 15 11
Enfield Cable, Pref.	1	7½	7½	1½	— 6 0 0
English Electric	1	5	5	20/3	+9d. 4 19 0
do. do. Pref.	1	6	6	21/-	— 5 14 3
Gen. Elec. Pref.	1	6½	6½	23/9	— 5 9 5
do. Ord.	1	5	7½	29/9	+1/3 5 0 10
Henley	1	15	16	3 1/16	— 4 10 5
do. 4½% Pref.	5	4½	4½	4½	— 5 6 0
India-Rubber	1	5	5	1⅛	— *4 9 0
Johnson & Phillips	1	10	10	59/3	— 3 7 7
Met-Vickers, Ord.	1	8	8	26/3	+1/3 6 1 11
do. Pref.	2	8	8	2⅜	— 6 14 9
Siemens Ord.	1	—	7½	34/6	—1/- 4 6 11
Telegraph Construction	12	20	20	26½	— 4 10 0

* Dividends paid free of Income Tax.

Exports and Imports of Electrical Goods and Machinery in October, 1925.

A LARGE decline in the value of exported submarine telegraph and telephone cable (£411,820) was again responsible for a reduction in the total value of electrical exports during October. The fall as compared with the September figures was £172,761. Upon the whole, the position improved, for apart from the submarine-cable decrease, all items, with three minor exceptions, showed satisfactory increases. The principal actual improvement occurred in the case of unenumerated electrical machinery, the value of which rose by £89,076. Insulated wires and cables also made an appreciably better showing, being £51,054 above the September figures, and exported telegraph and telephone instruments and apparatus increased in value by £25,524. The best proportional increase was recorded for railway and tramway motors, £16,869. Comparing the figures with those for October, 1924, it is seen that the fall in submarine telegraph and telephone cable was responsible for the bulk of the decline in the total, although other items made large contributions: for instance, "other motors and generators," and telegraph and telephone instruments and apparatus. The only important increases upon the October, 1924, figures occurred in the cases of unenumerated electrical machinery, insulated wires and cables, and glow lamps.

Turning to the import section, it will be observed that only two items were lower in value than in the previous month; unenumerated electrical machinery fell heavily, being almost halved in value. The increases were roughly proportional, unenumerated electrical goods, telegraph and telephone apparatus, and batteries and accumulators being the outstanding items. The rise from the October, 1924, figures was fairly general, although batteries and accumulators were prominent in the list, with an increase of £50,513. The only items which declined to any extent were telegraph and telephone apparatus and unenumerated electrical machinery.

While the re-exports rose in value by £7,248 as compared with the September figures, they were £2,755 lower than in October, 1924. In this section, also, batteries and accumulators showed an increase. This is probably a manifestation of radio activity in preparation for the ensuing winter.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Oct., 1925.	Inc. or dec. as compared with Sept., 1925.	Inc. or dec. as compared with Oct., 1924.	Electrical imports for Oct., 1925.	Inc. or dec. as compared with Sept., 1925.	Inc. or dec. as compared with Oct., 1924.	Electrical re-exports for Oct., 1925.	Inc. or dec. as compared with Sept., 1925.	Inc. or dec. as compared with Oct., 1924.
Electrical goods and apparatus (unenumerated)	£118,795	+ £9,777	− £23,987	£116,987	+ £30,548	+ £17,271	£8,630	+ £2,668	− £1,711
Insulated wires and cables ...	231,345	+ 51,054	+ 44,786	69,246	+ 18,026	+ 19,661	804	− 163	− 503
Glow lamps	50,547	+ 16,288	+ 15,219	33,681	+ 4,879	− 6,169	520	+ 247	+ 130
Arc lamps and parts	1,074	− 78	− 60	3,574	+ 1,568	+ 2,257	25	− 65	− 55
Batteries and accumulators ...	74,107	+ 9,711	+ 5,594	96,189	+ 26,552	+ 50,513	1,947	+ 1,588	+ 1,743
Meters and instruments ...	35,262	+ 11,801	+ 1,901	23,975	+ 1,311	+ 8,686	587	− 4	− 64
Carbons	645	− 450	+ 36	10,846	+ 3,186	+ 3,635	138	− 54	− 20
Electrical Machinery—									
Electrical machinery (unenumerated)	264,422	+ 89,076	+ 74,806	65,608	− 31,594	− 12,474	6,774	+ 2,402	− 438
Railway and tramway motors	39,409	+ 16,869	− 23,273	—	—	—	—	—	—
Other motors and generators ...	186,811	+ 8,428	− 93,853	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	8,494	+ 3,175	+ 1,199	353	+ 326	+ 116	—	—	− 585
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	50,571	− 2,116	− 23,171	13,953	− 4,281	+ 1,367	—	− 574	− 273
Submarine telegraph and telephone cable	13,093	− 411,820	− 119,476	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	228,907	+ 25,524	− 82,469	81,130	+ 31,728	− 23,303	3,619	+ 1,203	− 419
Totals	£1,363,482	−£172,761	−£222,748	£515,542	+£82,249	+£61,560	£23,044	+ £7,248	−£2,755
Increases for the ten months ended October, 1925...		Exports. +£2,065,720			Imports. +£928,913			Re-exports. +£35,505	

The Trade Position in Greece.

ACCORDING to a report by Mr. R. F. H. Duke, C.B.E., British Commercial Secretary at Athens (Stationery Office, 2s. net), the establishment of Parliamentary Government in Greece has led to a remarkable change, and the year 1924 may almost be regarded as a milestone in the economic development of the country.

As regards British trade, the situation has shown some improvement. The Government is beginning to realise the desirability of facilitating the investment of foreign capital in Greece and the co-operation of British industry in the development of the country. British firms have shown greater interest than was the case during the previous few years in Government contracts, both of a military and civil nature, and in public enterprises generally in Greece. There is no doubt that the Greek Government is most anxious to develop the country, and that many schemes of a productive nature can be undertaken with profit. The numerous public works schemes which were contemplated in 1921 and 1922 did not make much progress in 1923. The proposal of an American group to carry out irrigation drainage, hydraulic power and railway development has not reach a concrete stage. Tenders were invited for the exploitation of the Vladovo Falls on the river Vodo, to supply electric power to Salonika, but the scheme did not come to fruition. Recently proposals were submitted by a British group for the re-organisation of the electric light and power system of Athens and Piræus, including the extension of the Athens-Kephissia and Athens-Piræus railways, and to the Athens and Piræus tramway systems, involving an expenditure of some 3 million pounds. If the British firm is successful in carrying the scheme through, it should add very largely to British industrial prestige in Greece, and bring considerable employment to the engineering and electrical industries in Great Britain. The tender for the electrical distribution and the construction of tramways at Canea has been constantly postponed, and no decision has yet been taken.

The postal and telephone services are stated to be entirely inadequate. A British group in 1923 put forward a scheme for the installation and exploitation of an automatic telephone system which appeared to have prospects of success, but eventually the scheme was withdrawn and nothing more has been heard of it. Further invitation to tender for the supply of certain quantities of apparatus was issued in February last, but no decision has yet been reached. The telegraph service remains quite efficient, but proposals for the installation of general radio services have made no progress, and although a contract was signed between the Greek Government and the Marconi Co. in November, 1923, it has not yet been ratified.

The report recommends British firms to co-operate with merchants or capitalists of high standing in Greece. The complications of contract work, especially with the Greek Government, are such that without the assistance and advice of experienced Greek collaborators, foreign firms can hardly expect either to meet with success.

American Production and Prosperity.

A F.B.I. Report upon the United States.

Col. the Hon. F. Vernon Willey and Mr. Guy Locock, who recently paid a visit to the United States on behalf of the Federation of British Industries, have prepared a report containing a concise review of the factors operating in that country to-day. With regard to the prosperity of the United States it is mentioned that although the population is only 6.2 per cent. of the total population of the world, America produces 71.9 per cent. of the world's petroleum; 70.9 per cent. of the rubber; 60.2 per cent. of the pig iron; 52.7 per cent. of the copper; 57.8 per cent. of the telephone and telegraph material; and 82.7 per cent. of the automobiles.

It is stated that the general trend of business is highly satisfactory, and there is no indication of any slackening in the volume of trade. It is expected that next year will see all records broken, and that a prolonged period of prosperity is in front of the United States. Among the industries particularly mentioned in the report is the iron and steel industry, production in which took an upward turn in August this year. The weather has been generally favourable to the crops, and the prices obtained for agricultural produce are an important factor in the strength of the country's position.

As regards American production, it is reported that partly as a result of the war, enormous plant developments took place, and when the slump came there was widespread overcapacity. A remarkable recovery has been made towards maximum output. Whereas in 1921 the actual output was only 57 per cent. of the productive capacity, in 1923—the latest year for which figures are available—the ratio had risen to 71.8 per cent. and it is believed that since 1923 further progress has been made towards maximum output.

The financial position of the United States is undoubtedly sound, and the banking system established by the Federal Reserve Act has thoroughly justified itself. The position of banks and of industrial corporations is extremely liquid, due mainly to two causes; first, there is now comparatively little capital expenditure on plant, and, secondly, the financial burden of carrying large stocks has been greatly reduced owing to the policy of "hand-to-mouth" buying and direct sales to the consumer. The accumulated wealth of the United States is so great that the country will be driven by the force of circumstances, to follow increasingly a foreign investment policy. A table in the report shows that the United States investment in foreign countries was 1,445 million dollars in 1920—a phenomenal figure. In 1923 it had fallen to 444 million dollars, and in 1924 a rise to 959 million dollars was experienced. The most important American foreign investments are in the Latin-American countries, with Canada and Newfoundland second. So far as Europe is concerned, money has of late tended to flow towards government and municipal issues rather than towards productive enterprises, but the investigators believe that this point is not being lost sight of by American financial interests.

The domestic investment situation in the United States is remarkable for, first, the immense appreciation that has occurred in capital values, which it is considered is likely to be maintained; and secondly, enormous profits are being made in land deals. The increased capital values necessitate increased earnings. Normally it would have been expected that the influx of gold into the United States would have tended to raise prices substantially, but this has not been the case, as the producer found that if he raised his prices he would not be able to sell his products. This failure of American prices to rise, as predicted, is all the more remarkable in view of the enormous extension of the deferred payment system. The underlying explanation of this phenomenon is generally stated to be that the increasing efficiency of production in the United States has stopped a rise in price level, and that producers are holding their position by means of lower percentage profits and greatly increased output.

With regard to taxation, the report states that although it is difficult to accurately compare conditions in this country and the United States, it is probably right to say that American taxation is not more than 60 per cent. of the British, and a considerable reduction in Federal taxation is certain at the end of the present financial year, owing to the substantial surplus which will be shown. It is stated that although the volume of production has increased from an index figure of 200 in 1921 to 285 in 1923, the number of wage earners has only increased from an index figure of 150 in 1921 to 190 in 1923. These figures show clearly the increased output per head, and the improved utilisation of power resources, and are a striking tribute to the efficiency of American production. In the last 10 years the volume of railway freight has increased by 25 per cent., while the number of employés has remained stationary. The reasons generally given for this increased efficiency are (1) the spread of education, both general and technical; and (2) the labour situation, the salient points of which are restriction of immigration, high wages, unrestricted output and the utilisation of labour-saving devices, and the satisfactory relations between employers and employed. The American employer believes in high wages and he pays them. But he also believes in high output, and he sees that he gets it.

Industrial organisation has attained a pitch in the United States which has never been equalled in any other country with the possible exception of Germany. In individual business the tendency is towards the large unit. This tendency is likely to become more and more marked. Apart from the movement towards amalgamation, there is far more readiness in America than in Great Britain for the different firms in one industry to co-operate for their mutual good, and even to go so far as to pool a great deal of their technical experience. The capacity and efficiency of American production are so great that sooner or later the country must domestically reach the saturation point, and there is no doubt that as time goes on the United States will become increasingly a factor in world trade, and we shall meet with increasingly severe competition from it. There can be no doubt that as soon as the moment comes that foreign trade development on a large scale is necessity, a nation of such initiative, energy and organising power, will build up a foreign trade system which will rival our own. Whereas Great Britain is the greatest user of American goods, she is only fourth in the list of supplying countries, in which the first place is taken by Canada, the second by Cuba, the third by Japan, and the fifth by Brazil. A regrettable tendency during recent years has been the falling off in the re-export trade from Great Britain to America, which is now buying direct from foreign countries to a much greater extent. The future trend of the American tariff has of course an important bearing upon our trade with the United States. On the whole it may be said that there would be strong opposition to any further increase in the tariff, but it is unlikely that there will be a revision downwards.

There is unfortunately a general impression in the United States that England is definitely "down and out." All our difficulties are exaggerated, and the progress that we have made towards re-construction is ignored. Not only is this doing the prestige of Great Britain infinite harm, but it is also losing us business. The report earnestly urges that some concerted steps should be taken to bring the real facts before the American public. It is thought desirable that one or more Englishmen of high standing should take an early opportunity of visiting the United States, and in a series of speeches in different parts of the country should correct the harm which has been done to British industries. It is suggested that the F.B.I. should take the initiative in this matter.

The Electrically-driven U.S.S. "Lexington."—The second of the United States Navy's new airplane carriers, the U.S.S. *Lexington*, was launched on October 3rd, at the Fore River plant of the Bethlehem Shipbuilding Corporation in Quincy, Mass. As in the case of the U.S.S. *Saratoga*, of which this boat is a duplicate, the *Lexington* is one of the largest ships ever launched in the western hemisphere, and will excel the first line battleships of this country in propulsion power. This will be the third United States airplane carrier; the only one now in service is the *Langley*, which ship was rebuilt from the old collier, *Jupiter*, the first vessel of the navy to be equipped with the turbo-electric drive. The *Saratoga*, launched this spring at Camden, N.J., is not yet in service; originally, both the *Saratoga* and *Lexington* were to have been battle cruisers, but the modification of the American naval programme, due to the decisions reached at the conference on the limitation of armaments, led to the conversion of these battle cruisers into airplane carriers. As a naval vessel, the *Lexington* (with the exception of her twin, the *Saratoga*) is the longest in the world; her length is 874 ft. and beam 105 ft. The output of the electric generating equipment is 180,000 h.p.—greater than the combined rated output of the six electrically-driven capital ships now in commission, *viz.*, the *New Mexico*, *California*, *Tennessee*, *Maryland*, *Colorado*, and *West Virginia*.

The complete electrical equipment for the *Lexington*, as in the case of the *Saratoga*, was furnished by the General Electric Co., of America. The propulsion apparatus consists of four 35,200-kW turbo-generators, supplying current to eight 22,500-h.p. motors. The turbines are operated with steam supplied by 16 oil-fired boilers. The motors are connected in pairs to each of the four propeller shafts, the total energy thus delivered to each shaft being 45,000 h.p.—sufficient to turn the propeller blades at a rate of 317 r.p.m., and to propel the ship at the rate of 33 knots, or approximately 39 miles an hour. In addition to the propulsion machinery, there are six 750-kW, direct-current, auxiliary turbo-generators which furnish current for all electrical purposes, except main propulsion. Among other uses to which electricity is put is the operation of the steering gear, anchor windlass, ventilation fans, and lighting systems. As in the case of the *Langley* and *Saratoga*, the *Lexington* is completely and specially equipped for radio work. The antenna runs to the deck from a single topmast, which has to be lowered when the boat passes under the Brooklyn Bridge.

A Remarkable High-Frequency Cable.

Inductance Coils made with Multi-Wire Cable.

Among the features of the Government's great radio station at Rugby is a cable of novel construction which forms part of a variable inductance in the high-power radio-frequency communication circuits. Generally speaking, the cable may be



Fig. 1.—The 6,561-wire High-frequency Cable.

compared with the single wire which is wound into a coil for tuning and is familiar even to the wireless tyro.

The cable in these giant inductance coils contains 6,561 wires, each separately insulated with enamel, and connected together at each end to form what is, to all intents and purposes, one conductor, *i.e.*, all the wires are in parallel. The reason for the separate insulation of each fine wire in the con-

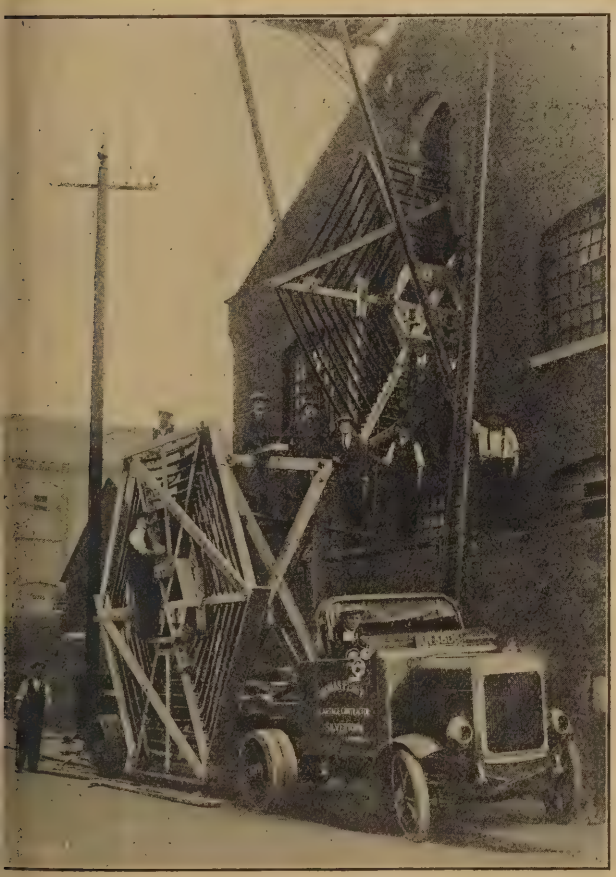


Fig. 2.—Cable and "Spiders" being removed from Works.

uctor is the alternating-current "skin" effect, as it was alled, which becomes of importance when the frequency eaches many thousands of cycles per second, as it does in vireless transmission.

The cable has two characteristics: The first is that, considered as a conductor, it is divided into a number of separate lements or wires, and the second is that the wires are plaited ogether in such a way that every wire over a given length passes through the same phases as every other wire with regard to the neutral axis, so that there is no tendency for a greater retardation, or impedance due to the high frequency, on any one wire more than another. The wires in an ordinary electric cable, although rotating around the axis, always remain at the same radial distance from the axis. In this unique inductance cable, owing to the different distances from the axis of the various wires from point to point, slight differences of potential are generated. If all the wires were bare, there would be short circuiting and the desired result would not be fully attained. To avoid this, the wires have been lightly insulated with enamel.

In the construction of this cable, the insulated wire was first covered with a layer of cotton to protect the enamel; three wires were then twisted together to form a unit, three of which units were next twisted again, and the operation was repeated until 81 wires had been assembled, when they were covered with a coat of silk to give further protection. Three such bunches were twisted again, and the operation repeated until the cable contained 6,561 wires.

The accompanying illustration (fig. 1) of the cable, showing the wires spread out fan wise, gives a clear idea of the construction of the cable, which was constructed in accordance

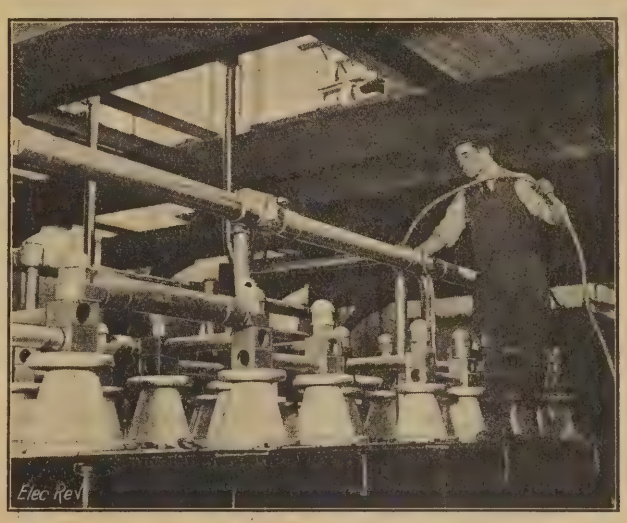


Fig. 3.—Condensers being filled with "Shell" Oil.

with the design and specifications of the British Post Office Engineering Department by W. T. Henley's Telegraph Works Co., Ltd. Its manufacture presented several unique features, which involved the design and construction of special plant and machinery.

The "spiders" shown in fig. 2 are really the complete inductance coils, the wooden framework being the former for the conductor. As they are 17 ft. in diameter, transport by rail was out of the question, and they were transported on special lorries from the manufacturers' works at North Woolwich to Rugby. The route had to be specially selected and surveyed to avoid the possibility of trouble with bridges, &c. In the second view it will be observed that the wall of the workshop had to be partly broken away to get them out. In all, nine of these huge tuning coils are to be used at Rugby.

After many years the theories of Lord Kelvin and Oliver Heaviside have thus found application in a branch of electrical development of which they were not cognisant at the time. Further, the theory and formula evolved by Lord Kelvin mathematically for frequencies of about 100 per second were experimentally proved to be correct 25 years later up to frequencies as high as 5,000 per second, and the frequencies used in wireless transmission are very much higher than this.

It has already been announced that some of the largest Dubilier condensers in the world have been installed at the Rugby radio station, and the third of the accompanying illustrations shows the condensers being filled with "K1" transformer oil supplied by Messrs. Shell-Mex, Ltd.

Lloyd's Register of Shipping.—The report of Lloyd's Register for the past year has been received. It states that the total tonnage of merchant vessels afloat holding the Society's classification is 28,436,965 tons—the highest figure recorded. Motor ships over 100 tons classified number 2,145, representing 2¾ million gross tons, and of these 19 exceed 8,000 tons; two are over 15,000 tons. The demand for double-acting Diesel engines is increasing, there being 25 sets of this type under construction; four sets of six-cylinder, two-stroke cycle, double-acting Diesel engines of 31,000 i.h.p. are being built for the quadruple-screw motor ship *Augustus* of 33,000 gross tons.

A New Design of Water Wheel.

New Jet Arrangement for Medium-Capacity Machine.

In order to meet a need which has been felt in water power work for a turbine having a capacity intermediate between the Pelton wheel and the low capacity reaction turbine, situations having been found where the Pelton wheel ran too slowly, but where the reaction turbine, with its less perfect speed regulation, and rather delicate wearing parts, was unsuitable, Messrs. Gilbert Gilkes & Co., Ltd., have designed a new impulse wheel, the "Turgo," which is claimed to maintain the simplicity of the "Pelton" type. The main difference between the two machines is that in the "Turgo" the jet makes an angle with the plane of the wheel, whereas in the "Pelton" it is directed straight on to the wheel tangentially to its circumference. This difference in the principle of the two methods is shown diagrammatically in fig. 1. The vanes or buckets can be completely enclosed at their outer periphery, allowing the water in passing over the vanes' surfaces to be completely controlled. Higher speeds can be obtained on this wheel, it is claimed, because a much larger jet can be efficiently used with a runner of given diameter. The speed regulation is accomplished by the firm's patent shaft governor.

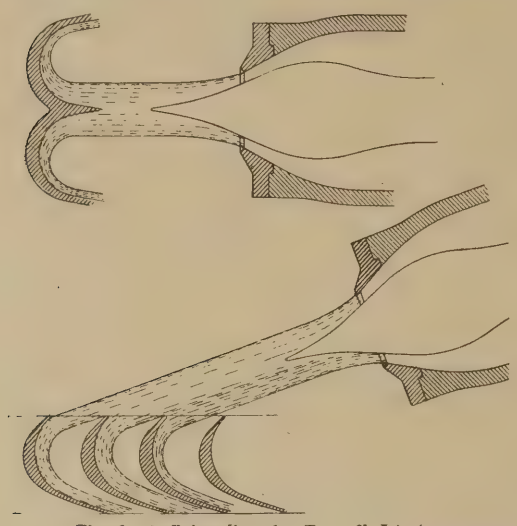


Fig. 1.—"Pelton" and "Turgo" Jet Arrangements.

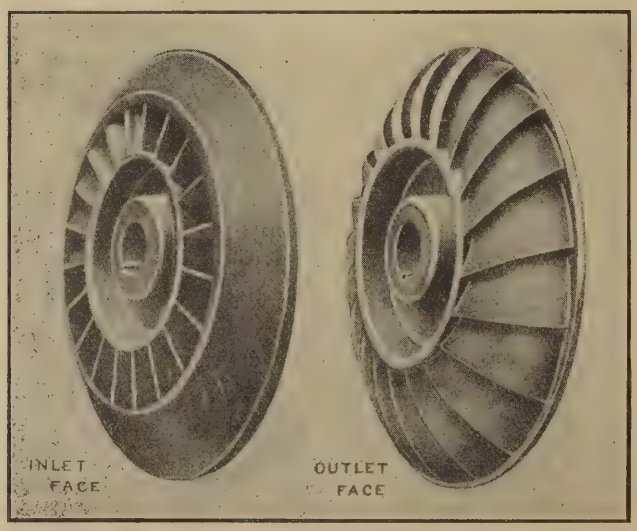


Fig. 2.—Turbine Wheel Faces.

Fig. 2 shows the inlet and outlet sides of a Turgo impulse wheel. The runner is made in one casting, and the water is directed on to the wheel in a jet of circular section through a nozzle exactly similar to that of the Pelton wheel. The plane of the jet makes a slight angle with that of the wheel, and the water enters at one side and passes out at the other. For heads up to 300 ft. the Turgo impulse wheel is standardised. The shaft is carried in ball and roller journal bearings and is located endways by means of a thrust ball bearing. The cast-iron casing is split on the horizontal centre line. Centrifugal throwers of the usual type prevent the escape of water along the shaft. In cases where no economiser is used, a hand adjustable spear rod is used to vary the size of the jet. Fig. 4 shows a complete unit fitted with a shaft governor, designed for direct coupling to an electric generator. The machine can be arranged on a vertical shaft where necessary. Fig. 3 shows a unit with the wheel exposed.

An efficiency curve prepared by Prof. A. H. Gibson, of Manchester University, from the results of tests made by him, on a 125-h.p. 18-in. wheel, shows a maximum efficiency of 83.5 per cent. at about 110 b.h.p.; the efficiency between 60 and 125 h.p. exceeds 80 per cent. and at 25 h.p. a 70 per cent. efficiency is recorded. The output of course varies with the fall of water and the size of the wheel. For an 18-in. wheel working on a 100-ft. fall the output is scheduled at 38.4 h.p., the water capacity being 260 cu. ft. per min., running at 451 r.p.m.

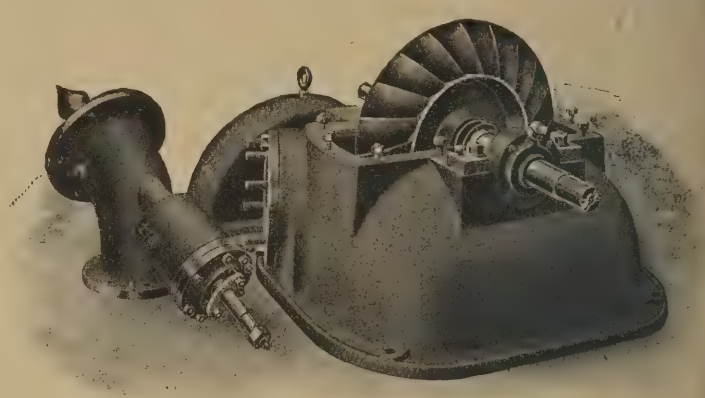


Fig. 3.—Machine with Wheel Exposed.

The Severn Barrage Scheme.—For some time little has been heard of the Severn barrage scheme, but it is gathered that, as the question of electricity supply in Great Britain is now under consideration, the Cabinet has decided that further investigations are desirable. A sub-committee of the Committee of Civil Research has accordingly, says the *Daily Telegraph*, been appointed, under the chairmanship of Lieut.-Col. Moore-Brabazon, Parliamentary Secretary to the Ministry of Transport, and the project will receive examination. It was stated in the House of Commons last May that a preliminary investigation of a very minor kind had taken place, and it confirmed the opinion of Sir John Snell that the scheme ought to be proceeded with. Lieut.-Col. Moore-Brabazon, who was speaking for the Government, said on that occasion that it was hoped "one of these days" to get a 200,000-kilowatt continuous supply out of the scheme. As regards the national electrification scheme, which is before a Cabinet Committee presided over by Sir Douglas Hogg, it is gathered that both financial details and questions of policy, such, for example, as the ownership of the proposed super-power stations, will have to be settled before a public announcement of the Government's proposals can be made.

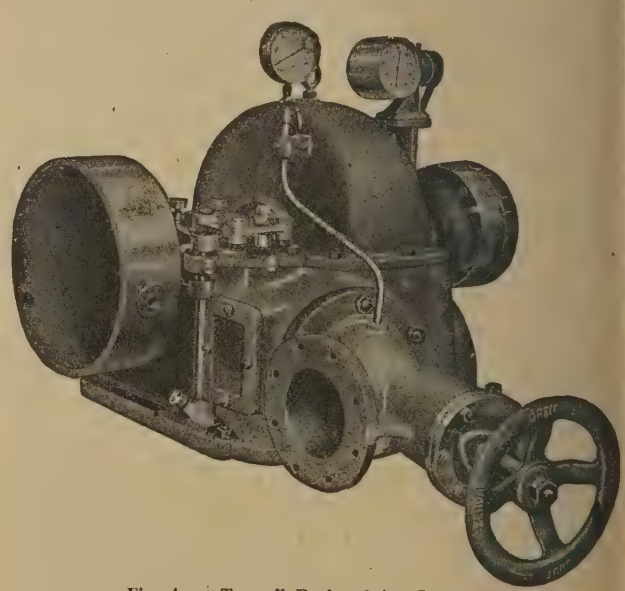


Fig. 4.—"Turgo" Designed for Generator.

Dielectric Problems in High-Voltage Cables.

By P. DUNSHEATH, O.B.E., M.A., B.Sc., M.I.E.E.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

(*Concluded from page 775.*)

HAVING examined the flow of current into an absorptive condenser under a steady unidirectional e.m.f., we will now consider what happens when such a condenser is connected to an a.c. supply.

Fundamentals of a.c. Losses.—The magnitude of the a.c. flowing (see fig. 3, last week) will depend on the current: a charging and geometric capacity; this will be a pure wattless current and comparable with that component of the d.c. ballistic capacity current associated with the charge C E (fig. 7); β flowing through the dielectric entirely by conduction or leakage, and γ into the capacity associated with absorption or the slow charging of component condensers through resistances. Only β and γ give rise to loss, the first to conduction loss and the second to what is usually styled hysteresis loss. This idea of hysteresis, based on a viscous molecular movement, seems to the author to be quite unnecessary, and by the following alternative conception, dielectric losses are considered to be due to currents flowing through circuits having definite resistances, composed in turn of an infinite number of component currents varying in phase relationship with the e.m.f. from zero to quadrature, see fig. 2. Thus a.c. dielectric losses can be considered to be I^2R losses and can be divided into non-cyclical losses, losses due to leakage, and cyclical losses due to absorption. Both presumably have the same origin, but the latter, being due to a current which flows through a condenser in series with the resistance, is thus dependent on the frequency. The value of the resistance in the second case is, of course, experimentally indeterminate.

Interpretation of a.c. dielectric losses in terms of the absorption equation $I_t = I + At^{-n}$ leads us to a definite expression for the a.c. power factor in terms of the d.c. absorption index n, from which values of $\cos\theta$ have been calculated, and the results are plotted in fig. 10 to cover a usual range of power factors obtained on impregnated-paper cables. It follows from the relationship brought to light in this diagram that, *so far as the losses due to absorption* are concerned, the perfect cable dielectric is that in which the index n in the absorption equation equals unity, giving zero power factor, and the nearer this index approaches its maximum value of unity the lower will be the a.c. power factor. The conclusion receives considerable support too from the experimental results which show that the drier and cooler a dielectric the nearer n approaches unity. This is an important conclusion and illustrates the very close connection that does exist between the a.c. and d.c. characteristics of a dielectric. It suggests also a method for the determination of a.c. power factor in which only d.c. tests are applied. The total losses in a given dielectric, however, comprise not only these due to absorption, but a further source of loss due to ionisation of enclosed air. The actual power factor determined experimentally will therefore be some value in excess of that given by fig. 10 by a quantity due to this other cause.

"V" Curve for Losses and Power Factor.—A very important and interesting relationship in the study of cable dielectrics is the variation of dielectric loss with temperature. Over

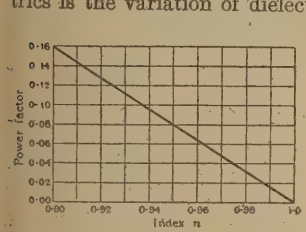


Fig. 10.—Relation between P.F. and Absorption Index.

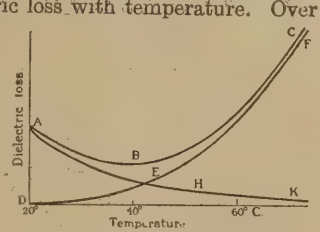


Fig. 11.—The "V" Curve Resolved into Two Components.

a working temperature-range the dielectric loss in most cables falls to a minimum at about 40 deg. C., and then rises again. The variation when plotted is the "V" curve of dielectric loss. The power factor curve is of the same shape owing to the charging currents being practically unaffected by temperature. So far no satisfactory explanation of the shape of this curve has been given.

The I^2R theory of dielectric losses formulated to replace the hysteresis conception seems to offer a better explanation of the "V" curve. Reverting to fig. 2, we recall that the elementary power factors were in each case proportional to the assumed series resistance. Now this conducting path in a dielectric is of an electrolytic nature with a negative temperature coefficient of resistance. If the temperature be raised, the resistance falls and with it the power factor $\cos\theta = \omega CR$. Both falling and rising portions are due to change of resistance with temperature. In the former case the resistance is in series with capacity, in the latter it is in parallel. The point is illustrated by fig. 11, where A B C is the curve obtained experimentally. Curve A H K is the component falling due to the decreasing resistance in series with capacities, and D E F the component attributed to direct leakage.

The author's tests embody one or two unique features illustrating the "V" curve, which may be described with advantage. In most tests high voltages are employed and, in order to explore a new field, it was decided to carry out a voltage/temperature range of loss tests at quite low voltages. The limits adopted were 50 to 110 volts, and the temperatures varied from 17 deg. C. to 85 deg. C. The dielectric losses were plotted against temperature for the different voltages, and the outstanding feature is the existence of the "V" curve. It is of considerable importance to note that it exists at such low voltages.

The shape of the "V" curve obtained from power-factor tests on a high-voltage cable may be deliberately changed by the use of different papers, impregnating compounds, and methods of manufacture. In all cases of impregnated-paper cables, where there is a minimum point in the "V" curve it seems to occur at a temperature about 30 deg. C. to 40 deg. C., but the minimum point can be eliminated entirely by certain treatment. For instance, in fig. 12 cable E was known to be imperfectly dried and the power factor, starting at an abnormally high value at normal temperature, continues to rise with temperature with no attempt at a minimum point. Cable F was impregnated under special conditions and with a special compound, both of which are known to produce a low power factor. In this case the power factor remains independent of temperature from 20 deg. C. up to 40 deg. C. and then only rises very slowly. Our present knowledge is insufficient to explain these curious variations in the "V" curve, but they may possibly be based on some peculiarity in the distribution of the elementary currents assumed in our treatment of absorption. If, for instance, the presence of moisture without actually adding direct conduction loads the system of condensers and resistances towards the conductance end of the series, the effect might be to produce a curve like E in fig. 12, or a curve like F could be produced by a "spreading" of the characteristics over the whole of the series.

Considerable light is thrown on the nature of the "V" curve by plotting the results of dielectric-loss tests taken on a length of cable at two different frequencies. While the 50-cycle loss is approximately double that at 25 cycles, at the low temperature the values run together as the temperature rises and at 150 deg. F. the loss is the same for both frequencies. As the charging current is proportional to the frequency, the power-factor curves have the opposite characteristic—they run together at the lower temperature and separate at the higher; at 50 deg. F. the leakage is negligible and at 150 deg. F. it predominates, but it will be shown in the next section that this assumption is incorrect. Notwithstanding the fact that the 25- and 50-cycle loss curves run together at the higher temperatures, it does not follow that at this temperature the loss is all direct conductance. The evidence is fairly clear that if tests were taken at much lower frequencies than 25, the two curves would separate at 150 deg. F. and for frequencies of the order of a fraction of 1 per second would separate very widely.

Connection between a.c. and d.c. Losses.—Very little information has been published on the connection between a.c. and d.c. losses in a cable dielectric; steady-current tests have been carried out on the cable referred to in the previous section and the connection between the a.c. and d.c. results have been calculated. The results obtained by comparing the d.c. tests just mentioned and the a.c. tests of the previous section taken on the same piece of cable establish several important points: First, the ratio of a.c. to d.c. losses in a paper cable at low voltages varies between wide limits (in this case from 4.350 to 12.3) depending on the temperature and the time of charging under d.c. conditions. Also the duration of the d.c. charge has a more marked effect on the ratio at low temperatures than at the high ones.

The most important result of all is in connection with the "V" curve explanation advanced in a previous section. The view sometimes expressed that at the higher working temperatures of paper cables the greater part of the dielectric loss can be attributed to conduction based on d.c. values seems to be wrong. The results obtained in these tests indicate that at 85 deg. C., which is in excess of normal maximum cable temperatures, the a.c. loss is more than 13 times the value calculated on the d.c. conductance, even on 120-minute d.c. results. As the conductance was still falling at the end of this time the ratio of a.c. to d.c. loss at 85 deg. C., based on final conductance, must have considerably exceeded the value of 13. The results show that around 80 deg. C. by far the greater part of the 50-cycle losses are cyclical. Following up the argument of Section IV, the difference between the ordinates of the upper and lower curves represents the I^2R losses due to the absorption currents flowing through component resistances, and it seems to follow that the absorption losses have definitely in themselves the two components to produce the dipping curve.

Attempts have been made by some investigators to throw light on the relationship between a.c. and d.c. losses by determining the effect of frequency under the a.c. conditions. Addenbrooke showed that, except for frequencies of the order

of 1 or 2 cycles per second, the loss in a large number of different dielectrics was a linear function of the frequency n and that if expressed as watts $= A + Bn$ the higher class of dielectrics gave the lower values of A. The author has examined this characteristic for impregnated-paper cables at different temperatures and at two frequencies. A typical set of results is plotted in fig. 13 for a length of 3-core super-pressure cable subjected to 25- and 50-cycle loss tests while immersed in water at various temperatures from 52 deg. F. to 150 deg. F. The curves show that the characteristic noted by Addenbrooke for different dielectrics is also brought to light by temperature variation in one and the same dielectric.

Rise of Power Factor with Voltage.—"Ionisation" is believed to be due to the presence of air entrapped within the cable dielectric. The results of the low-voltage tests given in Section V show no ionisation on this cable at 110 volts. The losses for these tests plotted logarithmically against voltage justify very exactly an expression $W = PE^m$ where W = loss in watts, E = applied voltage, and P and m are constants (m is found to be equal to 2 very exactly.)

An important factor in any study of the connection between power factor and voltage is the effect of overloading a cable. The tests taken immediately after manufacture may give only a very slight rise of power factor with voltage, but if a heavy current be passed through the cable so as to cause undue heating of the dielectric and expansion of the lead, then the repeat tests carried out on the length after cooling down will give a much sharper rise.

In view of the dependence of power factor on the two variables, temperature and voltage, and the need for a quick method of comparing the results on a number of cables, the author has found it convenient to employ solid diagrams for plotting the results. Four such models are shown in fig. 14. The values of power factor at any one voltage are plotted against temperature and the curve so formed is cut out of 5-ply wood ¼ in. thick. Similar curves are produced for each of the other voltages employed in the series of tests, and when they are assembled the resulting block gives a very useful bird's-eye view of the properties of the cable. In the determinaiton of the effect of some modification in materials, or manufacture,

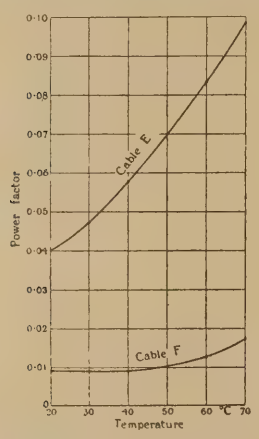


Fig. 12.—Effect of Imperfect Drying on Shapes of "V" Curve.

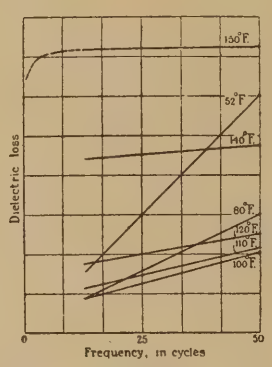


Fig. 13.—Impregnated-paper Cable; variation of Dielectric Loss with Frequency and Temperature.

when carrying out research work on cables, the comparison of two or more such blocks is much easier than the comparison of masses of figures.

Breakdown; Time-Voltage Relationship.—Quite recently the exact relationship between breakdown voltage and the time of application to the cable has called for detailed study. This time effect is quite a new phenomenon and F. M. Clark has shown that if a fibrous insulating material, such as impregnated paper, be subjected to a succession of voltage applications below the value necessary to cause failure, the dielectric being allowed considerable time for recovery between the applications, its power of resisting a straight breakdown test may be very much impaired. This means that indiscriminate high-pressure tests may seriously affect the life of the cable under working voltage, and that a succession of pressure-rises due to surges or lightning on connected open lines, although individually resulting in no failure, may make the cable progressively less able to withstand such voltages.

The author produces time/voltage curves for all cables made under research conditions by cutting a uniform length of cable into six or eight pieces, each 5 yards long, applying a quick breakdown voltage at a definite rate of increase and then applying 90, 85, 80 per cent., &c., of the value so obtained to the remaining pieces in turn. Plotting the results gives a curve that is very steep for short times and gradually flattens out until quite a small reduction in the voltage adds enormously to the time that the cable will stand up under it. As an indication of the order of the figures obtained, a good modern 33,000-volt cable will hold 75,000 volts three-phase at normal temperatures for 50 or 60 hours before failure. Instead of plotting the breakdown voltages against time the values may, as described by Owen, be plotted against the inverse fourth root of time when the points lie reasonably on straight lines. The greatest merit of this method of plotting seems to be that with it one can deduce with reasonable accuracy the probable voltage that a cable will hold indefinitely. It is evident that any precautions that can be taken to control the extent of pressure-rises on a cable system are well worth consideration.

Nature of Cable Breakdown.—Study of the conditions of individual papers taken from different parts of cables both broken down on test and subjected to prolonged pressure test, has led the author to formulate a theory of cable failure differing somewhat from those already advanced. The true explanation seems to lie somewhere between the tangential-stress theory of Höchstädter and the pyro-electric theory of Wagner.

Cables caught before actual failure in a pressure test reveal the following facts:—

(i) In a single-core cable at any point throughout the dielectric between the conductor and the lead sheath there may be a few consecutive papers showing signs of charring.

(ii) The papers above and below those damaged may be in perfect condition.

(iii) The charred condition is restricted neither to the proximity of the conductor nor to that of the lead; it may occur anywhere in the dielectric.

(iv) In a 3-core cable the same conditions hold, but, generally speaking, the charring occurs mostly on the outer core papers and either along the line of contact between cores or towards the centre of the cable.

(v) In a 3-core cable the belt papers rarely (one hestitates to say never, though this would probably be a correct word) show signs of charring.

In the earlier part of this paper it was contended that all a.c. dielectric losses are I^2R losses, the cyclical ones being due to the dissipation of energy when a current charging a condenser flows through a resistance. Now no cable dielectric is perfectly homogeneous; in a single-core cable, if the dielectric were perfect and uniform, the lines of current-flow would be



Fig. 14.—Models Recording Variation of Power Factor.

radial throughout and the current would be a pure displacement current. In a practical cable, however, we have (*a*) a layered dielectric where each layer contains paper fibres which have tiny quantities of moisture and so form electrolytic conducting paths perpendicular to the theoretical direction of the electric field; (*b*) inequalities in the contact between layers which result in a difference of impedance between one radial path and another.

Fig. 15 shows the result that may be expected from such considerations. Suppose that at point P there is a small patch where the two layers of paper are not making as efficient contact with one another as they do elsewhere. This weakness may be due to slackness of the papers, to an impervious spot in the paper preventing passage of the impregnating compound, or to imperfect drying. Whatever the cause, the result is to deflect the lines of flow of the displacement current and in so doing to turn them out of the radial direction. Immediately, the power factor of this part of the dielectric rises as the current flows along the paper fibres, energy is dissipated, and the resulting heat chars the papers and compound.

Further supporting evidence for this theory is given by the shapes of charred holes in single-core cable breakdowns. They frequently emerge on the outer surface in a direction oblique to the radius, as at Q.

A metal inter-sheath just on the inside or on the outside of the weak spot P would reduce the tendency of the weakness to spread, would reduce the I^2R loss and, without any question of the sheath being held at a definite potential for grading purposes, would strengthen the dielectric simply by its presence.

Assessment of Cable Quality.—Attention is being given by cable purchasers to (i) the drafting of specifications and (ii) tests in order to ensure that the cable shall meet all the condi-

tions of service satisfactorily. Apart from fixing the design, or approving a design submitted by the cable maker, there is a good deal to be said for matters under (i) being left to the manufacturer. In considering (ii) it will be appreciated that the tests which are suitable for cables to work on lower voltage are not suitable at 33,000 volts and upwards. The two

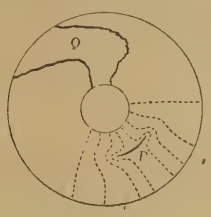


Fig. 15.—Effect of Irregularity on Dielectric Current.

guiding principles which might receive more attention by purchasers in selecting tests for use in accepting high-voltage cables are:—

(*a*) The tests which may shorten the subsequent life of the cable in service should as far as possible be restricted to special test-pieces not to be used afterwards.

(*b*) The object of using high-voltage cables is to lower transmission costs, and this object is partially defeated when the tests are made unnecessarily complicated and expensive, as the cost of the tests must be added to that of the cable. Tests on the thermal properties of a drum length, for instance, are very interesting, but, in view of all the other factors, are of minor importance to-day for acceptance purposes.

Discussion in London.

Mr. S. W. Melsom congratulated the author on having avoided the error of being too assertive, which had been noticeable in several recent papers. Whilst inclined to agree with the author's theoretical treatment of the subject, a good deal more experimental work would have to be carried out before his theory could be finally accepted. The assessment of cable quality needed a good deal of elucidation; it could have been made the subject of a paper to itself, and if the author had confined himself to that alone he would have earned the thanks of both makers and users of cables.

Mr. L. Emanueli, who was visiting this country from Italy, was specially welcomed by the President. While he agreed with several of the author's ideas, unfortunately the physical conception of what happened in a dielectric and upon which a mathematical theory could be built, was incomplete. However, the author's theory was the most probable one. The experimental part of the paper was incomplete, and a very important point in h.p. cable manufacture was the change in power factor caused by lowered insulation. The power factor diminished as the temperature increased, because the compound expanded and filled empty spaces. That part of the paper which dealt with cable breakdown was the most important. He referred to a paper he recently read before the International E.H.P. Conference, in which he described experimnts which showed that ionised air-pockets tended to displace the compound, which was sometimes accompanied by frothing, and in some cases it actually changed chemically. This was the probable reason of breakdown. A cable had been in successful operation in Italy at 130,000 volts for 18 months and it only differed from lower-voltage cables in that air and gas bubbles had been entirely eliminated from the insulation. Concerning inspection tests, he thought the ionisation test was better than the d.c. low-pressure test. To measure the power factor by passing current through the cable was apt to damage the dielectric, and he recommended the use of a constant-temperature bath. He hoped it would not be long before all cable makers would be able to come to some sort of agreement.

Mr. H. A. Ratcliffe explained that his undertaking had some 60 miles of 33,000-volt cable "more or less" in commission; that was to say, he had had his share of the troubles inseparable from a new technical development, but some of that cable had been in uninterrupted operation for six years. The author's explanation of dielectric charging phenomena threw valuable light on what happened inside a cable, and his views on that subject merited serious consideration. Dielectric stress tests should be made on experimental lengths, and not on the cable itself. What the cable user wanted to know was whether a cable could be expected to last for, say, 25 years under ordinary working conditions. He felt that transient phenomena were very much over-rated, and that when they did occur there was generally some definite explanation for them. He had abolished the use of spark gaps and surge arresters on 6,600-volt cables, whilst those installed on 33,000-volt cables had functioned rarely, if ever; the cables themselves provided the best sort of arrester for that sort of thing. The maximum stress theory had little bearing on a cable's actual behaviour; cable makers had rushed to the other extreme, but it was significant that they were now increasing the thickness of core walls again; 3-core cable breakdowns were as often as not due to mechanical rather than electrical causes.

Mr. H. A. Allen inquired whether the author had attacked charging currents from the point of view of the late Dr. Steinmetz, as expressed in his paper on "Cable Charge and Discharge." It provided an accurate method of comparing the qualities of different cables. In connection with fig. 12 it had not been stated which curve was due to the heavier oil. The explanation might be that infinitesimally small air bubbles were occluded in the insulation; the bubbles might exist among, and even inside, the fibres of the paper, but it was uncertain whether they were necessarily deleterious. Supposing that such finely divided air existed, as the temperature increased the oil expanded and compressed the air, so improving its dielectric properties and reducing the loss to a minimum.

Mr. C. J. Beaver, having "taken off his hat" to the first part of the paper, said he must "take off his coat" to the latter half. The I^2R theory had nothing to do with what occurred inside a cable and it did not explain the deterioration of papers during h.p. tests. He had not known that to happen except in the case of material that had been exposed to the air. It was neither electrostatic dispersion nor ionic flow (as had been suggested by Mr. L. Emanueli), but hydrostatic dispersion. The author had initiated another school of thought in this matter; 90 per cent. held the ionisation theory and the remaining 10 per cent. the moisture theory, but the factor that ultimately determined the breakdown of a cable was the amount of energy dissipated into heat per unit volume of dielectric. The statement at the end of the paper attributed to him by the author was incorrect.

Major A. M. Taylor was pleased the author considered that intersheaths improved the dielectric strength of cables. Intersheaths enabled the puckering of the paper to be checked and even eliminated, and their use also made it possible to control more effectively the temperature of the different sections of the cable.

Mr. H. C. Silver suggested that more attention might be devoted to the measurement of resistance and less to the electric strength. Was it possible that the passage of an electric current through the dielectric converted it into a partial conductor by chemical action, which could only take place in the presence of moisture?

Mr. G. W. Addenbrooke pointed out that dielectrics in an even field behaved differently to dielectrics in a cable. Mixing two substances together gave different results and that was the explanation of the dip in the curve of which the author made so much. Much of the moisture in the oil when the cable was tested went into the paper under the influence of heat, and it later returned; that was a part explanation, but an increase of pressure would reduce losses. Pressure had a great influence on resistance, but not on capacity, which was a point not mentioned in text books; it pointed to absorption losses being due to moisture and not to the material. What was needed was a pure physical explanation of what occurred inside a cable.

Mr. W. D. Owen was surprised at the author's admission that the time factor was a new phenomenon. The breakdown value fell with time and not at a constant rate; thus, the breakdown value of a dielectric could not be referred to in terms of a given time. A safety factor was a ratio, but in the case of cables of which two factors?

Mr. P. Dunsheath said he would reply to the points raised in full in the I.E.E. *Journal*.

A Fire-Extinguishing Demonstration.—We recently witnessed a demonstration given by the Total Fire Extinguisher Co., Ltd., of the "Total Fire Extinguisher," a product of the company, designed to deal with incipient fires irrespective of their origin, which is to be manufactured in this country in the immediate future. The apparatus consists primarily of a powder container and a steel cylinder containing liquid carbonic acid. The powder, a special preparation which, when heated, generates CO_2, is expelled from the container to the fire under the influence of the acid in the cylinder which is emitted in gaseous form through a suitable operating valve and nozzle to the powder container. The latter is fitted with a safety valve designed to work at 45 to 60 lb. per sq. in. pressure. The CO_2 cylinder is of seamless drawn steel tested to the standard requirements; it is, of course, suitably connected to the powder container. The apparatus is held in a bracket which protects the operating valve by a cover and also the discharge nozzle by a shoe. When suspended the "extinguisher" is held with the operating valve at the top. Should the apparatus be tampered with the cover opens, breaking the seal, and displays a red-light signal. The principle of the working of the "Total" is to cut off the supply of atmospheric oxygen to the burning object and surround the latter with a dense volume of the mixed extinguishing medium. The force with which the cloud is ejected enables the operator to fight the fire in a confined space. A question of considerable interest to the station engineer is that it is claimed that the extinguishing medium is a non-conductor of electricity, and that, therefore, the apparatus is suitable for fires of electrical origin, or where there is a danger of making contact with live conductors. At the demonstration structures of tar barrels and timber soaked in tar and petrol when burning furiously were dealt with by the "Total" with immediate effective results. The apparatus is manufactured in several sizes, from the small domestic size, which can be conveniently operated and carried by one person, to much larger ones carried in a cradle mounted on a pair of wheels. The largest type of extinguisher used at the demonstration holds 165 lb. of powder.

Notes from New Zealand.

(From Our Own Correspondent.)

Mangahao Inadequate.

The remarkably rapid growth of hydro-electricity in New Zealand may be gauged from the fact that already the Government's huge undertaking at Mangahao is threatened with a permanent overload. When this big project was first completed some eighteen months ago it was confidently expected that it would meet all the requirements of the district for some years at least, and it was even suggested that the Government would have some difficulty in disposing of available current. With the progress of reticulation, however, and the rapid growth of popularity of electricity as an illuminant and power agent, it now transpires that the various Power Boards in the district are anxious to acquire power far in excess of Mangahao's capacity.

The Government is now faced with the immediate necessity of constructing the second Mangahao dam for storage purposes, and the completion of this work will temporarily cope with the situation. The chief electrical engineer, however, has expressed the opinion that at the present rate of increase in demand, even the second dam will be inadequate and the Government will be obliged to push on with the Waikaremoana scheme, a contingency that was not expected to eventuate for some years at least.

Mangahao's present capacity is 24,000 h.p., and it is at the moment the largest scheme in operation in the Dominion. When the Lake Coleridge duplications are completed Mangahao will fall into the second place, but both Waikaremoana and Arapuni projects will cause even the revived Lake Coleridge scheme to fade into comparative insignificance.

Growth of the Electrical Demand.

During the last six years in New Zealand over 50,000 h.p. has been supplied from completed schemes at a cost of approximately £2,200,000, which works out at an average of £45 per horse power. In the case of the Lake Coleridge project the capital expenditure to date amounts to £1,008,491, and the total net profit for the past twelve months amounted to £5,434, thus reducing the total deficiency to £17,738, while works are in progress to raise the capacity of this plant to 27,000 kW. The Mangahao plant has absorbed some £1,493,456 capital expenditure to date, but as this station has not yet had a full year's run it would not be fair to compare it with others. The Horahora scheme has absorbed £522,973 in capital expenditure and the yearly working returns show a final net profit of £21,192, after all outstanding deficiencies have been wiped off. The Waikaremoana plant is only a small development at the moment, the major scheme not having been commenced, but a capital expenditure of £77,314 has already been involved, while as a final result of the year's operations the net loss is £3,295.

So far as the Department itself is concerned, the financial position is fairly sound. During the year its assets were valued at £4,753,248. The net expenditure amounted to £4,373,809, leaving a credit balance at the end of the working year of £379,439. Legislative authority exists for the raising of £4,000,000, and there are proposals to transfer £1,000,000 from the accumulated surplus and to raise another £4,000,000, so that the total available funds will reach £9,000,000.

Licensing of Wiremen.

As a result of accumulated pressure from those most intimately concerned, and partly in view of the large number of fatal and other accidents resulting from inexperienced wiring in some installations, the recent Power Conference in New Zealand has submitted draft regulations for the consideration of the Government covering the licensing and registration of all electrical wiremen. It is the desire of the Power Boards that after April, 1926, no electric wiring shall be done in any part of the Dominion except under the immediate supervision of fully-qualified and experienced men. When one considers the serious liability to fatal accidents made possible by placing electric wiring in the hands of incompetent individuals, it is in the best public interest that some such safeguarding measure should be instituted. In addition to the Wiremen's Act requiring the licensing and registration of all wiremen, it is proposed to set up a Board to administer the Act. This Board will consist of representatives of the Power Boards, insurance companies, the wiremen themselves, and the Government. The functions of the Board will include the providing of an examination for wiremen, maintenance of a register, inspections, and the examination of complaints, endorsement of licences, &c. The necessary appeal Board for the wiremen will consist of a magistrate and two qualified assessors, and provision is also made for the punishment of offences under the Act by fines up to £20. The measure is desired by all sections of the community and particularly by the wiremen themselves.

A New Railway.

An important railway undertaking is about to be launched within sight of the city of Wellington, when the largest railway tunnel in the Empire will be commenced, to link Wellington with the big settlement areas of the Manawatu. This tunnel will enter the hills between the existing railway stations of Kaiwarra and Ngarauhanga and continue in a straight line to the portal near the existing Tawa Flat railway station, a distance of eleven miles. At the present time the Wellington-Manawatu railway line is severely handicapped by the steep and winding grades between Thorndon and Tawa Flat, where the run over this 13-mile section on a 3 ft. 6 in. gauge takes almost 50 minutes, and limits the trailing loads to such a minimum as to seriously interfere with the economic operation of the whole line. The driving of the new tunnel is expected to take a minimum of five years, but it is not expected to complete the work within about eight years at the least. When this work is completed the schedule will be reduced by some 20 to 25 minutes, greater trailing loads will be possible, and it is anticipated that by that time plans will have been completed for the electrification of the whole of the suburban section as far north as Paekakariki at least—33 miles from the city. One important effect of this tunnel will be to bring a large tract of valuable settlement land within easy reach of the city and convert some thousands of acres of first-class seaside residential areas into suburban centres.

Electrical Material.

A large quantity of foreign electrical material has recently found its way into the New Zealand market, and has occasioned some little concern among dealers on account of the unsatisfactory results attendant upon its use. So far as inquiries have shown none of the poor material is of English manufacture, nor has it come through English firms, except in one instance, involving some lamps. Lamps seem to be the main supplies affected as these articles so easily advertise their inferiority, but there are several other lines, especially in radio materials, where the importations have proved unsatisfactory.

The Government is considering the question of setting up a Bureau of Electric Standards with a view to inspecting and testing all electrical apparatus and material imported into the country. At the present time a certain measure of inspection is being maintained by the fire underwriters as well as by some of the local bodies especially interested, but the rapid growth of electrical utilities is such that the matter must be handled on a large and comprehensive scale, and it would seem that the Government is the best authority to undertake the work. Government testing laboratories will be erected probably at Wellington and Auckland, and the supervising body will exert the same powers as a censor in examining all materials and refusing import entry in all cases in which goods fail to come up to the standard requirements.

Electro-Chemistry and Metallurgy.

Some Figures of Cost and Output.

(*Abstract of Chairman's Address*: Mersey and North Wales (Liverpool) Centre *of the* Institution of Electrical Engineers.)

Mr. A. E. Malpas, Wh.Sc., M.I.E.E., delivered his inaugural address as chairman of the above-named Centre of the Institution on November 2nd, choosing as his subject that of electricity as applied to the electro-chemical and electro-metallurgical industries. He briefly outlined the fundamental equations and reactions involved in the manufacture of calcium carbide and its derivatives, the oxidation of atmospheric nitrogen, the electrolytic production of gases, and the extraction of metals, relying principally on a very large number of lantern slides to illustrate the subject.

Pointing out that the largest outlet for calcium carbide was in the manufacture of cyanamide, the author remarked that the capacity of the American Cyanamid Co. at Niagara Falls was 75,000 tons per annum, and other plant in Germany and elsewhere was in operation on a more or less similar scale. The world capacity for the production of cyanamide was estimated at about 300,000 tons per annum, and, although at least 40 different compounds were produced from cyanamide as a raw material, probably the largest product was a nitrogenous fertiliser and in this field entered into competition with Chile saltpetre. One of the Norwegian water-power plants on the Hardanger Fjord, which was extended in 1914, absorbed some 50,000 h.p. for the manufacture of the carbide and some 6,000 h.p. for the conversion to cyanamide. From the Skjaldalsfos waterfall 130,000 was developed. Running at 100 per cent. load factor it was probable that the cost of generation did not exceed 0.04d. per kWh. The selling price metered as h.p. at the works transformer sub-station was 0.07d. kWh on the pre-war contract.

The home of the oxidation of atmospheric nitrogen process was also in Norway at Notodden, where over 400,000 h.p. was installed and 13,000 tons of air were blown through the furnaces every 24 hours. Some £8,000,000 had been spent on the development of the power plant and the equipment of the factories, equivalent to, say, £32 per kW installed. The heat recovered by the steam boilers per kilowatt-year expended in the furnace was equivalent to that of one ton of coal and was sufficient to supply the whole requirements for steam of the chemical processes involved.

Other solutions of the nitrogen problem had been found, more particularly that known as the Haber process and its modifications. Since this reaction was exothermic no great amount of power was required to maintain it once the reaction was started, so that the process was one that could be economically worked without the aid of cheap water power. The mechanical difficulties that had had to be got over in applying the equation in practice, had been solved in different ways by Haber, and later by Claude in France, and by Casale in Italy. The process was also being now worked on a large scale in England.

In connection with the electrolytic production of gases the Knowles cell was to-day probably the most widely used of the many variations, and it was gratifying to note that it was almost a local product in that it was manufactured on a large scale at Chester.

As a result of Sabatier's work on the hardening of oils by means of hydrogen, on which the supply of synthetic butter so much depended, the demand for hydrogen largely increased and was met partly by electrolytic methods and partly by other means, notably the Lane steam-iron process. To-day the electrolytic method appeared to be displacing the other processes. Still more recently, the demand for synthetic ammonia gas increased to such an extent as to necessitate further supplies of hydrogen and plant for producing it. Knowles cells capable of absorbing 20,000 kW and producing eight tons of hydrogen per day were at work, or shortly would be at work, not only in England, but in France, Italy, Russia, Chile, and other countries. Plant was now being erected in the French Pyrenees to absorb 11.250 kW and to produce 70,000 cu. ft. of hydrogen per hour, which would be used in the production of ammonia by the Casale process. Of minor importance, but still of interest, was the fact that there was a small Knowles installation at Bodio, in Switzerland, for the production of synthetic rubies. Oxy-hydrogen muffle furnaces were used, the supply of gases being produced electrolytically. Taking the cost of energy as 1/10th penny per kWh, the cost of hydrogen worked out at one halfpenny per metre cube for the power used.

Other gases than hydrogen were produced electrolytically by using an appropriate solution. The most commonly used was sodium chloride, giving chlorine at the anode and caustic soda and hydrogen at the cathode. The largest installation in the world was said to be the plant put down by the U.S. Government at Edgeware Arsenal, where 3,500 Nelson cells were installed for war purposes to give 100 tons of chlorine per day and the equivalent of caustic soda.

It was said that cells for the production of magnesium had been operated by the Magnesium Co. at Wolverhampton at 5,000 amperes, each taking 5 volts and giving an output of 100 lb. of metal per 24 hours, or 6 kWh per lb. of metal. It was thought that magnesium had a future before it for the production of light alloys and that it might some day compete with aluminium.

The output of aluminium had grown to very large dimensions, the raw materials used being bauxite and carbon. The crude material contained about 60 per cent. alumina and to refine it sufficiently for use required the expenditure of 8 tons of coal per ton of finished metal, which no doubt explained why the manufacture of aluminium had developed to the extent that it had done in England, the ore being first brought to the coalfields for refinement and afterwards treated in electric furnaces at one of the hydro-electric power plants. At the furnace each ton of metal required 25,000 kWh, so that at 1/10th penny per kWh the cost for electricity was £10 per ton.

The two hydro-electric installations in this country producing aluminium were those of the British Aluminium Co. at Kinlochleven, Scotland, and of the Aluminium Corporation at Dolgarrog, North Wales. At the Kinlochleven power house 35,000 b.h.p. was installed. The new installation at Lochaber would bring the total capacity up to 107,000 b.h.p. in a year of average rainfall. The Dolgarrog installation was capable of extension up to approximately 33,000 e.h.p. Both plants together should, when fully loaded, be able to turn out some 36,000 tons of metal per year and thus supply a large part of the world's consumption, which was said to amount to 45,000 tons in the year 1911. From figures published in 1910 it was estimated that the cost of power delivered to the Kinlochleven factories was 1/10th penny per kWh, including all charges from dam to switchboard, and that the cost would fall as the load increased. The cost of the power plant was given as £600,000 at that date and of the chemical plant £650,000, the equivalent of £17 and £18.5 per kWh installed respectively.

It was of interest to record that an installation built during the war at one of the hydro-electric plants in Italy for the production of aluminium had since been shut down and was turning over to the manufacture of synthetic ammonia. It would seem, therefore, that so far as aluminium was concerned, Britain should be able to hold her own, but that in order to foster other electro-chemical industries, everything possible should be done to reduce the cost of power production in this country.

Transmission Line Power Limits.

Mercury Rectifiers as Excitation Adjuncts.

The power limit of transmission lines is a live subject. In the October issue of the A.I.E.E. *Journal*, Messrs. R. E. Doherty and H. H. Dewey point out the essential features to be considered in a study of the problem and call attention to an experimental investigation of the subject. The latter part of their paper discusses the possibility of increasing the limit of power transmission by improving the apparatus and the characteristics of the transmission circuits, and it is pointed out that no great development may be expected from any scheme yet proposed regarding a modification in line characteristics. With reference to the apparatus, it is possible to make some changes in the design of synchronous machines tending to "stiffen" them, such as higher saturation, larger air-gap, &c., but in general no radical improvement of this sort may be expected that does not materially increase the cost and decrease the efficiency of the machine. Attention is turned therefore toward such schemes of regulation, or compensation, of the synchronous apparatus as would increase the maximum power. Among these is the use of reactors for locally controlling power factor and thus too the field excitation of the more important synchronous machines. However, the possible additional power thus obtained is limited, and, as it now appears, other and simpler methods which have greater promise will be resorted to.

Without expressing any assurance of practical application in the near future, it is noteworthy that a very substantial reduction in the effect of armature reaction has been actually obtained in a factory test by the use of the mercury-arc rectifier, as an adjunct in the excitation system. Its function is merely to supply field current in rigid proportion to the armature current, thus compensating for the latter *at the time it occurs*. By the nature of the circuits, and the variation of power factor, the space phase could not, in this particular case, be what was required. Nevertheless, the reduction in effective armature reaction, as evidenced by increased maximum power at the same voltage, under steady state, was of the order of 50 per cent.

Let the significance of this be clearly understood. Two maximum power (steady-state) tests were made on a miniature 250-mile line with a 225-kVA generator supplying a synchronous motor of the same size. One test was made with an ordinary vibrating regulator controlling the voltage of each synchronous machine; the other, with the rectifier as an adjunct. In the first, the power was gradually brought up to 120 kW at 2,000 volts at both ends of the line, 7 amperes on the motor field, 7.5 amperes on the generator field, which was the maximum power the system could carry; a further increase caused it to break out of step. Then the rectifier scheme was tried and the load was brought up to the same point, but this power was *not* the maximum; it was further increased at the same voltage to 154 kW, or an increase of 28 per cent.

This test is mentioned merely to illustrate the principle discussed; the point involved is the difference between the slope of a curve and the value of the function itself. It is not the value of voltage, but the slope of the voltage-power curve that indicates the degree of stability. If a system, controlled by vibrating regulators operating on the exciter is gradually loaded to imminent breakdown, the control can usually be taken over by hand and the same load held. In other words, although such regulators are highly effective in load transients in increasing the excitation as load is thrown on, they, nevertheless, do not significantly increase the steady state ultimate maximum power at normal voltage, over that corresponding to a fixed field current. The reason is that, even with the regulator, the slope of the voltage power curve, in the first moment, is practically the same as if the regulator were not operating; and if it should be different during a sudden transient, it must ultimately return to the steady state and thus to the slope corresponding to constant field. An exciter with a low time constant may expedite the regulation, but as long as the voltage must drop before the regulator contacts close, and the exciter field must be brought up before the alternator field current is changed, the compensation cannot possibly occur at the time the armature reaction occurs.

If this fact is not appreciated, it may be taken for granted that if the bus voltage is regulated, it may be assumed in calculations of maximum power that the voltage is *constant*. This assumption is justified only if $dE/dP=0$. It has even been proposed that by placing automatically regulated synchronous condensers along the line at given intervals, one may consider each of these sections as a unit, and that whatever power it is possible to transmit over one of them at the given voltage, can be transmitted, excepting losses, from one section to the other for a distance of, say, 1,000 miles. Now this would be possible only with infinite generators and also infinite condensers—*i.e.*, such that the slope of the terminal voltage curve against reactive kVA supplied by the condenser is zero. To illustrate magnitudes, the maximum power of a 250-mile line at 220,000 volts, infinite bus at both ends, is about 225,000 kW; of a 500-mile line, 130,000 kW. According to the proposal, with a condenser at the mid-point, it would be possible to transmit 225,000 kW, neglecting losses, over the entire 500 miles of line. Actually, a condenser at the mid-point of, say, 70,000-kVA capacity, would increase the maximum power only from 130,000 kW to 156,000 kW—not to 225.000 kW. This rather indicates what might be expected if the length were extended to 1,000 miles.

It is well to mention that consideration should not be confined to cases of long-distance straight-away transmission only. The problem, to a limited extent, relates also to power lines and networks of moderate distances, and the extent will undoubtedly become greater as the blocks of power to be transmitted continue to increase; or, indeed, to tie connections of central station systems—to any, in fact, in which the power to be transmitted approaches the power limit of the system under the operating conditions.

The progress to date has been little more than the demonstration of the principle in actual test, but it affords sufficient incentive to actively pursue the investigation when it is realised that for distances of transmission much above 300 miles the power limit with present equipment is such as to make such projects questionable from an economic standpoint, while, at the same time, the development of American resources will require the use of lines of this length in the near future.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

An Improved Draw-out Switchgear.

A new design of switchgear for 3-phase circuits and pressures up to 3,300 V, has recently been developed by Mr. GEORGE ELLISON, Perry Barr, Birmingham. The illustration, fig. 1, shows one of several switchboards supplied to a South Wales colliery. It is made up of eight units for one incoming and seven outgoing feeders. Each one is suitable for 200 A, and comprises an automatic circuit breaker, the necessary instruments and bus-bars. They are joined together by the bus-bar chambers and links. The gear is claimed to be freely accessible for inspection and adjustment, in accordance with the British standard specification No. 116, without resort to compound filling. The breaker element of each unit can be

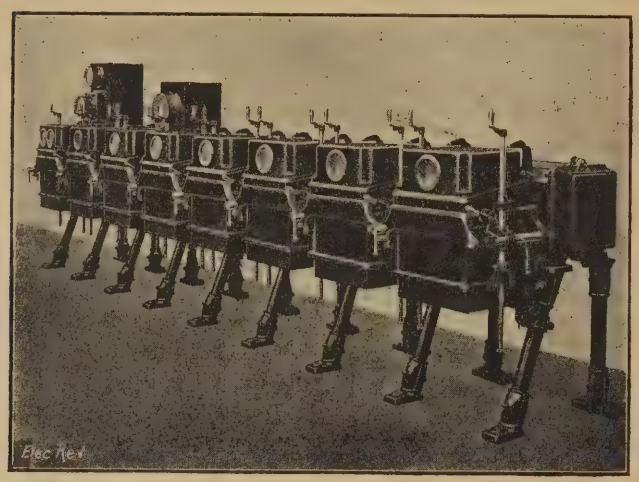


Fig. 1.—Draw-Out Unit Switchgear.

drawn out for isolating and the oil tank lowered without the use of auxiliary apparatus. Interlocks prevent access to current carrying parts unless the breaker is isolated. The trip coils are oil-immersed and the overload coils are direct connected in the main circuit; the breaker is operated by one handle, and easy operation is claimed without complication. The circuit is broken rapidly by two breaks in series, each 3 in. long, and the oil head is 6¾ in. above the points of break, assuring the safe rupture of high short-circuit currents; a welded steel tank is reinforced to withstand the shock of such an occurrence. A breaker may be entirely removed for overhauling and another mounted in its place if desired, or when the breaker is removed the aperture in front of the bus-bar chamber may be closed by a cover which can be locked up. Similar units may be arranged for the control of h.p. induction motors, in which cases the breaker is mechanically interlocked with a standard "Ellison" rotor starter erected in conjunction.

An Electric Sand-Pipe Heater.

The device illustrated in fig. 2, the Universal electric sand-pipe heater, is designed to keep sand pipes on locomotives, street cars and so forth, from clogging at the lower ends, and

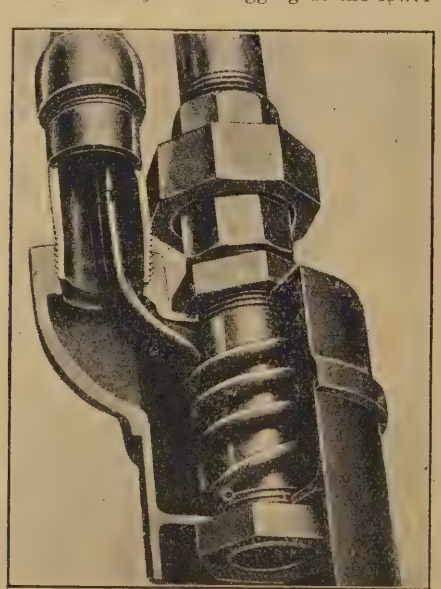


Fig. 2.—Sand-Pipe Heater.

has recently been patented in the United States. In stormy weather, the lower end of the sand pipe is always wet and it is a well-known fact that dry sand will not flow from a wet pipe without part of the sand sticking to the side of the pipe, eventually closing the outlet. The function of the device is to keep the orifice dry, permitting a flow of sand at all times, and thereby insuring full tractive effort and maximum adhesion for braking when needed. The heater is a simple device, screwed on the lower end of the sand pipe, simply making a shell which surrounds the pipe. Inside this shell and touching the sand pipe is an electric heating unit, which is supplied from the headlight generator. The heating element is covered with asbestos lagging, thus filling the space between it and the outer shell as well as retaining the heat.

Two sizes of heaters are manufactured, using 64 and 80 watts; two heaters are used on a locomotive.

Laboratory tests on the device were recently made by a large eastern railroad in the United States. Pipes were set up as on a locomotive and sand box and valves provided for track sanding. Water was allowed to trickle down the pipe and a blast of air equivalent to a cross wind blowing at 30 miles an hour was projected against the end of the sand pipe. Sand was permitted to flow down the pipe every 10 seconds. Without the heater the end of the pipe was closed with a grouty sand in from 5 to 15 min., while with the heater there was no wet sand in the lower end of the sand pipe at the end of 1¼ hours.

At a later date a road test was made. A five-gallon can of water was placed on the running board of a locomotive and a hose extending down to a point near the lower end of the sand pipe was used to trickle water on to the pipe. In making a 50-mile run without the heater on, the pipe clogged up every five minutes, being cleaned out each time. On the return trip, the current was "turned on" and the pipe gathered no wet sand. Again, another test was made in the freezing room of the Penn. Cress Ice Cream Company at Cresson, Pa., U.S.A. The sander was operated at a temperature of zero, with water trickling on the sand pipe. This was continued for two hours, at the end of which period there was nothing in the pipe.

The introduction of the electric sand pipe heater has solved the difficulty of obtaining a dependable flow of sand which arises from sand pipes stopping up, especially from the standpoint of safety. The patent is owned by a locomotive engineer engaged on the Pennsylvania Railroad.

An Electric Automobile-Engine Heater.

With the object of preventing the freezing of the water in the radiator and the engine cylinder jackets of motor vehicles when at rest in frosty weather, MESSRS. TURNCOCKS, Tunion Works, Aston, Birmingham, have recently introduced a simple device known as the Tunion electric automobile heater, fig. 3, which is intended to be placed under the bonnet of the car when the latter is put away for the night. It can be con-



Fig. 3.—Automobile Heater.

nected to an ordinary lampholder on a lighting installation, with a suitable flexible connection. The design of the heater is based on a current consumption of from 50 to 60 W, approximately the same as an ordinary metal filament lamp. The heat developed in the element is diffused over an area of 70 sq. in. of external surface from which to radiate. It is claimed that the working temperature is 200 deg. F. in free air. The heating elements are forced into an asbestos blanket under hydraulic pressure and firmly coated with polished bakelite.

Kaye Forced-feed Oilcans.

We have received a sample of a new "seamless" steel forced-feed oilcan which has been patented by MESSRS. JOSEPH KAYE & SONS, LTD., Lock Works, Leeds, who have recently received an order from the British Admiralty for 2,574 oil feeders made on this principle. Pressure on the thumb button ensures a jet of oil being forced to the spot required; the steel handle is riveted to the body of the can and the spout is double wrapped by a special process and is practically seamless. The top is fastened to the body of the can by means of serrated jointing. Various sizes are made, to hold from 1/16th to 2 pints, in steel and polished copper and brass.

An Appeal to the Student Engineer.

By W. F. MYLAN.

(*Abstract of Chairman's Address*; SHEFFIELD SUB-CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

I WOULD like to make a special appeal to those, who, qualified in every way, are not yet members, to take the necessary steps to become attached in an appropriate grade to this Sub-Centre and thus make it fully representative of the electrical engineering profession in this area. In this connection I address myself particularly to the younger men who are at the commencement of their careers.

The problem of increasing the value of the Sheffield Students' Section has been and is constantly receiving the attention of your Committee, which feels that, however great its efforts and how extensive its plans, the results will not be satisfactory unless a greater number of the younger members will actively take part in, and support by their attendance, the various meetings, discussions, and visits to works that may be arranged; and, more important still, by coming forward with papers to be presented before their fellow members. The Institution grows stronger and of more value to its members each year and to the younger men who have their careers in front of them, active membership can be of the greatest possible help and assistance, no matter on what lines their work may be proceeding or in what branch of the industry it is their intention to embark.

There is no branch of engineering, with the possible exception of aviation, in which recent progress has been so rapid and in which there is such an ever-widening future, and it would be a mistake on your part to assume that because a paper is one which at the moment does not appeal to you, you may miss the meeting at which it is read. Very shortly after you may find that to you the subject dealt with has become one of extreme importance.

The preparation and presentation of a paper is one of the most useful pieces of work the young engineer can undertake. You will not only be doing a helpful service to your brother engineers by presenting to them in a brief and concise form the information you have collected together by reading, investigation and observation, but you will have improved your own knoweldge of the subject dealt with. Try and take a share in the management of the section; don't leave this work to a few individuals. The experience gained as an officer or committee man will be useful in many unexpected directions. If a visit is arranged you should particularly make a point of being present. Quite apart from what you will see and learn of the practical application of electricity, it is a matter of courtesy to show your appreciation of the privilege granted to your section by attending. The young engineer should seize every opportunity of seeing how the many problems met with in engineering have been solved in different ways, and the practical applications of the theories which have been presented before him in the lecture room or in the text book. I feel that some apology is necessary to the senior members for dealing with these matters in a somewhat elementary form; but the student of to-day is the associate member or member of to-morrow, and if we are to see the Institution of Electrical Engineers maintain its true position in the engineering world, too much encouragement and assistance cannot be given to the younger element.

The matter is of greater importance still since we as a nation must keep in the van of progress, and to do so we must see that our young engineer is given every help and encouragement to fit him for the battle of life. Twenty to twenty-five years ago it could be said with some justice that in many branches of electrical engineering our competitors were greatly in advance of us, not only in excellence of design, efficiency of operation and performance, but also in the skilful application of electricity. Furthermore, their prices were usually lower than ours. To-day, thanks to that characteristic of the British as a nation, never to admit defeat, it would be difficult to point to one important branch of the electrical industry and profession wherein we are not at least equal to, and in many instances vastly in front of, our competitors and able, given equal economic conditions, to compete with them on price. To keep this position we must continue to advance, and to do so must ensure an adequate supply of fully trained workers equipped in every direction. I believe we are just verging on the period which will be known in after years as the electrical age. Some countries are much nearer to it than we are. Several nations are consuming two, three, four, or even five times as many kWh per head of population as we are. This may be only a very rough method of comparison, but it certainly would appear that there is ample scope for the electrical industry, especially when it is remembered that we are still a great manufacturing country, although perhaps not quite holding the predominant position that we did in the past. To retrieve that place should be the aim of all, and electrical engineers can here perform a very great part. It behoves we senior members, therefore, to do our share in helping on the young electrical engineer, and I would suggest to all of you, who are in close contact with the young men of our profession as friends and employers, to use your influence to get them to take an active interest in the work and meetings of this Institution. Five years ago we had 36 students attached to this Sub-Centre, to-day we have 52. Many of the original 36 will by this time have passed forward to other grades of membership, but there must be still a large number of young engineers who ought to be members of the Students' Section, and I suggest that a little active personal propaganda work on the part of the senior element would soon result in our Students' Section becoming a very live and useful body.

This country is passing through very trying times. Many of our industries are struggling for their very existence, and whilst the electrical industry is perhaps more fortunate than many others, we all have to face the intense foreign competition. Much of this is unfair, much of it is due to unequal economic conditions; practically none of it due to the superiority of the article offered. To all of you, I make an urgent appeal; be your purchases little or great, make sure above all, whenever you can, that you are buying British goods. Whether a product of the home trade or of our Colonies do insist that it be British throughout.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Is the Contracting Industry Degenerating?

In reply to Mr. T. Critchen's letter, I do not suggest that the regulations be slackened—what I would like to see would be the rule and regulation makers taking a few years' holiday and letting us get on with our work.

Had they taken their holiday in 1917 we should still be working on the Institution rules of that date, which are good enough for Mr. Fennell, of the Northwich Supply Company, and for many other members of supply companies; the mischief lies with the corporation supplies and the urban and rural districts, who each have their own book of rules, which in most cases they cannot enforce.

As an instance of the difference between 1917 and to-day, on a new job, the vacuum cleaner, iron, and radiator must be earthed (I have used all these things for eleven years without earthing them, without fatal or any other results, with three children growing up in that period). Once, however, the job is passed, it is open to the consumer to go to any shop or store and buy electrical devices, such as curling tongs, hair driers, violet-ray machines, radiators, &c., in many cases taking delivery over the counter; we, or any dealers, are not interested as to where they go so long as the sale is made. None of these items has an earth wire attached to it by the makers, and I am quite sure the dealers do not put one on, so that on a new job, we get some portion earthed and the later stuff not earthed; and if it is so dangerous, why are not the papers full of the accidents, fatal and otherwise, caused by unearthed apparatus?

Our only difficulty is to find out what the voltage is and if a.c. or d.c. is required, and that brings us to another difficulty, because in our area we have Altrincham 100 and 200 volts, Manchester 200 and 240, Salford and district 220 and 200, Ashton 240, Trafford Park 250, St. Annes 230; and it is only by careful cross-examination of the customer and knowing which is the new system and which the old, that we can fill an order.

I have sold many grosses of electric irons, hundreds of vacuum cleaners, radiators, kettles, &c., over the counter, having no further interest in the goods sold (unless they went faulty, when of course we heard about it); in this respect, why should we? We are competing with all the big stores in the country who are not contractors, but just purely salesmen.

I suppose the stores have the same sources of supply as the contractors, and in no single case is a piece of apparatus delivered to us with an earth wire—not even a washing machine, which most certainly should be earthed!

I am in entire agreement with Mr. Fennell and Mr. Critchen as to registration, and the sooner it is compulsory the better; at present the contractor is competing with wiremen and others working from private houses, carrying no stock, not helping the trade in any way, and probably out of business in a few months.

Manchester, *November 9th*, 1925. **E. O. Walker.**

Rural Electricity Supply.

In connection with this correspondence, it is interesting to note that the I.E.E. Informal Meetings Section, in its discussion on "How can the cost of Distribution be Cheapened?" elicited the fact that the Shropshire, Worcestershire, and Staffordshire E.P. Co. is erecting overhead distribution lines at about £400 per mile. This is much lower than the cost in many other parts of the country. However, it would be interesting to know why the cost could not be further very considerably reduced. In Sweden, as one instance, the cost of a line for a similar purpose is only about £100 per mile. What modifications should be made in this country to get somewhere near this figure without sacrificing public safety? It is not essential, for rural work, to provide an absolutely uninterrupted service; this fact enables costs to be reduced.

I know of lines in this country that have cost but little more than the Swedish example—but they have been erected without official sanction. However, I have constructed one at a similar cost, for which I have had the informal sanction of the

Electricity Commissioners. Hence it is not this body that stands in the light. It is further claimed in this correspondence that it is not the I.E.E. regulations or the P.O. Telephone Department, that put any really serious difficulties in the way.

It is a matter of very great importance to this country that the cost of overhead lines should be reduced; have any readers of the ELECTRICAL REVIEW any concrete suggestions that will facilitate the attainment of this end?

R. Borlase Matthews.

East Grinstead, *November 14th*, 1925.

The Cost of House Wiring.

Referring to "Inquirer's" letter under the above heading in your issue of the 13th inst., this we read with interest, and we would like to give our experience that as regards house wiring we find our keenest competitors are members of the E.T.U. who, when working on their own behalf, will complete a seven-point job in about 9 or 10 hours, but when taking 1s. 10d. per hour from us for their labours, our experience is that they take nearer one week; hence the impossibility of such competition for this class of work.

Heath Pritchard, Ltd.

London, *November 14th*, 1925. S. E. GRUBB, *Director*.

Legal.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

THE Court of Appeal, consisting of the Master of the Rolls and Lords Justices Warrington and Sargant, on November 11th reserved judgment in this case upon the appeal of the plaintiff company from the judgment of Mr. Justice Lawrence in the Chancery Division, holding that Rosenberg's patent for improvements relating to synchronous dynamo-electric machines, of which the plaintiffs are the owners, had been anticipated by Tesla's U.S.A. publication, but that if it had been valid it would have been infringed by the defendants, the British Thomson-Houston Company, Ltd.

Radio Instruments, Ltd., v. Super Radio Co.

IN the Chancery Division on November 10th, a motion in an action by Radio Instruments, Ltd., against the Super Radio Co. was mentioned to Mr. Justice Tomlin.

Mr. BOUSFIELD, for the plaintiffs, said it had been agreed to treat the motion as the trial of the action and the defendants would submit to a perpetual injunction with costs.

Radio Instruments, Ltd., v. Lesadd & Sons.

IN the Chancery Division on November 13th, Mr. Justice Tomlin had before him a motion by Radio Instruments, Ltd., for an injunction restraining Lesadd & Sons, Ilford, from infringing its patent in relation to radio instruments by selling them below the stipulated price.

Mr. BOUSFIELD, for plaintiffs, said that the defendants were prepared to treat the motion as the trial of the action, to submit to a perpetual injunction, and to pay two guineas as damages and 20 guineas as costs.

His LORDSHIP made an order accordingly.

Postmaster-General v. Ford.

THE adjourned summons obtained by the Postmaster-General against Mr. Robert Moffatt Ford, Albert Gate, S.W., came before Mr. Mead at the Marlborough Street Police Court on November 12th. The charges were that the defendant had established a radio station, installed apparatus, and worked the latter without a licence. Mr. Ford pleaded "Not guilty," and conducted his own defence. Evidence was given by Post Office officials of the discovery of the apparatus in defendant's house. Mr. E. H. Shaughnessy, assistant engineer-in-chief of the G.P.O., said that the apparatus found had been tested and ascertained to be capable of receiving messages, when a "cat's-whisker" and telephones were added. The witness said that any combination of apparatus which would receive radio signals constituted a "station," and unassembled parts were "wireless apparatus."

As defendant said that his closing statement would occupy some time, the magistrate again adjourned the case for a fortnight.

Consolidated Electrical Co., Ltd., and Allen & West v. London Woollen Co., Ltd.

IN the King's Bench Division, on November 12th, Mr. Justice Avory gave judgment in favour of the plaintiffs in this case, holding that they were induced by misrepresentation to take up certain shares in the defendant company.

False Pretences Charge Dismissed.

AT the Marlborough Street Police Court on November 13th, the Magistrate discharged Hyman R. Spinney, electrical engineer, who was charged with obtaining by false pretences telephones valued at £412 10s., the property of the General Radio Co., Ltd.

Trade-mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 11th. In the case of foreign applications, the names and addresses of the British representatives are also given.

Superselectodyne. No. 460,255. All goods in Class 8. No. 460,257. All goods in Class 13. Supertetradyne. No. 460,258. Superpentadyne. No. 460,259. Superhexadyne. No. 460,266. All goods in Class 6.—Société Française Radio-Electrique, 79, Boulevard Haussmann, Paris. (Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2).

Audalion (lettering and design). No. 457,674. Class 8. Loud speaker devices and telephonic receiving instruments.—Lee de Forest, 220, West 42nd Street, New York, U.S.A. (Frank B. Dehn, 103, Kingsway, W.C.2).

Kathodofone. No. 460,426. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Die Tri-Ergon Gesellschaft, 7, Tiefenhöhe, Zurich, Switzerland (A. M. & W. Clark, 53-54, Chancery Lane, W.C.2).

Kenmac. No. 461,327. Class 8. Apparatus for use in radio-telegraphy and telephony.—Kenmac Radio, Ltd., 2a, Dalling Road, Hammersmith, W.

Davreach. No. 461,928. Class 8. Radio-telephonic apparatus.—E. H. Millington, 5, Vaughton Street South, Birmingham.

Hitensite. No. 462,558. Class 8. Paper-insulated electric cables. Kalanoid. No. 461,068. Class 50. Electric insulating material composed of a mixture of levigated earth, oil, waxes, and bitumen. Emfinite. No. 462,775. Class 8. Electric cables.—Callender's Cable and Construction Co., Ltd.

Milliwatt. No. 458,202. Class 11. Electric heating cushions and pads.—Richard Heilbrun, 27 28, Lindenstrasse, Nowawes, Germany (Mathys & Co., 52, Chancery Lane, W.C.2.)

Musikon. No. 460,466. All goods in Class 8.—Will Day, Ltd., 19, Lisle Street, W.C.2

Phonalion. No. 461,296. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—The G. & L. Electrical Supply Co., Ltd., 1, Warwick Court, High Holborn, W.C.1.

Music Master (lettering and design). No. 460,969. Class 8. Receiving sets, sound reproducers and amplifiers, all for use in radio-telephony, and electric batteries.—The Music Master Corporation, 128, North Tenth Street, Philadelphia, U.S.A. (F. W. Golby, 3, John Street, Bedford Row, W.C.).

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

17,376. "Variable electric couples or inductance devices for wireless apparatus." London & Provincial Radio Co., Ltd., and E. Duckworth. July 21st, 1924. (241,614.)

17,447. "Wireless telephone transmitting systems." H. R. C. Van de Velde, J. Stewart, and E. H. Trump. July 21st, 1924. (241,617.)

17,448. "Radio-receiving sets." P. W. Willans. July 21st, 1924. (241,618.)

17,536. "Circuit-controlling means for electrical train-control apparatus." R. Haddan (J. B. Regan). July 22nd, 1924. (241,623.)

17,866. "Means or apparatus for transmitting motion to motor vehicles propelled by electric or other power." F. E. Popplewell. July 26th, 1924. (241,633.)

18,321. "Direct-current supply systems." British Thomson-Houston Co., Ltd., and F. P. Whitaker. July 31st, 1924. (241,642.)

18,623. "Methods of and apparatus for signal reception." British Thomson-Houston Co., Ltd. August 3rd, 1923. (220,004.)

18,916. "Means for reducing the glare of head-lamps." O. C. Worthington. August 8th, 1924. (Cognate application 24,136/24.) (241,648.)

19,209. "Electrical transformers." G. W. Hale and Radio Engineering Co., Ltd. August 13th, 1924. (241,653.)

19,332. "Circuit arrangements for automatic telephone systems and the like." Siemens Bros. & Co., Ltd., and W. G. Patterson. August 15th, 1924. (Cognate application 23,242/24.) (241,655.)

19,521. "Wireless receiving apparatus and the like." J. Gaunt. August 18th, 1924. (241,656.)

19,894. "Control of electric traction motors." Metropolitan-Vickers Electrical Co., Ltd. (Westinghouse Electric & Manufacturing Co.). August 22nd, 1924. (241,660.)

19,988. "Electrical devices such as variable electrostatic condensers, variable inductances, and the like." H. H. Andrewes and Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.). August 23rd, 1924. (241,661.)

20,162. "Electric motor control systems." English Electric Co., Ltd., and F. D. H. Bremner. August 26th, 1924. (241,662.)

21,477. "Wireless or electrical terminals, couplings, and the like." L. H. Reid. September 11th, 1924. (241,674.)

22,157. "Systems of electric distribution." British Thomson-Houston Co., Ltd. September 20th, 1923. (222,140.)

22,418. "Electrical apparatus for the measuremtnt of the level and flow of liquids." G. F. Shotter. September 23rd, 1924. (241,684.)

23,392. "Electric cooking utensils and other like apparatus, and an element therefor." A. C. Ireland. October 3rd, 1923. (222,884.)

23,397. "Rheostats." Igranic Electric Co., Ltd., and W. K. Alford. October 3rd, 1924. (241,694.)

25,181. "Head telephone receivers." Schneider, Maschinen-Werke Ges. F. July 30th, 1924. (237,854.)

25,558. "Electric condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (241,716.)

26,007. "Electrical apparatus for the elimination of aperiodic disturbances." H. J. J. M. de R. Belescize. July 22nd, 1924. (Addition to 226,784.) (237,547.)

27,363. "High tension thermionic valves." Siemens & Halske Akt. Ges. December 4th, 1923. (225,836.)

28,471. "Sparking devices for internal-combustion engines." R. J. Koster and F. E. Bright. November 27th, 1924. (241,740.)

29,806. "Method for the production of connectors for bonding electric rails." J. G. Kjellgren. December 11th, 1924. (241,749.)

30,611. "Telephonic repeating systems." International General Electric Co., Inc. December 22nd, 1923. (226,560.)

30,806 "Railway or tramway rail joints." E. A. Byrde. December 22nd, 1924. (241,754.)

1925.

2,022. "Electrical measuring systems." J. H. Beaumont (Naamlooze Vennootschap Instrumentfabrick en Handel voorheen P. J. Kipp & Zonen). January 22nd, 1925. (241,772.)

5,699. "Electrical contact plug." Deltavis Co. January 21st, 1925. (241,785.)

7,919. "Electrical contact plug." Deltavis Co. March 24th, 1925. (Addition to 241,785.) (241,794.)

8,415. "Protecting devices for electric detonators." H. L. Grant. November 6th, 1924. (241,796.)

9,704. "Spark plugs." M. F. Macdonald. May 1st, 1924. (233,325.)

9,927. "Variable electric condensers." L. E. Fillmore and L. W. Fillmore. April 16th, 1925. (241,805.)

11,172. "Safety device for electrically-heated vessels." Brompton & Kensington Accessories Co., Ltd., and A. Logan. April 29th, 1925. (241,812.)

The

Electrical Review

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The Weir Report Foreshadowed.

SELDOM has even a Beama dinner proved so fruitful of material for thought and discussion as that which was held by the British Electrical and Allied Manufacturers' Association on Thursday last week. The speeches reached a high level of interest and significance, and covered a wide range of subjects.

The most notable pronouncement was no doubt that of Lord Weir of Eastwood, chairman of the Committee of Inquiry into the electrical situation appointed by the present Government, which presented its report to the Minister of Transport on May 20th, 1925. Lord Weir professed to forget the famous report, which is still kept secret, and to give his own personal opinions; but Lt.-Col. Wilfrid Ashley, responding to the toast, said that Lord Weir had laid bare "its minutest details," and whilst we must make allowance for the badinage of an after-dinner speech, it cannot be doubted that the main principles of the report will eventually be found to correspond closely with the substance of Lord Weir's "personal views." It is important, therefore, to examine his remarks with care.

To begin with, he emphasised the fact embodied in the first paragraph of our leader last week—that continued uncertainty as to the future policy of the Government was most unsettling, and highly detrimental to electrical development. No doubt, as the Minister of Transport assured his audience, the matter is receiving the daily attention of the Cabinet. No doubt, too, as he indicated, and as we surmised in the same leader, it is the question of finance that blocks the way; but whatever the reason, it cannot be too strongly urged that the hands of the Electricity Commissioners and of the electrical industry in general are paralysed by the sense of impending changes which prevails, and the impossibility of making rapid progress so long as the intentions of the Government remain unknown. As Lord Weir said, such conditions "breed lack of confidence, and irresolution, and they stultify progress." Unfortunately, it is no new thing; repeatedly in recent years the electrical industry has been subjected to a similar trial of its patience, and might say with Mercutio to Parliament: "A plague o' both your Houses!"

Returning to Lord Weir's speech, he said he was sure "that effective and efficient development of our national resources will be ruined if it becomes either a political issue or is studied from a narrow or parochial stand-

point." Here we have the two horns of the dilemma with which the electrical industry is confronted; indeed, it appears likely to be impaled upon both of them. The Electricity Commissioners complain that the existing undertakers will not surrender their parochialism, and, on the other hand—that which we have often anticipated in these columns with dread—there is only too great a danger that electricity supply will become the plaything of politicians. These are the two great dangers by which we are threatened. On the one hand some of the schemes of the Electricity Commissioners have already been wrecked on the rock of parochialism, and now we see the rest in danger of being sucked into the whirlpool of political machinations.

Naturally we welcome Lord Weir's emphatic declaration that we must look to electricity as the provider of motive power for industry; but no less cordially we approve of his denunciation of the illusion that British industry can be restored to unbounded prosperity by the adoption of electric power. As we have already pointed out, under existing conditions, with few exceptions, the cost of power forms but 3 or 4 per cent. of the cost of the finished product, and even if electricity were given free to manufacturers they could not appreciably reduce the selling price of their goods.

The real need of the moment is not to cheapen electric power—with all respects to Lord Weir it is already cheap—but to utilise it to far better purpose. That is to say, our manufacturers should adopt every available means of increasing the use of power in their works, by substituting power for manual labour in every process where it is possible, as has been done in the United States, with the result so often quoted that there the consumption of electricity per head of population is more than twice as great as in this country. This was the case when the report of the Ministry of Reconstruction was issued in 1918, and since that date the ratio has been increased.

Turning to the question of providing an ample supply of electricity, Lord Weir rightly rejects the idea of erecting giant power stations at the pit-heads in conjunction with plant for the low-temperature carbonisation of coal. The pit-head plant scheme has been with us for a quarter of a century, and has been repeatedly shown to be uneconomic, but we are glad to see that he is full of confidence as to the future pre-treatment of coal, and that he regards it as essential that any new electricity scheme shall be so devised as to enable coal pre-treatment to be dovetailed into it with facility when the time is ripe. We also welcome his statement that every effort must be made to utilise to the best advantage the enthusiasm, enterprise and energy which the great municipalities and power companies have hitherto displayed in developing the supply of electricity. The most contentious passage in his speech was that in which he declared that the standardisation of frequency must be carried out at the earliest possible moment, even if it involved a heavy outlay. There is much to be said on both sides of this thorny question. Apart from the merits of the subject, we are inclined to attach considerable weight to the cat which Col. Ashley let out of the bag in his reply, namely, that finance is vitally important, and it is not easy to see where the money is to come from to pay for such standardisation.

To sum up, Lord Weir advocates the generation of electricity from "waste heat," and the provision of "an open market" for it—which means a network of mains; the development of large existing undertakings; legislative facilities for the construction of transmission lines; and the standardisation of frequency. Hence he puts forward no new or revolutionary propositions; all these questions have been discussed, and the first two items are already recognised as sound practice (within reasonable limits—we do not regard the interlinking of distant power stations as reasonable). The demand for relief in the matter of wayleaves and regulations for overhead lines is insistent, and we hope we shall see it satisfied. The standardisation of frequency and the erection of interconnecting mains appear to be the items involving financial assistance from the State, and we cannot profess to be enthusiastic in support of either of them.

The Human Being in Industry.

The presence of the Prime Minister, the Minister of Labour, and a prominent member of the late Labour Government, at the dinner of the National Institute of Industrial Psychology on November 12th, taken in conjunction with the evident revival of interest in the "new spirit in industry" shown by numerous writers in *The Times* and other papers lately, is a gratifying indication that the human side of organised industry is once more attracting that attention which is its due.

It will be remembered that during the strenuous conditions and the scarcity of labour that prevailed during and immediately after the war, much attention was given to the question of co-operation between the two, or three, parties constituting the modern industrial machine. The several Whitley Reports, the Garton Foundation Memorandum, and the inauguration of movements in the direction of the organisation of brain workers, will be within the recollection of our readers.

While attention was given at that time to remuneration, hours, and conditions of labour, the last of these three terms was usually taken to mean the general policy and control of industry, or at least of industrial concerns. The question whether individual workers were comfortable or otherwise at their particular jobs was not yet prominent in the minds of those who were thinking about the matters involved. The study of the efficiency movement had made some progress, and process specifications, some of which caused more irritation than they were worth, had been prepared by many zealous and well-meaning persons.

It must have been, as we understand, about half-a-dozen years ago that a few people, realising that, while the whole is greater than its part, the whole is made up of its parts, came together and founded the National Institute of Industrial Psychology. They resolved to begin the study of mass problems by studying the individuals of whom the mass is composed. They understood (and it is, of course, obvious when attention is drawn to the fact) that it is not sufficient to see to it that Bill Jones works for eight hours only, and is remunerated for so doing at standard rates. If he has to work in a cold, ill-lighted, or inconvenient shop, he will be as inefficient, as discontented, and as difficult to handle as if he is under the thumb of a tyrannical and grasping employer.

The methods upon which the Institute proposed to work commended themselves to many thoughtful persons. Amongst the foremost of these was the Right Hon. the Earl of Balfour, who consented to become, and still is, President of the Institute. These methods have proved so right, and so practical in every sense, that within six years of the Institute's birth we see, as we began by saying, Mr. Baldwin, Sir Arthur Steel-Maitland, and Mr. J. H. Thomas as the principal speakers at its annual dinner.

Such an Institute as this ought to be properly housed, to have an adequate library, and abundant facilities for research into its problems, which concern us all very intimately. Any firm can become a member and receive the *Journal* for the sum of £1 per year; any individual can become an associate for five shillings a year.

Several leaders of the electrical industry were present.

The Electrical Purification of Water.

Elsewhere in this issue a description is given of an interesting electrical process for the purification of water, which deserves more than passing notice. For many industrial processes distilled water is a necessity, and in some electricity works the make-up feed water for the boilers has to be purified by distillation, entailing a considerable expenditure of fuel. If the inventor's claim that the electro-osmotic process costs only one-fifth as much as distillation with coal is substantiated, it seems probable that the system will prove useful not only to the users of distilled water, but also to electricity supply authorities as an ideal type of off-peak load. It is true that it may not assume any great magnitude, but every aid to the improvement of load factor should be welcomed.

Electrical Gifts for Christmas.—I.

Some Notes and Suggestions.

We sincerely believe that British sellers of electrical appliances have not yet fully awakened to the possibilities presented by the observance of "times and seasons." It is regrettable that we should have to refer to the United States again, but we are compelled to say that things are ordered much better there in this direction. Dealers in that country not only realise that popular festivals can be made to bring business to them, they actually institute "seasons" for the purpose. For instance, they discovered that there were more marriages in June than in any other month; accordingly during May and June every retailer of electrical appliances advertises, each in his own way, presents for "June brides." Remarkable reports have been received of the results of this particular "stunt." Then, in addition to the religious festivals, which Americans celebrate in common with ourselves, they have a number of civil commemorations, *e.g.*, "Thanksgiving" and "Independence" Days, all of which are turned to good account by the pushful American dealer.



Fig. 1. The "All-Nite-Light."

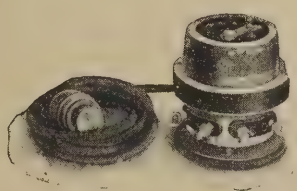


Fig. 2.—A Toy Transformer.

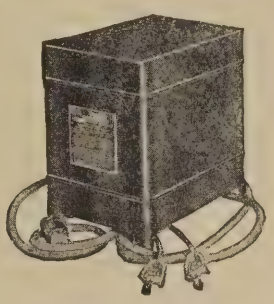


Fig. 3.—The "Tungar" Battery Charger.

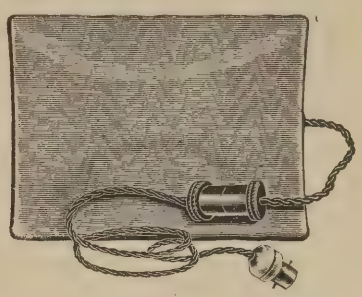


Fig. 4.—An Electric Heating Pad.

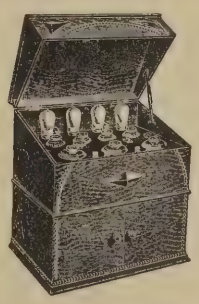


Fig. 5.—A 4-valve Radio Set.

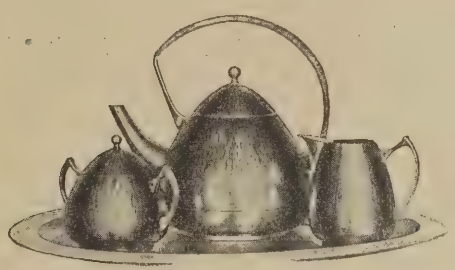


Fig. 6.—An Electrical Tea Service.

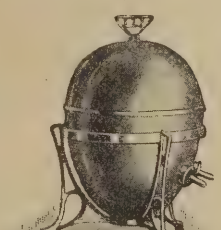


Fig. 7.—An Egg Boiler.



Fig. 8.—The "Eutherme" Toaster.



Fig. 9.—A Bed Warmer.



Fig. 10.—An "Electric" Toilet Mirror.



Fig. 11.—A "Juniorlite" Adjustable Lamp.



Fig. 12.—A Table Lamp.

While we believe that much more might be made of these special seasons, we realise that at Christmas, at least, British electrical dealers do make efforts to impress the public with the value and utility of electrical gifts. We think that utility should be the first consideration stressed, for in these days of money scarcity a useful gift is worth many times one that is merely a token. Next to utility we would place decoration, as this is an attribute of a great deal of electric lighting equipment. If the two can be combined, as is so often the case with electrical appliances, so much the better.

Apart from domestic appliances, no doubt radio apparatus will be in great demand this Christmas. As in the case of household devices, radio sets and components offer a wide choice. This year, therefore, in our suggestions for Christmas gifts we have included a few examples.

While novelty is no doubt a *sine quâ non* to many purchasers of Christmas presents, the standard electrical lines possess sufficient attraction for the majority. Therefore, although we have endeavoured to include as many new ideas in this article as possible, we have also introduced a number of familiar appliances to give an indication of the many directions in which Christmas gifts can be, and will be, sought.

We must not neglect to remind dealers of the opportunities which are open to them of arranging seasonable and effective window displays. Electrical traders must not be behind in this respect, nor, indeed, is there any excuse for them to be. Practically all of the large manufacturers of domestic appliances are willing to provide material for these displays, and the British Electrical Development Association exists to offer suggestions and suitable "literature" to drive home the idea of electrical Christmas gifts. There is still ample time to make the necessary arrangements for this display and publicity matter, for, generally, existing stock can be put forward as suitable presents.

The British Thomson-Houston Co., Ltd., considers that its small transformers are suitable Christmas presents. One of them, the "All-Nite-Lite" transformer (fig. 1) is certainly a useful gift. This device plugs into the ordinary lampholder and steps down the voltage for the purpose of supplying a 6-V bulb which is connected in the secondary winding. It is made for primary voltage ranges of 100/150 and 200/250, and is thus available for practically any a.c. supply. Another form of transformer is that illustrated in fig. 2, which is designed for the operation of electrical toys (such as railways), or other purposes for which low-voltage alternating current is required. The "Tungar" transformer-rectifier (fig. 3) is a very familiar device, and is very useful for home battery charging.

Messrs. Ward & Goldstone, Ltd., suggest two extremes (from the expense point of view). A simple and cheap device is the heating (or soothing) pad depicted in fig. 4. For those with longer purses the 4-valve cabinet receiver shown in fig. 5 is a gift which would be greatly appreciated. In the Jacobean style, the set is a handsome addition to the furniture of a room as well as an efficient radio set.

Some beautiful appliances are turned out by the British B.A.G., Ltd. Among them is the tea service illustrated in fig. 6. This consists of an electric tea-pot (2 pints, 450 W) in hammered antique brass, accompanied by a cream jug and sugar bowl to match, all on a tray of the same material. The egg boiler (fig. 7) is rather novel. It is itself egg-shaped, and contains a holder for four eggs; the material is nickel-plated brass and the loading is 225 W. Fig. 8 shows the firm's "Eutherme" toaster. This also has a nickel finish, and two most ingenious bread holders are provided which can be easily reversed without danger to the fingers. The loading in this case is 400 W. Another useful appliance is a bed warmer (fig. 9), a nickel-plated device on the lines of the antique warming pan, a 30-W element taking the place of the live coals.

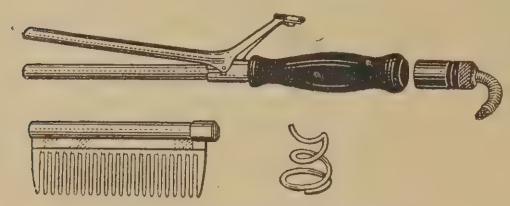


Fig. 13.—Hairdressing Equipment.

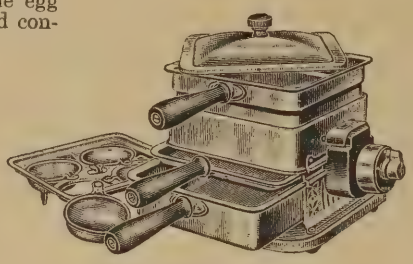


Fig. 14.—A Table Cooker.

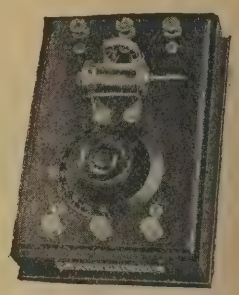


Fig. 15.—The "Junior" Crystal Set.



Fig. 16.—An Electric Massage Vibrator.



Fig. 17.—The "Handilite" Pocket Lamp.



Fig. 18. A Travelling Iron Equipment.

Messrs. Berry's Electric, Ltd., have introduced a new form of their toilet mirror (fig. 10). This is intended to stand on a table and a small electric lamp behind a lens projects a beam of light on to the face. The lamp also prevents obscuration of the mirror by the condensation of the breath.

While it may be said that most domestic appliances are gifts for ladies, that illustrated in fig. 13 is undoubtedly of this class. Not only can the device be used as curling tongs, a special form of comb can be fitted, as well as a little addition of whose object we are ignorant. This and the articles shown in figs. 12 to 14 are supplied by Messrs. L. G. Hawkins and Co., Ltd. Fig. 12 is a decorative but serviceable table lamp; and fig. 11 is a "Juniorlite" adjustable lamp. A table cooker is shown in fig. 14. This appliance is capable of performing more than its size (6¾ in. square) would suggest; it has a 650-W loading.

As was to be expected, the General Electric Co., Ltd., has a number of lines which are suitable for presentation this season. The company has a wide selection of radio apparatus, elaborate and simple, and an example of the latter class is the "Junior" crystal set shown in fig. 15. Electric massage is becoming very popular and it can be applied at home by means of the vibrator set depicted in fig. 16. A very handy equipment is the travelling electric iron outfit (fig. 18); an adjustable connector permits the iron to be used on 100/125-V or 200/250-V circuits and the set weighs only 2½ lb. The short-lived flash lamp battery can be dispensed with by the employment of the "Handilite" pocket lamp illustrated in fig. 17.

The development of table appliances has reached such a pitch that the kitchen need not now be relied upon to provide breakfast. With the equipment shown in fig. 19, a table plate made by the Jackson Electric Stove Co., Ltd., the morning meal can be prepared "sitting." The hob surround into which the actual cooker is fitted can be omitted if desired, but it forms a useful addition. The loading can be either 800 or 1,300 W as required, and a three-heat switching arrangement (as illustrated) can be fitted.

An electric kettle is another useful table appliance. Only electric kettles can properly be boiled at the meal table, for spirit stoves are prone to emit odours and incur accidents. Fig. 20 shows a kettle made by Premier Electric Heaters, Ltd. A "table" appliance of a different order, made by the same company is the iron illustrated in fig. 21, which, it will be observed, has a thumb-rest which relieves the strain on the hand, and a strong connector and flex guard.



Fig. 19.—A "Jackson" Table Cooker.



Fig. 20.—An Electric Kettle.



Fig. 21.—A "Premier" Iron.

American Christmas Gift Expenditure.—*Electrical Merchandising* calculates that the average American family expends $100 upon Christmas gifts, basing its estimate upon information gathered by department stores. Our contemporary says:—"With dozens of different useful and attractive articles in stock—with merchandise that appeals to the Christmas buying spirit, beyond all others—certainly the electrical merchant is in a strong position for the Christmas market ahead. It is up to him and to the aggressiveness of his selling during the next few weeks as to how much of each $100 Christmas appropriation will be rung up on his own cash register."

While it cannot be said that the average English family can afford to spend £20 upon Christmas presents, the rest of the above-quoted note may be applied to English conditions. Particular attention should be paid to "aggressiveness" of selling for only by this means will maximum results be obtained.

Modern Electric Cookers.

A Review of the Recent Improvements in Electric Cooking Stoves.

(*Continued from page* 810).

We illustrate in fig. 9 the construction of the element unit of the "Cosmos" boiling plate, to which reference has already been made. It is covered by a slotted metal top plate arranged so that the slots come between the element spirals. The General Electric Co., Ltd., is now supplying only the open type of boiling plate in its latest cookers. The "Magnet" plate, fig. 10, consists of spirals of nichrome wire wound on and held in a

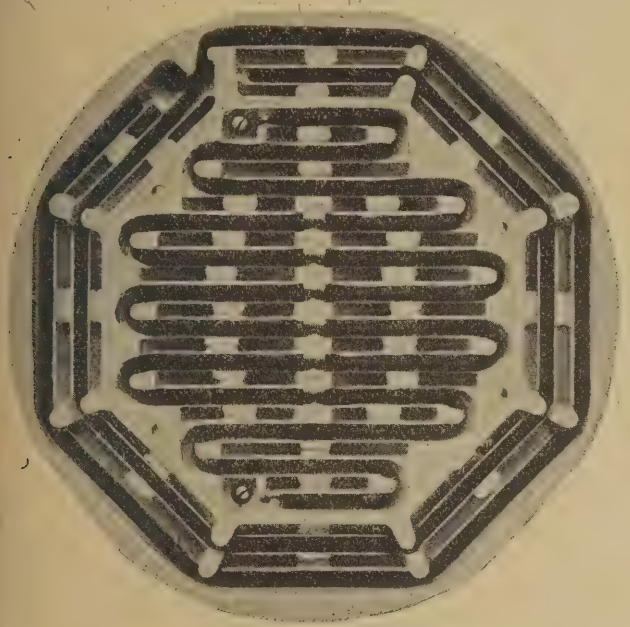


Fig. 9.—Semi-enclosed Plate.

specially constructed fireclay base. It is contained in a metal frame which can be easily removed by releasing four screws and the terminal bolts.

A particularly interesting design of the enclosed pattern of boiling ring is that adopted by Messrs. Belling and Co. in their latest production, the No. 6 "Belling" cooker. The makers have incorporated a new design of element unit, known as the "Honeycomb" (fig. 11). It is built entirely of fireclay, nickel chrome, and cast iron. The element spirals are threaded through holes

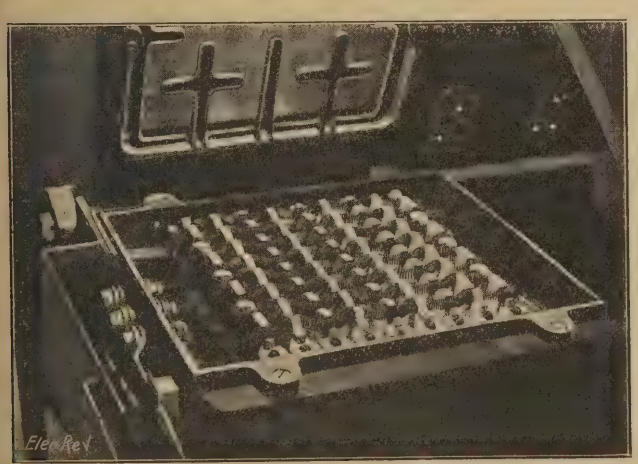


Fig. 10.—Open Plate.

in rectangular bars of fireclay, the holes being so placed that the bars are brought flush with one another, thus presenting a flat surface direct to the cooking utensils. In this way the spirals are fully protected by the fireclay in which they are housed, it being claimed that the sections are packed so closely that any spilt liquids cannot possibly reach the wire. The bars are made of fireclay with good heat-conducting properties at red-hot temperatures. The spirals are made off at plug-in terminals, and the whole is contained in a metal frame, so arranged that it may be "slid" into position in the cooker on rails or guides specially provided; plug sockets are suitably placed in the cooker framework to receive the plug terminals. The principal interest in this plate is that, while it is claimed to be of the fully-protected pattern, only the fireclay, in which the elements are contained, intervenes between the spirals and the cooking utensil. The insulating material is made in sections to accommodate contraction and expansion and to assist in radiation. The "Honeycomb" plate is arranged so that it may be used at both the top and bottom sides, hence being suitable for both boiling and grilling operations. Deflector

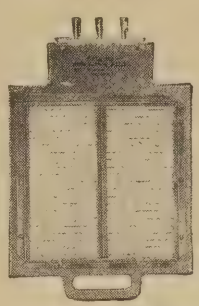


Fig. 11.—Closed Plate.

plates are arranged at the top and bottom of the unit, so that if only one side is required, the other side may be covered, and the whole of the heat from the elements deflected in the direction necessary. The spiral ducts are arranged very closely in the "Honeycomb" plate, and a large quantity of heavy gauge wire is used, giving it a claim to longer life than in the case of a short fine wire, also that in relation to the current density in the wire a higher temperature is obtained. It is also claimed that oxidisation is largely reduced owing to the wire being practically excluded from contact with moving air.

Generally speaking, the developments in the griller have followed closely those of the boiling plate as far as the complete electric cooker is concerned. An important improvement adopted in several makes is that where, while the bulk of the heat from the grilling elements is directed downwards to the crown plate, pro-

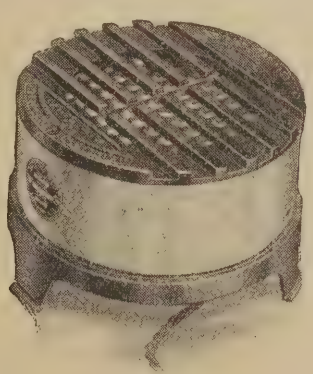


Fig. 12.—Boiling Ring.

vision is made in the hob plate above the elements for utilising the upward or otherwise waste heat for warming operations. In the more recent "Jackson" cookers, the grilling plates are attached direct to the hob plate. In the latest "Xcel" cookers, the grilling unit is composed of parallel fireclay bars through which nickel chrome spirals are threaded. Plug-in contacts are employed, as in the case of the boiling plates, 3-pin plug terminals being provided. The elements are wired so as to give 3-heat regulation, and a damping plate is provided so that the unit can also be used as an additional boiling plate. The damping device will slide underneath the

griller if it is desired to use it for boiling only; or, if it is used as a boiling plate while grilling operations are in progress, the damping plate will, of course, be removed altogether.

Apart from the boiling plates incorporated in the construction of the usual cooker, several firms are placing

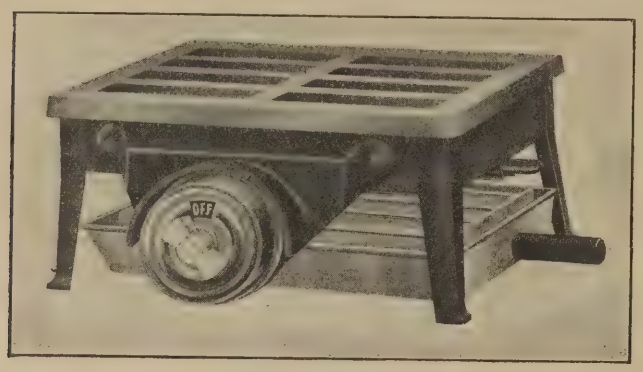


Fig. 13.—Table Plate.

on the market separate portable boiling and grilling units. These have necessarily to be made more substantially than in the case of the stationary unit, and probably to gain this end, something in the way of cooking efficiency has to be surrendered. Nevertheless, a strong portable cooking plate proves of great value in many cases. Fig. 12 shows such an apparatus made by Messrs. Belling & Co. It is described as the No. 7 boiling ring, and is of the open type. The frame is of fine-grain cast-iron, and the whole device is constructed to stand rough kitchen use. The Arora Co. has also produced an interesting boiling plate unit. It is of the open type, contained in a cast-iron frame, and consists of three sector-shaped elements of 500-kW capacity each. It is provided with a 4-heat control. The table plate shown in fig. 13 is an apparatus of this description, made by the Jackson Electric Stove Co., designed for both grilling and boiling.

It is a widely supported claim that cooking by means of electricity results in the nutritive value of the foodstuffs being retained in them in a manner superior to that in the case of other methods of cooking. It is in the oven that the general support to this claim is usually found. There are, in the main, two schools of thought also with reference to the position of the heating elements in the oven. On one side it is declared

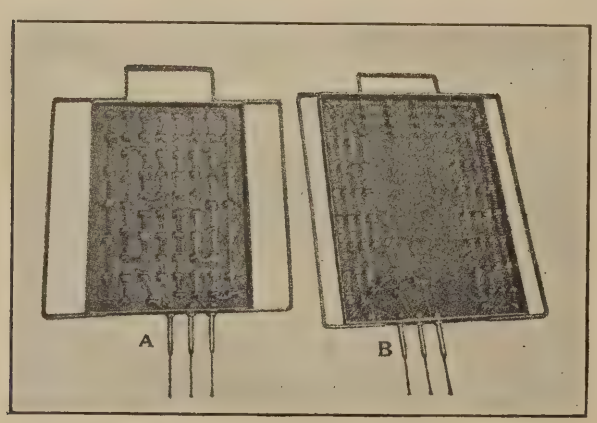


Fig. 14.—Oven Elements.

that the best results are obtained if the elements are placed at the top and bottom of the oven, it being maintained that a better heat circulation is produced. On the other hand there is the view that an even distribution of heat is necessary throughout the oven and that this can only be obtained with the elements placed at the sides so that the greater amount of heat is emitted near the bottom. In the "Universal" cookers the elements are placed at the top and bottom. The top element, which is of the open or exposed variety, is intended to be used for grilling purposes other than for heating the oven. Both units are employed to bring the oven quickly to the desired temperature, when the upper one may be "switched off."

Fig. 14 illustrates the construction of the oven elements, A, top, and B, bottom. They are arranged on the plug-in principle and are suitably connected for 3-heat regulation. The broiler element has a maximum loading of 1,500 W, and the consumption of the lower unit is 2,000 W.

Horizontal parallel side elements are adopted in the "Xcel" cooker. These are of 350-W capacity, and are standardised to fit on to standard busbars, and, as is the modern tendency, are so located as to give a maximum bottom heat, with two element bars nearer the top for browning. These are all protected by sheet-steel gate linings arranged on hinges so that they may be readily cleaned or removed altogether. It is claimed that the cooking temperature is reached in approximately 18 minutes from cold, and that with the switch then in the low heat position the cooking temperature will be maintained. The arrangement and housing of the elements in the Jackson cooker are very similar to those in the last-mentioned apparatus. The horizontally-arranged elements are attached to vertical solid bars by means of lugs and bolts. An extension of the lug is taken along the back of the clay giving it a stiffening. The clays are of a special mixture of fireclay and are

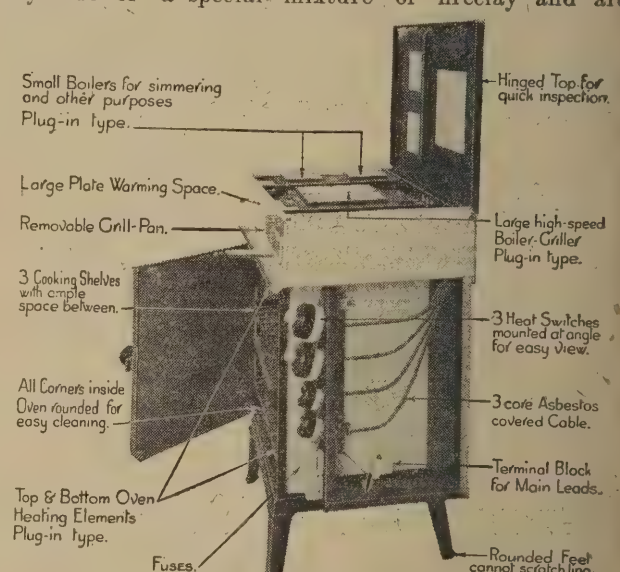


Fig. 15.—Construction of Cooker.

standardised. They are made up of three pieces to allow for expansion and easy replacement. The spirals, which can be obtained separately and rewound on the clays, are made off under nickel washers. They are wound in grooves in the clays, in which are provided small pips, which are gripped between the coils, holding the latter in position when they are subjected to abnormal heat expansion. As in the case of the boiling plate, the elements are interchangeable throughout 14 sizes of cookers. Fig. 1, p. 766, affords an excellent idea of the construction of the modern "Jackson." The side oven elements are spaced so as to radiate the bulk of the heat at the bottom of the oven. In the smaller ranges three elements are provided on each side, two at the bottom and one in the centre; in the larger sizes four elements are provided spaced out on the same lines.

Messrs. Belling & Co. adhere to the practice of installing the elements at the top and bottom of the oven. They have adopted the plug-in element similar to the arrangement in connection with the "Honeycomb" elements for the boiler and grid plates. The sockets are held in porcelain bushes in the back of the oven, and the element is slid into position on rails or guides. Fig. 15 shows the general construction of the new No. 6 "Belling" cooker.

All the general cooking in the oven of this cooker is done by the bottom heater only, which, with its heat-dissipating and protecting shutters, results, it is claimed, in an even cooking temperature throughout the oven without any burning. The top heater, which is used to give a quick initial "heating-up" and for the final browning, can also be used for grilling purposes.

(To be concluded.)

Electricity Supply in Isolated Villages.

An Interesting Installation in Norfolkshire.

The possibilities of supplying outlying villages with an efficient service of electricity for lighting and power purposes are being tested with very successful results in the village of Brundall, which lies about seven miles to the East of Norwich, in Norfolk. The village is exceptionally well served with transit facilities by two railway stations on the L.N.E.R. system, and a frequent service of motor-'buses to and from Norwich and Yarmouth. It has also the additional advantage of being pleasantly situated on the north bank of the River Yare. In 1921 the population of Brundall amounted to 633, since when it has probably increased by 50 per cent., as extensive building operations have been going on for some years, and are still in progress. It had been felt for a considerable time by some of the residents that an adequate supply of electricity was essential in the absence of gas or any other form of lighting or heating supply. So on February 25th, 1924, a company was formed with a capital of £4,000 to carry out an agreement made with the Norwich Corporation, by which energy would be purchased in bulk and distributed by the company from its own mains. Application was then made to the Electricity Commissioners for a Special Order, to give the company distributing powers in the parishes of Brundall, Blofield, and the surrounding area. Work was commenced in October, 1924, and on December 24th the first three consumers were connected to the system. At the end of August, 1925, about 60 consumers had been connected up, and 13 electric cookers and various motors for pumping and general purposes installed. Of these consumers, seven had private installations, which have been entirely replaced by the company's supply. Under its agreement with the Norwich Corporation, the company receives three-phase current, at 6,000 volts, 50 cycles, in a transformer house situated in the centre of the village. At this point it is transformed down to 400 volts for power, and 220 volts for lighting.

The main cables from Norwich are laid underground, but distribution throughout the village is effected by overhead bare copper wire, carried on poles as shown in fig. 1. After transformation, the current passes to a main switchboard in the transformer house, where the supply is divided into two sections, one supplying the east side and one the west side. The capacity of the transformer is 50 kW, with a present maximum load approaching 36 kW. The overhead mains consist of 0.04 sq. in. bare copper phase wires with split neutral 0.0125 sq. in. The main line is about 1½ miles in length, along which all three phases are taken with single- and two-phase distributors over roads branching from the main, fig. 4. The straight-line pole fittings are well shown in fig. 2, the top cross arm carrying the split neutral, and the two lower arms the three phase wires, with a spare insulator for a switch wire in the event of street lighting being required, fig. 3, which undoubtedly will be the case in due course. This arrangement will permit street lighting to be controlled from the transformer station, where the energy can be separately metered, and it will avoid the expense of employing men for lighting and extinguishing lamps. Near each pole a guard wire encircles the live conductors, as can be seen in the illustrations. The main street in places was heavily wooded, and a great deal of tact and trouble was involved in pacifying frontage owners when obtaining permission for the very small amount of cutting away that was actually undertaken. The Post Office, as usual, being first-comers, occupied the clear runs with



Fig. 1.—Distribution Line.

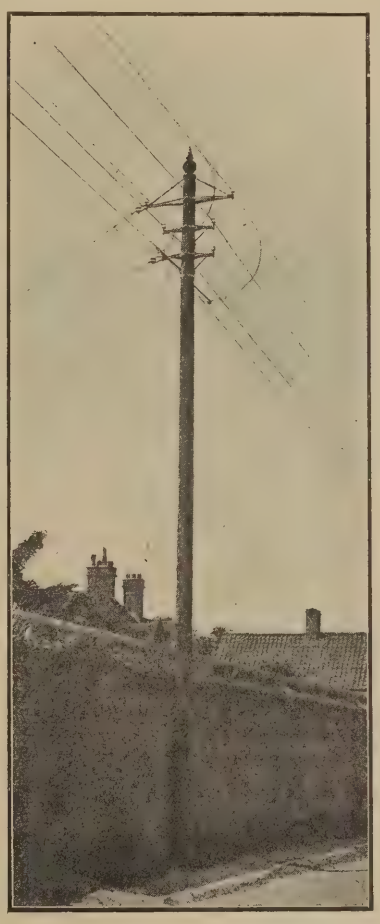


Fig. 2.—Straight-Line Pole Fittings.



Fig. 3.—Public Lighting Connection.

poles carrying 18 or more pairs of wires. Special guarding was undertaken to comply with the P.O. requirements, and in this respect fig. 5 shows clearly the "cage" erected, consisting of bare copper horizontal wires in line with the split neutrals. Below them the two sets are joined up at the sides and bottom by cross members. Some such arrangement, although probably entirely unnecessary from a safety point of view, is held to be compulsory, and the difficulty at once arises as to the possibility of the "cage" shorting the phase wires under the pressure of strong winds. To overcome this difficulty, special insulated stay pieces are connected in at proper intervals, between the phase wires and the guards, which have the effect of preventing the 'cage" swinging more than a few inches.

the gross rateable value, in addition to 1½d. per kWh wiring costs are simplified, only one meter is required, and the final cost per kWh becomes more favourable as the consumption increases. The carrying-out of this installation throws an interesting light on the difficulties to be overcome in supplying such rural areas. The pious hope expressed by various Ministers, that schemes of this kind would be helped and encouraged in every possible way, is not borne out in actual practice. Nearly every frontage owner discovers that his trees are exceedingly valuable, and a blank refusal to allow them to be trimmed is generally followed by permission, subject to payment. The payment for wayleaves is a very serious item in a small distribution system, and it would appear quite time that a definite decision should be



Fig. 4.—Branch Line.

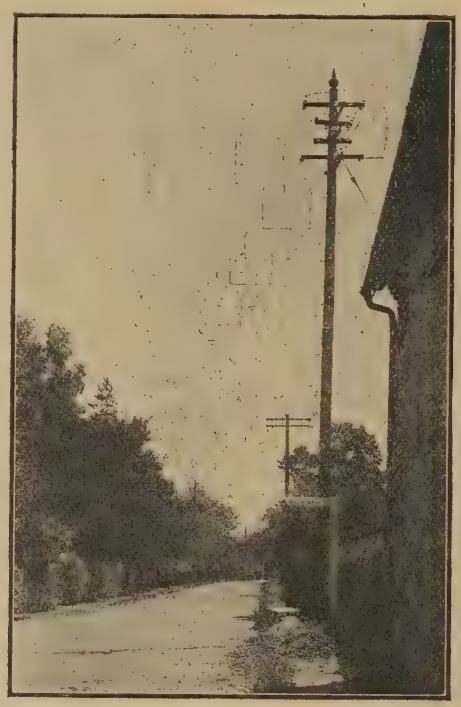


Fig. 5. - Special Guarding Arrangements.



Fig. 6.—Supply Service.

Fig. 6 shows the arrangement for the three-phase supply to the Brundall pumping station. Consumers' services are also carried overhead, being jointed in the copper bridges with special mechanical connectors; either bare or "P.B.J." wires are employed, according to the position. In certain cases, as shown in fig. 1, the split neutral has been bridged across the top where the supply wires run under the G.P.O. conductors. As it is the company's intention to encourage the use of electrical energy for purposes other than lighting, the "Norwich" method of charging has been adopted, and the terms are 25 per cent. on

obtained as to the actual rights of frontage owners who have trees growing within their boundary, but the branches of which overhang the highway from 3 to 12 or 15 ft. Such difficulties would not arise with underground mains, but the capital cost would at once increase the price of energy, and every service from an underground cable would cost at least four times the amount for a similar overhead service. The contractors for the whole of the overhead work, transformer house, switchboard, &c., were Messrs. W. T. Henley's Telegraph Works Co., Ltd., London, and the consulting engineer was Mr. G. T. Redgment, of Norwich.

The Electro-Osmotic Softening of Water.

A Method of Purification Much Cheaper than Distillation.

By W. G. RUMBOLD.

In *Elektrotechnik u Maschinenbau* of October 18th, Dr. Erwin Mayer contributes an interesting article on the above subject.

The following is an abridged translation of the article, which states in a simple manner the method of obtaining either practically pure water comparable to distilled water, or a soft water of a less degree of purity by means of the electro-osmostic method.

It is a fact long known that salts which are electrolytes dissolved in water are dissociated into positively and negatively charged ions known as cations and anions. The metals and hydrogen form cations and the acid radicles the anions. This property of electrolytes was first suggested by Arrhenius, and is now generally accepted as the true explanation of certain phenomena associated with the behaviour of these salts in water.

Under the influence of the electric current, as in electrolysis, the anions are attracted to the anode and the cations to the cathode.

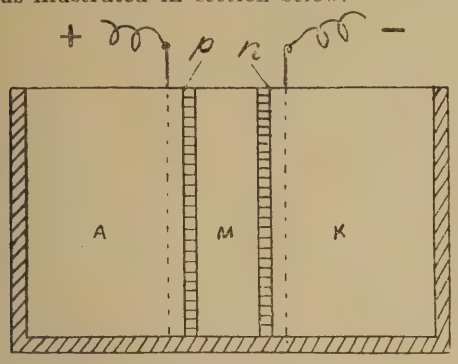
Taking a water which is hard, due to the presence of calcium sulphate in solution, the action of the electric current is that indicated in the following equation :—

$$CaSO_4 \underset{\longleftarrow}{\overset{\longrightarrow}{}} \overset{++}{Ca} + \overset{--}{SO_4}$$

The Ca ion is attracted to the cathode and the SO_4 ion to the anode. In consequence of secondary action, the Ca is converted into calcium hydroxide and the SO_4 to

sulphuric acid according to the equation: $Ca + 2HOH = Ca(OH)_2 + H_2$ and $SO_4 + HOH = SO_4H_2 + O$. Other salts usually found in natural waters behave similarly.

Under the influence of the electric current, the decomposition products are not removed, but remain in the water. In order, therefore, to obtain a pure water, these decomposition products must be eliminated. This can be successfully accomplished by separating the electrodes by suitable diaphragms which will permit the passage of the ions, but not that of the water molecules. This can be carried out in a so-called three-cell apparatus illustrated in section below.



Three-cell Apparatus.

The middle space M contains the water to be purified, and this is separated by two diaphragms *n* and *p* from the electrode spaces A and K. As explained above, the ions are attracted to the respective electrodes, with the result that the water in M gradually loses the dissolved salts by the passage of the ions through the diaphragms to the electrodes, becoming first softened, but in course of time entirely freed from dissolved salts. It is obvious that the degree of purification is a matter of choice, and depends upon the duration of the passage of the electric current. It is further obvious that this method of purifying water is an alternative to distillation.

With a single three-cell apparatus the purification process is an intermittent one. In practice, however, it is usual to make it continuous by using a series of these, usually ten, arranged very much like a filter press. The water to be purified is introduced into the middle space of the first of the series and by an automatic arrangement is conveyed to the corresponding space in the second, and so on through the series until it leaves the last either in a completely purified condition, or at the degree of purity it is desired to reach. The electric pressure is regulated for each one, being least in the first, and being gradually increased up to the end. This regulation depends upon the fact that resistance to the current increases as the salts are removed from the middle space.

The expenditure of energy for purification is governed on the one hand by the degree of hardness of the water and on the other by the degree of purification sought. For complete purification of a Vienna water of 10 degrees of hardness, about 1.8 kWh is necessary per hectolitre (22 gals.), while for a water of 20 degrees of hardness about 2.5 kWh is necessary. Treatment down to 2 to 3 degrees of hardness would require from 0.4 to 1.2 kWh for waters with an original hardness of from 10 to 25 degrees.

In all cases the production of pure water by the process is cheaper than distillation. The author states that under ordinary conditions the cost is about one-fifth that of distillation by coal fuel, or one-tenth when gas is used as the fuel.

In comparing the cost of softening boiler water by the electro-osmotic process with the chemical methods used for the purpose, the cost of electricity is the deciding factor, but the electro-osmotic process can be successfully used in the cases of certain waters which cannot be softened successfully by any other known method.

The process works practically automatically, requiring the minimum of attention. It can be advantageously worked during the night when the rate for energy is lower.

The extensive development of hydro-electric power in Austria has made it desirable to widen the basis of power application, and for this reason alone, the introduction of the electro-osmotic method of water softening is welcomed as furnishing a new use for electricity, if only in a subordinate degree.

Notes on Induction Motors.

The Influence of Connections on the Resultant Magnetic Field.

By S. W. SWANN, B.Sc. (Eng.)

The following notes on the influence of the connections of the windings on the resultant magnetic field in a three-phase induction motor may be of some interest. Three cases arise, *viz.*:—

(*a*) Any two phases interchanged.
(*b*) One phase reversed.
(*c*) One phase omitted.

Case (*a*).—The effect of this is to reverse the direction of rotation of the resultant magnetic field without altering its magnitude. This is a well-known result, and may easily be demonstrated by resolving the three alternating magnetic fields into their equivalent rotating components, paying due attention to the various phase relationships.

Case (*b*).—The vector diagram of the magnetic fields for this case is shown in fig. 1, where phase three has been reversed. Assuming the sequence of phases to be 1, 2, 3, the disposition of the various equivalent rotating fields at the instant when the current in phase 1 is a maximum is as indicated in fig. 1, where the rotating fields 1 and 2 are equivalent to the alternating field of phase 1; 3 and 4 refer to phase 2, and 5 and 6 to phase 3. We see that the rotating components 1 and 6 continually neutralise one another. If ϕ_m denote the maximum flux due to each alternating field, then components 2, 5, and 3 unite to form a single rotating field of magnitude ϕ_m and coincident with component 5 at the instant under consideration. The resultant magnetic field is therefore as indicated by

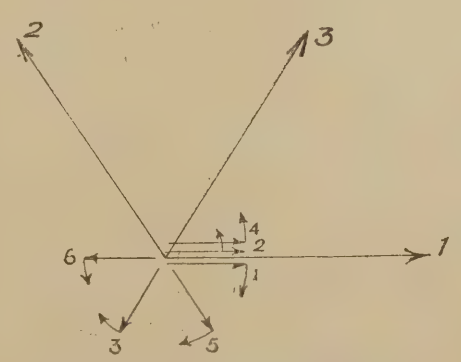


Fig. 1.—Vector Diagram of Magnetic Fields.

the vector diagram of fig. 2. Obviously, the two components coincide in direction along the dotted line OX. It is most convenient to decompose the rotating vectors into components along the rectangular axes OX, OY,

taking the zero of time at the instant when both vectors lie along ox. We therefore have —

$$x_1 = \tfrac{1}{2}\phi_m \cos\omega t,\quad y_1 = \tfrac{1}{2}\phi_m \sin\omega t,$$
$$\text{and } x_2 = \phi_m \cos\omega t,\quad y_2 = -\phi_m \sin\omega t,$$

paying attention to the opposite angular velocities, the suffixes 1 and 2 referring to the vectors $\phi_m/2$ and ϕ_m respectively. Combining these results we have—

$$x = x_1 + x_2 = 3/2 \cdot \phi_m \cos\omega t$$
$$\text{and } y = y_1 + y_2 = -\tfrac{1}{2}\phi_m \sin\omega t$$

for the rectangular components along ox and oy of the resultant magnetic field at any instant. From this we obtain— $x^2/(3/2 \cdot \phi_m)^2 + y^2/(\tfrac{1}{2}\phi_m)^2 = 1$.

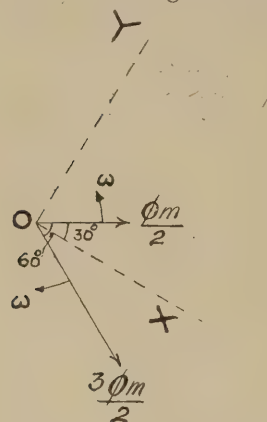


Fig. 2.—Vector Diagram of Resultant Magnetic Field.

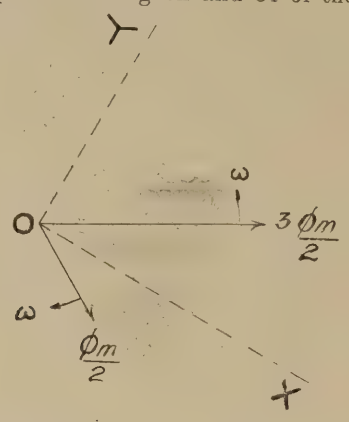


Fig. 3.—Rotating Vectors.

Therefore, the locus of the extremity of the vector of resultant instantaneous flux is an ellipse whose axes lie along ox and oy. The orientation of these axes is symmetrical with respect to the vectors 1, 2, and 3 in fig. 1.

In this case, therefore, the field is not constant in magnitude, but varies from $\phi_m/2$ to $3\phi_m/2$.

Case (*c*).—Supposing phase 3 to be open-circuited, it is easily seen that the system of rotating vectors is as shown in fig. 3. This is the same as fig. 2, except that the vectors ϕ_m and $\phi_m/2$ are interchanged. The detailed investigation of this case may be made in the same manner as for case (*b*). It will be found that the locus is the same, *i.e.*, an ellipse of semi-axes $\phi_m/2$ and $3\phi_m/2$. Also, at any instant, reckoning the epoch zero when both vectors lie along ox, the resultant flux vector is of the same magnitude in each case, but not in the same direction. In fact, the inclinations to ox of the vectors of resultant flux are given by—

$$\tan\omega t = -3\tan\theta \text{ (case (}b\text{))},$$
$$\tan\omega t = 3\tan\theta^1 \text{ (case (}c\text{))},$$

so that the angles θ, θ^1 are equal and opposite in sign. Of course, this is due to the fact that the vector of resultant flux rotates in opposite directions in the two cases, the direction of rotation being the same as that of the predominant rotating component in each case.

The torque produced under the circumstances of cases (*b*) and (*c*) is naturally irregular, and a characteristic pulsating sound issues from the motor.

Electrical Power Development.

A Review of the Electricity Supply Industry in Great Britain.*

STUDENTS of human progress have long recognised that the enthusiasm of the few is far more potent in effecting changes than the needs of the many. The vague desires of the multitude for betterment have to be concentrated on some definite scheme which promises an increase in wealth or comfort, and not until this has been done can the inertia of the mass opposing change appear as an irresistible force to bring it about. The public in this country, and the politicians who represent them, have at length been aroused to some appreciation of the advantages which would ensue from a more energetic development of electricity supply, and the appointment of the Electricity Commission after the war was an outward and visible sign of awakened interest. The enthusiasts have so far succeeded in converting the nation that every political party now places electrical development in the programme, and no public speaker would dare to depict a millennium in which electricity did not flow in the land like milk and honey.

This state of affairs, gratifying as it may appear to those who have laboured for the recognition of electricity as one of the essential factors of modern civilisation, is by no means free from danger. The mantle of prophecy has descended from the shoulders of the instructed few to those of the uninstructed many. The labourers of the eleventh hour are tempted to make up for their earlier aloofness by exuberant manifestations of energy, promising an immediate crop of impossible fruits if only they are allowed to manage the garden their own way. Now that public interest in electrical development is definitely aroused, it is more than ever important that public opinion should be correctly informed. A good case is merely weakened by exaggeration, and the best object in the world may be frustrated by trying to obtain it in the wrong way. It is only by propaganda that public opinion can be directed, and all who hope for the national benefits from a cheap and abundant supply of electricity are in duty bound to see that the economic effects to be expected are accurately stated and that political ideals are kept distinct from questions of engineering.

That the propaganda in favour of electricity in general has brought about a most welcome change in public outlook is undeniable, and we would not like to see it diminished. Hence the appearance of a book dealing with the national aspects of power development, written in such a way as to appeal to the educated layman, is to be regarded with pleasure.* The author, Mr. Hugh Quigley, has collected many of his contributions during the past few years to the technical and lay Press, and expanded them into a well-written and interesting volume of over 150 pages. A foreword by Mr. D. N. Dunlop, Director of the B.E.A.M.A., expresses the view that "Electricity is one of the fundamentals which will modify in the near future our whole industrial complex," and suggests that the book should be considered from this point of view. This, indeed, appears to be the underlying idea of the author, who shows by numerous diagrams and statistics what has been accomplished so far towards bringing nearer the state of affairs which he desires.

The book is extraordinarily free from any taint of political prejudice. Credit is given fairly to both municipalities and power companies in the main industrial areas for "having co-operated in advancing the cause of electricity through reasonable rates and effective service," and nowhere in the book is a partisan spirit observable. Controversial points, however, are to be found in plenty. The policy of interconnection, for example, is strongly advocated, though the author, like all other supporters of this policy, fails to show exactly how the presumed improvement of load factor is to be brought about by it. The inhabitants of every town in England have much the same hours of work and sleep. They all want power and heat during the day, light during the evening, and very little electrical energy of any kind from midnight till morning. The

*"Electrical Power and National Progress," by Hugh Quigley; with a foreword by D. N. Dunlop. Pp. 160; 18 figs. London: George Allen & Unwin, Ltd. Price 8s. 6d. net.

aggregate load factor of a number of towns is therefore substantially the same as the load factor of any one of them, and there is nothing to be gained by interconnection, except possibly a greater security of supply and a reduction of stand-by plant. The latter benefits are quite enough to justify the interconnection of near-by stations, but the idea of materially improving load factor or cheapening electricity by general interconnection on a national scale appears to be a pure myth.

More than once the author shows a certain want of appreciation of technical considerations. It is true that his statement that "the place for the electric power station . . . is in the heart of the coal-field" is somewhat negatived by a warning later in the book that "in this country the insistent advocacy of pit-head stations using coal at the place of extraction has tended to divert attention from the realities of the case." With the latter sentence we cordially agree. If the people who so glibly advocate pit-head stations could be got to understand that for every ton of coal burned in the furnaces six hundred tons of water at least has to be pumped through the condensers, less nonsense would be talked on the subject. Coal can be, and is, transported cheaply to any spot in the country, whereas water, in the immense quantities required by a modern power station, is only available in the places where Nature has provided it. In this connection it is not at all clear what Mr. Quigley means by his statement that "there is no water supply available in this country to provide condenser cooling water . . . for stations above 200,000 kilowatts, and it is extremely doubtful whether an average of 80,000 kilowatts can be exceeded even under the most intensive electrification." Why an island, of which no point is more than 50 miles or so from a sea or ocean, should be short of condensing water is unexplained, nor does the author tell us how the Gennevilliers station at Paris will manage to deal with 340,000 kilowatts, if we cannot exceed 200,000 kW in this country.

"The progress of supply in Paris since the conclusion of the war," he states, deserves careful examination, "since it supplies a clue to the immense improvement in the industrial and economic prosperity of France." This, of course, is special pleading of the worst kind. It would be equally true and equally false to state that the reorganisation of the Paris electricity supply has prevented France from paying her allies for money lent, has reduced the franc to the value of two-pence, and has brought the country to a financial crisis of extreme seriousness. If this is industrial and economic prosperity, France, we think, would be better off with a little less prosperity. The cause of electrical development is not served by statements which are obviously absurb.

One does not like to criticise the arguments in a book with the objects of which every sensible man is in agreement, but central-station engineers will be a little surprised to learn that "A motor working on a power factor of 0.8 is working out of phase . . . with the result that a high percentage of the total power sent out from the station has no earning value." This sentence might perhaps be passed as a loose mode of expression, were it not amplified by an illustration which shows a curious idea concerning the effect of bad power factor. It is stated (with reference to a 100,000-volt overhead line, 132 km. long) that "at 0.9 power factor 84,000 kilowatts can be transmitted to Berlin, while phase adjustment up to unity power factor increases this to 127,000 kilowatts." This point is elaborated by calculations to show that a 90 per cent. power factor increases the selling price of electricity by 50 per cent., and then we read: "the Berlin investigation illustrates on a large scale what is taking place in every part of Britain through low power factor; the capital and maintenance costs of transmission are at least 50 per cent. more than they should be with a proper system of supply at unity power factor." Most engineers, we think, would be glad enough to get even a 90 per cent. power factor on their feeders, and if this involves a 50 per cent. loss we wonder what the author would calculate the losses to be on a certain Continental system we recently inspected where the power factor was usually between 60 and 65 per cent.

In dealing with electrical development in Great Britain, the author has drawn largely on the valuable statistics published this year by the Electricity Commission, and by a judicious selection has brought into prominence many points of interest. Why, for example, have the costs of the generating plants of six large power companies ranged from £38.6 per kW installed, in the case of the South Wales Power Co., to £15.5 in the case of the Clyde Valley Co.? Turning to London, the municipal plants of Stepney and West Ham cost £17.1 and £19.1 per kW installed respectively, whereas the Charing Cross Co.'s plant cost £27.5 and that of the City of London Co. as much as £34.9 per kW installed. As regards the price of electricity, the variations are even more striking. The average price obtained by the Newcastle Electric Power Co. in 1923-24 was only 0.74d. per unit, and the Clyde Valley, Lancashire, Yorkshire and Mersey Companies all sold at an average price of less than a penny. In the London area the average consumer on the County of London Co.'s system has to pay no less than 3.93d. per unit, while his neighbour, who is supplied by the borough of Stepney, only pays 1.48d. on the average. Recent correspondence in *The Times* has shown the dissatisfaction which is rightly felt as regards the prices charged by the London companies, and it is to be hoped that the effect of the recently-formed Joint Electricity Authority will be to bring about a more equitable state of affairs. Whatever views one may hold about municipal trading, it is undeniable that some of the London boroughs have set an example in economical generation and cheapness of supply which the large companies would do well to emulate.

In conclusion, one would like to suggest to the author and to all other propagandists in favour of electricity that much industrial load might be obtained by a more detailed treatment of typical cases than seems ever to be given. If the advocates of main-line electrification, for example, would analyse the traffic between, say, London and Birmingham, showing what it costs now in capital charges, labour, fuel, and maintenance, and then give a corresponding estimate under electrified conditions, they would do much more to further their cause than by pointing out the progress of railway electrification in countries with no coal mines. Similarly in manufacturing questions: what, for example, is the actual cost of power per yard of calico in a steam-driven weaving shed, both actual, and in relation to total costs, and what would be the effect on the latter of reducing the power costs by purchasing electrical power? The case for electrification of all factories in which power is a significant item in the total manufacturing costs is unanswerable, but the benefit must be expressed in shillings and pence if conviction is to be brought home to the manufacturers.

Scholarships in Engineering.—The Council of the British Electrical and Allied Manufacturers' Association (Inc.) has recently granted the following scholarships, tenable for one year, each of the value of £100, together with the payment of college fees:—In Electrical Engineering: John Greenville Jackson, tenable at Faraday House; Felix Samuel Naylor, tenable at City and Guilds (Engineering) College, South Kensington; Frederick James Pepworth, tenable at the College of Technology, Manchester; William Raymond Shepherd, tenable at the College of Technology, Manchester. In Mechanical Engineering: John Stanley Clark, tenable at Birmingham University. In Electrical and Mechanical Engineering: Edward Norman King, tenable at Armstrong College, Durham University. The following scholarships have been renewed:—John Tempest Birtwell, tenable at the College of Technology, Manchester; John Charles Burke, tenable at the College of Technology, Manchester; Arthur Bernard Everest, B.Sc., tenable at Birmingham University; George Emil Gregson Foden, tenable at the Victoria University, Manchester; Isaac Herdman Hedley, tenable at Armstrong College, Durham University; Percy James Maggs, tenable at the City and Guilds (Engineering) College, South Kensington; Harold Giles Richards, tenable at the City and Guilds (Engineering) College, South Kensington.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

E.D.A. Activities.—In our article upon "Electrical Gifts for Christmas," which appears elsewhere in this issue, we mention the aid which the British Electrical Development Association proffers retailers of electrical goods. We have received specimens of the literature which the Association has prepared for the season. One sheet reproduces pictorial advertisements, electros of which can be purchased. These leave ample space for local matter and are very effective. A number of booklets are also available: one, entitled "Christmas Presents," sets forth the arguments for electrical gifts in a very attractive manner.

Employment during October.—The monthly review of employment conditions in the *Ministry of Labour Gazette* states that employment in the engineering trades during October continued bad on the whole, but showed a slight improvement except in the marine engineering section which experienced a marked decline. Employment in the electrical branch was fairly good. The general unemployment figure for the engineering industry was 11.3 per cent., a decrease of 0.2 per cent. In the marine section it was 25.5 per cent., while the electrical branch made the best showing with 5.5 per cent., an increase of 0.2 per cent. There were slight improvements during October in the electrical wiring and contracting, and electrical cable, wire and lamp manufacturing industries.

Unemployment.—The total number of registered unemployed persons on November 16th was 1,196,200, representing a decrease of 1,926 during the week and 12,799 during the past year.

Commercial Electrical Travellers.—The Electrical Trades Commercial Travellers' Association held a successful whist drive and social at Manchester Hotel, Aldersgate Street, on November 21st. The attendance was disappointing, only about 80 members and friends being present, although some 300 invitations were issued. Despite this slight set-back, a very enjoyable time was spent, and the prizes, which were presented to the winners by Mrs. Joyce, wife of the chairman of the Association, were really handsome. The evening was concluded with an excellent musical entertainment provided by Miss Beale and Mr. Bidwell (vocalists), and Mr. Boxall and Mr. Montague (entertainers). The entertainment secretaries and others who were responsible for the programme are to be congratulated upon the arrangements made; their efforts were deserving of much better support.

The British Industries Fair.—The Department of Overseas Trade announces that Canada and East Africa have notified their intention of participating in next February's Fair. Special sections are being organised in London to display Canadian and East African products.

The Shannon Scheme Dispute.—It is reported that the Irish Labour Party and Trade Union Congress have "blacklisted" the Shannon hydro-electric scheme, *i.e.*, they have called upon their members not to take employment under the contractors, the Siemens-Schuckertwerke. The position is that the firm offers labourers 32s. per week, whereas the unions demand 1s. 1d. per hour.

A "Siluminite" Blotter.—THE SILUMINITE INSULATOR CO., LTD., has sent us a blotter (of the rocking type) the parts of which are made of its insulating materials.

Local Exhibition.—BLACKPOOL.—Organised by the Corporation Electricity Supply Department, an electrical exhibition was opened at the Winter Gardens, Blackpool, on November 18th, and will remain open until December 12th. The Department has over 300 cookers on hire and is confident that as a result of the exhibition this number will be greatly augmented. Recently an "all in" tariff for the supply of current for domestic purposes, was introduced whereby a fixed charge of 12½ per cent. per annum on the net assessment for rateable value purposes, is paid quarterly, in addition to a charge of 1d. per unit for the current consumed. The principal exhibitors are:—The General Electric Co., Ltd., "Magnet" electrical appliances, including ovens, restaurant grillers and fryers, irons, cookers, toasters, hot plates, pedestal heaters and radiator fires, washing machines, &c.; Messrs. J. W. Fielding & Co., Blackpool, shop and house fittings, electric fires, vacuum cleaners, &c.; Messrs. R. Darbyshire, Ltd., Blackpool, the "Lightfoot" tubular electric heating system, "Exide" batteries, "Crypto" motors, "Hoover" vacuum cleaners, &c.; Mr. George Morrison, Blackpool, heating and cooking apparatus; and Messrs. Jones Bros., Blackpool, numerous applications of electricity in the home and workshop.

Maintaining Supplies during an Emergency.—In order to protect the public in the event of an industrial dispute which may result in the cutting off of supplies of essential commodities, the Government has organised a skeleton system to ensure that all such essentials shall reach the public. The arrangements include means of maintaining coal supplies, and regulations will be made whereby local authorities may place restrictions upon the consumption of gas and electricity in their areas.

Patent Application.—Application has been made for the restoration of Patent No. 174,744 of 1920, granted to Miles Walker for "An electric harmonic analyser."

Parliamentary Notices.—A number of applications whic are being made to Parliament for electrical powers appear i the *London Gazette* for November 20th and following issues We shall refer to the applications in the usual form when th collection is complete.

Trade Announcements.—MESSRS. SUPERADIO, LTD., of Pau Street, E.C.2, ask us to state that they have no connectio with Super Radio Co., the defendants in the action referred t on page 840 of our last issue.

THE ELECTRICAL SUPPLIES (LIVERPOOL), LTD., ask us to state in order to put an end to certain confusion that exists, tha they are not connected with the E.S. Company, Ltd., of Lon don and Machester, now in liquidation, or with any other busi ness trading under a name similar to their own.

MR. F. P. FRY, electrical engineer, of Newport, Isle of Wight has removed his business to larger premises at 80, Pyle Street

THE CURTIS MANUFACTURING CO., LTD., Paddington, W.2 informs us that it has no connection whatever with Pete Curtis, Ltd., a company which is mentioned under "Privat Arrangements" in this issue.

Catalogues and Lists.—THE BENJAMIN ELECTRIC, LTD. Brantwood Works, Tariff Road, Tottenham, N.17.—The "Benjamin Reflector," containing notes on poster lighting, office and shop-lighting equipment, automobile accessories, &c.

MESSRS. NEGRETTI & ZAMBRA, 38, Holborn Viaduct, E.C.1.—Lists Nos. C6 and C9, containing particulars and prices o various forms of distance thermometers.

RADIO INSTRUMENTS, LTD., 12, Hyde Street, New Oxford Street, W.C.1.—A descriptive pamphlet dealing with the company's new h.f. reactive anode unit.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park Manchester.—A series of new and revised leaflets dealing with the company's productions, including switch- and fuse-gear, motors and motor-controlling equipment, arc-welding plant, &c.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—An electrical fittings catalogue (244 pp.), beautifully illustrated by the photogravure process. The fittings include bowls, brackets, lanterns, electroliers, and many other kinds of electric lighting equipment. Fully priced.

MR. HARRY MOSS, 82, Leeds Road, Bradford.—Pamphlets advertising "Kohler" lighting sets, "Benjamin" reflectors, and "Whitecap" washing machines.

MESSRS. A. V. WILLMOTT, SON & PHILLIPS, St. John's House, Minories, E.1.—A number of pamphlets dealing with "Formica" insulating material and laminated bakelite products, with price list.

ELECTRICAL UTILITIES, LTD., Tudor Works, Park Royal, N.W.10.—Leaflet H.C./2, containing illustrated particulars of "Utility" electrical heating and cooking apparatus. Priced.

MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2.—Two illustrated pamphlets dealing with the "Silverlite" all-metal reflector.

BIRKBYS, Liversedge, Yorks.—A mailing card advertising "Elo" synthetic resin insulation.

THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, Oxford Street, W.1.—A price list of "Hotpoint" electrical appliances and a folder illustrating the company's electric irons.

THE BRIGHTON LIGHTING & ENGINEERING CO., LTD., St. Martin's Place, Lewes Road, Brighton.—An illustrated leaflet describing a new "Tell-tale" switch-fuse unit.

AUTOMATIC & ELECTRIC FURNACES, LTD., 173-175, Farringdon Road, E.C.1.—An illustrated catalogue of "Wild-Barfield" electromagnetic steel-hardening furnaces.

THE RICHARDS THREAD MILLING MACHINE CO. (1918), LTD., 222, Strand, W.C.2.—A priced pamphlet dealing with thread-milling machines for tube manufacturers, &c.

MESSRS. W. H. ALLEN & CO., LTD., Queen's Engineering Works, Bedford.—Catalogue No. 112a, describing the "Allen" heavy-fuel oil engine. Illustrated.

THE CARPAX CO., LTD., 312, Deansgate, Manchester.—Illustrated pamphlets advertising "Homcharger" battery-charging apparatus; "Sangamo" fixed condensers; and various forms of receiving sets and accessories. Priced.

THE ALTON BATTERY CO., LTD., Alton, Hants.—An illustrated leaflet describing the "Alton" battery installed at the Fenny Stratford telephone repeater station. Mention is made of other large contracts carried out by the company.

THE BRITISH THOMSON-HOUSTON CO., LTD., Mazda House, Newman Street, Oxford Street, W.1.—An illustrated folder dealing with "Keldon," "Ace" and "Trojan" lighting fittings, and a device advertising "Mazda" lamps.

MESSRS. T. HARDING CHURTON & CO., LTD., Atlas Works, Leeds.—Circular No. 620, describing the company's induction motors, with performance curves.

MESSRS. RANSOMES, SIMS & JEFFERIES, LTD., Ipswich.—Two priced catalogues, giving full particulars of the company's d.c. motors and dynamos, and induction motors respectively.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—The November "Osram Bulletin," containing notes and articles on the manufacture, sale, and installation of "Osram" lamps and radio valves.

Bankruptcy Proceedings.—T. ROBERTS and J. TAYLOR, rading as Roberts & Co., electrical engineers, 61, Old Town Street, Plymouth, and Fore Street, East Looe. These debtors were to have attended for their public examination at the Plymouth Bankruptcy Court on November 20th. Only the latter put in an appearance, and he Official Receiver said he did not anticipate that Roberts would attend and he might have to make an application with egard to him later. TAYLOR stated that Roberts suggested a partnership, each of them to contribute £150 capital. The witness contributed his share, but Roberts did not do so and made various excuses right up to the time he left. The Plymouth business progressed very well for the first six months. Then they contracted to light the town of Looe with electricity, and opened a branch establishment there, to which debtor attended. Roberts supervised the business both at Looe and Plymouth. The Looe contract was undertaken within a month of their starting business at Plymouth. While debtor was at Looe, Roberts, without consulting him, bought for £1,300 on the instalment system, a plant for supplying ice to the fishing boats. That plant had never been used or even erected. They also started a power station, and laid the cable in certain parts of Looe, but the street lighting had not actually been carried out. They had supplied light to private customers. Taylor, after stating that his partner had absconded, said that he consulted his accountants and at a meeting of the creditors which was convened he made an offer of 12s. 6d. in the £, which was not accepted. Debtor said the intention was to turn the concern into a limited liability company. The statement of affairs showed liabilities for dividend amounting to £3,223. As regarded his own private affairs, the liabilities were £19, and he had no assets. The Registrar adjourned the examination until January 1st.

VERNON REED, 10, Chapel Road, Eastville, Bristol, electrical engineer.—The first meeting of creditors was held on November 18th, at the Official Receiver's Offices, Bristol. The statement of affairs showed liabilities of £334, against assets of £11, leaving a deficiency of £323. Debtor attributed his failure to illness, loss of stock through defalcations of a former employé, and loss through delay in laying cables. He commenced business in December, 1922, as an electrical engineer with £100 capital, his savings. The business was fairly successful for the first six months, when, following a serious illness, he was unable for about 12 months to attend to it. In order to carry on he engaged an assistant but the business gradually diminished. He had several contracts to install electric light in certain houses; he completed the wiring and drew all the monies due for the work done, but could not complete the contracts owing to the delay in the laying of the cable, which was only put in a month ago. He was then unable to complete the contracts owing to lack of capital, and arranged for them to be taken over by another electrician. He became aware of his position about 12 months ago. The case being a summary one, was left with the Official Receiver as trustee.

The following are creditors:—

	£		£
Cottrell, E.	45	Sloan & Co., Ltd.	74
Sutton & Bridgman, Ltd.	150	Devening, —.	35

JAMES WILSON, electrical engineer, 70, Ebrington Street, Plymouth.—A meeting of creditors was held on November 9th. The statement of affairs showed gross liabilities of £637 and assets estimated to produce £412. The Official Receiver said that debtor commenced business in 1919, without capital. In October, 1923, he executed a deed of assignment. A friend purchased from the trustee the stock-in-trade, fixtures and fittings. Debtor stated that trade was satisfactory between 1923 and 1924, but he then had a struggle against ill-health. He was aware of his financial position in the early part of this year, but continued trading in the hope that his health would improve and he could put matters right. The public examination was fixed for December 18th.

W. K. COXON and E. R. WEARE (Western Mfg. Co.), Nursill, Lydney, Glos.—Trustee, Mr. C. Latham, 78, New Oxford Street, W.C., appointed November 12th.

H. C. PERRY, building and electrical contractor, 206, Mount Pleasant, and Birchfield Road, Headley Cross, Redditch.—Trustee, Mr. T. Easton, Official Receiver, 191, Corporation Street, Birmingham, released November 11th.

R. EMMOTT, electrical appliance merchant and contractor, 1, Manor Street, Bradford.—Trustee, Mr. W. Durrance, Official Receiver, 12, Duke Street, Bradford, released November 11th.

F. H. P. HOOLAHAN (Holloway Bros.), electrical engineer and instrument maker, 16, The Hale, Highams Park, and 299, Holloway Road, N.—Last day for proofs for dividend December 2nd. Trustee, Mr. E. Parke, Official Receiver, Carey Street, W.C.

W. K. M. WILSON, electrician and wireless apparatus dealer, 1, Mount Street, Heanor, Derby.—Last day for proofs for dividend December 2nd. Trustee, Mr. L. A. West, Official Receiver, 4, Castle Place, Nottingham.

F. P. CRAWLEY (New Central Garage), electric, radio, and motor engineer, 30, Mincing Lane, Blackburn.—First and final dividend of 5s. 8d. in the £, payable at the offices of Mr. T. T. Eaves, 47, Mosley Street, Manchester.

Dissolutions of Partnerships.—BELL CRYSTAL CO., 108, Dale End, Birmingham.—R. Withers and C. Campbell have dissolved partnership. Mr. Withers will attend to debts and continue the business at the same address.

WYATT & MAYO, electrical engineers, 46, Laygate, South Shields.—Mr. N. W. Wyatt and Mr. J. Mayo have dissolved partnership. Mr. Mayo will attend to debts and continue the business under his own name.

TINGLE BROS., ironfounders, mechanical and electrical engineers, and gasfitters, Bilson Foundry, Cinderford.—Messrs. W. and A. E. Tingle have dissolved partnership.

H. VINCENT THOMAS & Co., mechanical and electrical engineers, 5, Richmond Terrace, Swansea.—Mr. L. V. Thomas and Mr. H. W. Vincent have dissolved partnership. Mr. Thomas will attend to debts.

Company Liquidations.—ARTHUR LANGHAM & SONS, LTD., merchants, Holborn Viaduct House, Holborn Viaduct, E.C.—The statutory first meetings of the creditors and shareholders of this company were held on November 17th at Carey Street, W.C., before Mr. J. Barwick Thompson, Official Receiver. The statement of affairs showed liabilities of £10,730, against assets of £91, leaving a deficiency of £10,642 as regarded the shareholders, the issued capital being £4. The chairman reported that the company was registered as a private company on December 28th, 1923, with a nominal capital of £10,000, and was formed to carry on business as general merchants, importers of articles of Continental manufacture, and exporters of British goods. No established business was acquired, but the real object was to deal in electrical goods, household utensils and radio components. Immediately after the formation of the company, Continental purchases amounting to about £30,000 were made. In May, 1924, the company arranged for the purchase of 10,000 radio headphones; the total purchase price was £4,375, and 14 bills of exchange were accepted in respect thereof. No goods were received and it was ascertained that the manufacturers had gone into bankruptcy and could not execute the order. The company thereupon demanded the return of the bills but without success; they appeared to have been negotiated on the Continent. The circumstances in which the bills had been negotiated required further investigation. The failure of the company was attributed to its inability to obtain delivery of goods from abroad, but contributory causes were insufficient working capital and the bill transactions, which placed the company in serious difficulties. In the opinion of the Official Receiver the failure was due also to lack of proper business methods, extravagant expenditure and mismanagement. The liquidation was left in the hands of the Official Receiver.

REGENT RADIOPHONE CO., LTD.—Winding up voluntarily. Meeting of creditors at the offices of the Liquidator, November 27th. Particulars of claims to be sent by December 31st, to the Liquidator, Mr. E. H. Palmer, Bentinck Buildings, Wheeler Gate, Nottingham.

PORTA RADIO, LTD.—A meeting of members is called for December 21st at 39, Lombard Street, E.C., to hear an account of the winding up from the Liquidator, Mr. M. A. Heyburn.

GENERAL WIRELESS CO., LTD.—A meeting of members is called for December 17th at 31, Budge Row, E.C., to hear an account of the winding up from the liquidator, Mr. R. C. W. Clarke.

DE MARTIS ACCUMULATORS, LTD.—A meeting of members is called for December 21st at Adelaide House, King William Street, E.C., to hear an account of the winding up from the liquidator, Mr. C. A. Firth.

BRITISH EMPIRE EXHIBITION (1924), INCORP.—Winding up voluntarily. Liquidators, the Rt. Hon. J. H. Thomas, M.P., Sir J. A. Cooper, and Sir A. F. Whitney, 4b, Frederick's Place, Old Jewry, E.C. Meeting of creditors was called for November 26th, at Winchester House, Old Broad Street, E.C.

Private Arrangements.—PETER CURTIS, LTD., 75a, Camden Road, N.W., manufacturing electrical and wireless engineers.—As briefly reported in our last issue, a meeting of creditors was held on November 16th. A statement of affairs as at October 31st was presented, which showed liabilities of £16,190; the Paragon Rubber Co., Ltd., after deduction of debenture charge, was a creditor for £9,871. The net assets were valued at £757, leaving a deficiency, subject to the costs of winding up, amounting to £15,433. The company was incorporated in October, 1923, for the purpose of manufacturing and selling radio apparatus. Certain assets were purchased for cash amounting to £75. The subscribed capital was £100. In October, 1924, the capital was increased to £4,000. One of the directors, Mr. Forbes, drew £5 per week, but that remuneration was increased to £1,000 per annum. As from July, 1925, Mr. Forbes had voluntarily reduced his remuneration to £750 per year. In January, 1925, Mr. Forbes sold to the company a new high-frequency amplifier for £750, and took shares in the company for that amount. The Paragon Rubber Co. became large creditors, and subsequently Mr. A. E. Blackwell was appointed a director of Peter Curtis, Ltd., in the capacity of advisory manager. A floating charge was given to the Paragon Rubber Co. for £5,000. The chairman said he had no reason to doubt that the debenture was in every way valid. Continuing, he said that for the two years up to October 31st, 1925, there had been a loss of something like £1,100. That loss was attributed largely to the fact that the directors had found a general difficulty in launching a new organisation and during the period 1924-25 the company was left with heavy stock which had to be sold at unremunerative prices. The advances made by the Paragon Rubber Co. amounted at one time to something like £14,000, but it was unwilling to take advantage of the debenture. A meeting of the larger creditors had been held previously and the statement of affairs had been

placed before them. The chairman said that the directors had reason to expect that the company could in the future be conducted without loss. Mr. Latham proposed that, subject to all goods ordered subsequent to October 10th being paid for in cash, the creditors should accept an offer of 4s. in the £ payable not later than December 15th. The resolution was carried.

The Brazilian Electrical Market.—The United States Assistant Trade Commissioner at Rio de Janeiro, reporting at the end of last month, stated that electrical equipment sales in Brazil had fallen off considerably, only financially strong houses being able to buy. The market for radio equipment was "dead" after an exceedingly good month. The Sao Paulo power shortage would show improvement shortly owing to half of the Rasgao works being completed and the other half nearly ready.

Illuminated Assembly Rooms.—The accompanying illustration depicts a good example of modern ballroom lighting which is installed in the Star and Garter Assembly Rooms, Putney Bridge. The main illumination is effected by a number of artistic electroliers, while it is augmented by brackets



The Star & Garter Assembly Rooms.

fixed at frequent intervals on the walls. "Osram" gasfilled lamps in tangerine-coloured shades are used throughout. Over the stage, seen in the background, is a searchlight projector which is equipped with a rotary disk containing colour screens. The installation was carried out by Messrs. Tillotson, Fulham.

Siemens-Schuckert in Uruguay.—Siemens-Schuckert, of Germany, has applied for articles of incorporation in Uruguay for the purpose of opening a branch house in Montevideo under the name of Compania Platense de Electricidad Siemens-Schuckert. This action is being taken to obtain a more favourable position in supplying the growing demand for electrical supplies and equipment in Uruguay and for greater convenience in submitting bids on the numerous public tenders called for by Government and private institutions.—*Commerce Reports.*

The United States Electrical Export Trade.—Mr. Julius Klein, director of the U.S. Bureau of Foreign and Domestic Commerce, in the course of a recent address said:—"The United States is to-day the largest exporter of electrical goods, and its position is not seriously threatened. Before the war Germany led the world and supplied almost half of the total shipped by the five leading electrical manufacturing countries. The astounding advancement in technique in that industry in the United States and the tremendous domestic demand for its output are undoubtedly the two explanations of the position attained in our exports of this type."

Electric Furnace Orders.—Orders for its furnaces have recently been received by Automatic & Electric Furnaces, Ltd., from the Isotta Fraschini Fabbrica Automobili, Milan; the S.A. Tronvay et Cauvin, Paris; the Hans Keise A.G., Berlin; the L.C.C. Tramways Dept.; Henry Lane (Australia), Ltd., Newcastle, N.S.W., and a number of other British and foreign concerns.

German Foreign Electrical Trade.—Exports of electrical goods from Germany during the first six months of 1925 totalled 142,500,000 marks, as compared with 259,200,000 marks for the entire year 1924 and 290,300,000 marks for 1913. From January to June, inclusive, 1925, imports of these manufactures into Germany reached 8,400,000 marks, as against 9,100,000 marks in 1924 and 12,800,000 marks in 1913.—*Commerce Reports.*

For Sale.—Mr. H. J. Shaw will offer by auction on December 1st, at 85, Newington Causeway, S.E., various trade stocks of electrical and wireless manufactured goods and material. Messrs. Fuller, Horsey, Sons & Cassell will sell by auction at Church Wharf, Chiswick, on December 2nd, electric motors, circuit breakers, switchgear, &c. (See our advertisement pages to-day.)

A Report upon the British West Indies.—Mr. J. H. Wilson Goode, Trade Commissioner for the British West Indies, &c., has furnished the Department of Overseas Trade with a report upon the economic and financial conditions in his area. (Stationery Office, 2s. net.) Mr. Goode mentions a number of public works contracts which have been awarded, including one in connection with the Hermitage reservoir and hydro-electric works (Jamaica) which was let to a British firm for £149,978. Tenders are shortly to be invited for the remainder of the work. In British Honduras it is intended to recondition the Belize electric light and ice plant at an approximate cost of £20,800. The imports of electrical goods into Barbados, British Guiana, Trinidad and Tobago, and Jamaica aggregated £56,039 in 1924, as compared with £71,53 in 1923. The bulk of this business (£44,832 in 1923 and £34,82 in 1924) was secured by the United States. Great Britain supplied goods to the value of £22,593 in 1923, and £16,04 in 1924. It is stated that American influence gained considerable ground during the war, and although in many important lines the United Kingdom has since recaptured its trade, the predominance of American productions over a period of years has left an enduring mark. In certain lines German competition is increasing, and electrical goods are specially mentioned. German travellers are commencing to canvass these markets, and it is probable that German activities in this direction will increase.

Trade Marks in Argentina.—*British Industries* (the official organ of the F.B.I.), calls attention to the importance of maintaining a close watch upon trade mark interests in Argentina. It states that registration should be applied for and secured before any attempt is made to export goods to that country, and special care should be taken to renew the registration every ten years. The applications published in the *Boletin Oficial* should be watched by the local agents to guard against the registration of infringing marks.

Swiss Tariff Increases.—The *Board of Trade Journal* for November 19th published a list of articles which are to be subject to increased import duties upon entering Switzerland. Some duties are to come into force upon a date to be fixed, while others will probably be only used as instruments for obtaining concessions from other countries. The list includes the following items:—Insulated lead-sheathed cables; dynamo electric machines and transformers; automobiles, including electric cars; accumulators and plates; electrical measuring instruments; and telegraphic and telephonic apparatus.

Radio in Canada and the United States.—We have received a copy of a report prepared by Mr. W. A. Brooke, sales director of the Ashley Wireless Telephone Co., after a tour of Canada and the United States. Mr. Ashley says that an approximate analysis of radio apparatus used in Canada shows that it is about 90 per cent. American, Great Britain merely sharing in the balance. There is a preference for British goods provided that the price is reasonably competitive, and good sales of the Ashley Company's products were effected against American and Canadian competition. Canadians appear to depend mainly upon American broadcast



British Radio Apparatus at Montreal.

ing for their entertainment; the Dominion stations do not operate regularly. Both American and Canadian broadcasting is inferior in quality of transmission and standard of programme to British broadcasting. There is still no sign of "saturation" of the American radio market. All the factories visited were working at full pressure, producing an astounding quantity of apparatus. American radio components of the better class are superior to the average comparable British product; this is attributed to the opportunities for mass production. The accompanying illustration shows a stand arranged by the Ashley Wireless Telephone Co. at a Montreal radio exhibition.

Spanish-German Agreement.—The "tariff war" between Spain and Germany, which was expected to be of benefit to traders of other countries, has been brought to a swift end by the signing of a *modus vivendi* for six months.

Argentina's Electrical Imports.—During the first half of he current year the tariff value of electrical goods imported nto Argentina was 324,828,212 gold pesos, as compared with 78,743,353 pesos in the first six months of 1924.

Book Notices.—"Hütte, des Ingenieurs Taschenbuch." Edited by the Akademischen Verein Hütte, E.V., 25th edition, Vol. I. Pp. xvi+1,080; illustrated. Berlin: Wilhelm Ernst nd Sohn. Price 13.20 Rmk.—This publication, originally issued n 1857, has been brought up to date, and contains many new ections. Its contents embrace mathematics, technical physics, roperties of materials, measurements, surveying, &c.; in his volume only casual references to electrical matters occur, ut there is a vast amount of general information on engineer-ng subjects, with numerous tables and diagrams. There are hree other volumes in the series, which constitutes in con-ensed form an encyclopædia of engineering. The volume is learly printed in Roman type, with excellent illustrations, and s provided with a very full index.

"*Journal* of the Institution of Electrical Engineers." Vol. LXIII. No. 347. November, 1925, and Index to Vol. LXIII. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIV. No. 11. November, 1925. New York: The Insti-ute. Price $1.

"Electrical Power and National Progress," by H. Quigley. Pp. xii+160; figs. 18. London: G. Allen & Unwin, Ltd. Price 8s. 6d. net.

"Electrical Engineering Problems." Part 1. "Direct Cur-ent Circuits and Apparatus," by J. G. Pertsch, jun. Pp. iii+213; figs. 100. London: McGraw-Hill Publishing Co., Ltd. Price 10s.

"Elementary Electrical Technology," by A. M. Parkinson. Pp. x+179; figs. 130. London: Oxford University Press. Price 6s.

"Artificial Sunlight," 2; Special Report of the Public Health Department of the Metropolitan Borough of Poplar. October, 1925.—This publication is issued as a supplement to the pecial report of the Department, August, 1925, "Practical rtificial Light Treatment." It contains a description of the U-V-Scope," a simple portable photometer for gauging the ntensity of ultra-violet rays.

"Technologic Papers of the U.S.A. Bureau of Standards."—Vol. 19, No. 290, July, 1925 (30 cents); No. 295, August, 1925 10 cents).

"Scientific Papers of the Bureau of Standards," Vol. 20, No. 511, August, 1925. Price, 15 cents.

"High Vacuum Surface Condensers," by D. T. McHutchi-on. The Technical Section, Association of Engineering and hipbuilding Draughtsmen. Price 2s.—The factors affecting he rate of heat transmission in a surface condenser are fully iscussed and supported by curves. Many diagrammatic lustrations are given.

"The Dynamical Theory of Gases," by J. H. Jeans. Fourth dition. Pp. iv+444; 28 figs. London: Cambridge University ress. Price 30s. net.

Illumination Design Courses.—The ninth illumination esign course arranged by the Electric Lamp Manufacturers' ssociation was held at the North-East Coast Lighting Service ureau, Newcastle-on-Tyne, from November 23rd to 25th. The enth took place at the Scottish Bureau, Glasgow, from ovember 24th to 26th. The programmes of the courses were ractically identical, covering the lighting of shops, factories, treets, the home, &c., both from the technical and commer-ial aspects. The Glasgow Bureau reports that between seven nd eight hundred people have already attended lectures and emonstrations there.

At the London Bureau (Savoy Street) lectures have this onth been given by members of the staff to meetings of local hambers of Commerce, the Institution of Electrical Engineers, he National Association of Supervising Electricians, the Elec-rical Wholesalers' Federation, and other bodies.

Trade Opportunities in Spain.—The British Chamber of ommerce for Spain has informed *The Times* that in view of he difficulties imposed by Germany on imports of fruit from pain, commercial relations between these countries have been roken off. Spain as a result has totally prohibited imports f German goods into the Canaries and her North African orts, while imports into the Peninsula and the Balearic Isles re to pay duties under the first column of the Spanish tariff, 0 per cent. British exporters, the Chamber states, would do ell to avail themselves of the opportunities offered during is tariff war.

Electric Mine Locomotives in Russia.—The Westing-ouse Electric International Co., of East Pittsburgh, U.S.A., as received an order from the Amtorg Trading Corporation, he commercial representatives of the Soviet Government in merica, for 25 mine locomotives to be used in connection ith the electrification of the coal mines in the Donetz dis-rict. A distinctive feature of the locomotives is that they ill have adjustable wheel bases so that they can be operated n tracks from 24 to 30 inches in width.

Russian Electrical Manufactures.—A message from eningrad says that two 8,500-kW generators and 6,000-kW ansformers, the first of their kind constructed in the Soviet nion, have been turned out for the Volkovstroi concern by he Elektro Trust works. According to Swedish engineers orking for the Volkovstroi, the new Russian generators and ansformers approach in excellence Swedish and British akes.—*Reuter's Trade Service* (Moscow).

Irish Free State Electrical Imports.—The Irish Free State Ministry of Industry and Commerce has now issued detailed figures of imports for the first six months of 1925 as compared with the corresponding period of last year. From these we have compiled the appended table, showing the value of the total imports of electrical machinery and apparatus into the Free State and the amount attributed to the United Kingdom as country of shipment but not necessarily of manufacture:—

	Total. January to June.		U.K. Share. January to June.	
	1925. £	1924. £	1925. £	1924. £
Electric wires and cables	51,516	33,733	42,209	28,786
Teleg. and telephone instruments and apparatus	16,956	20,029	16,769	19,925
Electric lamps and parts	22,830	21,562	22,443	20,152
Batteries and accumulators	12,429	9,749	11,751	9,038
Radio sets and parts ...	23,035	69,337	22,373	68,094
Other electrical goods and apparatus ...	32,378	62,493	30,599	60,180
Electric generators ...	6,445	4,058	6,050	3,920
Electric motors	13,549	8,942	13,353	8,520
Other electrical machinery	33,591	19,491	32,013	18,452
Total	£212,729	£249,394	£197,560	£237,067

It will be seen that while wide variations are shown in the different classes of goods, the 1925 imports show a drop of £36,665 as compared with those of last year. All but £15,169 of the goods came from the United Kingdom, and of the balance £8,628 is attributed to Belgium, £3,724 to Germany, and £2,817 to "other countries."

The French Electrical Industry.—In the course of an article contributed to *Commerce Reports*, the United States Consul at Paris says that the amount of new capital invested in the French electrical industry up to September this year was $1,154,500,000 fr. as compared with 764,000,000 fr. for the whole of 1924. The bulk of this (875,500,000 fr.) was absorbed by electricity supply companies, while manufacturing firms took 153,200,000 fr.

The German Electrical Industry.—According to statements made by the price bureau of the Central Union of the German Electrotechnical Industry, the increase in the prices for manufactures which took place in July was made on the advice of the bureau and not on a decision arrived at by the bureau. Previous to this advance the competition which obtained had resulted in great losses. If it is assumed that the electrical industry had a turnover of from 500 to 800 millions of marks in 1924 and the loss through the reduction in prices in that year is taken at from 10 to 12 per cent., the lower receipts amounted to 80 millions. At present 87 firms belong to the price bureau as compared with 90 a year ago, and the bureau is of the unanimous opinion that if a further improvement of about 10 per cent. in current prices could be obtained with the same turnover, the works would be relieved of anxiety concerning the raising of funds for renewals and the production of reasonable balance sheets.

The report of the Electricity Company (late Lahmeyer) of Frankfort-on-Main, states that the expectation that with the return of regular currency conditions the electricity and tramway undertakings would also make an upward movement had in general been fulfilled, as most of the undertakings had been able to pay a dividend for the past year. It would, however, be wrong to assume from this circumstance that all the difficulties experienced by those concerns had been overcome. Their reserve funds had either been lost or were no longer available for use. Besides works of renewal, extensions were necessary and capital was required. The constructional departments of the company have been well employed and an abundance of orders is also on hand for the current year. The net profits for 1924-25 amounted to 1,610,000 marks and a dividend at the rate of 8 per cent. is proposed on the ordinary shares.

The Rhenish-Westphalian Electricity Works Company, of Essen, whose intention to pay a dividend at the rate of 8 per cent. out of net profits of 12,030,000 marks in 1924-25 has already been reported, states that the sales amounted to 1,099.47 million kWh hours as compared with 696.38 millions in 1923-24, although the latter year suffered from the effects of the occupation of the Ruhr. Nevertheless, the increase last year was still 11 per cent. over the maximum, which was attained in 1922-23. The present capacity of the works is 475,000 kW, and to meet the growing demand the cables were extended and now comprise about 620 miles of 100,000-V conductors with nearly a further 100 miles in course of construction. The company is introducing 220,000-V lines, and is linking up with the power station of the Mayence Company at Hochst near Frankfort-on-Main.

New Belgian Companies.—The Société Industrielle et Commerciale Electro-Mécanique S.A. ("Sicem") has been formed at Ostend with a capital of three million francs to deal in electrical apparatus, to construct tramway systems, power and transmission works, &c.

The Union Electrotechnique is the name of a company recently formed in Molenbeek-St. Jean, with a capital of one million francs, to manufacture and deal in all classes of electrical apparatus, but more especially ventilators, bells and meters.

The Austrian Radio Market.—Broadcasting has become very popular in Austria, but the radio apparatus business recently experienced trouble owing to the over-estimation of the demand which sprang up with the commencement of broadcasting, resulting in dealers being left with large stocks. A good deal of apparatus is imported in spite of the fact that there are a number of Austrian manufacturers, and equipment is even exported to Czecho-Slovakia, the Balkans, and Poland.

Electricity Supply in the United States.—A review of American industry published in *Commerce Reports* recently shows that the electric power industry has made remarkable progress in the last three years. As an index the position in 1919 is given as 100 and on this basis the industry reached 136 in 1922-23 rising to 148 in 1923-24, and to 158 in 1924-25. Only one branch of industry has developed to a greater extent, *i.e.*, the "five and ten cent store" business.

British Goods Campaign.—The Federation of British Industries has written to the Government urging the desirability of a campaign for promoting the sale of British goods. One of the suggestions is that the Government should allot a definite fund sufficient to run an extensive advertisement and publicity campaign on a national scale for at least two years, by means of newspaper advertisement, poster and other publicity. Every effort it is suggested should be made to encourage and where necessary co-ordinate with this central campaign, campaigns for their particular products by individual trades and individual industrial centres. The subject is one possessing special interest when we are at the beginning of the great shopping period of Christmas-time.

Locomotive Depôt Improvements.—Improvements involving an expenditure of £43,000 are to be made at the Whitemoor locomotive depôt of the London & North-Eastern Railway. Among the new plant which will be installed is an electro-mechanical coal-handling equipment.

Lighting and Power Notes.

Australia.—New South Wales.—According to the *Industrial Australian and Mining Standard*, the New South Wales Ministry has now definitely decided to abandon the Jackadgery hydro-electric proposal. The scheme to harness the waters of the Shoalhaven River to provide power for the south-eastern portion of New South Wales is to be pushed forward. Mr. Carter, engineer of the Public Works Department, has made a report, in which it is estimated that the scheme would involve an expenditure of about £1,679,000, and would make available 50,000 h.p. Constructional work would extend over about ten years. The Shoalhaven scheme would form a connection between the Burrinjuck and Port Kembla schemes. It is anticipated that the initial stage of the work to serve Goulburn and the Federal capital with power would be completed within three years, and would cost £504,000.

Victoria.—The Victorian Electricity Commission has now completed two years' operations in the western district of the State. The main transmission line from Geelong to Warrnambool is 116 miles long, and operates at 44,000 V. The supplementary h.p. lines, which serve towns off the main route, spread over 123 miles, and are operated on 6,600 V and the l.p. recticulation accounts for 103 miles of lines. Of the total of 324 miles, 49 miles of 6,600 V and 28½ miles of reticulation were put into operation during the last year.

Canada.—Electrical Development.—The *Financial Times* states that the Quebec Power Co., according to Montreal advices, has purchased the Laurentian Power Co., which owned in fee simple the water power at Seven Falls on the St. Maurice River, 35 miles from Quebec, with a total plant capacity of 18,000 h.p. Provision has been made at this plant for the addition of another set of 6,000 h.p.

China.—Electrical Development.—According to the recently-issued report of the Société Indo-Chinoise d'Electricité, the central electricity supply stations at Hanoi and Haiphong are making steady progress. In the first-named plant a new 1,500-kW generating set is being installed. A concession covering 20 years has been concluded with the Hanoi authorities. At Haiphong the company has acquired the steam-operated station which formerly belonged to the Société Industrielles de Chimie d'Extrême Orient, and a new engine and generator are to be added. The Indo-Chinese Co. is also establishing a power station in the town of Nam-Dinh, which is expected to be ready for operation early next year.

Continental.—Czecho-Slovakia.—*British Industries* states that the first stage in the electrification of Bohemia is nearing completion, and it is expected that the new power station at Ervenice, about 70 miles from Prague, will be put into operation in a month's time. The enterprise is under the joint ownership of the Czecho-Slovak Government, the Province of Bohemia and the Municipality of Prague. The programme of electrification, which has been spread over a number of years, also comprises a gradual change from steam to electric power at the Wilson station at Prague and on some of the lines in the vicinity of the capital. The erection of a hydro-electric station on the River Moldau near Prague is to be taken in hand in the early part of next year.

Belgium.—The Cockerill Co., of Seraing, the largest industrial undertaking in Belgium, has recently added an 8,000-h.p. gas engine and generator to its electric power plant, bringing the total capacity up to 37,000 h.p. During the past year the output of the various plants increased from 85 to 98 million kWh.

France.—A concession has been secured by the Société d'Energie Electrique du Tarn to establish h.p. overhead transmission lines between the hydro-electric stations which the company is establishing on the river Tarn between Courri and Truel, and the steam-operated station of the Compagni Générale Industrielle at Carmaux. The lines will transmi energy at 60,000 V.

Bulgaria.—The Société d'Electricité de Sofia et Bulgarie increasing its capital with the object of extending its opera tions. At present the company owns a hydro-electric statio at Pantcharevo, about 10 miles from Sofia, and a steam operated station in the city itself. These having become insuffi cient to meet the growing demand, it has been decided t erect a new plant about six miles from Sofia with an initia capacity of 18,000 kW. The energy will be transmitted to th city at a pressure of 35,000 V.

Cuba.—Electrical Development.—A company has bee formed at Habana with a capital of $2,000,000 to construct a electrical installation which will utilise certain waterfalls and supply electrical energy to a number of industrial concern and railways.—*Reuter's Trade Service* (Habana).

Dolgarrog.—Electricity Supply Restored.—The electricity supply for the whole of the area served by the North Wales Power Company is now fully restored. One of the 5,000-kW hydro-electric generators in the new power house a Dolgarrog was started up on November 16th and the 1,200-kW machine in the old power house is also running.

Glasgow.—Electrical Progress.—The Corporation Electricity Department reports that twice within the past few days fog has been responsible for establishing new records in output. The previous record, 1,000,000 kWh in one day, has been exceeded on two occasions, while the record maximum demand of 88,000 kW has also been established.

Ibstock (Leicestershire).—Electricity Supply.—It is understood that the Leicestershire and Warwickshire Electric Power Company has purchased a site in Ibstock for the erection of a transformer station. Many of the business premises and residences in the district have been wired for an electricity supply.

Lanark.—New Sub-Station.—The Clyde Valley Electrical Power Co. is to erect a sub-station with a view to providing an electricity supply for the town.

Leeds.—Electricity *v.* Gas.—In connection with the erection of houses on the Corporation housing estates, the Improvement Committee has instructed the city engineer to prepare plans for nearly 100 houses, to be fitted exclusively with electricity, or gas. Each house will contain only one open fire, the object of the scheme being to reduce the smoke nuisance. The plan is to establish "all-electric" or "all-gas" colonies, in which not only the houses, but the streets also, will be served exclusively with one system or the other.

Lichfield.—Electricity Agreement.—The agreement for the supply of electricity in bulk by the Walsall Corporation to the City Council has been completed and orders have been given for the necessary mains and sub-station equipment.

London.—Bermondsey.—The Borough Council has received sanction to a loan of £8,026 for mains extensions, services, and meters.

Loughborough.—Wiring of Small Houses.—The electrical engineer has been instructed to prepare a scheme for assisted wiring in the borough and to report to the Council.

Louth.—Electricity Supply.—The Town Council has received a proposal for a supply of electricity from Grimsby. It is proposed to lay the cables along the railway and to supply intermediate villages with electricity.

Millom.—Electricity Supply.—Reporting on his interview with the Electricity Commissioners, the engineer for the electricity scheme stated that no objections were raised to the scheme, with the exception that the Commissioners questioned the ability of the Council to raise the necessary loan. The engineer did not consider that there would be any difficulty in that respect, and suggested that the Council should write the Commissioners for their consent to the scheme and ask for the co-operation of the local M.P.

Nantwich.—Electricity Agreement.—It is reported that the Electricity Distribution of North Wales and District, Ltd., and the Urban District Council have come to terms in connection with a scheme for providing an electricity supply for the town.

Northern Ireland.—Carnlough (Co. Antrim).—At a recent meeting of the ratepayers, a committee was appointed to make the necessary arrangements for obtaining an electricity supply for the town.

Paisley.—Year's Working.—The report on the working of the Corporation electricity undertaking (engineer, Mr. W. Blair Smith) for the year ended May 15th last, shows a total income of £92,108, as compared with £89,836. The working expenses amounted to £53,808, as against £51,206, leaving a gross profit of £38,299 (£38,630), to which was added a balance in hand at the beginning of the year of £7,298, making a total of £45,597 available. This was disposed of as follows: Loan and other charges, £35,235; transferred to reserve, £6,000; balance carried forward, £4,362. The capital expenditure during the year, which included £9,730 for mains, and £7,882 for transformers, &c., amounted to £26,221. The sales of elec-

trical energy increased from 9,236,623 to 10,605,733 kWh, and the maximum supply demanded rose from 5,000 to 5,390 kW. The 6,000-V, 3-phase e.h.p. ring main feeder was completed and put into operation during the year, and a commencement was made upon large extensions of electric street lighting in the town.

Romsey (Hants.).—Electricity Agreement.—The Town Council has sealed an agreement for an electricity scheme with Christy Bros. & Co., Ltd.

Rugby.—Price Reductions.—The Urban District Council is to reduce the charges for electricity for heating and cooking from 2d. to 1½d. per kWh.

South Africa.—Cape Town.—An agreement has been entered into between the Corporation and the Tramways Co. for the Corporation to supply the whole of the company's requirements of electrical energy for a period of ten years from January 1st, 1927. The price per kWh for the first five years is to be 1.0625d. measured on the d.c. bus bars at the different converter sub-stations. For the remaining period the price is to be reduced by a figure representing any decrease in the total cost of generation. An annual consumption of 4,750,000 kWh is to be taken or paid for. The anticipated revenue to be received for this supply is approximately £24,000 per annum and the capital expenditure for converters, switchgear and h.p. cable connections will be about £20,000.

South-East Lancs. Electricity Advisory Board.—The Board has considered the proposal for a bulk supply of electricity to Eccles Corporation from Salford Corporation and has recommended to the Electricity Commissioners that the proposed contract between Salford and Eccles be approved.

A communication has been received from Wilmslow Urban District Council protesting against the electricity charges made by the Alderley and Wilmslow Electric Supply, Ltd., and the Board has passed a resolution that the Engineering Advisory Committee be instructed to investigate the question of supply in the area served by the company with a view to recommending the adoption of any course which would improve and cheapen the supply in the area.

Stockport.—Electricity in Bulk.—The New Mills and Marple Urban District Councils have concluded separate agreements with the Corporation for a bulk supply of electricity to their districts.

Sunderland.—Electricity Supply.—The Sunderland Bridge Council has decided, at the request of the Rural District Council, to be represented at a conference of several authorities to discuss the question of purchasing electricity in bulk and distributing it at a cheaper rate and under better conditions than at present.

United States.—Hydro-Electric Development.—The *Electrical World* states that the first unit of the Yonah hydro-electric plant, fourth in a series of six power developments planned for the Tallulah, Chattooga, and Tugalo River system of the Georgia Railway and Power Co., was recently put into service. The set has a capacity of 12,500 h.p. The dam is 70 ft. high and 900 ft. long. The power house, when completed, will contain three units with a combined capacity of 25,000 kW. The other two units will, it is anticipated, be ready by January 1st. Two more developments will be started as soon as the Yonah plant is completed. They are the Nacoochee project, which will be at the head of Lake Rabun, and the Burton project, which will be at the foot of Lake Burton. The two will add 16,500 h.p. to that already developed and will bring the total power of the system up to 279,500 h.p. The new plant will supply energy to Atlanta and other cities, and energy will be transmitted at 110,000 V.

Whitchurch.—Electricity Supply.—The Rural District Council has decided to support an application by the Whitchurch Gas Co. for an Order to supply electricity in the rural area.

Wirral.—Inquiry.—The scheme for the electrification of the Wirral Peninsular, the first part of which will cost £110,000, formed the subject of an inquiry which occupied three days (November 17th, 18th, and 19th) at Birkenhead. The inquiry was conducted by Colonel T. C. Ekin, Chief Inspector to the Electricity Commissioners. Mr. Craig Henderson, for the Wirral Council, said the Council wanted to borrow £110,000 for its electricity undertaking. It had obtained leave from the L.M. & S. Railway Co. to lay mains along the line of the railway as far as Meols. A supply would also be taken from the Mersey Power Co.'s station at Ellesmere Port. The Wallasey main would be for 6,600 V, and the one from Ellesmere Port 33,000 V. Mr. C. R. St. John (engineer to the scheme) said that there were about 1,000 houses already wired for lighting in the area.

Mr. Burton T. Hawkins, electrical engineer, Wallasey Corporation, stated that his Council objected to Moreton being supplied with electricity from Birkenhead. The Wallasey Corporation had entered into an agreement with the Wirral Council to afford it a bulk supply. Mr. J. E. Nelson (electrical engineer, Mersey Power Co.) said that his company had entered into an agreement with the Wirral R.D.C. to supply electricity in bulk. Mr. Wooll, for the Wirral Ratepayers' Association and the Parish Councils of Willaston and Hooton, said that the scheme was unreliable and extravagant, and was beyond the financial resources of the district.

Mr. G. P. Shallcross, electrical engineer of Birkenhead Corporation, said he had prepared a scheme to supply the Wirral, providing for 12 miles of overhead feeders, 3½ miles of underground lines, and 14 miles of l.p. mains, with six sub-stations. The total expenditure was about £60,000.

Mr. W. H. Jones, chairman Heswall Parish Council, said his Council would support the Birkenhead scheme. Mr. F. Clarke, Chairman of the Executive Committee of the Ratepayers' Association, stated that eleven parishes had passed resolutions rejecting the Wirral scheme.

Mr. Wooll claimed that the Wirral Council's scheme was not as cheap or as efficient as that offered by Birkenhead. The inquiry was concluded.

Worcester.—New Plant.—The Electricity Committee has recommended to the City Council that a new 6,000-kW turbo-alternator be installed at the Hylton Road works, at an estimated cost of £47,700. The proposal has been referred to the Finance Committee for consideration.

Tramway and Railway Notes.

Australia.—Melbourne.—*The Industrial Australian and Mining Standard* reports that the Melbourne and Metropolitan Tramways Board, owing to a variety of reasons, has suffered a severe loss in its transactions during the past year. Mr. A. D. Murdoch, the general manager, in giving evidence before the Arbitration Court, stated that for the two years 1923-1924 the net revenue had decreased from £471,176 to £282,203, and the surplus of £8,862 in 1923 became a loss of £125,465 in 1924; while for the last financial year the loss had increased to £232,000. Mr. Murdoch gave, as reasons for the serious loss sustained by the Board, severe motor-'bus competition, a fortnight's strike, and the great increase in privately-owned motor vehicles.

Consideration has been given by the Victorian State Cabinet to the future control of the metropolitan tramways. A suggestion has been made that when the term of the present Melbourne and Metropolitan Tramways Board expires the board should be abolished, and that in its place there should be established a board consisting of three experts in tramway matters. Other proposals which have been made are that the control of the tramways should be transferred to the Railways Commissioners, or that the board should be enlarged to embrace more direct municipal representation.

Sydney (N.S.W.).—The eastern section of the Sydney city railway will be opened for traffic in July next year. The structural work of the St. James' and Museum stations is nearly complete, Devonshire Street subway alterations are in hand, and the surface work between Devonshire Street subway and Cleveland Street bridge is in progress. The expenditure on the work up to July last was £2,340,100.

Continental.—Spain.—The Sol-Quevador section of the Alphonse XIII underground electric railway in Madrid has recently been completed and opened for traffic. The line is an extension of the Sol-Venta section, the two forming a railway which runs from the east to the west of the city, a distance of nearly four miles.

Sweden.—Successful trial runs with electric goods trains took place on October 13th on the Moholm-Falkoping section of the line between Stockholm and Gothenburg, the electrification of which will soon be completed. Four trains were despatched simultaneously in each direction, the longest consisting of 50 trucks. A fully-loaded train maintained a speed of 37½ m.p.h.

Dover.—Loan Sanctioned.—The Town Council has received from the Ministry of Transport sanction to a loan of £7,184 for the reconstruction of the tramway track in Snargate Street, Northampton Street, and Stroud Street.

Glasgow.—Through Running.—According to the *Electric Railway and Tramway Journal*, Mr. Dalrymple, general manager of the Corporation tramway undertaking, is to confer with the manager of the Lanarkshire Tramways Co., on the question of mutual through-running.

Dudley.—Light Railway Order.—The Minister has recently made an Order authorising the abandonment of parts of the Dudley and district light railways.

Liverpool.—Tramway Improvements.—In a statement at a recent meeting of the Tramways Committee, Mr. F. C. Wilson said that the new turbine at the Lister Drive power station would probably be put into service within the next two months. Further tramway extensions were contemplated, and new and improved types of tramcars were under consideration.

London.—Proposed New Tube.—The Metropolitan Railway Co. proposes to construct a new tube from Baker Street to Kilburn and Willesden Green, and powers to construct it will be sought in the next session of Parliament. The line will be three miles in length and will act as a loop line to deal with the increasing traffic between Baker Street and Uxbridge and Aylesbury. There will probably be new stations at Maida Vale and Kilburn. The cost of the scheme is estimated at £2,000,000.

New Tube Cars.—The Underground Co. has placed orders with Messrs. Cammell, Laird & Co. and the Metropolitan Carriage, Wagon & Finance Co. for 78 new cars required for the Morden and Kennington extensions, which will be ready for service next midsummer.

Walthamstow.—Loan.—The Urban District Council has applied to the Minister of Transport for sanction to a loan of £98,000 for tramway purposes.

Telegraph and Telephone Notes.

Aircraft Radio.—Wave-length.—For wireless communication with aircraft a limited wave-length band in the neighbourhood of 900 metres has been allotted, and while this has sufficed in the past, it is now in danger of being very overcrowded. When, as the *Financial Times* points out, it is considered that the average number of machines arriving at, or departing from, the London terminal aerodrome daily is about 70, and that there are frequently five or more machines within the British control area simultaneously, it is not difficult to understand that interference between machines and ground stations frequently occurs. The problem will be rendered the more acute when, as will possibly take place in the future, facilities are afforded to airway passengers to send private messages in a similar manner to that in vogue on board ship. As a partial solution, a scheme will be tried shortly in which the larger machines will carry an operator who will transmit and receive all his messages by telegraphy instead of telephony. Another aid is being sought in the use of shorter wave-lengths.

Imperial Wireless Committee.—South African Agreement.—The first fruits of the work of the Imperial Wireless Committee, which has been in session since last June, is a "beam" wireless agreement, which was signed on November 19th, between representatives of the British Post Office and the South African Wireless Co. Agreement has been reached on the handling of "beam" traffic in the two countries, and also as to the division of revenue. Stations for communication with South Africa are approaching completion at Bodmin and Bridgewater, whilst a corresponding station is being erected near Cape Town, and it is expected that the stations, which will be under the independent control of the British and South African Governments respectively, will be open for traffic next spring. The rates to be charged in the new service are one-third below the ordinary cable rates.—*Reuter.*

Italy.—Telephone Service.—A Bill dealing with the special assignment of a hundred million lire (about £1,000,000) per annum for six years to provide for the systematising of the inter-urban telephone communication service of the State will shortly be submitted for the approval of the Italian Parliament. The past want of organisation and lack of funds have brought matters to a crisis. The existing plant is quite inadequate for present needs, and renders impossible the necessary facility for telephonic communication over long distances.

Pacific Cable.—Duplication Dispute.—The Canadian Postmaster-General, the Hon. Charles Murphy, following the award of £2,260,000 contracts by the Pacific Cable Board for the duplication of the existing "All-Red" cable between Bamfield (Canada) and Fiji, declares that the duplication of the cable was decided on in the absence of the Canadian representatives on the Board, which controls the cable in the joint interests of Great Britain, Canada, Australia, and New Zealand. He adds that the contracts were awarded despite Canada's protests and in defiance of the Imperial Cable Act, which specifically states that no new work can be undertaken without the full concurrence of all the parties concerned. He has recommended his Government to withdraw from partnership in the cable, and urges that a new Imperial Act should be passed to enable Canada to "get her money back."

The contracts were placed last month. The section between Bamfield and Fanning Island, which is 3,458 miles in length and is the longest cable in the world, is being made by the Telegraph Construction and Maintenance Co., of Greenwich, while the section between Fanning Island and Suva (Fiji) is in the hands of Messrs. Siemens Bros., of Woolwich.

The *Daily Express* understands that Mr. Murphy has circulated among members of the Canadian Parliament and members of the Pacific Cable Board a pamphlet setting out his protest against the Board's "illegal and unbusinesslike action." He discloses in a cablegram dispatched to the Board last January his astonishment at receiving notification from Sir William Mercer, the chairman, that the Board had "no intention of consulting any of the Dominion Governments previous to awarding the contracts for the duplication of the cable." Then he claims to have established that:—

1. Tenders which the Board proposed to accept were "unduly high, even in the opinion of the Board's own engineers."
2. Following Canada's representations, the contract price was considerably reduced, comparisons having been made with the cost of laying new cables elsewhere.
3. No investigation was made by the Board into the wireless "beam" system.
4. No consideration was given by the Board to the installation of cables having a greater capacity than the Board's moderate requirement of 600 letters a minute, although recent inventions have given cables practically an unlimited capacity.
5. By providing for the use of a British "covering" material, the Board had indicated its fear of infringing the American "Permalloy" patents, and had actually earmarked £150,000 in the contract price for damages in the event of possible litigation; also that the Board had subsequently paid £107,000 for a licence permitting it to use a new "covering" or "loading," known as "Numetal."

As soon as the award of the contracts was announced, Mr. Murphy cabled Canada's willingness to withdraw from partnership in the cable enterprise and suggested that she should receive her share of the Board's savings. Otherwise, he declared, "more than £600,000 of Canada's money will be spent illegally and in total disregard of her wishes. Unless it is established beyond question that the duplication is an urgent public necessity, Canada would prefer to receive her share of the estimated cost, rather than agree to a disbursement of funds in a manner unpopular to Canada."

Mr. Murphy pointed out that as, apparently, the future prosperity of the Pacific cable was assured—the surplus last year amounted to £167,893—Canada's further assistance was not required. "The main purpose of the cable is to link Great Britain and Australia, and Australia also imposes a substantial terminal charge on every message received, yielding a revenue of about £200,000 a year. Canada has no such commercial interest, and therefore demands payment of her five-eighteenths share in the accumulated reserve."

The Board's reply was that compliance with Canada's wishes would require the passage of another Imperial Act, as it had no power to pay out funds other than for the laying and management of cables. Canada paid no part of the original capital, which the National Debt Commissioners of Great Britain wholly advanced.

Mr. Murphy replied that Canada, having taken no share in the liabilities of the Pacific cable, is not entitled to a share in the assets, and he contends that the Board wrongly assumed that Canada's agreement in 1921 to a duplication of the cable between Honolulu and New Zealand authorised the present expenditure. He asserts that the Board "wrongly pretended" that a letter by one of Canada's representatives on the Board bound Canada to the duplication of the cable from Bamfield to Fiji. He maintains that this letter referred only to the duplication between New Zealand and Fiji.

Russia.—Telephone Service.—With further reference to our recent note announcing the Soviet Government's intention to spend £20,000,000 on raising the telephone service in Russia to modern standards, it is reported that large American electrical companies are to be invited to co-operate in the project. Russia has at present only one telephone to about every 1,160 people; during 1922 the number of telephones in Petrograd decreased from some 40,000 to 8,966, though the population of the city increased by 300,000; while in Moscow, the headquarters of the Soviet, telephones decreased from more than 54,000 to about 25,000, in the face of an increase of population, during the same period, of some 500,000. The Government desires to increase the number of telephones in the country from 120,000 to 1,000,000, linking up the village centres over widely-scattered areas. It is also anxious to establish long-distance communication with Warsaw, Berlin, Paris, and London. It is understood that the International Standard Electric Corporation has informed the Soviet Government that it is not prepared to re-enter Russia until it has been compensated for the confiscation of its plant, which was nationalised by the Government after the revolution. The Government, while making no guarantees, is said to be willing to discuss terms for a reasonable adjustment of the claim.

The Telegraph Service.—Speed of Transmission.—The Post Office is experimenting with German telegraph apparatus, by means of which six separate messages can be sent over one wire at, it is claimed, a speed of 100 words a minute, says *The Times*, which explains that one advantage of the invention is that it can be used over ordinary telephone wires. Different wave-lengths are employed, and thermionic valves are used which set up oscillation. At the receiving end there is a filter which separates the different messages.

Radio Notes.

Broadcasting Committee. — Inquiry Commenced.—The Committee which has been appointed by the Government to inquire into the radio broadcast service met at the House of Lords on November 19th in private. Sir Evelyn Murray, Secretary to the Post Office, presented a statement with reference to the relations of the B.B.C. to the Government and the Press, and was questioned thereon by members of the Committee. On December 3rd and 4th the public will be admitted, when evidence is given by the British Broadcasting Co., Ltd., and the Wireless League.

Ceylon.—New Station.—Experiments have been in progress since the end of September at the wireless station at Colombo, where new continuous-wave plant is in use, to ascertain whether it is possible to establish regular direct wireless communication on a commercial basis between Colombo and Perth, in Western Australia. Communication has been readily established, and the object of the experiments is to discover whether it can be maintained at all hours of the day and night and under all conditions, says *The Times*. The new plant will be used also for broadcasting purposes on an 800-metre wave-length.

New Wave-lengths. — Geneva Recommendation.—Severe jamming having been experienced recently by some of the B.B. Co.'s stations, it is understood that the International Wireless Bureau on November 20th advised by cable from Geneva that the following alterations should be made in the wave-lengths of three stations:—Leeds, 346 to 321.5; Edinburgh, 328 to 324.5; Nottingham, 326 to 327.5.

New Studio.—Oxford.—The new studio which the British Broadcasting Co., Ltd., has opened in Oxford was used for the first time on Monday evening, November 23rd.

(*Continued on page 863.*)

A Modern Electric Heater Manufactory.

The New Works of Messrs. Belling & Co.

We were recently afforded an opportunity of visiting the new "Bridge Works" at Enfield of Messrs. Belling and Co. These works, which stand on a 10-acre site, are the outcome of the very considerable progress made by the company since its inauguration in 1912. In that year the first "Belling" works were established at Enfield for the exclusive manufacture of electric fires, the original firebar with which all the fires were fitted being patented at that time. The demand for these fires increased so rapidly that larger premises were soon taken over at Edmonton, where the firm commenced the manufacture of other domestic electrical appliances, such as cookers, water heaters, &c. These premises were burnt down and rebuilt and enlarged in 1920, but the expansion of the business made it necessary to build a larger factory on modern lines, and the site at Southbury Road, Enfield, was chosen for this purpose.



Fig. 1.—The New Works.



Fig. 2.—Plating Department.

The new factory, fig. 1, consists of two separate buildings, the larger one, a 6-bay building, the factory proper; and a smaller 3-bay building which is now being equipped as a foundry, in which it is intended to turn out the whole of the castings for the Belling products. The premises are of fireproof construction, built entirely of steel and concrete, with roofing of corrugated asbestos arranged with steel and glass north lights, making it a well naturally-lighted works. The floor area of the factory proper is 23,400 sq. ft., and that of the foundry is 11,700 sq. ft.; it is interesting to note that four new bays are being added to the main shop. The works are laid out on modern lines, the various departments being arranged so as to facilitate the handling of the raw and manufactured materials, and the easy transportation of the products, in their various stages of production, between the departments. The larger building also accommodates the offices, which are arranged along the front of the building.

A central avenue, figs. 3 and 5, down the length of the main shop accommodates the benches and equipment for the assembling of the various parts for both the heating and cooking stoves, each of these products being dealt with by a separate department. The smaller processes of manufacture, such as the winding of the elements and the lacquering and blacking of the frames, &c., are dealt with in surrounding compartments. Nickel chrome element spirals are wound on the special winding machines, fig. 4, which provide horizontal high-speed revolving mandrels on which the wire is turned. A stout wire is used for the elements, and the spirals are mounted on specially-constructed fireclay bars which are prepared by another firm; this work is done on assembling benches near at hand. At the present time the cast frameworks for the various stoves are received from an outside source. On receipt, the castings are first filed down and then dealt with in the blacking room, fig. 6. Here the castings are sprayed by means of compressed air from an electrically-driven compressor, shown on the right of fig. 6, and then baked in electrically-heated ovens. The heating elements in these ovens were installed by Messrs. Belling & Co. When in use the ovens are heated up to a temperature of between 300 and 400 deg. F. After being blacked the frames are conveyed to the central avenue or assembling shops, where they are fitted with the elements, switches, &c.

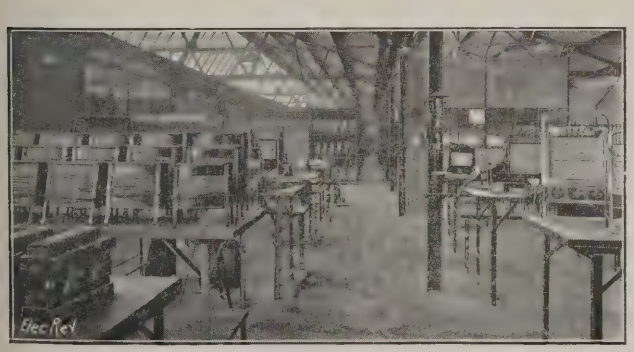


Fig. 3.—Assembling Benches.



Fig. 4.—Winding and Cutting Machines.

A large proportion of the products of the works is represented by the manufacture of electric fires constructed with light sheet metal frames. These frames are prepared sectionally on special stamping and

cutting guillotine machines, fig. 4. After being assembled they are treated in the blacking department in a similar manner to that in the case of the heavy cast frames. Before assembling in the frames, the element bars are electrically tested separately; and after the stove is built up it is tested as a whole both as regards the elements purely and also for leakage to the frames.

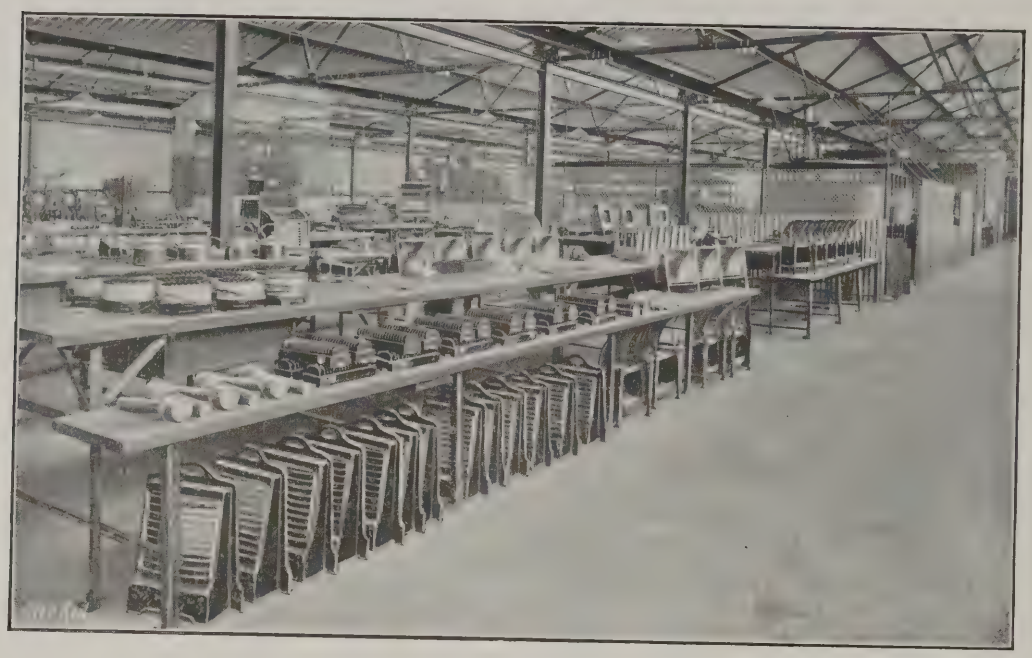


Fig. 5.—Central Avenue.

For the latter tests, a pressure of 1,000 V is flashed across the elements and the frames.

Many attractive designs of light brass and other metal frames are another feature of the works production, and these are treated in the electro-plating department, where any of a number of finishes can be given according to taste. The plating tanks are shown in fig. 2; some of them are electrically heated. Various stores are arranged throughout the factory, situated near where the stored contents are next to be required in the process of manufacture of the stove. In the case of the cooking stoves, the elements for the modern designs are made up as complete units and are not assembled in the frames, &c., until final dispatch, which, pending the completion of a railway siding, is done by road vehicles. A suitable sloped loading platform is provided for this purpose at the main entrance of the large building. Packing rooms are situated near the loading platform, the heavy packing being effected on the same level as the latter. For a water supply, the firm has had a well sunk on the site, from which water is pumped electrically to a 2,000-gallon tank raised on a brick column, fig. 1, to a level approximating that of the factory roof.

The electricity supply for the works is received from the North Metropolitan Electric Power Supply Co. It is metered and distributed in a special switchboard room, a 5-panel slate distribution board being erected for the purpose.

In all of the many designs of electric fires which are now produced at these works is incorporated the "Belling" multi-parabola fire-bar. The heating surface of this bar is made up of 75 small parabolic wells. The heat is generated in the spirals of nickel-chrome wire, which lie in the wells and give off their heat all round. The front of the spiral thus radiates heat direct into the room, while the heat round the back of the spiral is radiated by the wells, which were specially designed with this in view. The fire-bar itself is convex in shape to ensure that the heat radiates out over a wide area, and not merely in one direction only. In addition to being a highly efficient element, a claim made by the makers, the special construction of the multi-parabola fire-bar renders it reliable. The wire is almost entirely protected by being sunk just below the surface of the fireclay; there is thus small risk of the wire becoming broken. The "Corinthian" fire is an excellent example of the attractiveness which is a feature of many of the designs produced by this firm. It is designed particularly for use in the drawing room, and is pleasing in tone, with gracefully curved sides and simple but distinctive ornaments. The frame is sufficiently wide to effectively cover an existing grate without spoiling its general appearance.

Many forms of electric cooking appliances are included in the manufactures of the firm, from the complete cooking range down to the small portable boiling plate. Considerable importance is attached by the company to the question of water heating, and it has produced several sizes of immersion heaters.



Fig. 6.—Blacking and Stoving Room.

The Bradford Electricity Undertaking.

The Inauguration of an Interesting 20,000-kW Generating Set.

The Bradford Corporation claims to have been the first local authority to utilise powers conferred by Parliament for the public supply of electricity.

The Bolton Road Works were opened in September, 1889, and the Valley Road Works were first commissioned in 1897; they were later extended and the plant was added to from time to time. the first turbine in this station being installed in 1909, and the new plant inaugurated last week completed the change. Thus, turbo-generators of 59,000-kW capacity are now housed in an engine room that was designed in 1900 to accommodate 5,000 kW of reciprocating machinery.



Fig. 1.—Valley Road Works, 1925.

Mr. Thomas Roles, city electrical engineer and manager, gives the total cost of the latest extension as slightly over £100,000, and the new machinery was formally inaugurated on November 18th by Lieut.-Col. W. W. Ashley, Minister of Transport, and Mrs. Ashley, in the presence of Sir John Snell, Chief Electricity Commissioner, and other distinguished guests. Fig. 1 is an aerial view of the generating station.

The new turbine, manufactured by the English Electric Co., Ltd., as will be seen from fig. 2, is a two-cylinder tandem combination, with the impulse elements confined to the h.p. end and the reaction elements to the l.p. end. The latter cylinder is of the double-flow design, and there are two main bearings either side of the h.p. rotor and two main bearings either side of the l.p. rotor. The two turbine and the alternator rotors are coupled together through "English Electric" standard multi-tooth couplings, and each turbine rotor is provided with a Michell double-thrust block housed in the h.p. and intermediate bearings.

The h.p. cylinder has interesting features: the angle of expansion from the first nozzle in front of the first stage to the exit from the last row of blades is very good, and was attained by the employment of an unusually large number of stages for a comparatively small heat drop. The limiting factor in this direction has hitherto been the difficulty of locating sufficient number of stages between adjacent bearings without running through the first critical speed. With the usual construction of built-up rotors with the disks bored in the centre to take the shaft, the hubs of the disks have to be thickened to take the stress concentration with a reasonable factor of safety. This gives a definite minimum pitch between adjacent bearings, if the first critical speed is to be avoided; avoiding the first critical speed by thickening the shaft has distinct limitations because of the attendant increase in h.p. gland losses, and so by cutting the whole of the h.p. rotor from one forging, the English Electric Co. has obtained twelve-stages, figs. 3 and 4, giving a remarkable angle of expansion in an overall length which could only have accommodated a seven stage cylinder of the usual built-up type.

The diameter of the shaft and total weight of the rotor are, in addition, considerably less than could have been realised with the built-up construction, and other features are the unusually small diameter and, consequently, low blade speed. We see here a sharp departure from a practice which has hitherto been almost universal among designers of impulse machines.

This small-diameter, multi-stage construction provides a low-stressed rotor with a uniformly good velo-

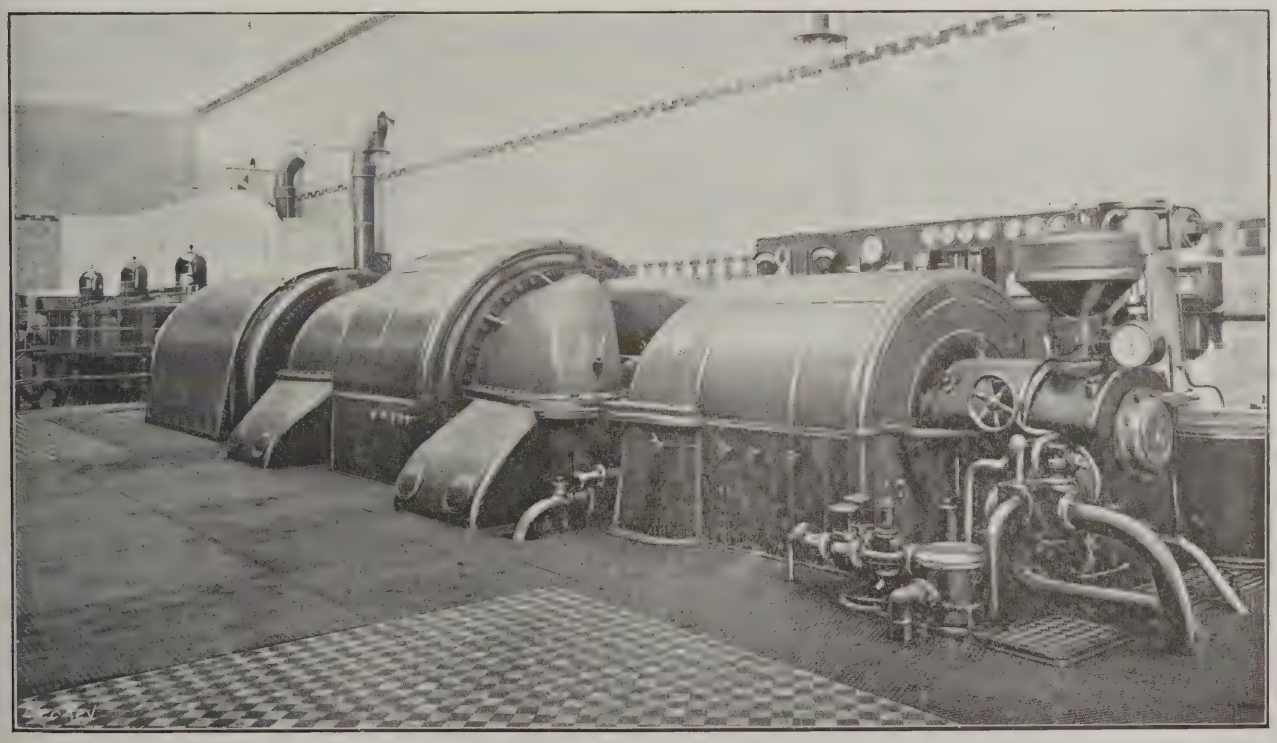


Fig. 2.—The New Two-Cylinder, Impulse-Reaction, 20,000-kW, 3,000-r.p.m. Turbo-generator.

city ratio and circumferential steam admission, and permits a stator casting of exceptionally small proportions, the internal stressing of which is such as to minimise distortion. The division between the cast-steel and cast-iron sections comes after the eighth stage, and thus divides the total cylinder into two very simple castings of small dimensions with a very small temperature drop across each section.

This design for the h.p. cylinder represents a bold departure from, indeed, almost a reversal of, those general principles which have until recently governed the design of most impulse machines. While having a blade development and angle of expansion comparable with those of the highest efficiency reaction design, the safety characteristics of an exceedingly low-stressed impulse machine are preserved, and it would appear that the necessity for the usual compromise between safety and efficiency has thus been largely obviated.

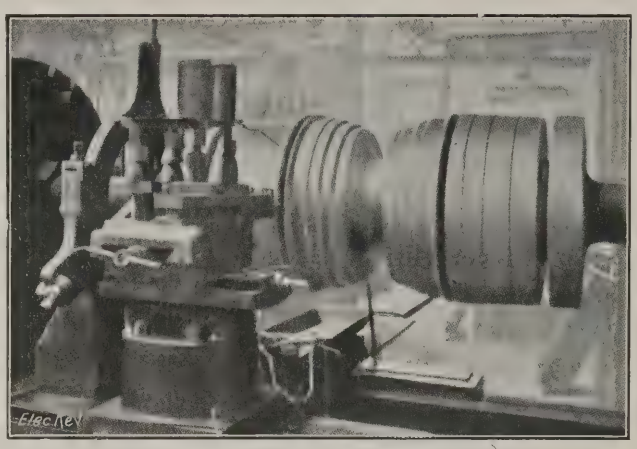


Fig. 3.—Turbine l.p. Rotor being Machined.

The steam exhausted from the h.p. casing passes through two pipes on either side of the shaft axis, while the large volume of l.p. steam is dealt with on the double-flow reaction principle, passing something like 200,000 lb. of steam per hour, it being considered sounder practice to divide the steam and thus halve the blade height rather than introduce single-flow devices which necessitate fine clearance where it is least desirable. The balance of end thrust with the double-flow exhaust must also assist the running characteristics of the turbine materially.

An annular space between the fourth and fifth rows of the l.p. blades on either side of the centre is an extraction belt for the first stage of regenerative boiler feed water-heating system, the two belts being coupled together by a connecting pipe on the under side of the frame, the extracted steam being taken to a feed heater under the engine room floor. Exhaust steam from the condenser air ejectors and gland drains is used for the second stage.

The turbo-generator, designed for a maximum continuous output of 20,000 kW, has its lowest steam consumption at 16,000 kW, the steam pressure being 190 lb. per sq. in., temperature 659 deg. F., and vacuum 28½ in. A noteworthy feature of the alternator (by Messrs. C. A. Parsons & Co., Ltd.) is its large output at the high speed of 3,000 r.p.m. The peripheral speed has been kept moderate by the adoption of a comparatively long rotor, the over-all length of the alternator and exciter being 22 ft. 8 in., and the outside radius of the stator casing 4 ft. 1¼ in.; it is a 6,600-V, 2,190-A, 50-cycle, 0.8-p.f., totally-enclosed machine.

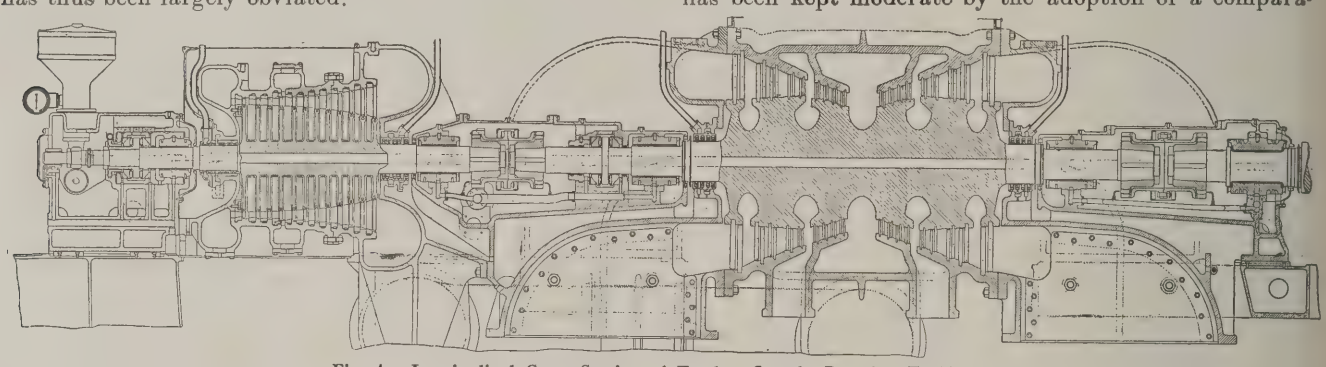


Fig. 4.—Longitudinal Cross Section of Tandem Impulse-Reaction Turbine.

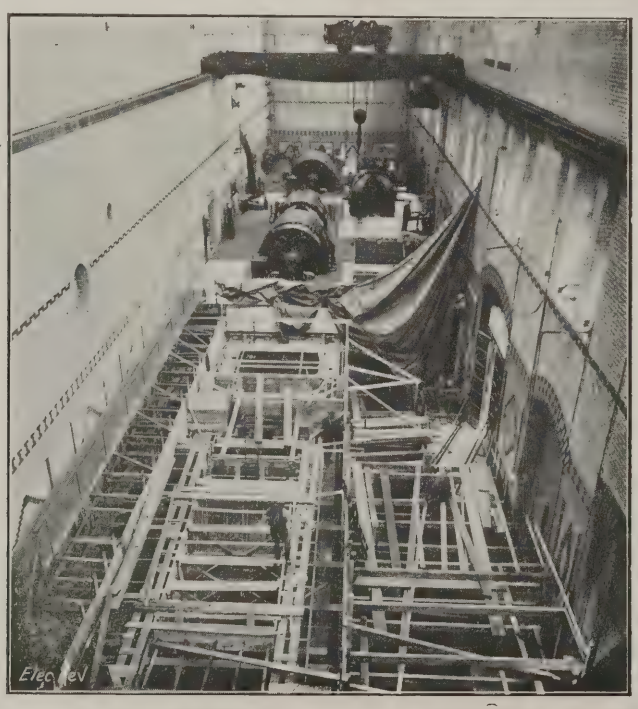


Fig. 5.—Foundations for the New Machines.

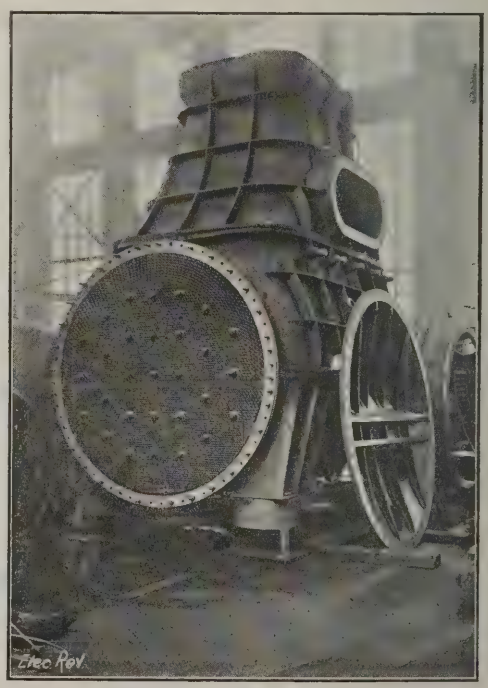


Fig. 6.—One of the Twin Condensers.

The stator casing was cast in one piece; no "through" core bolts have been used, and the "tunnel" formation of stator slot has been employed. The core conductors are made of Parsons helically-stranded coreless cable, the individual wires being in-

sulated and spiralled in a definite lay to reduce eddy currents. Thermocouples were embedded during construction. The rotor was machined from a solid forging, and a hole was trepanned axially through the centre of the shaft to enable the forging to be examined by means of optical instruments. Cool air is admitted along the whole length of the stator on the closed-circuit system of forced ventilation, using a surface air cooler and a separate motor-driven fan.

The twin Cole, Marchent & Morley condensers, one of which is shown in fig. 6, have a cooling surface of 35,000 sq. ft., are interconnected, and the water circulates through the tubes twice, the total quantity being 1,770,000 gallons per hour. Expansion stress is relieved by spring supports under the condensers' feet, and a balance pipe connects the two adapting pieces of the exhaust branches; this pipe is steam-jacketed to ensure that its expansion will be equal to that of the turbine.

Each of the three sets of C.M. & M.-Delas air extractors, two of which suffice for full-load duty, will deal with 120 lb. of air per hour with a steam consumption of 1,000 lb. per hour. Air is extracted from both sides of each condenser shell; the two-stage extractors have convergent-parallel water-jacketed diffuser tubes. Each of the two Mather & Platt condensate extraction pumps suffices for full-load duty; one is driven by a 30-h.p. d.c. motor and the other by an a.c. motor.

The evaporative capacity of the 27 water-tube boilers now in use is 676,000 lb. per hour. The 1923 boiler-house extension contains four Babcock & Wilcox marine type water-tube boilers, each of a maximum evaporative capacity of 81,000 lb. per hour.

(To be concluded.)

Ald. Wilfred Taylor presided over the proceedings generally as the chairman in office during the period of construction of the new set, which has been on load, as a matter of fact, since September. Miss M. D. Turner, daughter of Alderman Turner, presented bouquets to Mrs. Ashley and to the Lady Mayoress of Bradford (Mrs. J. Stringer).

At the Town Hall luncheon Ald. Turner again presided, and Mrs. Ashley was presented, on behalf of the three principal contractors, with a handsome table lamp of beaten silver.

Lt.-Col. Ashley, M.P., Minister of Transport, toasting "The City and Trade of Bradford," asked all manufacturers to support the British Industries Fair. The Lord Mayor of Bradford (Alderman J. Stringer) responded.

Sir John Snell, C.B.E., proposing "The Bradford Electricity Undertaking," said it was gratifying to note that in a time of industrial depression the undertaking was able to manufacture and sell at an average price of little more than 1½d. per kWh. In spite of the fact that the engineer had been handicapped to some extent by the lower steam pressure of older days, the undertaking had been able to maintain an annual thermal efficiency of some 16 per cent., whilst at the best station in the country the thermal efficiency was a little under 20 per cent. At the present moment the average consumption from public utility undertakings per head of population was only some 125 kWh per annum, whereas the sales in Bradford were already about 240 kWh, and the day was near when Bradford would have to consider going further afield in order to have the necessary generating plant to meet the needs of its own citizens. In the efforts for re-organisation in the Aire and Calder Electricity District of West Yorkshire, settlement had not been reached, and he could not help thinking that, had all the authorities concerned shown the same statesmanship and breadth of view as those connected with the Bradford undertaking, that settlement would, in fact, have been reached before now. "I ask again," said the speaker, "at this public opportunity afforded me, all of those parties to whom I have referred, to endeavour once more to come together."

Alderman Wilfred Turner, responding, said that the installation which had been started that day must not be regarded as a sign of latter-day repentance for past misdeeds in Bradford. Three large sets now housed in No. 3 engine room were actually approved by the Bradford Electricity Committee nearly 10 years ago, but war-time difficulties of obtaining plant and difficulties in arranging the removal of older plant without interrupting the continuity of supply had caused the delay.

"The Guests" were toasted by the chairman, and the Lord Mayor of Leeds (Councillor J. Arnott) and the Mayor of Huddersfield (Alderman Law Taylor) responded.

A toast to the "Contractors" was given by Councillor J. W. Longley, chairman of the Bradford Electricity Committee.

Mr. V. Watlington (English Electric Co.), Mr. G. Bedford (C. A. Parsons & Co., Ltd.), and Mr. R. S. Brailsford (Cole, Marchent & Morley, Ltd.) responded.

Councillor J. H. Palin, M.P. (ex-Lord Mayor of Bradford), proposing a toast to the Bradford City Engineer and his staff, presented Mr. T. Roles with a silver salver, the gift of the contractors, in appreciation of their happy association.

Mr. Roles, responding, paid a tribute to the way in which Mr. Townley, the deputy engineer, had carried on during his (Mr. Roles's) illness.

Radio Notes.

(Continued from page 858.)

Hungary.—REGULATIONS.—Possession of wireless receiving sets in Hungary has now been legalised, and regulations governing their use have been issued, says *The Times*.

Sweden.—INTERCONNECTION OF STATIONS.—The Government and private broadcasting stations in Sweden are all now being connected together to the main station in Stockholm, *via* underground or aerial wires. At Stockholm there are amplifiers on each main route, and there are intermediate amplifiers at Ange and Norrköping. To prevent the stations nearest Stockholm taking too much of the power from the lines to the detriment of the stations further away, adjustable resistances are inserted in the feed to each station just before the local amplifiers in the station. The line between Stockholm and Boden is 1,000 kilometres long, in which at present one amplifier suffices, but additional ones will be required when the station at Umea and other projected stations are added. Some 40,000 licences were issued in 1924; 110,000 were issued up to September 30th, 1925.

Switzerland.—SECRET BROADCASTING.—By order of the Swiss Federal Post and Telegraph Department, the Geneva police have recently seized the wireless receiving set of a Geneva individual who had failed to register his set and to pay the yearly 10-fr. tax, says *The Times*. According to the Swiss regulations, which compel amateurs to register their sets and to pay a tax, and which forbid them to write down what they hear, a fine may be imposed up to 1,000 fr. The Swiss police have also seized ten secret broadcasting posts set up by a secret association of young men for corresponding between themselves in Switzerland and with foreign countries.

Spain.—WAVE-LENGTH.—The fresh distribution of wave-lengths among the Madrid wireless companies in order to avoid complaints of mutual interference is again being considered. The monopoly project cherished by different emitting companies at Madrid and in the provinces seemed a little while ago to have been dropped; the scheme has now been revived, but is meeting with strong opposition.—*Reuter's Trade Service* (Madrid).

United States.—RADIO INDUSTRY.—The receipts of the United States wireless industry for 1925 are expected to exceed $500,000,000 (£100,000,000), which would be an advance of $200,000,000 over last year's figures. The increase within five years from the $6,000,000 (£1,200,000) of 1920 marks a "record" expansion for any American business. The manufacturers estimate that in 1925 they will have sold 3,000,000 wireless sets and 20,000,000 valves, as well as $150,000,000 (£30,000,000) worth of parts and accessories for home-made sets and replacements. According to Major H. H. Frost, president of the Radio Manufacturers' Association, the industry now employs about 300,000 persons in 1,200 factories and 40,000 workshops. Out of 584 existing broadcasting stations, 108 are operated by educational institutions, 47 by churches, and 39 by newspapers.—*The Times*.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Ashford.—December 14th. Electricity Department. Concrete engine foundations, concrete cooling pond, reinforced concrete road, steam and small electric circulating water pump, fuel-oil pump, oil-purifying plant, fuel-oil storage tanks, &c. (See this issue.)

Australia.—SYDNEY.—February 1st. Municipal Council. Bunnerong power house equipment. Six 25,000-kW turbo-alternators, 18 100,000 lb. per hour boilers, &c., and 33,000-V switchgear. (November 13th.)

MELBOURNE.—April 12th. State Electricity Commission of Victoria. Plant for the Sugarloaf and Rubicon hydro-electric scheme, consisting of turbo-generators, transformers, switchgear, cranes, and accessory plant. The Secretary, 22-32, William Street, Melbourne.*

Victorian State Railways. January 20th, 1926. Automatic battery charging equipment.* January 13th. Double recording wattmeter.*

Banff.—December 14th. Town Council. Electrical work in connection with the new Town Hall. Specifications from Town Clerk.

Belgium.—December 2nd. Belgian Post and Telegraph authorities, La Salle Madeleine, Brussels. Supplying and laying telephone cables at Ostend, La Panne, and Knocke. Particulars (Cahier des Charges Special No. 3-159) for 5 fr.

Bridlington.—December 7th. Electricity Department. One oil engine, direct coupled to a 275-kW d.c. generator, fuel storage tank, cooling tower, pipework, and pumps. (November 13th.)

Cork.—Public Works Department, Dublin. Installation of electric lighting in the Munster Institute, Cork. Mr. J. J. Healy, secretary.

Dublin.—December 10th. Great Southern Railways Co. Stores for six months, including electric lamps, &c. Stores Superintendent, Inchicore, Dublin.

Egypt.—December 30th. Inspecting Engineer in London, Queen Anne's Chambers, S.W. Telegraph and telephone material and motor generator and telegraph apparatus.

ALEXANDRIA.—December 10th. Ministry of the Interior. Machinery in connection with the waterworks scheme at Mellawi, consisting of electric motors and centrifugal pumps, control panels, l.p. armoured cable, &c. (C.X. 1,796.)*

Exeter.—December 11th. Electricity Department. One 3,000-kW steam turbo-alternator and accessories. (November 20th.)

Glasgow.—December 4th. Corporation Health Department. Electric lighting installation and heating works in connection with the alterations and extensions to Mount Blow Home, Dalmuir. Specifications from Office of Public Works, City Chambers.

London.—METROPOLITAN ASYLUMS BOARD.—December 2nd. Renewal of electric cables, &c., at the Brook (Fever) Hospital, Shooters Hill, Woolwich, S.E. (November 13th.)

ISLINGTON.—December 17th. Electricity Committee. One 75-kW a.c. motor and d.c. generator, with starters, switchgear, &c., and three 5,000-kVA Scott-connected transformers, &c. (November 20th.)

H.M. OFFICE OF WORKS.—December 3rd. Electrical accessories. (November 20th.)

Manchester.—December 8th. Tramways Committee. Permanent-way special trackwork. Specifications from Mr. H. Mattinson, general manager and chief engineer, 55, Piccadilly, Manchester.

Marlborough.—Borough Council. Conversion of 62 street lamps from gas to electricity, including connecting up to existing mains. (November 20th.)

New Zealand.—WELLINGTON.—January 19th, 1926. Public Works Department. 50,000- and 110,000-V switchgear and steelwork for the Waikato electric power scheme. (B.X. 2,157.)*

January 26th. 50,000-V switchgear for the Waikato electric power scheme; transformers for the Lake Coleridge power scheme.*

GISBORNE.—Borough Council. Diesel engine, alternators, and auxiliary plant, rotary converter, and switchboard. (November 13th.)

Normanton.—November 30th. Urban District Council. Electric wiring of houses, Snydale Road. Specifications from Mr. J. Hepton, electrician, Council Offices.

Oldham.—December 5th. Electricity Department. Eight water-tube boilers, with superheaters, chain-grate stokers, steel chimneys, and induced draught plant. (November 6th.)

Peterborough.—November 30th. Electricity Department. Buildings and civil engineering work, pulverised fuel equipment, two boilers and boiler-house equipment, one 6,000-kW turbo-alternator and turbine-room equipment, e.h.p. and l.p. switchgear, &c. (November 13th.)

South Africa.—JOHANNESBURG.—December 14th. Electricity Supply Commission. Plant and material for transmission lines and sub-stations in connection with the supply of electricity in the Cape area rural districts.*

December 23rd. Union Tender Board. Telephone apparatus and supply of telegraph material for the Department of Posts and Telegraphs.*

December 17th. Municipal Council. 2,000-kW motor converter. (B.X. 2,142.)*

CAPE TOWN.—December 3rd. Electricity Department. Substation plant and transmission lines. (B.X. 2,139.)*

Thornton.—December 13th. Urban District Council Electricity Department. Supplying, laying, jointing, and coupling-up complete of an electricity supply system. (November 20th.)

Uruguay.—MONTEVIDEO.—January 29th. State Electricity Supply Works. Fuse wire, enamelled lamp shades, cut-outs, switches, lampholders, sockets, &c. (B.X. 2,126.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Durham.—County Council. Accepted:—
Installation of electricity at Ryhope police station.—Maggs & Gordon.
Electrical installations at schools:—Haswell elementary (£184); Horden (£84); and Shotton (£283).—Simm & Richardson. South Hetton (£170).—Reid, Ferens & Co.
Departmental telephones (£126).—Devereux, Mordee & Co.

Dorchester.—Electricity Committee. Recommended:—
Supplying and laying cable, Victoria Park district (£561).—Johnson and Phillips, Ltd.

Exeter.—Tramways Committee. Accepted:—
Four tramcars (£7,374).—Brush Electrical Engineering Co., Ltd.

Government Contracts.—The following Government contracts were placed during October, 1925:—

ADMIRALTY, CONTRACT AND PURCHASE DEPARTMENT.
Battery spares.—Hart Accumulator Co., Ltd.
Condenser boxes.—Automatic Telephone Mfg. Co., Ltd.
Junction boxes.—Hawkers, Ltd.
Junction and distribution boxes.—Park Royal Engineering Co., Ltd.
Cells.—London Battery & Cable Co., Ltd.
Electric travelling crane.—Cowans, Sheldon & Co., Ltd.
W./t. heterodyne units.—H. W. Sullivan, Ltd
Lamp fittings.—W. McGeoch & Co., Ltd.; Fairless Engineering Supplies Co., Ltd.
Motor generators.—Newton Bros. (Derby), Ltd.
Motors and control gear.—F. & A. Parkinson, Ltd.
Terminal panels.—Park Royal Engineering Co., Ltd.

WAR OFFICE.
Secondary batteries.—Pritchett & Gold and E. P. S. Co., Ltd.
Electric cable.—Callender's Cable & Construction Co., Ltd.
Electric cells.—Edison Swan Electric Co., Ltd.
Secondary station cells.—Chloride Electrical Storage Co., Ltd.
Conduit and fittings.—Barton & Sons, Ltd.
Copper sheet.—British Insulated & Helsby Cables, Ltd.; H. H. Vivian and Co., Ltd.
Ebonite.—Hightensite & Ebonite Mfg. Co., Ltd.
Electric lighting fittings.—Cable Accessories Co., Ltd.
Generators.—Small Electric Motors, Ltd.
Power units.—Douglas Motors, Ltd.
Switchboards.—General Electric Co., Ltd.
W./t. valves.—British Thomson-Houston Co., Ltd.; Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.

AIR MINISTRY.
Thermo ammeters.—E. Turner.
Underground cables (Wittering).—G. E. Taylor & Co.
Fans (Middle East).—Veritys, Ltd.; Metro-Vick Supplies, Ltd.
Switchboards (Altrincham).—Erskine, Heap & Co.
Generating sets.—Mark Webber, Ltd.
Motor generators.—W. Mackie & Co., Ltd.
Valves.—Edison Swan Electric Co., Ltd.; British Thomson-Houston Co., Ltd.; General Electric Co., Ltd.; Mullard Radio Valve Co., Ltd.

POST OFFICE.
Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; British L. M. Ericsson Mfg. Co., Ltd.; International Electric Co., Ltd.; Peel-Conner Telephone Works; Radio, Phonopore & Electricals, Ltd.; Siemens Bros. & Co., Ltd.; Telephone Condenser Co., Ltd.; Western Electric Co., Ltd.
Testing and protective apparatus.—Phœnix Telephone & Electric Works, Ltd.; Power Equipment Co., Ltd.
Battery stores.—Alton Battery Co., Ltd.
Telephone cabinets.—Siemens Bros. & Co., Ltd.
Cable (various).—British Insulated & Helsby Cables, Ltd.; Enfield Cable Co., Ltd.; Hackbridge Cable Co., Ltd.; Johnson & Phillips, Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Loading coils.—Western Electric Co., Ltd.; General Electric Co., Ltd.
Telephone cords.—British Insulated & Helsby Cables, Ltd.; Western Electric Co., Ltd.
Ducts.—Doulton & Co., Ltd.
Tungar rectifiers.—British Thomson-Houston Co., Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; R. Johnson & Nephew, Ltd., F. Smith & Co.
Copper wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; R. Johnson & Nephew, Ltd.; Nevill Druce & Co., Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co.; J. Wilkes, Son and Mapplebeck.
Switchboard wire.—General Electric Co., Ltd.; Macintosh Cable Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Sloan-City, North-Palmer's Green and Brixton-New Cross Junction: Callender's Cable and Construction Co., Ltd.
Electric lighting installation.—Mount Pleasant Sorting Office: Electrical Installations, Ltd.
Electric lifts.—G.P.O., South: Etchells, Congdon & Muir, Ltd. Douglas (Glasgow) telephone exchange: J. Bennie, Ltd.
L.p. switchgear.—Mount Pleasant: Crompton & Co., Ltd.
Telephone exchange equipment.—Primrose Hill: British L. M. Ericsson Mfg. Co., Ltd.; sub-contractors: Chloride Electric Storage Co., Ltd., for batteries; Crompton & Co., Ltd., for machines. Wellington (Salop): British L. M. Ericsson Mfg. Co., Ltd. Wiltshire (Lancs.), Blackburn, Wembley, Thornton Heath, Grangewood (London), Wimbledon, Speedwell, Kingston, Hounslow, Grosvenor (London): Automatic Telephone Mfg. Co., Ltd. Royal (London): General Electric Co., Ltd.
Private branch exchanges.—Lord Mayor Treloar's Cripple Hospital and College; Manchester Corporation (Paving, Sewering and Highways Department); Birkenhead Corporation; Bleachers' Association, Ltd. (Manchester): Relay Automatic Telephone Co., Ltd.
Telephone repeater station power plant.—General Electric Co., Ltd.

H.M. OFFICE OF WORKS.
Wiring, &c.—British Museum, White Wing: T. Clarke & Co., Ltd.

CROWN AGENTS FOR THE COLONIES.
E.h.p. and underground cable and boxes, &c.—W. T. Henley's Telegraph Works Co., Ltd.
Telegraph cable and jointing material.—Johnson & Phillips, Ltd.
Electric bracket cranes.—J. Booth & Sons, Ltd.
Electric column crane.—Craven Bros. (Manchester), Ltd.
Electric lifts.—Smith, Major & Stevens.
Train-lighting equipment.—J. Stone & Co., Ltd
Switchgear.—English Electric Co., Ltd.
Ironclad switchgear.—Metropolitan-Vickers Electrical Export Co., Ltd.
Telegraph and telephone materials, &c.—Siemens Bros. & Co., Ltd.
Telephone switchboard.—British L. M. Ericsson Mfg. Co., Ltd.
Train control apparatus.—Western Electric Co., Ltd.

Hull.—Electricity Committee. Accepted:—
Three engines and exciter (£650).—Marple & Gillott, Ltd.

London.—CLAPHAM.—L.C.C. Education Committee. Installation of electric lighting at New Road school, Clapham:—

Commercial Telephone & Electrical Co., Ltd. (Recommended.)	**£528**
Smethurst & Co. (London), Ltd.	532
Bailey & Incledon	534
R. Langston-Jones & Co.	573
A. Hawkins & Sons	595
J. Biggs	610
J. Brent & Co., Ltd.	685
Burdette & Co., Ltd.	687

Maidenhead.—Board of Guardians. Accepted:—
Installing electric lighting in the sick wards at the Institution.—S. Evans and Co.

Northampton.—Howden-Ljungström Preheaters (Land), Ltd., has received an order from the Stirling Boiler Co., Ltd., for two large preheaters to work in conjunction with two 50,000-lb. boilers to be installed at the Northampton Electric Light and Power Co.'s station.

Preston.—Finance and General Purposes Committee. Accepted:—
Electrical winding apparatus for Town Hall clock, including overhauling and repair (£306).—W. Potts & Sons, Ltd.

South Shields.—Reporting on the purchase of foreign meters, the electrical engineer states that he has obtained a quotation from Messrs. Robert Hornby & Co., Ltd., the London agents for a Continental firm, from which it appears that in sizes up to 15 amperes he can purchase at 12s. per meter cheaper, and in the larger size of 20 amperes 19s. cheaper than is at present being paid. The question of the purchase of foreign meters is to be discussed at the next meeting of the Electricity Committee.

Tynemouth.—Electricity Committee. Accepted:—
Cable.—Hackbridge Cable Co., Ltd., and Macintosh Cable Co., Ltd.

West Saltney.—Council. Accepted:—
50 lamp standards (£181).—W. Lucy & Co., Ltd.

Winchester.—We are informed that the amount of the accepted tender of Messrs. Babcock & Wilcox, Ltd., for boiler plant for the Corporation Electricity Department is £4,964, not £5,188 as stated in our issue of November 20th.

Forthcoming Events.

Royal Society of Arts.—Monday, November 30th. At John Street, Adelphi, W.C. At 8 p.m. Cantor Lecture, "Coal Ash and Clean Coal," by Dr. R. Lessing. (Lecture II.)

British Electrical Development Association (North-Eastern Area Sub-Committee).—SECOND CONFERENCE.—Monday, November 30th. At Messrs. Sopwith's Lounge, Northumberland Street, Newcastle-on-Tyne. Discussion on "The Possibilities of To-day," to be opened by Mr. A. Albrecht.

Institution of Civil Engineers.—Tuesday, December 1st. At the Institution, Great George Street, S.W. At 6 p.m. Paper on "Trafford Wharf Reconstruction at the Manchester Docks," by Mr. H. A. Reed.

Electrical Society of Glasgow.—Tuesday, December 1st. Paper on "Wiring Systems," by Mr. T. S. Seymour.

National Association of Supervising Electricians.—Tuesday, December 1st. At the Junior Institution of Engineers, 39, Victoria Street, S.W. At 7.15 p.m. Lecture on "Electric Time Service," by Mr. F. Hope-Jones.

Roentgen Society.—Tuesday, December 1st. At 32, Welbeck Street, W. At 8.15 p.m. Ordinary scientific meeting.

Edinburgh Electrical Society.—Wednesday, December 2nd. At the Royal Scottish Society of Art, 117, George Street. At 8 p.m. Discussion night.

Institution of Electrical Engineers.—Thursday, December 3rd. At the Institution, Victoria Embankment, W.C. At 6 p.m. Paper on "An All-Electric House," by Prof. S. P. Smith.

(North-Western Centre).—Tuesday, December 1st. At the Engineers' Club, Manchester. At 7 p.m. Lecture on "The Engineer: His Due and His Duty in Life," by Mr. T. Carter.

(South Midland Centre).—Wednesday, December 2nd. At the University, Birmingham. At 7 p.m. Paper on "An All-Electric House," by Prof. S. P. Smith.

(Western Centre).—Monday, December 30th. At the South Wales Institute of Engineers, Cardiff. At 6 p.m. Lecture on "Switchgear Developments during the Past 20 Years," by Mr. J. H. Thomas.

(Scottish Centre).—Wednesday, December 2nd. At the Grosvenor Restaurant, Glasgow. Annual dinner.

(Wireless Section).—Wednesday, December 2nd. At the Institution, Victoria Embankment. At 6 p.m. Paper on "The Performance of Amplifiers," by Mr. H. A. Thomas.

Junior Institution of Engineers.—Friday, December 4th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "Super Heterodyne Reception," by Mr. A. E. Bowyer-Lowe.

Association of Mining Electrical Engineers (Western District Sub-Branch).—Saturday, December 5th. At 62, Wind Street, Swansea. Paper, "A Review of the Mines Electricity Acts," by Mr. W. J. Charlton.

Institution of Engineers-in-Charge.—Wednesday, December 9th. At St. Bride's Institute, Bride Lane, E.C. At 7.30 p.m. Paper on "Oil Fuel for Commercial Purposes," by Mr. H. G. Burford.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

The "FRANKA" Vacuum Cleaner.
The "KAPLAN" Turbine (British makers only).

Notes.

B.E.S.A. Specification.—To the British Engineering Standards Association specification for tungsten filament electric lamps (No. 161) have been added three new schedules: Normal vacuum train lighting lamps, gasfilled train lighting lamps, and traction vacuum type lamps (series burning). The adoption of these schedules by those responsible for train and tramcar lighting will reduce the variety of types of lamps used for this purpose, and do away with the large number of differing pressures for which these lamps have had to be made in the past. The schedules, copies of which may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, will be included in loose pamphlet form in B.S.S. 161, until that document is revised, when they will be incorporated. The new edition is expected to be ready early in the New Year.

Electrical Association for Women.—We are interested to learn that the inauguration of the Glasgow and District Branch of the above Association, on November 19th, was a success. The Corporation of Glasgow and the Electricity Committee gave the Branch Association every support, including the use of the City Chambers for the inaugural meeting, and the Corporations of Greenock and Paisley also co-operated. Lady Belhaven, the first president of the branch, said that electricity was, or ought to be, in this country the poor man's servant, but though it was cheap once it was installed, there was considerable initial expenditure, which was beyond the poor man's purse. They were, however, only at the very beginning of the things that electricity could do. The origin and work of the Association were explained by Miss C. Haslett. Mrs. Sadler, widow of ex-Bailie Sadler, was appointed hon. treasurer of the branch, with Miss K. F. Kennedy as hon. secretary.

Scott's Old Boys' Association.—The annual dinner of the above Association was held on Saturday last at the Engineers' Club, London, with Mr. C. Newton Russell in the chair. There was a good gathering of "Old Boys," as it was a special meeting, the guest being Mr. Howard Marryat, who is one of the oldest of the "Old Boys," and has hitherto played the greatest part in keeping them together. After dinner the Chairman, in proposing the health of Mr. Marryat and the thanks of the Association to him for his indefatigable work in keeping the "Old Boys" in touch with each other, presented him with a framed testimonial and photograph of the old works and boys, and a case of pipes.

The Association is desirous of obtaining the names and addresses of some of the "Old Boys" who have been out of touch for some years, and if this notice reaches any of them, they are asked to communicate with Mr. Howard Marryat, of 28, Hatton Garden, E.C.1, who will see that in future they shall have invitations to the annual dinner, &c.

Midland Electrical Engineers' Ball.—This very popular and well-attended function which has now become a permanent annual fixture was held at the Grand Hotel, Birmingham, on Friday evening, November 20th, Mr. W. H. Heaton acting as chairman.

Mr. R. A. Chattock, this year's President of the Institution, appeared to be enjoying himself as much as he always does, with Mr. W. B. Woodhouse as a good second, and among those from far afield we had the pleasure of meeting Mr. Salt, of Carlisle and Mr. Bexon, of Kilmarnock.

Mr. Harry Lawson displayed even more agility than usual and if, perchance, he were to forsake engineering (which the gods forbid), he would undoubtedly find a place in any troupe of Russian dancers.

Over 400 were present, the Corporation and company engineers being particularly well represented, as were also the great Midland electrical engineering concerns, and as everyone seemed to know everyone else the evening was, as is always the case at Birmingham, a thoroughly cheery one.

The popular and indefatigable Mr. W. Y. Anderson and his executive colleagues may congratulate themselves most heartily on the complete success of all the arrangements which had been made, and we are sure that all those present would wish to thank them for the weeks of toil which must have been necessary to bring about such perfect staff work. We look forward to next year.

Prize Award.—FONDATION GEORGE MONTEFIORE.—The Triennial Prize of this Trust has been divided by the jury of experts, into four parts. The first, comprising 6,000 francs, has been awarded to Mr. F. Creedy, of London, for his two papers entitled "Some Developments in Multi-speed Cascade Induction Motors" and "Variable Speed Alternating-current Motors without Commutators"; the second, of 4,000 francs, to Professor J. B. Whitehead, of Baltimore, for his paper "Gaseous Ionisation in Built-up Insulation"; the third, of 4,000 francs, to Mr. Chechelowsky, of Antwerp, for his paper "Study on Operating and Releasing Times of Telephone Relays"; and the fourth, an additional prize of 2,000 francs, to Mr. Raymond Wilmotte, of London, for a paper on "Une Nouvelle Forme de Transformateur."

The President announced that the next competition would take place in 1927 and that the prize fund would amount to 20,500 francs.

Local Society.—EDINBURGH ELECTRICAL SOCIETY.—Members of the Society on November 18th heard a most interesting lecture on accumulators, the title being "Stationary Batteries for Country House Lighting and Power Station Work," by Mr. E. C. Mackinnon, M.I.E.E. (Chloride Co.). Lantern slides were shown and a very interesting evening was spent. Mr. J. G. Burchell, president of the Society, occupied the chair, 30 members being present.

Electrical Vehicles in Italy.—Notwithstanding the increasing vogue of petrol vehicles in Italy, it is interesting to learn that the postal transport work in Turin is done by a contracting firm which employs a fleet of about 40 electric vans for the work. The Società Italiana de Veicoli Elettrici has a large fleet of electric taxicabs in service in Milan, while a company is also running a number of single-deck electric 'buses in Rome.

Appointments Vacant.—Foreman electrician (£450) for the Air Ministry Works and Buildings Department, Iraq. Assistant switchboard attendant (74s. 3d.) for the Leyton U.D.C. Electricity Works. Draughtsman (temporary) (110s.), for the Battersea Borough Council Electricity Department. (See our advertisement pages to-day.)

Fatality.—While four men were erecting a wireless pole and aerial in a garden at Havercroft, near Barnsley, recently, the pole swayed and fell on to the wires belonging to the Yorkshire Electric Power Co., which convey power from Thornhill to the New Monckton Collieries. The aerial came in contact with a live wire, and Harrison Milburn (27), a foreman at the collieries, received such a shock that he died instantly. Two of the other men incurred shock and were slightly injured. At the inquest a verdict of "Death from misadventure" was returned. An official of the power company stated that the voltage upon the line was 11,000 volts.

Attempt to Blow up Electric Cable.—An attempt, by shale-oil strikers, it is believed, says the *Manchester Guardian*, was made during the night of November 20th-21st to blow up a main electric cable from Roman Camp, which supplies power to the works of the Scottish Oil Co. at Broxburn, Uphall, and Middleton, and other pits. Gelignite was exploded under the cable only a few yards from the main Edinburgh to Bathgate railway. Much damage was done, but the perpetrators failed in their chief purpose, and they only succeeded in cutting a branch cable supplying power for the pumps in the Loaninghill mine.

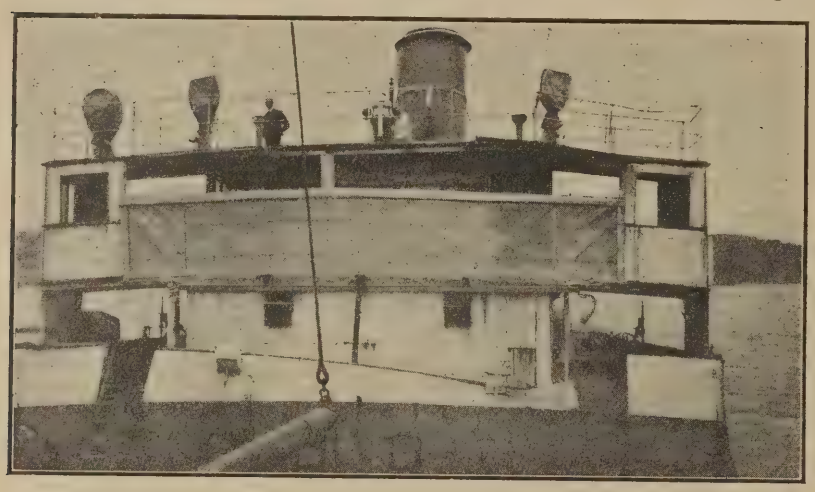
A Cable Ship's Ordeal. — With her decks presenting a scene of chaos and her after holds filled with water, the cable ship *Lord Kelvin* entered Queenstown Harbour on the morning of November 10th after a severe ordeal in mid-Atlantic during a gale, as has already been reported in our pages.

In an interview with a *Journal of Commerce* correspondent, one of the officers said that when the majority of the crew were asleep late at night on November 6th, a wave struck them broadside, carrying everything in its path overboard. "We thought the ship was about to sink, and an S.O.S. signal was sent out. Previously we had picked up signals of distress from six other vessels the same night. All the boats had been smashed or washed overboard, the engine-room telegraphs and other deck fittings were torn away and carried overboard, the forward bridge superstructure was washed away, the tops of the tank hatches were stove in and the holds flooded, and the saloon was badly buckled. All the lights had been put out of action owing to the inrush of water in the engine-room, which damaged the dynamos. During the darkness we almost collided with two ships that were coming to our aid, and only by lighting flares could we make our presence known. We managed to get the ship around and run before the gale.

"During the height of the storm several large buoys, weighing about a ton each, became loosened on the foredeck, and Mr. Foote, the chief officer, volunteered, with a number of men, to secure them. While this dangerous task was being accomplished, Mr. Foote was caught by a big wave, and was going over the side when a member of the crew grabbed him by his clothes and pulled him back again. Several of the crew received injuries, but none was seriously injured.

"Orders for the engine-room from the bridge had to be conveyed by relays of men transmitting the verbal instructions from one to the other."

The accompanying illustrations, for which we are indebted to Mr. A. N. C. Horne, of Queenstown, show some of the damage caused; note the temporary repairs to the bridge, a large portion of which was broken in.





The Cable Ship "Lord Kelvin"; Damage Caused in Recent Gale at Sea.

A New Type of Radiation.—It is reported that Dr. R. A. Millikan, director of the Physics Laboratory of the California Institute of Technology, has discovered a type of high-frequency radiation of very great penetration, having a wave-length only one-fiftieth of that of the shortest rays previously known—about one ten-millionth of that of light rays. The existence of such rays has been suspected for many years. Dr. Millikan, whose scientific achievements compel respect for his statements, identified the rays by sending balloons up to a height of nearly ten miles, carrying recording electroscopes, and by experiments on Mount Whitney at a height of 11,800 feet, where he found that the rays could penetrate the equivalent of 68 feet of water or 6 feet of lead before complete absorption. He believes that they are produced by nuclear transformations enormously more energetic than those involved in the radioactive changes that are already known, and that they reach the earth at all hours of the day and night with equal intensity.

Parliamentary.—On November 19th, Mr. Albery asked the Home Secretary whether there was any independent periodic inspection of water reservoirs or electric power dams; and, if so, by whom. Sir W. Joynson-Hicks said that accidents due to the bursting of such reservoirs or dams had fortunately been very rare and so far, at any rate, as general legislation was concerned, no provision had been made for any independent periodic inspection of such works.

Road Authorities and Mains.—A Committee of the House of Lords, on November 19th and 20th, heard an application by the Northamptonshire County Council for the insertion of special protective clauses in an Order proposed to be granted by the Board of Trade to the Northampton Gas Light Co. The main provision asked for by the County Council was to the effect that if it was carrying out improvements to roads, and it was found necessary to alter the position of the gas company's mains, the cost should be borne by the company. The general law was that the cost of moving mains must be borne by the authority carrying out the improvements.

On behalf of the County Council it was stated that the provisions of the general law were passed at a time when roads were not subjected to the heavy traffic which they had to bear at present, and road construction methods were quite different; therefore, the general law was inadequate to meet present-day conditions. On behalf of the gas company, however, it was contended that if there were to be an alteration of the existing law, it should be effected by general legislation, applicable to all gas undertakings, and not to one particular company.

It was mentioned that representatives of public utility undertakers—gas, water, electricity, &c.—were at present conferring with the County Councils' Association and representatives of other highway authorities in an endeavour to agree upon conditions with respect to the laying of mains which should apply generally throughout the country, and should be embodied in a general Act. It was pointed out that a decision by the Committee might prejudice the work of the conference and it was suggested that the Gas Company's Order should be held up, pending a decision of the conference. The Gas Company, however, would not assent to this course.

Subsequently, the County Council asked the Committee to insert a protective clause similar to one inserted in an Act of the Sunderland & South Shields Water Co., in 1921, by a Committee of the House of Lords, which contained the provision now sought. Further, the Council offered to undertake that, if and when the conference referred to produced a clause applicable to public utility companies generally, it would substitute that clause for the Sunderland clause. It was stated on behalf of the Gas Company that the clause in the Sunderland Act was inserted in view of special circumstances.

The Committee decided not to grant the County Council the protection asked for.

The Severn Barrage Scheme.—On November 23rd, Colonel Woodcock asked the President of the Board of Trade if it was his intention to proceed further with the Severn tidal power scheme inquiry, in view of the fact that the city of Bristol was proposing to spend about £1,000,000 in the erection of a power station in close proximity to the River Severn to serve Bristol and part of the surrounding district.

Sir Burton Chadwick said that the practicability of the Severn Barrage scheme had been referred to the Committee of Civil Research, which had appointed a special sub-committee to advise on the whole question. Any local electrical developments would no doubt be brought to the notice of the sub-committee by the Departments immediately concerned.

Welsh Dam Burst.—Inquest Postponed.—The inquest upon the bodies of the victims of the recent North Wales dam burst has been further adjourned until December 2nd. It has been decided to hold it at Conway, as most of the inhabitants of Dolgarrog are employés of the Aluminium Corporation or dependants of employés.

The Public Works and Roads Exhibition.—That the activities of local Government service grows more diverse and important each year was clearly indicated by the Public Works, Roads and Transport Congress and Exhibition (November 19th to 26th) which is held biennially at the Royal Agricultural Hall, London. The present show was the third of the series, and some 720 authorities nominated 1,315 delegates to the Congress, which considered, amongst other things, "The Uses of Electricity for Housing and Institutional Purposes" (paper by Mr. R. Hardie, Glasgow, arranged by the I.M.E.A.) and the "Repair of Roads Against Tramway Track" (paper by Mr. F. Wood).

The Agricultural Hall has been re-lighted, the installation having been carried out by Messrs. Jacob, White & Co., Ltd. The overhead fittings (Lighting Equipment Co., Ltd., St. Albans) employed are of the "Trent" pattern with prismatic band refractors, and gasfilled lamps, sprayed one-third of the way up, have been used to eliminate any glare that might arise from the low position of the filaments in the refractors. The "Goliath" porcelain holders are carried by anti-vibration disks, and there are six rows of 13 lamps. The area illuminated is 312 ft. by 125 ft., which was originally lighted by 35 10-amp. flame arcs, consuming 19 kW; with the new 300-watt gasfilled lamps the consumption is 23.4 kW.

Amongst the exhibits Messrs. Walker Vehicles, Ltd., had a "balanced drive" electric tractor on view, which should be of use to municipalities on account of its versatility. On the stand of Messrs. Hadfields, Ltd., tramway materials included car wheels which had tires secured by the firm's "lock-fast" method, whilst Messrs. Richard Hill & Co., Ltd., showed electrically-welded fabric for reinforcement in road construction.

Amongst the air compressors shown by Messrs. Reavell and Co., Ltd., was a portable set intended for tramway repair work; it is run from the overhead trolley wire, and is of sufficient capacity to operate a concrete breaker on heavy work, the motor being totally-enclosed and the compressor air cooled so that no water circulation is needed. The exhibit of the Horstmann Gear Co., Ltd., comprised an extensive range of automatic lighting appliances for street lamps; Newbridge time switches are made in a variety of types for from 1.5 to 50 amperes and with 8- to 45-day clocks. The Hackney Borough Council is fitting type E/B/I time switches to all lamps in its area.

The Sullivan Machinery Co.'s electric hoists and haulage gear combine light weight and portability; ball bearings are employed, and the whole of the mechanism, including the driving motor, is contained within the drum itself. The road materials displayed by W. Shepherd & Sons, Ltd., included parging blocks for paving tramway margins; they are 9 in. long and made of brickware, so shaped as to fit the cavity at the side of the rails and afford a solid vertical paving face. Their use is claimed to obviate the necessity for filling the rail cavities with cement grout, &c. Weldless steel tramway, power transmission, and telegraph poles were shown by Messrs. Bromford, Ltd., besides superheater tubes, steam mains, &c.

The Jackson Electric Stove Co., Ltd., was also exhibiting, and in conclusion it may be stated that about 176 firms displayed their products in some 82,820 sq. ft. of space.

Educational.—We have received a copy of the annual report for the 129th (1924-25) session of the Royal Technical College, Glasgow. The total number of students in attendance during the session is shown as 4,753, as compared with 4,816 for the previous year. The statement of accounts for the year shows an expenditure of £72,545, resulting in a deficit at the end of the year of £1,873. The plant in the electrical engineering workshop has been thoroughly overhauled, new machine tools have been acquired, and a line of shafting has been installed. Special evening courses were given during the year in technical radiology, wireless telegraphy and telephony, and electrical machine design.

Institution Notes.

Institution of Electrical Engineers.—Sheffield Sub-Centre.—In a recent paper, Mr. A. R. Cooper, a student member, said that the application of electro-pneumatic machinery to colliery safety requirements was worth the investigation of every colliery engineer; identical units had been in use for many years on the Underground and on the biggest railways in the world. The process of delivering the full tubs and filling the cage again with empty ones involved many subsidiary operations, particularly in the case of an upcast shaft where airlocks had to be used. In the electro-pneumatic system all those operations had been smoothed out into an ordianry cycle in which everything was so interlocked that the possibility of accidents or mishaps was reduced to an absolute minimum, and the whole system was under the control of a master switch which could stop further progress at any point of the cycle. With lantern slides to illustrate his descriptions, Mr. Cooper dealt in detail with the apparatus, concluding with a description of the installation at the Silverwood Colliery, near Rotherham.

Illuminating Engineering Society.—At the opening meeting of the Society on November 26th, at the Royal Society of Arts, reports on progress during the vacation and developments in lamp and lighting appliances were to be presented, and some interesting novelties, including new forms of lighting fittings, the "Mutochrome" colour projector, artificial daylight, new photometric apparatus, &c., were to be shown.

Diesel Engine Users' Association.—Oil Engine Working Costs.—At the November meeting, the Association considered a report which had been prepared by the Committee on the subject of heavy-oil engine working costs for 1924-25, which forms the fourth of the annual series. The average total engine cost of 36 home stations with a total output of over 32,000,000 units and with an average annual plant load factor of 15.3 per cent. was 0.806d. per unit generated for the year 1924-25. The improvement in this figure, as compared with the average figure of 0.899d. per unit generated for the year 1923-24, is largely accounted for by the reduction in the maintenance cost. The average total engine cost for eight overseas stations with a total output during the year of over 18,000,000 units was 0.746d. per unit generated. Among the 44 undertakings listed in the report, 19 additional engines have been put into service, representing an increase in the installed capacity, taken over the whole of tne undertakings, of 25 per cent. Of the 19 engines put down, four are of 1,000 h.p. or upwards, four are of 750 h.p., and the average capacity of the new units installed is over 500 b.h.p.

Physical Society of London.—At the meeting held on November 13th, Mr. F. E. Smith, C.B.E., F.R.S., president, being in the chair, a vote of congratulation on the recent presentation to him of the Hughes Medal of the Royal Society was carried by acclamation. A paper entitled "Valve-Maintained Tuning Forks without Condensers" was read by Mr. T. G. Hodgkinson, A.M.I.E.E. The paper was illustrated by a demonstration. The valve-maintained tuning fork is now a much-used piece of apparatus, but the influence of the conductance of the valve electrodes on the design has not been considered. The paper discussed the design of valve-maintained tuning forks without condensers and showed that the conductance of the valve grid decided the direction in which the electrode coils must be wound; and also that it was advantageous, particularly in the case of low-frequency forks, to interpose transformers between the valve electrodes and the fork magnets.

In the discussion, Dr. W. H. Eccles said that the author had shown how account must be taken of the valve characteristics in designing the apparatus, and how to secure that the maintained frequency should be the true frequency of the fork. The latter point was particularly important when the harmonics of the fork frequency were employed: thus it was possible to utilise the twenty-ninth harmonic of a 1,000-cycle fork, giving a frequency of 60,000 cycles. In this way standards could be obtained and oscillations generated over a wide range of the wireless spectrum, at constant and accurately known frequencies. Dr. C. V. Drysdale said that stroboscopic methods of measurement had always suffered from the defect that the rate of a fork was varied by the means adopted for maintaining vibration. Dr. Eccles's invention of the valve-maintained fork was of great importance as a solution of this difficulty, and the author was to be congratulated on having put the matter on a satisfactory quantitative basis.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Sir Thomas Callender, managing director of Callenders' Cable & Construction Co., Ltd., is at present in America, where he is visiting some of the latest super-power stations, and also the works of the Okonite-Callender Cable Co. at Paterson, New Jersey.

Mr. G. P. Dennis, consulting electrical engineer, of Birkenhead, has been elected a member of the Town Council.

The *Shanghai British Chamber of Commerce Journal* for October contained the following announcement:—"Mr. Donald McColl's connection with the Shanghai Electric Construction Co., Ltd., ceased on June 9th, and Mr. C. Burgess, late of the Walsall Corporation Tramways, has been appointed General Manager. Mr. R. B. Herbert has been appointed Shanghai Manager and Deputy General Manager."

Stoke Newington Borough Council Electricity Committee has received a letter from Mr. C. S. Hann (the Borough Electrical Engineer), submitting a medical certificate recommending the continuation of his treatment at Arosa for five or six months from October 13th. The Committee recommends that the four months' leave of absence previously granted to Mr. Hann be extended to six months from July 13th, 1925, on full pay, with a further three months' leave on half-pay.

Obituary.—Sir E. E. Pearson.—We regret to record that Sir Edward Ernest Pearson, a director of S. Pearson & Son, Ltd., the well-known contractors for public works, and a brother of Lord Cowdray, passed away suddenly on November 19th at the age of 51 years. He was a director of the Electric and Railway Finance Corporation.

Mr. R. Franklin.—The death took place on November 16th, at his residence at Romford, of Mr. Richard Franklin, O.B.E., a director of the Chesham Electric Light & Power Supply Co. He was 49 years of age.

Herr R. M. Friese.—The death is reported from Berlin of Herr Robert M. Friese, who was for many years director of the Siemens-Schuckert Works in Charlottenburg, and lately acted

as adviser to the central experimental department of the associated Siemens undertakings.

Mr. A. Shuttleworth.—We regret to record the death of Mr. Alfred Shuttleworth, a director and for some years chairman of Clayton & Shuttleworth, Ltd., of Lincoln, which occurred on November 22nd, at the age of 82 years.

Mr. Ernest May.—The death occurred on October 28th, of Mr. Ernest May, president of the Cie. Française des Câbles Télégraphiques. Mr. May was born in Strasburg in 1845, and served in the Franco-Prussian War. His interests were principally financial and he was connected with several banking firms. In 1879, Mr. May founded the Société Générale des Téléphones which installed the first telephone system in Paris; this company later became the Société Industrielle des Téléphones. He took a leading part in the field of submarine telegraphy and was one of the founders of the Société des Télégraphes Sous-Marins, which was affiliated in 1894 to the Société du Télégraphe de Paris to form the present Cie. Française des Câbles Télégraphiques in which Mr. May was active up to the time of his death. He participated in the formation of a number of radio companies.

Wills.—The late Mr. W. A. J. Gunther, of the firm of Wansbrough, Skelsey & Gunther, left £11,406 gross and £11,320 net personalty.

Mr. H. D. Ellis, a director of the Tottenham District Light, Heat & Power Company, left £54,196 gross and £51,092 net personalty.

New Companies Registered.

Frank A. Smith, Ltd. (209,772).—Private company. Registered November 19th. Capital, £5,000 in £1 shares. Objects: To acquire the business of a wireless engineer and manufacturer of and dealer in radio apparatus now carried on by F. A. Smith at 90, High Street, Stourbridge, and 51, Broad Street, Worcester, as "Frank A. Smith," and at Union Street, Stourbridge, as "Smith's Radio Supplies." The joint managing directors are:—F. A. Smith (chairman), Love Lane, Stourbridge; and R. W. Petley, Pedmore Lodge, Stourbridge. Qualification, £500 shares. Solicitor: P. H. Chappell, Hagley Road, Stourbridge.

H. L. Wood & Son, Ltd. (209,735).—Private company. Registered November 17th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of apparatus for transmitting, communicating, or receiving music, speeches, messages or other means of communication, by radio-telegraphy and telephony, &c. The first directors are:—H. L. Wood, 7, Taswell Road, Southsea, electrical engineer; and Lilian O. Wood, 7, Taswell Road, Southsea (both permanent). Qualification of other directors, 100 shares. Secretary: F. Fuller. Registered office: 36, Russell Street, Portsmouth.

Francis Lamp Locks, Ltd. (209,732.)—Private company. Registered November 17th. Capital, £20,000 in £1 shares (16,000 10 per cent. cumulative preference and 4,000 ordinary). Objects: To carry on the business of manufacturers, repairers, importers and exporters of and dealers in implements, utensils, cylinders, screws, appliances and accessories for use in connection with devices for locking electric lamps of all kinds and for preventing the removal of lamps from the holders, &c., and to adopt agreements (1) with C. H. F. Thompson and J. A. Macdonald, (2) with the said J. A. Macdonald, and (3) with A. H. Leggett. The first directors are:—Brig.-Gen. A. H. Leggett, C.M.G., D.S.O., 3, Meadow Road, Ashtead, Surrey; Capt. V. Gordon, 12, St. James's Square, S.W.1; Comdr. C. C. Sherman, R.N., Woodville, Ashtead, Surrey; and J. N. Evans-Jackson, 37, Queen's Gate Gardens, South Kensington, S.W.7. Remuneration, £150 each per annum (chairman, £200), free of tax. Solicitors: Parkers and Hammond, Friars House, New Broad Street, E.C.2. Registered office: 83, Pall Mall, S.W.1.

Radio Exhibitions, Ltd. (209,754).—Registered November 18th as a company limited by guarantee and not having a share capital, with 1,000 members each liable for £5 in the event of winding up. The objects are:—To promote and encourage exhibitions of appliances and apparatus of all kinds used for radio-telephony and telegraphy, submarine signalling and radio transmission of every kind, to organise and hold or take part in organising and holding such exhibitions in London or elsewhere; to carry on business as proprietors or managers of exhibition halls, &c. The first directors are:—R. A. Lodge, A.S.A.A., 24, Stanley Gardens, Hampstead, N.W.3 (secretary and chief accountant of Radio Press, Ltd.); P. W. Harris, M.I.R.E., 29, South Ridgeway Place, Wimbledon, S.W.19 (editorial manager of Radio Press, Ltd.); and W. F. Edwards, A.S.A.A., Cartref, Fairfield Avenue, Edgware (commercial manager of Radio Press, Ltd.). Secretary: R. A. Lodge. Solicitors: Hodgkinson and Bonnett, 124, Chancery Lane, W.C. Registered office: Bush House, Strand, W.C.2.

Helikon Wireless Co., Ltd. (209,716).—Private company. Registered November 16th. Capital, £300 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless accessories, electricians, mechanical engineers, &c. The subscribers are:—J. Roysentul, 45, Woodberry Grove, N.4, electrical engineer, 5 shares; R. Fishler, 26, Dempsey Street, Stepney, E.1, clerk, 2 shares. The first directors are not named. No share qualification required. Solicitors: Lach Szyrma & Co., 18, Old Compton Street, W.

U-Phone Company, Ltd. (209,701).—Private company. Registered November 14th. Capital, £15,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in gramophones, phonographs, musical and sound-producing instruments, sound boxes, horns and instruments, apparatus, accessories and materials capable of being used in connection with radio-telegraphy and telephony, in particular, cables, wires, ropes, accumulators, batteries, detectors, meters, tuning switches, induction coils, condensers, headphones, thermionic valve panels, valve receivers, amplifiers, aerial and other insulators, &c. The directors are:—R. Burrill, 19, Lascelles Terrace, Roundhay Road, Leeds, cabinet maker; W. H. Wilks, 31, Blenheim Place, Leeds, cabinet maker; F. Whiteley, 116, Scarr's Lane, Milnsbridge, Huddersfield. R. Burrill may retain office while holding 1,000 shares. Qualification of directors, £100. Remuneration as fixed by the company. Solicitors: Simpson, Peckover, Curtis & Batley, 41, Park Street, Leeds. Registered office: Conway Factory, Harehills Lane, Leeds.

Lustrolux, Ltd. (209,719).—Private company. Registered November 16th. Capital, £25,000 in £1 shares. Objects: To acquire the whole of the property and assets of Crowther & Osborn, Ltd. (in liquidation), and to carry on the business of manufacturers and repairers of all kinds of apparatus and articles used in the generation, distribution, supply of electricity or electrical energy, or which are used or capable of being used for medical, scientific, radio-telegraphic or telephonic transmitting or receiving purposes, electricians, mechanical engineers, weavers and knitters of natural or artificial silk, cotton, woollen or worsted spinners, &c. The directors are:—O. W. Porritt, Torside, Helnshore, Lancs., woollen manufacturer; W. L. Turner, Abbey Manor, West Kirby, Cheshire, metallurgist (both permanent, subject to each holding 250 shares). Remuneration as fixed by the company. Secretary (*pro. tem.*): W. J. Battison. Solicitors: F. R. Locke, 9, Cook Street, Liverpool.

Felcourt Products, Ltd. (209,806).—Private company. Registered November 20th. Capital, £100 in 1s. shares. Objects:—To carry on the business of manufacturers and repairers of, and dealers in plant, machinery, apparatus, and appliances for agricultural, horticultural, electrical, radio, automobile, aerial, engineering, building, cabinet-making, furniture-making, chemical, and other businesses; builders, contractors, electricians, furnishing and general ironmongers, timber merchants, sawmill proprietors, &c. The directors are:—R. B. Matthews, Greater Felcourt, East Grinstead; W. H. Pike, 1, Felcourt Cottages, East Grinstead; W. H. R. Pike, "Oaklands Cottage," Lingfield, Surrey. Qualification, 5 shares. Remuneration as fixed by the company. Secretary: Miss Elsie E. Elmitt, The Orchard House, Felcourt, East Grinstead.

W. A. Rood, Ltd. (209,826).—Private company. Registered November 20th. Capital, £200 in £1 shares. Objects:—To adopt an agreement with W. A. Rood and E. H. Pearce and to carry on the business of electricians and wireless dealers formerly carried on by them at 74, St. George's Road, Kemp Town, Sussex. The directors are:—E. H. Pearce, 26, Lewes Crescent, Brighton, barrister; W. A. Rood, 74, St. George's Road, Kemp Town, Sussex, electrical engineer. Qualification, £5. Remuneration, £10 each per annum. Secretary: E. H. Pearce. Registered office: 74, St. George's Road, Kemp Town.

Maywood Engineering and Electrical Manufacturing Co., Ltd. (209,816).—Private company. Registered November 20th. Capital, £2,000 in £1 shares. Objects:—To acquire the property and assets of Major L. Russell-Wood, and to carry on business as electrical, mechanical, and hydraulic engineers, manufacturers of electrical apparatus and engines of all kinds, carriages, vans, wagons, carts, cycles, and other vehicles, &c. Power is taken to carry on business as chemists, druggists, and manufacturers of, and dealers in all chemicals, drugs, or other articles, &c. The subscribers (each with one share) are:—P. E. Mann, "Woodlands Glen," Tinsley, Sussex, chartered secretary; J. A. Stocker, 701, Salisbury House, E.C.2, chartered secretary. The first directors are:—P. E. Mann (chairman) and Major L. Russell-Wood. The latter is a life director so long as he holds 1,050 shares. No qualification required for other directors. Each of the shares numbered 1-350 has five votes so long as they are in the name of Lady Mills. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C. Registered office: 701, Salisbury House, London Wall, E.C.2.

Official Returns of Electrical Companies.

Leatherhead and District Electricity Co., Ltd.—Issue on November 9th, 1925, of £100 debentures, part of a series already registered.

Bucks Electric Wire and Engineering Co., Ltd.—Satisfaction in full on November 4th of debentures dated August 28th, 1924, and March 24th, 1925, securing £500 and £800 respectively.

Chloride Electrical Storage Co., Ltd. (35,389).—Capital, £500,000 in 62,000 preference, 329,625 ordinary, and 108,375 unissued shares of £1 each. Return dated June 4th, 1925. 62,000 preference and 329,625 ordinary shares taken up. £75,738 paid on 48,750 preference and 26,988 ordinary shares. £315,887 considered as paid on the remainder. Mortgages and charges, nil.

John Davis & Son (Derby), Ltd. (66,606).—Capital, £35,000 in 20,000 ordinary and 15,000 preference shares of £1 each. Return dated July 8th, 1925. 15,000 ordinary and 11,000 preference shares taken up. £26,000 paid. Mortgages and charges, nil.

Anglo-American Telegraph Co., Ltd. (2,891C).—Capital stock, £7,000,000 in £310,480 ordinary, £3,344,760 preferred ordinary, and £3,344,760 deferred ordinary stock. Return dated June 5th, 1925. All stock taken up. £600,000 paid. £6,400,000 considered as paid. Mortgages and charges, nil.

Greenwood & Batley, Ltd. (27,098).—Capital, £600,000 in 140,000 preference, 354,585 ordinary, and 105,415 unclassified shares of £1 each. Return dated August 5th, 1925 110,660 preference and 354,585 ordinary shares taken up. £201,312 paid (being £1 per share on 69,340 preference and 121,340 ordinary, 6s. on 14,660 preference, and 10s on 12,520 ordinary shares, and including £39 paid on 130 shares forfeited). £247,515 considered as paid on the remainder. £26 in arrears. Mortgages and charges, £100,000.

Ackroyd & Best, Ltd. (54,600).—Capital, £25,000 in 3,200 preference and 1,800 deferred shares of £5 each. Return dated October 5th, 1925. All shares taken up. £15,500 paid on 3,100 preference shares. £9,500 considered as paid on 100 preference and 1,800 deferred shares. Mortgages and charges, £50,000 sealed debentures.

Evershed & Vignoles, Ltd. (43,206C).—Capital, £30,000 in £10 shares. Return dated July 15th, 1925. All shares taken up. £30,000 paid. Mortgages and charges, £15,000.

Rangoon Electric Tramway & Supply Co., Ltd. (86,932).—Capital, £800,000 in 50,000 preference shares of £5 each and 550,000 ordinary shares of £1 each. Return dated May 15th, 1925. 50,000 preference and 300,000 ordinary shares taken up £485,000 paid. £65,000 considered as paid. Mortgages and charges, £413,258.

Chamberlain & Hookham, Ltd. (59,920).—Capital, £100,000 in 9,500 preference and 10,500 ordinary shares of £1 each. Return dated June 24th, 1925. 8,000 preference and 10,100 ordinary shares taken up. £36,990 paid on 7,298 preference and 100 ordinary shares. £53,510 considered as paid on 702 preference and 10,000 ordinary shares. Mortgages and charges, nil.

C. F. Casella & Co., Ltd. (106,869).—Capital, £17,000 in 15,000 ordinary and 2,000 preference shares of £1 each. Return dated October 14th, 1925. 12,204 ordinary and 2,000 preference shares taken up. £3,504 paid. £10,700 considered as paid. Mortgages and charges, £1,400.

Globe & Simpson, Ltd. (173,934).—Capital, £4,000 in £1 shares. Return dated August 21st, 1925. 3,100 shares taken up. £2,450. £650 considered as paid. Mortgages and charges, nil.

Rawlings Bros., Ltd. (67,908).—Capital, £100,000 in 30,000 preference and 70,000 ordinary shares of £1 each. Return dated September 25th, 1925. 20,685 preference and 50,744 ordinary shares taken up. £71,429 paid. Mortgages and charges, nil.

Baynes Electrical Co., Ltd. (176,835).—Capital, £2,000 in £1 shares. Return dated October 26th, 1925. 213 shares taken up. £213 paid. Mortgages and charges, nil.

Electro-Mechanical Brake Co., Ltd. (98,226).—Capital, £30,000 in 2,500 preference and 27,500 ordinary shares of £1 each. Return dated November 9th, 1925. 1,500 preference and 22,500 ordinary shares taken up. £17,965 paid on 1,500 preference and 16,465 ordinary shares. £6,035 considered as paid on 6,035 ordinary shares. Mortgages and charges, £7,500.

Barsi Light Railway Co., Ltd. (44,589C).—Capital, £800,000 in 50,000 preference and 30,000 ordinary shares of £10 each. Return dated October 28th, 1925. 50 000 preference and 26,000 ordinary shares taken up. £759,267 10s. paid. £732 10s. in arrears. Mortgages and charges, £140,000 4 per cent. debenture stock and £114,700 4 per cent. "Latur Extension" debentures (balance of £125,000 issued).

White, Jacoby & Co., Ltd. (52,494).—Capital, £7,500 in £1 shares. Return dated October 9th, 1925. 5,794 shares taken up. £3,437 paid. £2,357 considered as paid. Mortgages and charges, £1,500.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

French Companies.

Negotiations are in progress for the absorption of the works and business of the *Société des Câbles de Lyons* by the *Compagnie Générale d'Electricité*, of Paris.

The *Société Le Fil Dynamo*, of Lyons, has decided to pay out of net profits of 486,000 fr. a dividend at the rate of 20 fr. per share for the past year.

The *Société Industrielle des Téléphones* records profits of 9,236,000 fr. for the past year. The dividend is expected to be at the rate of 50 fr. per share.

The *Société Electro-Câble* reports net profits of 4,460,000 fr for 1924-25, as compared with 4,191,000 fr. in the previous year. In 1923-24 the ordinary shares received a dividend at the rate of 40 fr. per share, and it is assumed that the same rate will be distributed for the past year.

Barbados Electric Supply Corporation, Ltd.

The report for the year ended June 30th last records a trading profit of £10,078, as compared with £9,069 in the preceding year. After charging debenture and loan interest and expenses, and putting £1,000 to reserve for taxation, there remains available a sum (including £1,577 brought forward) of £8,514. Of this amount £5,000 is transferred to depreciation reserve, £2,000 to renewals reserve, and the balance of £1,514 is carried forward. £3,997 was spent on capital account during the year. The growth in the demand has necessitated the extension of the plant; a further 340 kW of Diesel generating plant has been ordered, which will increase the plant capacity to 780 kW. Meeting: December 2nd.

Western Telegraph Co., Ltd.—The report for the year ended June 30th last states that the revenue was £1,472,374 and the working expenses £804,780. After providing for debenture interest and taxation and adding £327,323 brought forward, there remains an available balance of £862,335. The directors have transferred £250,000 to general reserve. Four dividends, totalling 10 per cent., free of tax, have been paid, and a balance of £300,440 is carried forward. The meeting was to be held yesterday (Thursday).

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Auckland Electric Power Board (5 per cent: Water Power Conversion and General Extension Purposes Loan, 1925).—£250,000 5 per cent. debentures, 1946, issued at 98 per cent., partly paid and fully paid.

Richmond (Surrey) Electric Light and Power Co.—163,670 new shares of £1 each issued at 24s., partly and fully paid, Nos. 31,331 to 200,000.

Ferguson Pailin, Ltd.—90,000 ordinary shares of £1 each, fully paid, Nos. 30,001 to 100,000 and 130,001 to 150,000. 60,000 7 per cent. cumulative participating preference shares of £1 each, fully paid, Nos. 1 to 30,000 and 100,001 to 130,000.

Application has been made to the Committee to allow the following to be officially quoted:—

Melbourne and Metropolitan Tramways Board.—Stock and partly-paid scrip for £300,000 5 per cent. stock, 1944.

United River Plate Telephone Co.—152,000 ordinary shares of £5 each fully paid, Nos. 760,001 to 912,000.

Shawinigan Water and Power.—$2,000,000 capital stock.

Companies Struck off the Register.—The names of the undermentioned companies have been struck off the Register and they are thereby dissolved:—

Giband Magneto Co. (England), Ltd.
International Dowsing Electric Heating and Appliances Co., Ltd.
Lobito Benguella and Catumbella Electric Light and Power Co., Ltd.
London Electrical Trading Co., Ltd.
Northern Electrical Engineering and Plating Co., Ltd.
Romapac Tramway Construction Co., Ltd.
Tramway (Conduit) Point Syndicate, Ltd.

Swiss Company.—The directors of the *Maschinenfabrik Oerlikon* state that an improvement took place in the activity of the works in 1924-25. At present deliveries often have to be made at less than the cost of production, and at the same time guarantees have to be given which can only be reached by the most careful and precise manufacturing. The net profits for 1924-25 were 1,740,000 fr. as against 1,760,000 fr. in the previous year, and the dividend on the share capital of 16,000,000 fr. is at the rate of 8 per cent., as before.

Belgian Company.—The *Société des Câbleries et Cordoeries du Hainaut*, of Dour, which has a capital of 4,854,196 fr., reports a net profit of 1,059,854 fr. for the last financial year, as compared with 672,110 fr. in the preceding year. No dividend was paid in 1923-24, but this year a sum of 455,000 fr. is being distributed among the shareholders, this being equal to a dividend of about 9¼ per cent.

German Company. — *Rhenish-Westphalian Electricity Works.*—A profit of 12 million marks is reported for the year 1924-25, permitting of the payment of dividends of 8 per cent. on the bearer shares, and 12 per cent. on the registered shares. The sales of electricity were 58 per cent. above those of the preceding year.

New Issue.—*Electrical Distribution of Yorkshire, Ltd.*—The directors state that the recent issue of 250,000 shares of £1 each was applied for more than twice over.

Parsons Foreign Patents, Ltd.—The net profit for the year ended June 30th last was £2,299. To this is added £456 brought forward, making £2,755. Dividends of 5 per cent. on the ordinary and 22.5d. per share on the deferred shares are being paid, leaving £119 to be carried forward.

Edison Swan Electric Co., Ltd.—A dividend of 10 per cent. (as in 1924) is recommended on the ordinary shares in respect of the year ended June 30th last.

Barcelona Traction, Light and Power Co., Ltd.—A dividend of 1½ per cent. has been declared on the 7 per cent. non-cumulative participating preference shares.

Power-Gas Corporation, Ltd.—A dividend at the rate of 4 per cent. is recommended for the year ended September 30th last.

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange markets are mainly quiet. Rubber continues to prove the devouring element of money, public attention being largely absorbed by the rush to buy rubber shares on account of the strength of the produce. Other markets are thrust on one side. So are members who try to deal in rubber shares. After being treated like a Rugby football for strenuous hours in the Stock Exchange, and signing innumerable contracts up to nearly midnight, the weekly commentator upon electrical stocks and shares may deem it discreet to apologise in advance for possible lapses in his English.

New issues are well taken where they present attraction. The Lancashire Electric Light & Power Company's offer of preference and ordinary shares was promptly over-subscribed. Allotments are expected to appear towards the end of this week. Applicants who are not already shareholders in the company will receive but modest allotments. Newcastle-on-Tyne Electric new ordinary shares are changing hands freely on the basis of 1s. 6d. premium. Active business is increasing in the Richmond Electrics distributed by the Bournemouth and Poole Company. The price has risen to 7s. 6d. premium, and investment paid up to 8s. premium for the shares.

Bournemouths are easier at 59s. after their steady advance, and the list of London shares is quietly firm. South Londons and Westminsters show small gains. Charing Cross and Bromptons are both slightly easier. Edmundsons rose 6d. to 24s. Yorkshire Electrics at 30s. have hardened.

British Insulated are ⅛ up, at 3¾, thanks to board's recommendation that £333,333 of reserves shall be capitalised, and distributed as ordinary shares in the proportion of one new share for every three old shares held. The new shares will not rank for the interim dividend, but will participate in the final dividend for the year ending next month.

Edison Swans slipped back to 8s. 6d., there being some disappointment at the retention of the dividend, just declared, at 10 per cent. Optimism had looked for 12½ per cent. Siemens have recovered to 35s. 6d. Johnson & Phillips, now ex dividend, stand higher at 58s. 9d. Metropolitan-Vickers have been again in favour by reason of the contracts that the company is securing, and the price strengthened to 27s. Callenders reacted to 3 5/16; General Electric drooped to 29s., although it is said that the company is doing very well in the wireless branch of its business.

Marconis remain at 26s. 3d., and are a languid market. Canadians are dull at 5s. 9d., there being little interest taken in them. Radio Corporations have gone back to 9⅜ for common and preferred, New York offering the shares with freedom on account of the recent decline shown in the company's earnings. The South African Wireless Company has signed an agreement with the British Post Office for "beam wireless."

Western Telegraphs are 5s. up at 17⅝, upon recognition of the shares' cheapness as compared with those of the other parties in this group. The company has declared the usual dividend at the rate of 10 per cent., tax-free, per annum. Anglo-American deferred stock is ¼ better at 24⅝. United River Plate new shares are quoted but slightly under the price for the old. Oriental Telephones are better at 43s. Automatic Telephones keep firm at 2½. Curiosity is excited by a further advance in the ordinary shares of the International Automatic Telephone Company. These are now up to 34s. 6d., notwithstanding the option to buy them, at 30s., held by the American firm of Gary & Co. The advance in price is held to imply some possible rearrangement of the Gary agreement, but nothing is known, up to the time of writing, on this head.

Underground Electric Railways Income bonds are a point to the good at 98, but the rest of the railway market is dull. District, Metropolitan and Central London stocks are down from ½ to 1. The London traction issues have not changed.

While Mexican Light Common and Preferred are both 2½ lower, the company's 5 per cent. first mortgage bonds have put on 2 points. Anglo-Argentines exhibit strength; Brazilian Tractions are again a dollar down at 78. In Amsterdam and Berne, issues have been made within the past week of 7 per cent. 15-year bonds of the Berlin municipal electricity works. The Dutch terms were 91½.

Babcocks are better at 52s., but there is a good deal of irregularity in iron, steel and allied shares. The rise in the price of raw rubber has had no unfavourable effect upon shares in the cable manufacturing group, while it has served to lash the rubber share market into a condition of extraordinary animation, with the usual sequel of physical fatigue to those engaged in dealing.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	1924.	Price Nov. 23. 1925	Rise or fall	Yield p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	13	14	59/- xr	—1/-	4 14 11
Brompton Ordinary	1	10	10	1⅝	—⅝	*6 8 1
Charing Cross Ordinary	1	14½	15	2⅞	—1⅜	6 3 1
do. do. 4½ Pref.	1	4	4½	17/6	—	5 2 10
Chelsea	1	12	12	2	—	6 0 0
City of London	1	15	15	47/-	—	6 7 4
do. do. 6% Pref.	1	6	6	28/-	—	5 4 4
Clyde Valley	1	8	8	27/6	—	5 16 4
County of London	1	15	15	57/-	—	5 5 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	24/-	+6d.	5 16 8
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	32/6	—	6 3 0
Kensington Ordinary	5	14	15	13	—	5 15 5
Lancs. Light and Power	1	7½	7½	26/6	—	5 13 2
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5⅝	—	5 6 8
Metropolitan	1	10	11	38/6	—	5 14 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	22/6 xr	—	6 4 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	15	—	5 16 8
South London	1	15	15	2⅞	+1/16	5 17 1
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	18/9	—	6 8 1
Westminster Ordinary	1	15	15	45/-	+6d.	6 13 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	30/-	+6d.	6 6 8
HOME RAILS.						
Central London Ord. Assented Stock	4		4	66	—1	6 1 3
Metropolitan	4		5	70½	—½	7 1 10
do. District	8½		8½	47	—1	7 8 11
Underground Electric Ordinary	10		Nil	Nil	2⅜	— Nil
do. do. "A"	1/-		Nil	Nil	8/-	— Nil
do. do. Income Bonds	6		6	98	+1	*6 2 5
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref. Stock	6		6	103	—	5 16 6
do. Def.	1½		1½	24⅜	+¼	6 1 10
Automatic Telephone	1		8	6	2⅛	— 2 6 10
Chili Telephone	5		6	5	6⅛	— *4 7 0
Cuba Sub. Ord.	10		5	5	6¾	— 7 8 2
Eastern Extension	10		10	10	18½	— *5 9 7
Eastern Tel. Ord.	Stock		10	10	180	— *5 11 1
Globe Tel. and T. Ord.	10		10	10	18½	— *5 9 7
do. do. Pref.	10		6	6	11	— 5 8 1
Great Northern Tel.	10		22	22	34½	— 6 8 6
Indo-European	25		7	8½	45½	— *4 13 5
Marconi	1		10	10	1⅝	— 7 12 4
Marconi Marine	1		10	7½	⅞	— 8 11 6
Oriental Telephone Ord.	1		12	12	43/-	—1/- *5 11 7
United R. Plate Tel.	5		8	8	7⅛	— 5 5 10
Western Telegraph	10		10	10	17⅝	+¼ *5 13 6
HOME AND FOREIGN TRAMS. &c.						
Anglo-Arg. Trams First Pref.	5		5½	5½	3⅛	+1/16 7 14 5
do. do. 2nd Pref.	5		6	6	3⅞	— 8 14 6
do. do. 5% Deb.	Stock		5	5	75½ xd	— 6 12 5
British Electric Traction Ord.	6		6	6	122½	— 4 18 0
do. do. 6% Pref.	6		6	6	106	— 5 13 2
Brazil Traction	100		4	4	78	—1 5 2 7
Brit. Columbia Elec. Rly. Pce.	Stock		5	5	89½	— 5 11 9
do. do. Preferred	96/-		96/-	96/-	98⅝	— *4 17 6
do. do. Deferred	129/5		129/5	129/5	115½	—1 *5 12 7
do. do. Deb.	4¼		4¼	4¼	77½	— 5 9 8
Lond. & Sub. Trac. 5% Pref.	1		2½	Nil	4/6	— Nil
London United Tram. Deb.	Stock		4	4	42½	— 9 8 4
Mexico Trams. 5% Bonds	—		5	5	63½	— 7 17 6
Mexican Light Common	100		Nil	Nil	31½	—2½ Nil
do. Pref.	100		Nil	Nil	11½	—2½ Nil
do. 1st Bonds	—		5	5	71½	+2 6 19 10
Yorkshire (West Riding)	1		5	—	18/9	— 5 6 8
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1		12	12	52/-	+9d. *4 12 4
British Aluminium Ord.	1		5	10	1⅝	— 5 6 8
British Elec. Transformer Pref.	1		Nil	7	1	—
British Insulated Ord.	1		15	15	3¾	+⅛ 4 0 0
Brush Ord.	1		10	10	25/6	— 7 16 11
Callenders	1		15	15	3⅛	—1/3 4 10 7
do. 6½% Pref.	1		6½	6½	23/9	— 5 9 5
Crompton Ord.	1		Nil	Nil	13/9	—
Edison-Swan	4/-		10	10	8 6	—6d. 4 11 0
do. 5% Deb.	Stock		5	5	84	— 5 19 1
Electric Construction	1		10	10	33 9 xd	— 6 6 0
Enfield Cable. Pref.	1		7½	7½	1½	— 6 0 0
English Electric	1		5	5	20/3	— 4 19 0
do. do. Pref.	1		6	6	21/-	— 5 14 3
Gen. Elec. Pref.	1		6½	6¾	23/9	— 5 9 5
do. Ord.	1		5	7½	29/-	9d. 5 3 5
Henley	1		15	16	3½ xd	+2/- 4 11 5
do. 4½% Pref.	5		4½	4½	4½	— 5 6 0
India-Rubber	1		5	5	1⅛	— *4 9 0
Johnson & Phillips	1		10	10	58/9 xd	+1/- 8 6 9
Met. Vickers. Ord.	1		8	8	27/-	+9d. 5 18 6
do. Pref.	2		8	8	2⅜	— 6 14 9
Siemens Ord.	1		—	7½	35/6 xd	+1/6 4 4 6
Telegraph Construction	12		20	20	26½	— 4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only genera and they may vary according to quantities and other circumstance

CHEMICALS, &c.	Price November 24th.	Fortnight's Inc. or dec.
a Acid, Oxalic per lb.	6½d.	
a Ammoniac, Sal per ton	£60	..
a Ammonia, Muriate (large crystal) "	£52	..
a Bisulphide of Carbon "		
a Borax "	£25	
a Copper Sulphate "	£25 10s.	
a Potash, Chlorate per lb.	4d. to 4½d.	
a " Perchlorate "	5½d.	
a Shellac per cwt.	£15 15s.	
a Sulphur, Commercial "	£8 10s.	
a " Roll "	£8 10s.	
a Soda, Chlorate per lb.	8¼d. to 8¾d.	
a " Crystals per ton	£5 to £6 5s.	
a Sodium Bichromate, casks per lb.	4d.	
METALS, &c.		
b Aluminium, Ingots per ton	£120 to £125	
b " Wire per lb.	1/9 to 2/6*	
b " Sheet "	1/6 to 2/-	
p Babbitt's Metal and Anti-friction Metal—		
Grade I per ton net	£253	£3 inc.
Grade II " "	£180	£2 inc.
Grade III " "	£100	£1 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	10¼d.	
c " Tubes (solid drawn) "	1/- to 1/0½	
c " Wire, basis "	10⅜d.	
c Copper Tubes (solid drawn) "	1/1½	
c " Bars (best selected) per ton	£92	
c " Sheet "	£92	
c " Rod "	£92	
d " (Electrolytic) Bars "	£69 s.	
d " Sheets "	£148 10s.	
d " Wire Rods "	£78 5s.	
d " H.C. Wire per lb.	9⅛d.	
f Ebonite Rod "	2/3 to 2/4	
f Sheet "	2 3½ 2/6	
a German Silver Wire "	2/3	
h Gutta-percha, fine "	9/9	
h India-rubber, Para fine "	4/-	2½d. inc.
i Iron Pig (Cleveland Warrants) per ton.	nom.	
l " Wire, galv. No. 8, P.O. qual. "	£12	
g Lead, English Pig "	£37 5s.	30s. dec.
g Mercury per bot.	£14 12s. 6d. to £14 15s.	5s. inc.
e Mica (in original cases) small per lb.	5d. to 8/-	
e " " medium "	4/- to 8/-	
e " " large "	10/- to 20/- & up.	
p Phosphor Bronze, plain castings "	1/3½	
p " " drawn bars & rods "	1/8	
p " " rolled strip & sheet "	1/9½	
p " " wire "	1/4	½d. inc.
o Platinum per oz.	£26	
d Silicium Bronze Wire per lb.	1/0½	
r Steel, Magnet, in bars "	7½d.	
a Tin, Block (English) per ton	£282 10s. to £283	£2 10s. to £2 15s. inc.
n Wire, Nos. 1 to 16 per lb	4/3	2d. inc.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

A Small Hydro-Electric Scheme.—An interesting small hydro-electric scheme has recently been completed at Lunesdale, near Lancaster, for a supply of electricity to Hornby Castle for Mr. H. C. W. Foster. The picturesque stream, Roeburn, has been harnessed to generate the electrical energy. The water wheel of the old mill at Wray has been removed and supplanted by an immersed turbine of 30 h.p., fed from the high dam and from an automatically-filled tank. The turbine is fitted with a flexible coupling and an automatic oil-pressure governor. It has a propeller-type runner, and is complete with guide valves, &c. A 20-kW compound-wound generator is coupled and supplies a three-wire system at 500 V. It is of the two-bearing type, and is equipped with a static balancer to deal with 25 per cent. out-of-balance load. An ironclad switchboard supported on a steel frame carries the necessary distributing switchgear and instruments. The transmission line (53 poles) is 2,700 yards long. The aerial cables run in an approximately straight line to a terminal pole to the east of Hornby Castle. From this pole the line is branched to the castle and to the estate workshops. Immersion heaters controlled by an automatic system, a thermostatic switch operating tappet switches, are installed for water heating in the castle. In the workshops a 25-h.p. B.T.-H. motor is installed, directly coupled to an "Aston" generator for charging the batteries for the lighting supply of the castle and outer buildings. A 15-h.p. motor drives a line of shafting, which operates circular saws, planing machines, &c. It is also intended to electrically equip the laundry, in which a 30-h.p. oil engine is at present installed. The work has been carried out by the Austin Lighting Co., Ltd., Banbury. Tests have given entire satisfaction. It is expected that the village of Hornby will ultimately benefit by the scheme.

Canadian Electrical Imports and Exports.

The following figures, showing the imports into and exports from Canada of electrical and similar materials during the year ended March 31st, 1925, are taken from the recently-issued trade statistics. Figures for the year 1923-24 are given for purposes of comparison, and notes of any increases or decreases have been added :—

	1923-24. $	1924-25. $	Inc. or dec. $
Imports.			
Copper wire, plain, tinned, or plated—			
Total	67,000	71,000	+ 4,000
From United Kingdom	2,000	1,000	− 1,000
„ United States	65,000	70,000	+ 5,000
Copper wire, covered, including cable—			
Total	347,000	341,000	− 6,000
From United Kingdom	77,000	33,000	− 44,000
„ United States	264,000	304,000	+ 40,000
Electric batteries, primary—			
Total (mainly from U.S.A.)	40,000	24,000	− 16,000
Electric batteries, storage—			
Total	765,000	924,000	+ 159,000
From United Kingdom	221,000	334,000	+ 113,000
„ United States	544,000	590,000	+ 46,000
Electric fans—			
Total	70,000	48,000	− 22,000
From United Kingdom	1,000	—	− 1,000
„ United States	67,000	47,000	− 20,000
Electric fuses, fuse plugs, and cut-outs—			
Total (mainly from U.S.A.)	200,000	163,000	− 37,000
Lightning arresters, choke coils, &c.—			
Total (mainly from U.S.A.)	140,000	113,000	− 27,000
Rheostats, controllers, &c.—			
Total	426,000	299,000	− 127,000
From United Kingdom	19,000	37,000	+ 18,000
„ United States	400,000	261,000	− 139,000
Sockets, outlets, and receptacles—			
Total	147,000	144,000	− 3,000
From United States	139,000	132,000	− 7,000
„ Japan	8,000	8,000	—
Spark plugs, magnetos, and other ignition apparatus—			
Total	568,000	441,000	− 127,000
From United States	562,000	437,000	− 125,000
„ United Kingdom	6,000	3,000	− 3,000
Electric cooking and heating apparatus—			
Total	159,000	118,000	− 41,000
From United Kingdom	4,000	1,000	− 3,000
„ United States	154,000	117,000	− 37,000
Dynamos and generators.—			
Total	1,214,000	978,000	− 236,000
From United Kingdom	149,000	74,000	− 75,000
„ United States	1,064,000	810,000	− 254,000
Electric light fixtures—			
Total	546,000	546,000	—
From United Kingdom	6,000	10,000	+ 4,000
„ United States	520,000	505,000	− 15,000
Electric meters—			
Total	270,000	210,000	− 60,000
From United Kingdom	49,000	28,000	− 21,000
„ United States	221,000	181,000	− 40,000
Arc lamps—			
Total (mainly from U.S.A.)	39,000	24,000	− 15,000
Incandescent lamps—			
Total	689,000	386,000	− 303,000
From United Kingdom	22,000	6,000	− 16,000
„ United States	107,000	93,000	− 14,000
„ Japan	77,000	65,000	− 12,000
„ Holland	331,000	178,000	− 153,000
„ Belgium	69,000	10,000	− 59,000
Electric motors—			
Total	1,929,000	1,816,000	− 113,000
From United Kingdom	108,000	204,000	+ 96,000
„ United States	1,811,000	1,536,000	− 275,000
Self-contained lighting sets—			
Total (mainly from U.S.A.)	67,000	20,000	− 47,000
Telegraph instruments (including wireless)—			
Total	1,044,000	2,655,000*	+1,611,000
From United Kingdom	108,000	1,138,000	+1,030,000
„ United States	932,000	2,497,000	+1,565,000
Telephone instruments—			
Total	483,000	303,000	− 180,000
From United Kingdom	60,000	27,000	− 33,000
„ United States	422,000	276,000	− 146,000
Switches, switchboards, circuit breakers, and parts—			
Total	1,059,000	949,000	− 110,000
From United Kingdom	43,000	38,000	− 5,000
„ United States	999,000	909,000	− 90,000
Transformers—			
Total	382,000	295,000	− 87,000
From United Kingdom	6,000	5,000	− 1,000
„ United States	293,000	261,000	− 32,000
Electrical apparatus, n.o.e.—			
Total	3,736,000	3,833,000	+ 97,000
From United Kingdom	139,000	172,000	+ 33,000
„ United States	3,571,000	3,541,000	− 30,000

* Imports of wireless apparatus in 1924-5 :—Total $2,500,000, including $1,127,000 from U.K. and $2,355,000 from U.S.A.

	1923-24. $	1924-25. $	Inc. or dec. $
Exports.			
Batteries, telegraph and telephone apparatus—			
Total	450,000	314,000	− 36,000
To United Kingdom	133,000	62,000	− 71,000
„ United States	46,000	18,000	− 28,000
„ Newfoundland	17,000	37,000	+ 20,000
„ Australia	53,000	4,000	− 49,000
„ New Zealand	55,000	19,000	− 36,000
Dynamos, generators, and motors—			
Total	20,000	28,000	+ 8,000
To United Kingdom	1,000	4,000	+ 3,000
„ United States	10,000	2,000	− 8,000
„ New Zealand	1,000	146,000	+ 145,000
Electric cooking and heating devices—			
Total	101,000	181,000	+ 80,000
To United Kingdom	2,000	4,000	+ 2,000
„ New Zealand	56,000	146,000	+ 90,000
„ Australia	37,000	21,000	− 16,000
Spark plugs, magnetos, and other ignition apparatus—			
Total	245,000	289,000	+ 44,000
To United Kingdom	108,000	99,000	− 9,000
„ Australia	67,000	73,000	+ 6,000
„ New Zealand	23,000	27,000	+ 4,000
„ British South Africa	16,000	16,000	—
Electrical apparatus, n.o.e.—			
Total	1,067,000	771,000	− 296,000
To United Kingdom	698,000	47,000	− 651,000
„ Australia	38,000	8,000	− 30,000
„ New Zealand	72,000	24,000	− 48,000
„ Newfoundland	19,000	327,000	+ 308,000
„ United States	42,000	34,000	− 8,000
„ France	10,000	—	− 10,000
„ Japan	13,000	258,000	+ 245,000
Copper wire and cable, insulated—			
Total	444,000	584,000	+ 140,000
To United Kingdom	—	36,000	+ 36,000
„ United States	2,000	2,000	—
„ Brazil	164,000	99,000	− 65,000
„ British South Africa	—	108,000	+ 108,000
„ Newfoundland	21,000	44,000	+ 23,000
„ New Zealand	49,000	64,000	+ 15,000
„ Cuba	123,000	126,000	+ 3,000

The total value of all electrical apparatus, including lamps and fixtures, imported into the Dominion rose from $12,110,000 in the fiscal year ended March, 1923, to $13,977,000 in the following 12 months and $14,289,000 in 1924-25, whilst that of similar apparatus exported fell from $1,884,000 in 1923-24, to $1,582,000 in 1924-25. These totals do not include wire and cable.

Conditions in Canada.—Following upon their American report, Col. Willey (president of the Federation of British Industries) and Mr. G. Locock (assistant director) have contributed some notes on their visit to Canada to *British Industries*. In a number of respects these impressions run parallel to the American report; for instance, it is mentioned that Canadians, in common with Americans, have an idea that this country is "down and out." The extent of American influence is commented on. The business methods of the two countries are similar; means of communication are rapid; American advertisements are constantly before Canadians' eyes; and there are now 1,100 branch factories of American firms established in Canada, with the natural result that such factories turn for their supplies more naturally to their parent country than to Great Britain. In spite of these handicaps there is without doubt a great opportunity for British trade in Canada, since there is a real sentiment in favour of British goods, when they can be obtained on anything like equal terms. It is, however, essential that British exporters should pay attention to quick deliveries, generous terms to their agents, more widespread advertising, and adapt themselves to Canadian conditions. Special opportunities are said to exist in British Columbia.

Marine Radio-Telegraph Apparatus.

Some Comments and New Devices.

By Major B. BINYON, O.B.E., M.A., M.I.E.E.

(*Abstract of Chairman's Address*: WIRELESS SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

I AM duly sensible of the responsibility which now falls upon me at a time which, I think, is somewhat critical in the further development of this important section of the Institution.

With the advent of broadcasting it is not unnatural that the demand for an independent institution of radio engineers should again arise. This matter is receiving the attention of your Committee, which has drafted a number of recommendations for submission to the Council of the Institution; it is not in our interests to seek any enlargement of membership at the expense of status.

Marine Radio Apparatus.

There has been no new international legislation since the Radiotelegraphic Convention of 1912, and although the principal powers have introduced national rules to meet new technical conditions, there is urgent need for the co-ordination of such regulations by international agreement. The General Post Office, Board of Trade, and the fighting Services, through committees on which the wireless companies are represented, are revising our national wireless regulations.

Ships spark sets are usually made in three standard sizes: 1½, ½ and ¼ kW, the rating being defined as the power supplied from the motor-alternator to the primary of the h.p. transformer. Modern practice is to supply the transmitter components completely assembled, usually in an iron structure of the switchboard type. The use of an expanded mild-steel protective enclosure is quite satisfactory in most cases, but care in design is necessary with regard to the distribution of the magnetic field from the h.f. inductances, otherwise appreciable losses can be set up.

The principal types of spark-gap in use to-day are the synchronous and quenched gaps. In a paper read before the Section in June, 1922, Mr. Lea dealt with the merits of the synchronous gap and showed that, as a high-frequency generator, it had an efficiency of the order of 70 per cent. He pointed out, however, that the only criterion which is of importance is the ratio of the power used to the signal strength received.

In order to make a comparison on this basis, tests have recently been carried out by my company to compare the two types of spark transmission, and to ascertain their relative merits with what is commonly called i.c.w., the use of which in the mercantile marine is of importance, for it is the only reasonable method by which a gradual transition from the spark system to c.w. can be effected without undue capital loss.

The results show the efficiency of i.c.w. over the spark systems both for signal field strength and audibility. The audibility of quenched gap is singularly poor for the field strength; the synchronous gap gives good audibility with a weaker field strength than either quenched gap or i.c.w., while the last named gives good field strength, good audibility, and good tuning, and the same audibility (on crystal) may be obtained in comparison with a synchronous spark with much less power. If lower receiver decrements were employed, i.c.w. should give even better results on account of its sharper resonance curve.

Power for power, a larger aerial current is obtained with a quenched gap than with a synchronous gap, which is of especial interest in view of a regulation recently introduced by the Post Office basing the range of ships' stations upon the metre-ampere standard. This regulation is very convenient for ship inspection purposes, but by ignoring the factors of audibility and tuning, it definitely favours the adoption of a quenched gap, particularly on the smaller class of ship having low masts and low-power sets. These results are directly contrary to the generally-accepted view that i.c.w. gives poor audibility with crystal reception, but all ships now fitted with c.w. installations also carry spark sets, and more information is urgently needed as to whether i.c.w. can be relied upon to carry out all the functions of a spark transmitter, bearing in mind the receiving conditions aboard other ships.

Lifeboat Installations.

Legislation has recently been introduced for the compulsory fitting of wireless sets of the spark type to ships' lifeboats. There is still a wide difference of opinion whether the petrol engine or the storage battery is the more suitable prime mover; in any case, batteries must be supplied for the filaments and h.p. supply of the valve receiver. The Board of Trade regulations specify that the battery shall be of sufficient capacity to provide for transmission of Morse signals for six hours continuously with a power of 15 metre-amps. in the aerial. The accepted definition of "Morse" load is 60 per cent. of the increase in load produced when the key is pressed.

The quenched-gap system is the most suitable for lifeboat sets; the circuits can be simple and auto-coupled, and the gap needs no adjustment and is unaffected by moderate variations in alternator speed. The Board of Trade regulations require only one wave, *viz.*, 600 metres, with 15 metre-amps. in the aerial. The height of a lifeboat aerial averages from 6 to 7 metres; hence, to obtain 15 metre-amps. an aerial current of not less than 2.5 amps. is required. To attain this current in a very small aerial (the average capacity is 0.00019 mf.) very high potentials are necessary, which considerably increase the insulation difficulties under wet conditions. The aerial potentials (crest value) measured under working conditions are of the order of 40,000 volts.

To test the efficiency of a lead-in insulator, salt water was poured over the set while in operation; the aerial current soon fell from 3 to 2 amps. and steam began to rise from the canvas-covered wood immediately surrounding the lead-in insulator, ultimately the wood dried and charred. These difficulties were overcome by fitting a large metal cowl over the insulator and a flat earthed plate of similar diameter over the woodwork surrounding the insulator.

Reception conditions in an open boat in stormy weather and with a poor aerial are likely to be very difficult, consequently valve amplification is essential. A detector valve followed by two stages of l.f. amplification is a simple arrangement entailing no filament rheostats or other adjustments. If dull-emitter valves of the "peanut" type are employed, the filament current can be supplied from a single cell of the main nickel-iron pattern (1.2 volts), the entire battery (18 volts) being used for h.p. supply; h.p. batteries of the dry-cell type deteriorate too rapidly, when not in use, to be depended upon. Under "S.O.S." conditions extreme selectivity is of no importance.

Characteristics of Ships' Aerials.

The "T" aerial is most generally employed, and is usually convenient as regards the disposition of the down lead clear of other rigging; this form of aerial also enables a lower natural wave-length to be obtained without appreciably reducing the wave-length obtainable when the maximum loading inductance is of the order of 300 mics.

Single-wire aerials are coming largely into favour for the reason that, having no heavy spreaders, the inertia and wind forces are less. For single-wire aerials is is usual to employ a heavily-galvanised steel wire with a hemp core, and tests at sea show that, although the current obtained is less, there seems to be no drop in signal range, as compared with the twin copper-wire aerial.

Regulations still provide that all ships shall be capable of transmitting on 300 metres, but the natural wave-length of aerials in large ships often exceeds this figure; consequently, it is necessary to provide either a series condenser or to split the aerial and lead in the two down leads separately. The expenditure in either case is wasteful since the efficiency of such arrangements is poor, and in practice 300 metres is rarely, if ever, used by large and medium-sized vessels. The continuance of this regulation is, therefore, very undesirable.

The application of the rough formulæ for the calculation of the natural wave-length of a "T" aerial,

$$\lambda_0 = 4\left(H + l/2\right) \text{ metres}$$

is by no means accurate for ships, owing to the disturbing effects of the rigging. Tuning data obtained from a large number of ships all having a uniform type of aerial-tuning inductance indicate that the following approximate constants in the formulæ are more nearly correct:

$$\text{Twin "T" aerials } \lambda_0 = 5{\cdot}2\left(H + l/2\right) \text{ metres}$$

$$\text{Single "T" aerials } \lambda_0 = 4{\cdot}6\left(H + l/2\right) \text{ metres}$$

The porcelain chain type of insulator, if carefully designed, is probably the most satisfactory for marine purposes, though it is heavier and more expensive than either the porcelain rod or rubber strop. It is mechanically very strong and safe in use, and with a properly-designed chain the losses, when employing a 1½-kW c.w. set, should not exceed 15 watts on the most difficult wave-length and with the insulator sprayed with water equivalent to a heavy tropical rain.

Automatic Call Devices.

During 1923 and 1924 the Admiralty, at the request of the Board of Trade, conducted a series of tests with calling appliances submitted by the Post Office, Marconi's Company, and Radio Communication Co. Generally, the trials demonstrated that the long dash call gave too many false calls, and that the most suitable form of signal consisted of a series of dashes of four seconds each, separated by an interval of one second, and that it should be possible to develop apparatus to register 90 per cent. effective calls.

In one type of calling device the telephone terminals of the ship's receiver are connected to a note amplifier and the amplified current is then rectified a second time and passed to a sensitive relay of the moving-coil type; the tongue of this relay therefore follows all incoming signals, whether Morse or the special signal it is desired to select. The timing element of the selector consists of a very simple form of electric motor, the armature comprising a simple iron bar without any windings. The speed is controlled by a governor of the gramophone type, and the motor drives a magnetic clutch through a reduction gearing, the speed of the clutch being two revolutions per minute. When the magnetic clutch closes, it drives an extension shaft on which the selecting cam mechanism is mounted and, if the signal be of the correct type, the clutch is held closed until a final cam operates a contact which rings the alarm bell. If, however, the signal is incorrectly timed, the selector mechanism breaks the clutch circuit, and the cam

shaft is instantly reset to the zero position by means of a spring. A certain amount of latitude in the cutting of the cams allows for slight inaccuracies in sending; an average of only one false call in 500 was registered in the Admiralty trials.

Aural Direction Finding.

The modern tendency in the mercantile marine is to adopt small multi-turn loops, either fixed or revolving, in place of the larger single-wire triangular loops formerly employed.

In the Robinson system, in unskilled hands, the 90 deg. ambiguity may be a source of danger unless a preliminary observation be made on one coil only, and a special switch is usually provided to cut out the auxiliary coil for this purpose. In a new device designed to obviate the necessity for any preliminary observation, the reversing switch and operating handwheel are mechanically inter-connected. The handwheel is no longer rigidly connected to the spindle carrying the coils, but drives the coils through a coupling that permits a certain amount of backlash (say, one degree of arc). This backlash in no way affects the accuracy of bearings, since the indicator dial and coils are rigidly fixed on the same shaft.

The relative motion of the handwheel and shaft is utilised to operate the reversing switch, and, if the leads to the switch are connected in the correct sense, the device operates in the following way: The signal from the distant station is heard on the 'phones and the handwheel moved to and fro to the extent of the backlash; this operates the reversing switch. Generally, the two positions give unequal signals. The operator turns the handwheel in the direction giving the weaker signal, and *continues turning it in that direction*, thus turning the whole system. He then is driven away from the "90 deg.-out" bearing towards the "correct" bearing. After he has turned a few degrees, he again moves the handwheel to and fro and judges the relative signal strength. He again rotates the system in the direction corresponding to the weaker signal, and after a few attempts gets a balance. The "correct" bearing is now indicated by the pointer on the dial.

Visual and Automatic Direction Finding.

Any aural system depends to some extent on the personal element, and in consequence varying results may be obtained. A system, at present only in experimental form, has been devised to give a direct *visual* indication of the balance. The method is based on the principle that when an a.c. with a small d.c. superimposed on it is passed through a d.c. moving-coil galvanometer of sufficiently slow period, the galvanometer will show the value of the d.c., and more particularly will show when the d.c. reaches a zero value.

The standard Robinson system is used, but the reversing switch is replaced by a special motor-driven commutator that has two functions: To reverse the (i) relative connections of the main and auxiliary coils, and (ii) rectified output from the amplifier to the galvanometer in synchronism with (i). If we suppose, first, that the commutator is at rest and the coil received, the galvanometer will show a deflection of, say, 10 deg. due to the rectified signal current from the amplifier. system is in the position of balance, and that a signal is being On turning the commutator through 180 deg., the "Robinson" reversal is carried out, and the current through the galvanometer is also reversed. Since we supposed that the coil was in the position of balance, the galvanometer will again read 10 deg. in the opposite direction.

If the commutator is now run sufficiently fast, the galvanometer will not be able to follow the alternation of direction, and will stay at zero. If we now suppose that the coil system is turned so that a balance is not obtained, the galvanometer will receive more current in one direction than in the other, and will be deflected from zero. Therefore, if the coil system is rotated until the galvanometer pointer is at zero, the coil system will indicate either the correct, or the "90 deg. out" bearing.

The elimination of the "90 deg. out" bearing is done in a way similar in principle to the device described above, namely, by correlating the movement of the galvanometer pointer with the movement of the operating handwheel. The great advantage of the visual indicator method is the speed with which really accurate bearings may be taken, and that little or no previous practice is necessary. In the case of a man who has never worked a d.f. set before, the galvanometer method will give an accuracy of plus or minus ¼ deg., as compared with plus or minus 2 or 3 deg. by the aural method.

By replacing the galvanometer with a sensitive relay of the moving-coil type, a series of interesting developments are possible. The relay may be made to light one of two lamps, showing whether the coil system is to be turned to port or starboard. In aircraft, employing fixed coils, an indicator of this character should prove of value in enabling the pilot to "home" on a ground station by watching two lamps on his dashboard. If the relay is made to operate a reversible motor, or a magnetic clutch mechanism with a reversing gear, the d.f. coils can be made to turn automatically in the direction of the correct bearing.

The accuracy of any d.f. observations is affected by interference, and in the case of aural methods any interference is at once apparent to the operator. In the case, therefore, of any visual indicator or automatic system it would be necessary to provide also an aural indicator which, in the case of a ship's installation, might take the form of a loud speaker, in order that the observer may know if any interference is present and also for the purpose of identifying the transmitting station whose bearing is being observed. I believe, however, that when an efficient system of i.c.w. beacon station is introduced operating upon a wave-length of 1,000 metres, troubles from interference will largely disappear, particularly as ranges in excess of 50 miles are not generally required.

The British Electrical and Allied Manufacturers' Association.

Annual Dinner.

On Thursday last week the British Electrical and Allied Manufacturers' Association held its annual dinner at the Connaught Rooms, London. The Earl of Derby (President of the Association) was to have taken the chair, but unfortunately was unable to be present owing to the sudden death of his uncle. Col. R. K. Morcom, C.B.E. (chairman of the Council) presided in his stead, and at the commencement of the proceedings read a telegram from Lord Derby expressing his deep regret at his unavoidable absence. A telegram of condolence was sent to him from the company.

There was a large attendance of members and guests, numbering about 600. Amongst the distinguished guests were Lord Weir of Eastwood (Vice-President), Sir Philip Cunliffe-Lister, K.B.E., M.C., M.P. (President of the Board of Trade), Lt.-Col. Wilfrid Ashley, M.P. (Minister of Transport), Sir Benjamin Longbottom, Air Chief Marshall Sir H. M. Trenchard, Bt., G.C.B., D.S.O., Major-General Sir Philip A. M. Nash, K.C.M.G., C.B., Eng. Vice-Admiral Sir Robert B. Dixon, K.C.B. (Engineer-in-Chief of the Fleet), the Hon. Sir Charles A. Parsons, K.C.B., F.R.S., Sir R. L. Wedgwood, C.B., C.M.G. (General Manager, L.N.E.R.), Dr. S. Z. de Ferranti, Sir George Sutton, Sir Vincent L. Raven, K.B.E. (President I.Mech.E.), Sir Joseph Cook, G.C.M.G. (High Commissioner, Australian Commonwealth), Mr. J. S. Smit (High Commissioner, Union of South Africa), Sir Robert A. Hadfield, Bt., F.R.S., Sir H. A. Walker, K.C.B. (General Manager, Southern Railway), Sir Archibald Denny, Bt., Sir Philip Dawson, M.P., Mr. R. A. Chattock (President, I.E.E.), Sir Harry Haward and Mr. S. L. Pearce (Electricity Commissioners), Mr. W. McClelland, C.B., O.B.E., Mr. W. O. Smith, Mr. W. L. Hichens, Sir Joseph E. Petavel, K.B.E., F.R.S., and Mr. H. J. Ward (President British Engineers' Association).

After the toast of "The King," Lord Weir of Eastwood proposed "The National Development of Power Resources." Referring to the Committee of three (of which he was chairman) he remarked that the Government had not yet published its report, and he could not disclose its contents, but he did not know why it should not be published at once, nor did he know to what extent the Government would adopt the report or when it would deal with it. Nothing could be worse for industrial development than a state of uncertainty. He said he would forget the report and give his own views on the subject of the toast. He thought that the effective development of our national power resources would be ruined if the question became a political issue, or was considered from a narrow point of view. Efficiency and economy should be predominating considerations. They must look forward to the main energy requirements of the country being filled by electricity because of its potentially low costs and its applicational advantages. As yet electricity was much too expensive, and we did not use half enough of it; moreover, it should be made much easier to obtain a supply. We appeared to possess inherent possibilities of supplying electricity at a cheaper rate than any other country. Scotland and Wales possessed considerable natural resources in the shape of water power, of which the fullest possible advantage must be taken, but the main asset of the country was coal, and our real development problem was to find how best to conserve our fuel resources and convert them into electrical energy economically, and then how to make it available everywhere.

There was a dangerous illusion prevailing that British industry could regain prosperity through a drastic change in electricity supply. Prosperity could not be regained either in that way, or by legislation. A new sense of responsibility and a new unity of national effort must play the larger part, but efficiency in industry and reduction in the cost of production demanded the most efficient and economical service, and in that capacity electricity held pride of place. The problem could not be solved by any scheme involving the immediate erection at the pit-heads of giant stations using low-temperature-carbonisation processes. No one knew enough about that subject to do it on a commercial scale as yet, and we could not afford to do it experimentally. He fully believed in the pre-treatment of coal, but until much more had been discovered it was futile to speak of its immediate application to electrical development. Nevertheless any new electrical scheme should be so devised as to enable the pre-treatment of coal to be dovetailed into it when the time arrived. It was more immediately ne-

cessary and important to utilise waste heat, and any new electrical scheme should provide an open market for the sale of electrical energy generated by this means. Hitherto electricity had been generated only to meet local demands, but it could be produced cheaply as a by-product if a market were provided for it by interconnecting lines. Any change that was made must recognise the valuable work done and the progress made by the great municipalities and power companies; the enthusiasm and activity of those bodies must be conserved and developed. No sound scheme could fail to deal with the existence and continued growth of many small undertakings which every real electrical engineer would sweep away if he could.

The economics of generation were altogether different from the economics of transmission and distribution. Greater legislative freedom should be accorded to transmission and distribution, which had suffered from harassing legislation that increased the cost of electricity to no purpose. The purchase clause must be reviewed, wayleaves made easier to obtain, and overhead transmission lines encouraged. They must have recourse to common sense and give practical encouragement to the undertaker.

Turning to the question of standardisation of frequency, he was a convinced advocate of the earliest possible adoption of a standard frequency, even though it should involve substantial national expenditure. It opened out new possibilities and new freedom to develop. To the manufacturer it secured simplification and lower cost of production: to the user it meant cheaper apparatus and increased confidence in the use of electricity. The opportunity of standardisation was fast disappearing, for the cost of the change was constantly increasing. The opponents of the change could justify their opposition if the view that was taken was short enough—if they considered the conditions in a single area only; but he appealed for a national view of the matter to be taken.

He would prefer to see less money spent on the counter-propaganda of gas and electricity and more applied to teaching the consumer to use them both more efficiently. Both products were real public utilities, and such services should be efficient. Gas and electricity differed in respect of generation, for gas could be stored, but electricity could not. If gasholders were abolished he was sure the gas manufacturers would readily appreciate the value of Government help to interconnect their works.

It was not justifiable to make radical changes in electrical development unless the Government and the people had complete faith in the future of this country. Given that faith, the Government should put electricity in the best possible position to serve the country under the conditions of restored industry and higher standards of living that would obtain in the future. We were only learning how to use electricity, and should plan to-day for the best use of electrical energy 10 years hence. We had unique coal resources and a small and densely populated country, potentially offering the best possible conditions for the development of electrical energy. We had excellent municipal authorities and supply companies, and manufacturers who in the past had fought the hardest fight ever seen against the competition of foreign plant, and they could now deal with any plant requirements. In the B.E.A.M.A. they had an Association of unique value, and a president of whom the whole country was proud. To these assets let them add wider legislation, freedom, and co-ordinated effort; then our country need be in no doubt as to the successful development of our power resources.

Responding to the toast, Lt.-Col. Ashley (Minister of Transport) on behalf of the Government, expressed its indebtedness to Lord Weir and his colleagues for the care with which they had prepared their report at great personal inconvenience. The report was admirable for its lucidity and insight, but contained a good deal of explosive material, and it was not advisable to publish it just yet. However, the author had laid bare its minutest details! It had received, and was receiving, most careful attention on the part of the Government; a measure of this importance must not be hastily decided on, for one false step might do damage for generations to come. He hoped that a decision on this vital matter would be announced before Christmas. He knew that the delay was hanging up business, and the sense of that gathering would not be forgotten. The Government highly appreciated the work done by the B.E.A.M.A. for the electrical industry; it had given valuable help during the war, and its collective exhibit at Wembley last year was the finest in the Exhibition. The World Power Congress which it organised was also a distinct aid to industry.

They were all indebted to the Electricity Commissioners for the work that they had done under very difficult circumstances. It was well known that the powers that they possessed were not those that they were meant to have, but with such powers as they had, with the aid of persuasion (which was not very effective without a big stick in the background), they had done splendid work. If they had accomplished nothing else but the London electricity scheme, that alone would have justified their existence. It was of no use to look forward to great development without faith in the future. He himself had the fullest confidence in their future as a commercial nation. Unemployment was decreasing, and the demand for electricity was increasing; as electricity was the hand-maid of industry, that indicated that trade was on the upward grade. Anyone must be blind who could not see that electricity in the future would be the great agent for domestic services. It would help the housewife; it would remove the pall of fog—help hospitals—help agriculture—make travelling more comfortable—and he hoped the railway companies would in the near future see the desirability of following the example of the Southern Railway and would electrify not only the suburban but also the main railway lines. He would repeat that he was fully sensible of the necessity of forming an early decision. The Government was working at it literally every day. Finance was of vital importance; in the present state of the nation's finances, it was not easy to find such sums as might have been put down in the report, but he hoped these difficulties would be overcome.

The toast of "Our Guests" was proposed by Col. R. K. Morcom, who said he was glad to see four High Commissioners present, and hoped they would develop the "B.E.A.M.A. habit," and never look beyond its ranks for the fulfilment of their requirements. The Government Departments, which realised that the B.E.A.M.A. was out to help them, were well represented; the supply and consulting branches of the industry were also present in force, and he looked to them for increases in the order book and moderation in their specifications. There were many other eminent men, and members of trade associations and technical institutions in the fullest sympathy with their spirit of co-operation. Lastly, there were the great railways, which they hoped each year to bind more closely to the electrical industry, for the benefit of both parties.

Sir Philip Cunliffe-Lister, responding to the toast, said the gas industry was the only one left to him now, but he would be the last to under-rate the possibilities of electricity; they were both vital to the future interests of this country, and it would be a most fatal mistake on the part of either to pretend that it could completely supplant the other. There was an ample field for both; they were complementary to each other, and the closer the two industries could get together the more successful both would be, and the better it would be for this country. He still retained a close interest in the future of the Association, and of the industries combined under its ægis; they were all grumblers, but he thought the times were not too bad for electricity. He congratulated them on the co-operative spirit prevailing in the electrical industry, which had enabled them to combine effectively. They were not afraid to collect the power engineers of the world at Wembley last year, and to learn from them and teach them, individually and collectively. The Association was a great pioneer of research, which was the key to success in competition. By conviction and faith he was an optimist as to the future of British industry. Immense mischief had been done abroad by those who pretended that Britain was unable, and was not certain to surmount all her difficulties. The feeling of optimism was justified by such positive factors as the Pact of Locarno, in which the world had turned its back on war, and the great harvests throughout the world. It was up to everyone, personally, to give a push to British trade, and to help the revival of British industry by buying British goods. They should also promote the British Industries Fair, and support the British Shopping Week, which he hoped would become an annual event. By "British" he meant the whole of the British Empire; it was the help from within the Empire that had pulled us through the past crises, and the future was not only hopeful, but certain. He was sure that we had reached the turning-point.

Sir R. L. Wedgwood referred to the recent celebration of the centenary of the railways, and speculated as to the character of the next centenary, when perhaps Sir Vincent Raven's electric locomotive would be towed out of a museum for exhibition. It was exactly 21 years since the first steam railway (not an urban railway) was converted from steam to electrical operation. That was the North-Eastern Railway on the Tyneside; the Lancashire and Yorkshire Railway followed three days later. Progress in this country had been slow and limited. No case had yet arisen where the economies to be effected by electrification had been the primary reason for adopting electric traction; that was the problem to be solved—then the electrification of the main lines must follow speedily. The deciding factor was the voice of the sleeping partner of industry—coal; so long as coal was cheap, the steam locomotive would hold its own, except for suburban services. In other applications of power, electricity was driving steam out of the field, and was the motive power of the future. Electrical manufacturers could look back on a year of reasonable prosperity, and forward to one equally promising.

Major-General Sir Philip Nash, rising to propose the toast of the "Chairman," expressed his regret at the absence of Lord Derby, but felt that he could not recall a B.E.A.M.A. dinner that had been more successful than this one. He was sure that things were going to improve—and very shortly.

Responding, Colonel Morcom said it was a great pleasure to hear so many speakers full of optimism. They had to make the B.E.A.M.A. universally acceptable by living up to a great ideal. The President—whose absence was regretted—was a good sportsman. That was the highest praise one could wish for; it implied three ideas: to give a square deal, to be considerate to others, and to be loyal to themselves. They should remember those three criteria. Among certain people the B.E.A.M.A. was unpopular; not all its members were always loyal to the Association. They should see that all the members of their staffs were loyal, and that every buyer should be able to say that the B.E.A.M.A. always gave him a square deal. It was most important that it should be respected, and that could only be done by its being respectable. Then the B.E.A.M.A. would progress, our electrical industry would become the greatest in the world, and the B.E.A.M.A. the greatest Association the world had ever seen.

Assisted Wiring Schemes.

The Second E.D.A. Conference.

ASSISTED wiring schemes formed the subject of a paper by Mr. James Edgar, of South Shields, at an E.D.A. Conference, held on November 20th. The paper gave details of a scheme which the author had put into operation in South Shields recently, and in the discussion which followed, information with regard to other schemes in operation in various areas was given Mr. R. P. Sloan (Newcastle-upon-Tyne Electric Supply Co.) presided.

Mr. EDGAR said that, whilst supply engineers would continue to explore the industrial field for further power users, the future of the supply industry depended to a very great extent upon the expansion of the domestic load. His scheme was a simple one. Canvassers employed by local contractors approached prospective consumers, and were supplied with a number of forms containing agreements for signature by both tenant and landlord, the canvassers being paid on commission by the contractors. When forms were completed the contractor was given an official order. No initial charge was paid by the prospective consumers, and the contractors were paid by the Corporation at rates which had been mutually agreed upon, after the installation had been tested and passed. The prices paid to contractors were: for a 7-point installation, 17s. 9d. per point; for a 6-point installation, 18s.; 5-point, 18s. 6d.; 4-point, 19s.; and for all below a 4-point installation, 19s. 6d. In addition, 10s. per installation was allowed for supplying and fixing a double pole ironclad switch and fuses. The installations could be carried out in v.i.r. cable drawn into grip steel conduits, or, alternatively, in metallic-sheathed cable on the surface. All materials used must be of British manufacture At present, installations were limited to six lighting points and a plug, and covered everything up to and including lamp holders, but the lamps and shades were provided by consumers. A prepayment penny-in-the-slot meter was installed, and the charge was the flat rate charge per unit for lighting for the time being in force, plus twopence per unit for all energy consumed up to a consumption of 150 units for each £1 of capital cost of the wiring installation. The present flat rate for lighting purposes was 4½d. per kWh, so that consumers under this scheme paid 6½d. per kWh.

The first applications were received on May 12th this year. The number of private dwelling houses connected at that time was 3,434. At the end of six months from the inception of the scheme, 7,477 applications had been received, the total to date being over 9,000, of which 1,870 would eventually be connected to mains which existed prior to the adoption of the scheme; 26.25 per cent. of the applications were for three-light installations. The number of consumers connected to date was 2,950, and it was anticipated that by March 31st the number connected under the scheme would approximate 6,000.

The "service density" (*i.e.*, the ratio of the number of consumers connected to the number of potential consumers) in 24 streets which he had selected at random, averaged 13.8 per cent. before the scheme was introduced; this had increased to 50.5 per cent. The average consumption per consumer for the quarter ended September last was slightly over 17 kWh, and he assumed that the average annual consumption would be about 130 kWh. The average cost of an installation, including meter, was £7 18s. 0½d., on which the annual interest and sinking fund charges, based on a 10 years' life at 3½ per cent. sinking fund and 4½ per cent. interest, amounted to £1 0s. 7d., or, over the period of 10 years, £10 5s. 10d. The average consumption was estimated at 123.6 kWh per annum, producing, over a period of 10 years, at twopence per kWh (the extra charge in respect of the wiring and meters), £10 6s. Results to date showed that this average consumption would be exceeded. The capital to be expended on mains was estimated at £17,000, whilst the cost of 6,000 services was estimated at £18,000, a total expenditure of £35,000, the capital charges on which would amount to £2,800, equivalent to 0.88d. per kWh sold. The estimated total cost per kWh sold was 1.561d., leaving a net surplus of 2.939d. per kWh. Several consumers who had had their premises wired for lighting under this scheme had since installed heating circuits at their own cost.

Discussion.

In opening the discussion, the CHAIRMAN gave particulars of a similar scheme adopted by the Newcastle-upon-Tyne Electric Supply Co. towards the end of last September, which had worked satisfactorily so far. A year prior to the commencement of the scheme, consumers were connected at the rate of 200 per month, but applications for connection were now being received at the rate of over 1,000 per month, and he hoped that that rate would be materially increased as the scheme developed and became better known. There was a prepayment scheme, but consumers had the option of paying a straight rental; he was strongly in favour of the latter system.

Mr. EDGINGTON (West Ham) asked what was the position if a consumer vacated premises, and the incoming tenant did not wish to continue to take electricity. The cost of installation in South Shields was apparently far below the London cost.

Mr. HOWARD SMITH said that the scheme was not very favourable to the contractor. He urged that in the adoption of these schemes the supply authorities should work with the contractors.

Mr. W. E. ROGERS (West Ham) said that the figure of £3 per service in South Shields was low, but he assumed that there was more than one installation connected to each service. He asked on what terms money was borrowed to carry out the work.

Mr. ABBOTT (Shropshire Electric Power Co.) said his company could not lay a service for £3. Capital charges on generating plant were likely to be heavy in the case of a small undertaking, and he suggested that Mr. Edgar's figures would not show much profit. His company had found that it paid to wire for three lighting points and one plug point free in some cases, and many consumers paid for extra points.

Mr. PAGE (W. T. Henley's Telegraph Works Co., Ltd.) said that a contractor in one district found the conditions very much against him as compared with another district, and it seemed to him that electricity was handicapped by this lack of uniformity.

Mr. MARSDEN (Sevenoaks) asked if there were any limit to the rateable value of the properties in which assisted installations were provided; whether there was any limit of distance from the main to the house; and whether the consumers were given the option of having a sixpenny or shilling meter installed. Where the cost of mains in such a scheme was excessive, part of the revenue should be allocated to this object.

Mr. HOWELL (Battersea) referred to a scheme started recently by his undertaking. The minimum number of lights in any house was six, complete with lamps, shades, switches, and so on. There was a standing charge of 16s. 3d. per quarter, inclusive of the cost of installation and meter rent, and 1d. per kWh consumed. The installation became the property of the consumer in ten years.

Mr. PINKNEY (Newcastle-upon-Tyne Electric Supply Co.) advocated that lamps should be supplied with assisted installations; it was a mistake to encourage people to get their first taste of electric light with carbon lamps, which could be bought cheaply. Apparently, Mr. Edgar did not employ registered contractors, and it seemed, therefore, that supervision must either be expensive or inadequate. Registered contractors should be employed. The contractor was able to increase output, and obtain prompt payment from a "gilt-edged" purchaser, so that, with short credit and certain payment, he was encouraged to organise for big business. By carrying out installations on a large scale, he could also reduce overhead charges, and reduce prices. He urged accessory manufacturers to organise properly on mass production lines, in order to reduce *their* prices.

Mr. W. E. BUSH (E.L.M.A.) calculated that, if 500 of the 560 supply undertakings in the country had put schemes of this nature into operation, each installation using an average of 3½ lights, the business which would result to the electrical industry would amount to £25,000,000 in six months; that indicated that supply engineers had the prosperity of the industry very much in their own hands.

Mr. F. SELLEY (Marylebone) advocated the employment of contractors for hire purchase and free wiring schemes. In a block of 540 artisans' flats which were wired on the hire system in Marylebone, over 400 were connected in 18 months. In 303 flats using electricity for lighting only, the estimated consumption for 12 months was over 26,000 kWh, and in 114 using it for lighting, heating and cooking, the estimated consumption was over 178,000 kWh. Slot meters were installed, the rate for lighting only being 7d. per kWh, 2d. going towards the cost of the wiring. There was also a "telephone" system of charging for "lighting and other uses," with an inclusive quarterly rental charge varying for two, three, and four-room flats, the rentals being 10s. 10d., 14s. 4d., and 17s. 9d. respectively, plus 1d. per kWh consumed. There was another system of wiring by hire purchase. The Electricity Department obtained competitive prices from contractors and added a percentage—never more than 15 per cent.—thus giving the consumer the benefit of the lowest tender.

Mr. V. A. HITCHMAN (County of London Electric Supply Co.) asked Mr. Edgar if he really thought that 2d. per kWh extra would cover the cost of wiring; as time went on he would probably find that maintenance was a big item.

Mr. LEON GASTER (Secretary, Illuminating Engineering Society) urged that, when a system of assisted wiring was introduced, the method of lighting should be good. He advocated dispensing with meters, and charging a flat rate per lamp. With regard to contractors, he mentioned a system which prevailed in some foreign countries, whereby registered contractors deposited £50 with a local organisation, and if they did not carry out good work they forfeited that sum and lost business.

Mr. L. G. TATE (Secretary, Electrical Contractors' Association) said the bulk of his members realised that hire and hire purchase powers could only be exercised by supply authorities, who could make their profit on the electricity sold. He and his Council realised that, to compete with a gas cooker, an electric cooker had to be hired at a price which was unremunerative to anybody depending simply upon the hire charge. The only point of difference between supply authorities and contractors was as to who was to carry out the installation work, and if the supply authorities would say that they would only employ registered contractors, the contractors would be only too pleased to support them, as they were supporting Mr. Edgar in South Shields.

Mr. ALABASTER (Bermondsey) said that a system of free wiring had been in force in Bermondsey since 1923, the installations being carried out by direct labour. The charge to the consumers was 3d. per kWh above the ordinary price, 2½d. of this being in respect of the installation, and ½d. in respect of meter rent. The supply authority supplied lamps and shades, and replaced burnt-out lamps. He asked what would be the extra cost of the service if South Shields consumers wanted more than six points.

Mr. H. T. YOUNG (Messrs. Troughton & Young) said that it was better that installation work should be carried out by contractors rather than that the supply authority should do it, because the British public were prejudiced against monopoly, and a prospective consumer, if he had no alternative than to go to the supply authority, would probably not bother at all. A fixed charge per quarter encouraged consumers to use more apparatus, and an alternative system, such as that referred to by Mr. Howell, might be offered to consumers.

Mr. C. W. SULLY (E.L.M.A.) suggested that the E.D.A. might call the various interests together to consider these schemes in detail, and collect data for the guidance of those adopting assisted wiring schemes.

Mr. EDGAR then replied to the discussion. With regard to the figure of £3 per service, he said that in many cases he was able to connect four consumers to one service cable, and, in a great many other cases, two consumers. The figure was £3 per consumer, not £3 per service. It was his intention to take up cooking and heating when the work in connection with lighting had slackened down. He had not yet found a case in which a new occupier had refused to take over the installation. The risk was very small. He assured Mr. Howard Smith that the electricity department in South Shields was only too anxious to work amicably with the contractors; all the installations in Souh Shields were very carefully tested during progress and on completion. Up to the present no money had been borrowed for the scheme. The Corporation had used a special reserve fund inaugurated four years ago. Application had been made to the Electricity Commissioners, however, to borrow £10,000, and application would be made for a further £10,000 later. He believed that the period of the loan would be ten years. He did not agree that the cost per kWh should include capital charges on the generating plant because the generating plant was already there, and there must be sufficient overload capacity or standby plant to meet all the load which would arise from these comparatively small consumers for some time to come. There were only the extra generating costs and distribution costs. He took no account of the rateable value of the properties which were wired under this scheme. As to the limit of distance from the main, he said that the tenemented property adjoined the footpath, and it was only necessary to run from the footpath straight in to behind the front door. The Corporation laid a new distributor along any street provided it was satisfied that the revenue would equal at least 20 per cent. of the cost of laying the cable. If a shilling-in-the-slot meter was desirable, and was asked for, it was installed instead of the penny-in-the-slot meter. When the scheme was started there was only one registered contractor in South Shields, but he believed many had now applied for registration. Out of approximately 3,000 installations connected there had been a very small number of installations condemned because the insulation resistance was not sufficiently high. He agreed that the number of orders placed in the hands of contractors should have a tendency to reduce the price per point.

He had not found it necessary to follow up the consumers in order to sell irons, because a very large number were purchasing irons themselves. The manager of the local Co-operative Society, which had an electrical department, had agreed to allow its members to have such apparatus as electric irons on easy-purchase terms, and the plan had been very successful. Since the commencement of the scheme, in May, the Corporation had paid the local contractors over £15,000, and he had recently got his Committee to certify another £3,000 to £4,000 for a month's work. He agreed that two systems of charging might be advisable, but the scheme he had introduced was rather too young to justify experiment at this stage, and perhaps after twelve months' working the question of introducing some other system of charging might be considered.

The Engineer and his Duty.

His Due and his Duty in Life.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

MR. T. CARTER, M.I.E.E., commences his eight-page paper with an outline of the rights and duties of life; having reminded his hearers of what an engineer is, he asks how the life of an engineer may have its fullest usefulness. The author maintains that we have not long begun to realise how much a problem like this concerns us as a nation. We make far too little attempt to ascertain whether those who decide to be engineers are real engineers; we also let many escape into other occupations who should be compelled to come into engineering. The finding of engineers to train is far more important than the finding of methods of training them. Strictness at the beginning may reduce the number of those who become engineers; but that is what is needed. The proper selection of potential engineers and the rejection of all others would so increase the efficiency of the profession that there would be no lack of directing ability. To keep its place in the world, a nation must more and more cherish and utilise every one of its members to the fullest of his possibilities.

In pursuit of our aim, we must discover the inmost nature of children at an early age, and it may be hoped that teachers will more and more try to do this as part of their work. Tests of intelligence and vocational tests are being made tentatively in many places, both of children still at school and of those passing out into employment, and suggestive information has already been collected. By checking attainment against prediction, thus keeping abreast of each child's development, it will eventually be possible for the head of a school to give definite advice regarding the career of at least some of his scholars.

Dr. Johnston, of Highgate School, keeps records of all boys, even those of average capacity, which are systematically studied as they go through the school, so that they may be guided into appropriate callings. Dr. Johnston writes: "There are two ways in which help can be given: first, and in practice more important and helpful, though it is on the negative side, we are able to inform parents with great confidence what form of activity the boy should *not* attempt, and I have always advised parents to let no boy become an engineer unless he combines in his capacity two particular forms of talent: (*a*) real aptitude in dealing with scientific apparatus and adapting means to ends, and a real feeling for the purpose of machinery in general; and (*b*) distinct capacity in the practical applications of mathematics and the use of mathematical formulæ for utilitarian purposes. If he has higher mathematical knowledge and could deal with the abstractions of theory, so much the better, and he might become a better and greater designing engineer. . . .

"Secondly, on the positive side, I have found it possible to do a certain amount, but not very much. Of the many positive suggestions that are given, all valuable in some way, 20 or 30 per cent. yield important results."

The very facility with which we may pick up a smattering of a subject nowadays, and the ease with which a thin veneer of showy knowledge is spread over great slabs of essential ignorance, may lead us back to the conditions of the dark ages, if we are not careful. If we are to apply our knowledge to the best advantage in our practice, we must keep it as varied as we can, consistently with thoroughness; in addition, we must try to acquire the wisdom that will show us how to use it. Luck is often nothing else than a readiness for the coming chance, and an immediate grasping of it when it arrives.

One of the most remarkable things about engineering is that there is scarcely a region of the world's activity into which the engineer's direct influence does not extend. The contrivances of engineers having made so much possible and even inevitable, must not they now, when they see the monster that has been created, design some new contrivance that will so mollify and tame it that the world may once again be safe?

On the whole, engineers have not taken much part hitherto in public life; many of them are by nature not fitted for it, though that is not to say that all who are in it now are pre-eminently suitable. Some engineers, however, in addition to their technical accomplishments and their ingrained habits of reflection and investigation and logical deduction, have so clear a view of what is wrong in affairs generally, and of what may have to be done to put it right, that they ought certainly to be in positions of wide authority, dealing with public problems not merely as engineers, but as men of the world with special qualifications because they are engineers. The way out of the turmoil will only be found by patient thought and long consideration and conference, and the public-minded engineer is peculiarly well suited for this. Parliament cannot do much to devise remedies; its main province is to register in its Acts the state of public opinion at a given moment, and thus to create conditions favourable to progress along desired lines; and it is for those who are faced by any problem to work out a solution for it, and then, convinced that they have found it, to go and ask Parliament to sanction it. If some engineers were also members of Parliament and of other great deliberative bodies, many problems would be passed into practice with increased effectiveness, and the whole outlook of public life might be redirected for the better. Thus would full usefulness be reached in service to the nation; engineering would become a still finer thing than it is; and the life of an engineer would be more desirable because his work would be more highly appreciated.

Discussion in London.

Mr. J. SWINBURNE, F.R.S., opened the discussion with some nteresting remarks on the subject of education, of which a lear definition was, he said, needed. The four essentials vere to teach a boy, first, to earn his own living; then ygiene, &c., in order to keep him physically fit; thirdly, to e a good citizen; and, fourthly, how to amuse himself, so hat he would not become dissatisfied. In Ancient Egypt hey had some excellent engineers, and wonderful astronomers, ut they were all priests, and down to this day education was nfluenced by them. Public school headmasters were often nade bishops. Why was not the President of the I.E.E. nade a bishop? Modern education retained many features of ncient education; scholars were not taught to help themselves o think, and the whole system was based on memory; things vere taught because authorities had said that they should e taught. A university educated man knew nothing, and ie could not earn his own living, because he was taught hings that would be of no use to himself. Engineering was othing but common sense and physical science also. An ngineer was a man who "thinks straight"; engineers should ot confine their logic to themselves; they should use their ctive minds in social questions of the day. Many opinions vere products of the fallow mind. They were not real opinions, ut accidental prejudices. A little clear thought and study vould clear up many of the problems of the day. The crowd mind should also be studied; human beings were not logical, nd it was therefore desirable for engineers to exercise their ctive logical minds in public affairs.

Dr. S. Z. DE FERRANTI pointed out that however great was nowledge, character was greater still. They could not all gree with the definition of a professional engineer, in which erm he would also include the manufacturer and specification vriter, and outside was a great class of engineers, all looking or mechanical means to assist people in their daily life and vork. Such mechanisms, however, could not be usefully used xcept by engineers, and so it was fortunate that the number f mechanically-minded people was growing very rapidly, and t must be so if they were to "live." Engineers must often ossess great persuasive powers in order to enlist the help f others in giving them the means to carry out their ideas. nd in this sphere great knowledge of character was required. he great engineers of the past had also shown great perse- erance and mental effort in persisting in face of very great ifficulties. Engineers must "engineer" people in order to ive them things which the engineers thought they should ave. He hoped the paper would receive the consideration t deserved.

Mr. G. E. G. HINSHELWOOD (Student Member) said it was new departure for a student to speak at a formal meeting f the Institution, but the privilege would be appreciated y all student members, and they would benefit thereby. The igh ideals of the paper could be mostly absorbed by engi- eers, but how much better would it not be if the worker ould do so. He favoured the more careful selection of young nen who were to become engineers.

Mr. W. DAY explained that there was much in the paper hat was applicable to most callings and professions. It herefore had no special significance for engineers. If selection were adopted, what would become of the very great unfit urplus? The gift of insight to character was very rare, and t would therefore not be easy to select the desirable people.

Mrs. M. S. MATTHEWS (Graduate Member) pleaded for more elf-sacrifice in place of self-expression. Until they stepped further than "self," they would not realise the meaning of "life." Where a son was to follow his father, it would be wise to give the son the freedom of the works at a very early age, in order that the people he would later have to control might learn to respect him, and that he might appre- ciate them. She agreed with the need of the study of litera- ure as a means of enlarging the mind.

Mr. B. O. ASON said there seemed to be an idea that engi neers were not qualified for the larger posts of life. To correct hat fallacy was the biggest fight they had before them. They must aim at controlling the country by engineers instead of awyers.

Mr. P. DUNSHEATH said the paper was packed with horse- ense. Flexibility of ideas was very necessary, but it was rarely found. If a man refused to change his opinion, he had wasted the intervening year. There was too great a tendency nowadays to "smooth the path"—rather a dangerous sug- gestion, because it tended to destroy initiative. There was much to be said for choosing the right men to be made into engineers. During the war technical units had to draft into themselves men who were not engineers because such men often carried out the work better than so-called engineers. There were not many schoolmasters, however, who knew what sort of boy would make a good engineer; "he who knows, does; he who does not, teaches." Some day there might be consultants who would give advice to parents on such matters.

Mr. W. J. JOHN said that in technical education very much depended on the teachers. They should be engineers, and should be granted periodical leave, which should be spent in manufacturing works, so that the teachers themselves could be up-to-date in what they taught; there was a great gulf between a student and practice, which ought to be bridged by the teacher.

Mr. G. D. HURLBATT thought the paper of such value that it ought to have been sent to higher authorities. The author aimed a little too highly, and had weighted his paper a little too heavily on the "duty" side instead of the "due."

Mr. E. KILBURN SCOTT was of the opinion that they should capture the executive of the country. Engineers were too often exploited, and in many cases non-engineers were at the head of affairs. They should see that things were done, instead of merely talking about them. They wanted more engineers in Parliament.

Mr. T. CARTER briefly replied to the various points raised.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Rural Electricity Supply.

Mr. Purse's letter in your issue of November 13th is deplorable. Because I did not advocate compulsory application of the I.E.E. (1924) Rules he hits at me through the cause of Rural Development. There is something involved far greater than my reputation as a debater, or Mr. Purse's position as a maker of rules. There is a general desire throughout the country to see the benefits of electricity made available in the country districts, where there is no public supply of power, heat, and light in any form. This cannot be done unless supply engineers recognise the difficulties and help each other to remove them.

The I.E.E. Rules are no special impediment to rural supply, and I have not suggested that they are. Mr. Walker introduced them as an example of over-regulation. While a consumer can demand and obtain connection—except in a few cities—provided the leakage does not exceed 1/10,000 of the maximum current, and the fittings are in a reasonable condition—the subject is not a live one outside those few city areas. If the I.E.E. would draw up a short statement of what is required to carry out a good commercial job at £1 a point in private houses and, say, 12s. in shops, there would be some chance that we would adopt it. As it is the Rules (1924) are only used for large installations, where cost is of secondary importance.

Mr. Bartholomew does not accuse me of side tracking; he complains that I compel him, again and again, to come back to the subject he would like to leave. He does not think I am losing—his anxiety to use every possible weapon, including simulated indignation and ridicule, shows that he, the official advocate of the Post Office, is fighting all out with his back to the wall.

When we go to law, we would like to sit on the bench and try our own cases *in camera*. The Post Office has manœuvred electricity undertakers into allowing this astounding state of things until now. The facts have been known for years and talked of in private, but engineers do not like to get up against public officials and Government Departments, and no-one has moved. The reception I have received at the hands of the Post Office fully justifies any man's hesitation, but under new conditions, which have developed sooner in Mid-Cheshire than in most areas, it became absolutely necessary to make a move and to point out the fact that we have a legal remedy provided in the Electricity Acts, *viz.*: a choice of arbitration or of appeal to the Electricity Commissioners. Mr. Bartholomew has very wisely ignored this in the hope that it will be forgotten. We are reluctant to do either, so we have availed ourselves of a further remedy, *viz.*: to appeal to the public, and that is why I have written to the ELECTRICAL REVIEW in the first instance, and have sent the photograph of the Middlewich monstrosity. This cost £250; when the expenditure of £30 on the part of the company and of a little energy on the part of the Post Office would have avoided a public eyesore and a scandalous waste of public money.

I expect your readers enjoy the comic relief which Mr. Bartholomew introduces into this otherwise serious discussion. If they look at the Middlewich monstrosity as depicted in your issue of November 6th, they cannot fail to notice the resemblance of the two towers to those of modern windmills. I am certainly tilting at the towers and must accept the *rôle* of Don Quixote to that extent. If Mr. Bartholomew continues to allot these various characters to me I shall soon be able to earn a fabulous salary "On the Halls" as a Protean Artiste.

The correspondence has brought out very clearly the unreasonable attitude of the Post Office. We have this specific case—typical of others—the Northwich-Middlewich-Winsford Junction or local line. It is important to keep it overhead because of the necessity to maintain certain qualities which are lost if it is put underground—yet 1½ miles of it were put underground last year! The Post Office has met this *prima facie* case of error on its part by refusing to produce the calculations, which should exist, to justify this refusal to put a further 50 yards or so of it underground at our cost. I say that this attitude is unreasonable and contrary to our democratic form of Government; it is sheer autocracy.

We are responsible for public utility undertakings equal in public importance to the telephone service, and we decline to be fobbed off with vague talk such as this about maintenance of speech efficiency on local lines—when used occasionally for trunk calls. This qualitative talk could be used equally well to bolster up a refusal to put subscribers' connections underground if this happened to be a rule just now, because two of

these *always* form part of trunk circuits during subscribers' trunk calls.

Mr. Bartholomew says he is not used to his statements being questioned. I agree that service in the Post Office breeds that attitude—but it is very bad for him really. The important principle at stake is not which official is to blame if this particular line is on the verge of unintelligibility—which it must be if 50 yards more cannot be put underground—but whether the Post Office will supply to an interested party, information which any reasonable man would give to substantiate a disputed statement. To use Mr. Bartholomew's expression in a more polite form: Is the Post Office big enough to admit it has made a mistake in refusing technical information? As for inertia or laziness, it required far less energy to say "no" than to work out the effect of putting a section underground in a possibly doubtful case. So Mr. Bartholomew and the higher officials puff out a speech-efficiency smoke screen and melt away behind it. This is a form of inertia, or reluctance to take trouble, as I have said—or laziness as Mr. Bartholomew prefers to call it.

I do not blame them, I blame myself and the other supply engineers for our inertia in the past. It has been far easier for us to provide unnecessary gear, &c., in each case as it arose than to undertake the thankless task of persuading the Post Office to moderate its attitude, and it saved time. What was, however, merely a nuisance and an occasional expense under town conditions, where most of the Post Office lines are underground, has become a serious handicap in country work where Post Office lines are all overhead and where all ours must also be overhead because costs must be kept down; so we must get the matter put right *now*.

Mr. Bartholomew makes his case worse by setting out again the illogical actions of the Post Office. It is useless for him to spread out his hands and ask you to write me down an ass. He is, in fact, reminding those who know the Post Office "System" of many such cases in the Post Office service. In fact, unbelievable things go on continually. It has reminded me that at one time they persisted in altering our address from Northwich, Cheshire, on envelopes, to Norwich, Suffolk, delivering them to Norwich.

Mr. Purse suggests "subsidy" as a remedy. This might suit West Ham—but we provincials would rather avoid waste than ask the taxpayer to help us to over-capitalise our concerns. Up to the present we in Mid-Cheshire have avoided even a Treasury guarantee, which is a distinction in these days, and we hope to continue to be self-supporting.

W. Fennell.

Northwich, *November 17th*, 1925.

Salaries of Combustion Engineers.

It is very evident from the amount of salary offered in connection with recent vacancies for combustion engineers that the importance and value of such a man, if properly qualified, are not yet sufficiently realised in this country. As is now generally recognised, the boiler house has become the most important part of a power station from the profit-earning view, but the best efficiencies cannot be obtained unless boiler-house operation is under the close supervision of a specialist.

If shift engineers are to be encouraged to study this all-important branch of power plant engineering, some really attractive inducement must be held out in order to make the additional close study, both in the works and in spare time, worth while; to offer the same salary for a specialist or expert as is paid to the shift engineer with general training only, is not likely to encourage a man to go to the extra expenditure of time and money necessary.

The writer has had this complaint addressed to him on several occasions by men who have devoted considerable time and money to obtaining specialist knowledge, only to find that the salaries offered for the positions they desire are not such as to make application worth while.

Chas. F. Wade.

Sheffield, *November 20th*, 1925.

[We warmly endorse our correspondent's statement. The boiler-house is the Cinderella of electricity supply, but it is, as Mr. Wade points out, the place where efficient management is of the first importance. The combustion engineer must be adequately trained in chemistry and physics as well as in mechanical and electrical engineering, and ought also to be versed in psychology; he should therefore be one of the two most highly paid engineers after the chief on the staff of a large power station.—Eds. Elec. Rev.]

A Review Reviewed.

I am obliged to the reviewer of my book on the induction motor for pointing out some obvious defects, and I should be obliged if you would allow me to remark on a few of his observations. He says, in effect, that much of the utility of the book is due to the free use of the writings of Steinmetz, Walker, Kloss and Smith, and he accuses me of not paying due acknowledgment for Chapter I. I stated explicitly that I had made use of the works of Steinmetz, and, indeed, I should like to know what writer on the induction motor is not indebted to Steinmetz. With regard to Dr. Walker, although I am an admirer of his works, I am not conscious that I owe him the slightest indebtedness in this book, otherwise I should be grateful to acknowledge it. As regards Dr. Smith, I admit taking copies of torque-slip curves for Chapter I from his papers on "Design" due to the fact that I had little time to accomplish my task; otherwise I am not indebted to him for anything much that is not acknowledged. Your reviewer takes exception to the expression: "torque in synchronous watts." This term is universally used, and is not the invention of an American at all. He expresses surprise that so little use has been made of Mr. Creedy's invention and so much of the Hunt motor. The reason is that the Hunt motor has an extensive application and is a much more practical solution of the problem of speed control—although still imperfect—than Mr. Creedy's invention. While acknowledging the ingenuity of Mr. Creedy's device, I fail to see any great application for it.

The same remarks apply in lesser degree to the phase converter. One needs to preserve some right sense of proportion with regard to the space devoted to essentials and non-essentials. I am willing to submit to just criticism, but I notice that a vast amount of my own work—much of which is original, particularly on design—passes unnoticed, and credit is given to others. I think it is due to the purchasing public that the man who sits in judgment on the work of his fellows should have the courage of his convictions and sign his name to the review, so that it may know what weight to put on his criticism.

In this instance it would seem that the reviewer has not read the book at all, but has seized on a few trivial points which are relatively unimportant on which to place his carping criticism, and, further, he is guilty of making vague, general observations, which is what one would expect from one who makes a fetish of originality, but who probably never did anything original in his life.

H. Vickers, Ph.D., M.Eng.

Vancouver, Canada, *October 30th*, 1925.

The reviewer of Dr. Vickers's book regrets that his review was unsigned, but Dr. Vickers may rest assured that the only reason for the reviewer's name not appearing is because it is not the custom of the Electrical Review to publish signed reviews. The review was written to enable intending purchasers to understand what they were likely to get for their money. If anything, the reviewer thinks that he was rather generous to the author, in view of some of the defects to which attention was drawn.

The Reviewer.

The Metering of Three-phase Power.

In the second paragraph of his letter commenting on Mr. Malcolm's interesting article, Mr. Jaques makes a grave charge against the supply undertakings when he states that inaccurate systems of metering are frequently employed, *many* of them being unfair to the consumer. Later in his letter he cites a case 15 per cent. against the supply undertaking. Can he give us any figures to substantiate his statement?

Referring to the problem of the correct meter for a three-phase four-wire supply, I would point out that the meter engineer has to decide which of the available apparatus on the market will give him the best results at a rational cost. Mr. Jaques will probably agree that three single-phase meters will do this. If it is necessary to measure the kW demand as well as the energy, then it will be necessary to use a three-phase four-wire meter, and whilst I agree that it is desirable to approximate as closely as possible to the three single-phase meters, one has to bear in mind that there are very few three-element meters on the market which are fitted with demand indicators and that interaction between the elements is an important source of error—in spite of what makers' pamphlets say—and these errors tend to be greater in a three-element meter than in a two-element meter. Mr. Jaques must give the meter engineer credit for knowing what he is about, and if he installs a two-element four-wire meter it is because he knows the circuit conditions and considers that he is getting the best possible all-round accuracy.

Whilst dealing with this subject may I be allowed to extend the scope of this discussion still further by pointing out that there is not a maximum-demand indicator on the market which comes within the limits of error specified in the B.E.S.A. Meter Specification; and I doubt whether any of them will come within the limits of error specified in the B.E.S.A. Instrument Specification.

As a meter engineer I am more concerned about inaccuracies in maximum-demand indicators than about two-*versus* three-element, three-phase, four-wire meters.

A Meter Superintendent.

November 17th, 1925.

I am glad that Mr. H. Hugh Jaques endorses my plea for accurate metering, and agree with him that the subject is one which does not always receive the attention and thought it merits. However, I think he will concede that supply engineers are gradually discovering the error of their ways as the errors of their metering systems come to light, and every day the "link with the consumer" is emerging from the ignominious position it once held to one of comparative and due importance.

I am sorry Mr. Jaques was disappointed in the scope of the article in question, but would point out that it was not intended to be a complete treatise on the subject, but merely a demonstration of the effect of various common abnormal conditions which can, and do, arise in everyday three-phase industrial power practice.

With regard to the metering of three-phase four-wire supplies, the use of the "three-element" type of meter is certainly preferable, but the cost is generally prohibitive, and is usually considered out of proportion to the benefits to be obtained. As the subject, however, is one on which opinion is still divided, investigation is indicated, and I propose to carry out experiments in this direction at an early date.

London, *November 17th*, 1925. **Geo. D. Malcolm.**

The Cost of House-Wiring.

In your issue of November 13th there is a letter by "Inquirer," entitled "The Cost of House-wiring." Writing from practical experience as a wireman, the average number of points complete per day for an eight-hour day for wireman and mate is four points a day. That is working in an occupied house, which means the shifting of furniture and raising of oil cloths, &c., and using slip tubing and cable.

November 16th, 1925. **Wireman.**

Buy All-British Goods!

I have been very much impressed lately with the admirable slogan that many firms are using, *viz.*:—"Buy British goods and thus support home industries," and it has made me wonder to what extent many who use this axiom act up to it in its entirety.

This calls for the further question what percentage of the component parts of an article can be purchased abroad and yet allow the complete article to be marketed as of British manufacture. It is much too large a field to be covered in a brief communication, but to illustrate the point we will take, say, a wireless intervalve transformer. Apart from the labour, this article consists of two main components: (1) the wire with which the coils are wound, and (2) the laminations which compose the iron circuit.

Now it does seem to me that a transformer wound with wire manufactured in America, or on the Continent, is not essentially a British transformer, although it is a "Transformer assembled in Britain." I believe members of the N.A.R.M. have very rigid regulations as to the supply of only British goods, and I am wondering if it is compulsory that these goods must be made of entirely British components. I certainly would not go so far as to say that the metals from which the components are made should be mined in this country, but I do think that we in Britain can handle their conversion.

Doubtless many manufacturers and traders purchase items from British wholesalers, in the genuine belief that they are getting entirely British-made articles, whereas it may be that the wholesaler himself is purchasing from a foreign source.

Prescot, *November 19th*, 1925. **James Nelson.**

British Industries Fair.

Your leader suggesting an Electrical Section is timely, and we would attend if the Electrical Section were in London. We have once exhibited at Birmingham Fair, but the Castle Bromwich site is very inconvenient as compared with the White City site for London. Besides, all foreign visitors go to London and only a portion go to Birmingham.

It would be much better to amalgamate and hold the joint exhibition in London.

Manchester, *November 23rd*, 1925. **J. D.**

The Licensing of Electric Wiremen.

Permit me, please, through your "Correspondence Columns," to express my gratitude that at least one nation (or should I say one Dominion) is endeavouring to protect the genuine electrical wireman.

I refer to the paragraph on p. 836 under the heading "Notes from New Zealand," which states that all electrical wiremen will have to pass a test; I think (and I am sure a good many contractors do) that something of the kind ought to be done in England, for there are numerous men to-day who cannot carry out the work necessary to comply with the rules of the I.E.E. The Rules, I think, are not too severe, considering the danger that can be caused by unqualified men, who cannot claim the union rate of wages because they are incompetent; but who, on the other hand, are employed by some contractors who are cheap-jacks, and would have to raise the price per point should they employ genuine electrical wiremen. I think more than myself will endorse the idea of New Zealand.

Stacksteads, *November 23rd*, 1925. **Joshua Rose.**

Legal.

Bartholomew v. Electrical Distribution of Yorkshire, Ltd.

ADJOURNED from October, the hearing was concluded at Rotherham County Court last week of a claim for £35 damages by Thomas Bartholomew, a carting contractor, of Rotherham, against the Electrical Distribution of Yorkshire, Ltd. It was stated that the defendants, having laid a cable, had left a road in a dangerous condition. Plaintiff said that when he was driving his 'bus over the trench the jolt was sufficient to break his rear axle.

His Honour Judge LIAS gave judgment for the plaintiff for the full amount.

Metropolitan Water Board v. North Metropolitan E.P.S. Co., Ltd.

MR. JUSTICE ROMER, in the Chancery Division on November 19th, had before him a summons taken out by the Metropolitan Water Board asking for a declaration that upon the true construction of the Electricity Supply Act, 1919, the Minister of Transport had no power to make an order authorising the North Metropolitan Electric Power Supply Co., Ltd., to abstract any water from the King George reservoir at Chingford, the property of the Board.

Mr. F. H. MAUGHAM, K.C., for the plaintiffs, said the point was whether a reservoir of a body of water was a "source" or not within the meaning of the Act, in which power was given to electrical undertakings to take water from "any river, stream, canal, inland navigation, or other source." It was a matter of great importance to the Board because if water could be taken from a reservoir it was difficult to see what could prevent its being taken from a main. If it had been intended by the section to give the word "source" as wide a meaning as the SolicitorGeneral must contend for, was it not plain that there would have been some provision for the protection of the water authorities? Not a single gallon of water could be taken from a dock without the consent of the owners, and the Crown did not intend to authorise the Minister to make an order which might deprive the Board of millions of gallons of water every day. The Board was at the greatest stress at some parts of the year to supply the needs of the public, and the smallest variation in the temperature of the water returned to the reservoir would have the most serious effect on the carrying out of its statutory duties.

The SOLICITOR-GENERAL said it was true that the Minister of Transport had the power to make such an order as was in contemplation, but his Lordship must take it that he had not arrived at any considered opinion as to whether the order was likely or ought to be made. He first of all wished to hear the objections which might be raised to the proposal to make such an order against the Board, and these would all be laid before the Minister at the inquiry to be held. But he wanted his Lordship's guidance and decision to govern, not merely that case, but others that might arise in different parts of the country. There was no appeal from the decision of the Minister, but he was at liberty to impose what conditions he liked as to the utilisation and return of water. This case turned upon the question of the interpretation of a particular word and not upon the merits of this particular proposal. The Minister had power to make an order, but it was also within his power to say: "I will make the order if you will do such things as are reasonable to provide compensation to the person whose water you are taking." He (Counsel) contended that the word "source" covered a natural sheet of water such as a lake as well as a body of water partly natural and partly artificial.

His LORDSHIP said he would take time to consider his judgment.

Marconiphone Co., Ltd., v. British Portable Radio, Ltd.

THE petition by the Marconiphone Co., Ltd., for an order for the compulsory liquidation of British Portable Radio, Ltd., was dismissed by Mr. Justice Romer in the Companies' Winding Up Court on November 17th.

Counsel for the petitioners said that the respondent company had paid them out and there were two other creditors whose debts had also been paid and the costs provided for.

Automatic Telephone Patents Extended.

IN the Chancery Division on November 18th, Mr. Justice Tomlin heard the petition of the Automatic Telephone Co., Ltd., Liverpool, for the extension of the period of six patents relating to improvements in telephone systems, on the ground that the applicants had been unable to work the patents during the war.

Mr. COURTENAY TERRELL, for the applicants, said that the patents which would in the ordinary course expire in January next, related to automatic telephones. The company was incorporated with a large capital to acquire patents from the Automatic Telephone & Electric Co., of Chicago. He asked for an extension of six years—an unusual extension—because the invention required an enormous amount of plant, and immense experience, and was one which would be chiefly used by the Government.

His LORDSHIP granted an extension of five years.

Damages Against Accrington Corporation.

AT the Accrington County Court, on November 20th, Messrs. H. Nuttall & Co., brewers, were awarded £11 13s. 6d. damages in respect of injury to a lorry by one of the Accrington Corporation's tramcars. A counter-claim by the Corporation for £106 for damage to its tramcar failed.

London Electric Supply Corporation Summoned.

AT the Greenwich Police Court, on November 23rd, Mr. Dummett continued the hearing of a summons against the London Electric Supply Corporation, Ltd., for failing adequately to protect an e.h.p. transformer, in consequence of which an employé was killed.

It was stated in evidence that an earthing device failed, and the employé, named Harwood, was sent to rectify it. He was found later dead inside the transformer cage with burns

on two fingers. The pressure on the transformer was said to be 10,000 V, but Mr. Hillbery, defending, said that if that had been the case Harwood would have been burned up.

Mr. SCOTT RAM, Electrical Inspector of Factories, said that the terminals might have been enclosed to render them safe against accidental contact.

The company's defence was that the enclosing of the transformer in a cage was sufficient protection.

Mr. Dummett reserved judgment.

De Laval, Chadburn Co., Ltd., v. Empson Centrifugals, Ltd.

IN the Chancery Division on November 19th, Mr. Justice Astbury had before him a summons taken out by the defendants in the action of De Laval Chadburn Company, Ltd., against Empson Centrifugals, Ltd., asking to strike out the plaintiffs' statement of claim on the ground that it disclosed no cause of action, or, alternatively, to strike out certain passages from it as tending to prejudice the fair trial of the action and as being embarrassing and irrelevant.

Mr. Macaskie appeared for the defendants, the applicants, and Mr. Warwick Draper for the plaintiffs, the respondents to the summons.

His LORDSHIP said the statement of claim alleged that the plaintiff company was incorporated in 1923 for the purpose of carrying on the business of designers, manufacturers and merchants of and dealers in centrifugal and other separators for all or any purposes and was the selling agent and concessionaire in the United Kingdom for the well-known and successful centrifugal oil purifier machine known and described as the De Laval centrifugal oil purifier. In September, 1923, the defendant company was formed by A. W. Empson for the purpose of manufacturing and dealing in centrifugal oil purifiers. Mr. Empson is managing director of the defendant company. On December 5th, 1924, there appeared in the ELECTRICAL REVIEW an article by H. D. Jukes, who (his Lordship was told) was an independent investigator, and who in his article made a report recording the results of a series of tests made by him with the oil purifier of the plaintiff company. The report (said the judge) was then set out at considerable length and it detailed certain results obtained by Mr. Jukes. Whether the plaintiffs could obtain better results from their machines or whether Mr. Jukes was right or wrong in what he said did not appear. The statement of claim went on:—On February 6th and 20th, 1925, the defendant company inserted in the same REVIEW an advertisement of their goods and the statements complained of in the advertisement were then set out in full. The first was "Insulating oil treated in the Empson centrifugal oil purifier (that is the defendants') has been exposed to the atmosphere for three weeks and still had a B.D.V. of 56 K.V." The next sentence was: "Compare this with a report recently published concerning another method of centrifugal purification which showed that while the oil left the machine with a B.D.V. of over 50,000 volts it fell to 38,000 volts after standing for about 48 hours in a closed tank." That was a reference and an accurate reference to part of Mr. Jukes's report. The next sentence complained of was: "The efficiency of a centrifugal oil purifier cannot therefore be judged solely on rate of flow and B.D.V. straight from the machine." That was the whole cause of action alleged—the insertion of this advertisement which made a certain statement as to the efficiency of the defendants' machine and compared it with the report made not by the plaintiff company at all but by an independent writer in the ELECTRICAL REVIEW. The cause of action alleged by the plaintiffs was then attempted to be stated: "By the said advertisement the defendant company referred and were understood by the readers of the same to refer to the said report of the said H. D. Jukes and the said oil purifier of the plaintiff company and meant and were understood by the said readers to mean that the plaintiff company's oil purifier was inferior and ineffective. The said advertisement of the defendant company was an inaccurate and unfair paraphrase of or allusion to the said report on the plaintiff company's oil purifier and defamatory of the plaintiff company in their business. By the said advertisement which was in fact read by many persons whose names are unknown to the plaintiff company, the defendant company has falsely and maliciously published a libel upon the plaintiff company in their business in oil purifiers. Notwithstanding a protest sent to the defendant company by the plaintiff company's solicitors on April 7th, 1925, the defendant company threaten and intend to continue the publication of the advertisement complained of or other advertisements or words containing similar unfair and defamatory allegations. By reason of the premises the plaintiff company have been injured in their credit and reputation and have suffered damage." Then an injunction was asked for, to restrain the defendant company from printing, publishing, issuing and distributing the statement contained in the advertisement or any similar statement referring directly or indirectly in any unfair or defamatory manner to the plaintiff company's oil purifiers to the prejudice of the plaintiff company; and damages and costs were asked for.

This statement of claim contained two alleged causes of action, an alleged slander of the plaintiffs' goods and an alleged libel on the plaintiff company. So far as it alleged slander he was of opinion that it disclosed no cause of action and ought to be struck out. As to the alleged libel there was nothing in the defendants' advertisement which was any libel at all. It was the commonest thing in the world for one trader to advertise that his goods were better or more efficient than any other and the Courts had said over and over again that that disclosed no cause of action. Mr. Draper apparently fe ing the force of these criticisms, had attempted to suggest th what the plaintiff company really wanted was to obtain injunction against some sort of unfair competition, but the junction that was asked for was solely confined to the repe tion of the advertisement complained of and similar adverti ments, and it was quite impossible to read that as asking relief otherwise than such as could be based upon allegatio in the statement of claim. The statement of claim disclos no cause of action and it must be struck out. The costs wou be the defendants' in any event.

Mr. Draper asked for and obtained leave to appeal.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the prin specification.
The numbers in parentheses are those under which the specifications will printed and abridged, and all subsequent proceedings will be taken.

1924.

2,051. "Condensers for wireless telegraphy and telephony." J. Williams. October 25th, 1924. (241,806.)

10,530. "Electrically-operated indicating apparatus for vehicles." McCreath. April 29th, 1924. (Cognate applications Nos. 22,620/24 a 27,070/24.) (241,964.)

15,839. "Variable electric condensers." J. H. Watkins, E. B. Watki and Dubilier Condenser Co., Ltd. July 1st, 1924. (241,971.)

15,942. "Telephone transmission lines." A. Rosen. July 2nd, 19 (241,972.)

17,788. "Publicity telegraphs and advertising devices." H. K. Harr July 25th, 1924. (241,978.)

17,999. "Manufacture of coated metallic conductors." General Elect Co., Ltd., and C. J. Smithells. July 28th, 1924. (241,984.)

18,038. "Electric traction systems employing storage batteries." E. Muller. September 26th, 1923. (222,448.)

18,123. "Electric distribution systems." V. F. Spigai. July 29th, 19 (Convention date not granted.) (219,984.)

18,216. "Secret signalling systems." Western Electric Co., Ltd. Ju 31st, 1923. (219,987.)

18,249. "Variable electric condensers." R. Woods. July 30th, 19 (241,992.)

18,292. "Composition or mixture for use as an insulating material electrical work and for other purposes." C. Pickstone. July 31st, 19 (Cognate applications 1,688/25 and 1,689/25.) (241,993.)

18,359. "Manufacture of highly refractory bodies." Naamlooze Vennot schap Philips Gloeilampenfabrieken. August 9th, 1923. (220,301.)

18,402. "Electric motors." W. C. Fairweather (Underwood Typewrit Co.) August 1st, 1924. (241,994.)

18,411. "Filaments for thermionic valves and for electron-emitting devices S. R. Mullard and Mullard Radio Valve Co., Ltd. August 1st, 192 (241,996.)

18,585. "Electric relays for automatic voltage regulation." A. H. Railli and A. E. Angold. August 5th, 1924. (242,002.)

18,723. "Sound directing or amplifying horns and like acoustic apparatus. E. A. Graham. August 6th, 1924. (Addition to 217,675.) (242,004.)

18,745. "Sparking plugs." F. Lilienthal. August 6th, 1923. (220,315.)

18,827. "Electric telegraphy." H. V. Higgitt and Eastern Telegraph Co Ltd. August 7th, 1924. (242,006.)

18,909. "Electromechanically operated electric switch devices." Englis Electric Co., Ltd., and T. Zweigbergk. August 8th, 1924. (242,008.)

19,091. "Variable electric condensers." W. F. Dunn and E. A. Tansley August 12th, 1924. (242,010.)

19,425. "Electrical signalling systems, particularly wireless receiving sy tems." G. W. Hale and R. Lyle. August 16th, 1924. (Cognate applicatio 29,603/24.) (Addition to 223,630.) (242,013.)

19,465. "Asynchronous dynamo-electric machines." Neufeldt and Kuhnke August 17th, 1923. (220,652.)

21,171. "Radio condenser." F. B. Dehn (Mohawk Electric Corporation September 8th, 1924. (242,023.)

21,535. "Antenna systems for receiving wireless signals." Telefunken Ge fur Drahtlose Telegraphie. September 11th, 1923. (221,825.)

22,066. "Telephone receivers." C. A. M. Buckley and H. S. Buckley September 18th, 1924. (242,035.)

22,562. "Electromagnetic sound reproducers." C. E Brigham. Septembe 24th, 1924. (242,041.)

23,240. "Automatic telephone systems and the like." Siemens Bros. an Co., Ltd., and W. Patterson. October 1st, 1924. (242,048.)

24,405. "Holders or supports for thermionic valves or electron discharg tubes." W. S. Sholl. October 14th, 1924. (242,057.)

25,908. "Magnetic separators." S. D. White and J. B. Kramer. Octobe 30th, 1924. (242,071.)

30,175. "Method of and device for signalling by means of electric waves." E. Bräuer. December 14th, 1923. (226,243.)

31,021. "Dynamo-electric machinery." K. Nobuhara. December 24th 1924. (242,108.)

1925.

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1,366. "Sound directing or amplifying horns and similar acoustic apparatus." G. Campbell and E. S. Dumont. January 16th, 1925. (242,122.)

4,959. "Electric discharge devices." Westinghouse Lamp Co. February 23rd, 1924. (229,704.)

5,789. "Electric switch." W. Fairweather (Singer Manufacturing Co.). March 3rd, 1925. (242,140.)

6,352. "Construction of inductance coils." Western Electric Co., Ltd. (Western Electric Co. Inc.). March 9th, 1925. (242,143.)

6,992. "Electrical power transmission systems." Dr. B. Zavada. March 14th, 1925. (242,145.)

7,287. "Bulkhead and like lamps." Heyes & Co., Ltd., and W. A. Heyes. March 18th, 1925. (242,146.)

8,668. "Electric terminals" F. V. Breemdem. April 1st, 1925. (Cognate application 13,824/25.) (242,156.)

8,937. "Electric condensers." Dubilier Condenser Co., Ltd. April 4th, 1924. (231,883.)

9,099. "Electrical arrangement for working blast heaters for blast furnaces." Zimmermann & Jansen Ges., and H. Rappold. April 6th, 1925. (Addition to 30,571/24.) (242,161.)

9,267. "Sound amplifying and diffusing apparatus." M. T. P. Griffiths. April 7th, 1925. (242,164.)

9,399. "Supports for secondary electric batteries." Chloride Electrical Storage Co., Ltd. (Electric Storage Battery Co.). April 8th, 1925. (242,166.)

12,370. "Sheathing for single-core alternating current cables." Felten and Guilleame Carlswerk Akt. Ges. May 12th, 1924. (233,736.)

13,649. "Arrangements for driving auxiliary machines for electrical generators." Akt. Ges. Brown, Boveri et Cie. May 24th, 1924. (234,523.)

13,747. "Control of dynamo-electric machines." British Thomson-Houston Co., Ltd. May 27th, 1924. (234,812.)

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Future Competitive Capabilities of Germany.

AN abstract appears in another part of our current issue of a report made by the Commercial Secretary to H.M. Embassy in Berlin, supplemented by further information prepared by the Commercial Secretary in the Occupied Territories at Cologne, regarding the economic, financial and industrial situation of Germany in 1924 and extending also for a few months into 1925.

The impression conveyed after a perusal of the general review by the Berlin Secretary is that a considerable improvement has taken place in that country. As he states, the currency question has been the fundamental cause of Germany's economic troubles, whereas the return to sound financial conditions has led to a marked general improvement.

A few questions which may be selected from this general review are of particular interest to Great Britain from the standpoint of competitive capability in the markets of the world. These relate to the problem of adequate working capital, the extension of the industrial works in recent years, taxation, organisation, and labour. As is known from recent capital transactions that have been projected, the problem of the possession of sufficient working capital remains the chief disadvantage under which the German business world has to labour at the present time. Truly some of the larger concerns have been able to increase their funds by the sale of industrial debentures, particularly in the United States, at rates of interest averaging 7 per cent., but the actual cost has been about 10 per cent. owing to bank commissions, &c. As the total amount of these issues, the Secretary says, is probably only about £100,000,000, much has still to be done in the matter of the provision of additional capital. Although this would appear to refer to the raising of further foreign capital, in his summary of the general review the Secretary seems to think that German commerce and industry will have to earn a large amount of working capital, and, in fact, he states that the creation of this capital must depend in the main on the exertions of the German people themselves.

On the second point—the productive capacity of the country—it is admitted that this has largely increased

during the period of inflation, but the Commercial Secretary is unable to say whether the augmentation has been 10, 20, or even 30 per cent. within the present frontiers, as compared with the same area before the war. It is, however, known that the output capacity of many of the iron and steel and machinery works in particular has been greatly augmented in recent years in order to compensate as far as possible for the losses in these directions through the cession of Alsace-Lorraine and a part of Upper Silesia. Concerning the social burdens placed on employers, as represented by old age pension insurance, accident insurance, and unemployment relief, it is submitted that these charges do not weigh less heavily upon British employers.

We now come to a still more important question, and the vital point which differentiates English from German costs of production, namely, labour. We are told by the Secretary that the German workman receives considerably less than the wages of his English colleague and often works a longer daily shift; he also works unremittingly, except for the usual pauses, during the whole of the time, unhampered by trade-union restrictions as to the quantity of his output. In the aggregate this system must make an enormous difference, although the German workman has only in a few instances returned to piece work. Unless some adjustment is made, the Secretary states that the effect of this difference will make itself increasingly felt according as the disadvantages from which Germany at present suffers, particularly the financial one, disappear. It may be that this is the reason why foreign manufacturers, not only those of British nationality, who have visited the country during the past year and have looked into matters themselves, are said to have been one and all amazed, not at the amount of German competition which they experience, but at the fact that it is not greater. Of course, the chief reason why this rivalry is not more severe is, as already pointed out, mainly the financial difficulty under which German trade is at present suffering.

The danger of over-production and excessive protection seem to have been apprehended in some quarters in Germany, and in these circles the remedy advocated is the establishment of international "horizontal" co-operation, which means that the same branches of industry in the different countries should arrive at an understanding concerning output and prices. It is the only remedy, it is contended, for the universal coal crisis as well as for that existing in the iron and steel trades. As is well known, an international combine of this kind has been formed among the electric lamp producers of the world, and is said to work satisfactorily, and to provide an excellent example for other suffering industries to follow that are waging a war which can only result in the extinction of the contending parties. To this may be added that a somewhat similar arrangement has already been made in the potash industry as between France and Germany, and that in various directions in Germany it is suggested that an understanding should be reached between the producers of aniline dyes in that country and those in England, the United States, and other countries.

Under all the circumstances of the situation, and taking into account the augmented productive capacity of many of the industrial works and the determination to develop German activity, it is no wonder that the Commercial Secretary in Berlin states that in the future competition with England, labour will be the primary and organisation the secondary factor, while at the same time it is considered to be improbable that taxation will ever be heavier in Germany than in England, or even equally heavy.

The Report of the Electricity Commissioners.

The fifth annual report of the Electricity Commissioners, issued at the end of last week, arrived at a later period of the year than its predecessors. In their prefatory remarks the Commissioners review the conditions brought about by the intervention of the late and present Governments, which, whilst intended to accelerate the "intensive development" of electricity supply, has unquestionably been the cause of serious delay, and may not improbably continue to retard progress for many months to come. In accordance with the policy outlined by Mr. Snowden in July last year, the Commissioners retained Messrs. Merz & McLellan to report upon the question of a complete standardisation of frequency, and their report, with the Commissioners' recommendations, was submitted to the Minister of Transport a year ago. That report has not yet been published, although prepared, according to the Expenses account of the Commission, at a cost to the State of £4,206. The Commissioners were also authorised to confer with the I.M.E.A. and other bodies with regard to the formulation of main transmission schemes and a distribution system for rural supplies, but the change of Government brought the whole matter to a standstill, and there it has remained. As they somewhat pathetically remark, "while these important investigations preliminary to a decision on policy were in progress, the Commissioners necessarily felt constrained from proceeding with the initiation of new schemes of reorganisation," and, time and again, reference is made to this obstructive factor in the body of the report.

Hence the chief items upon which they can congratulate themselves were the concluding stages of the constitution of the Edinburgh and Lothians, London and Home Counties, East Midlands, and West Midlands Electricity Districts, and the issue of the two exhaustive Returns of Authorised Undertakers and Statistics which form so valuable an addition to the reference literature of electricity supply. Returns for the years 1923-24 and 1924-25 are to follow as soon as possible.

However, the routine proceedings of the Commission suffered no apparent diminution, and a vast amount of work was accomplished.

The total energy generated by electricity supply and traction undertakings during the year was 7,415.3 million kWh, an increase of 11 per cent. Returns were received from 584 power stations, of which three-quarters generated less than 10 million kWh each, and the Commissioners regretfully admit that they have been obliged to sanction the establishment of small generating stations in various parts of the country. However, since their appointment 54 small stations have been shut down and 21 relegated to the category of stand-by plant. The sales of energy increased by 15 per cent. to nearly 5,000 million kWh, out of 6,047 millions generated by authorised undertakers, or 117 kWh per head of population. This figure, however, does not include electricity used for traction or that generated at private stations, which, we believe, would bring the consumption *per capita* up to 250 kWh.

The proceedings in connection with the London and Home Counties Electricity District are fully set forth, though the Order constituting it came into operation after the close of the year under consideration. The capacity of the generating plant in the District installed or sanctioned at March 31st, 1925, amounted to 1,139,232 kW, of which local authorities owned 43 per cent. and companies 57 per cent.

Commenting on the West Midlands Electricity District, which was originally part of the North-West Midlands Electricity District as provisionally delimited, and which was constituted by an Order (subject to confirmation by Parliament) in April last, the Commissioners remark that this was the only instance in which the full support of the local authority and company undertakers was forthcoming to the establishment of a Joint Electricity Authority and to the transfer of the generating stations in the District to the Authority. It was also the first instance in which a Power Company surrendered its powers in a District in return for the granting of power to supply electricity for all purposes in other portions of its area. This is a measure of co-operation which does all parties credit; the failure of undertakers in other Districts to show a similar spirit must have been a bitter disappointment to the Commissioners.

The total capacity of generating plant for new stations and extensions sanctioned by the Commissioners during the year was about 480,000 kW, thus maintain-

ing the rate of growth in spite of the industrial depression. In some cases, of course, the new plant was to replace obsolete plant.

A number of consents were given for the establishment of main transmission lines at 33,000 volts, and two for 66,000 volts (County of Durham Electric Power Supply Co. and North Wales Power Co.).

Special Orders were made in respect of 66 applications; at the beginning of the year 74 applications were under consideration, and 88 were received during the year. The amount of loans sanctioned was £13,379,060, an increase of 37 per cent., mainly for plant and mains. Glasgow Corporation received sanction for a loan of £1,850,000, and Birmingham Corporation for £1,049,851, for extensions.

The expenses of the Electricity Commission amounted to £47,134; the final instalment of £23,000 in repayment of advances from H.M. Exchequer was paid, and the amount to be apportioned amongst authorised undertakers was £67,000.

The Electrical Trade at Birmingham.

As we have already directed attention to the desirability of firms in the British electrical trade being reasonably in evidence at the Birmingham Section of the British Industries Fair in February next, we need say little now beyond urging them to come to a quick decision. There is still time enough for a trade dispay of a thousand and one electrical articles to be brought together, and the cost per company or firm need not be such as to trouble any of them. Elaborate exhibits are not necessary, but a simple and businesslike collection of apparatus, switchgear, small motors, lamps, cables and wires, appliances, devices, fittings of all kinds, instruments, accessories, and so forth, can be brought together to form an electrical market humming with trade activity, which during twelve days would impress not only the Colonial and foreign visitors who are coming, but also all those home concerns which are taking part in the Fair as exhibitors, not forgetting the trade association visits that we understand are being arranged. Surely the effort and the small cost could hardly fail to be well worth while. Let us give it a real trial—make part of the Fair an electrical market-place for 12 days!

Continental Competition.

Information contained in a Wellington dispatch to *The Times* will be welcome in this country, for it illustrates the depth of the desire of the New Zealand Government to encourage the importation of British manufactures. The Government, it is stated, has raised from 25 to 50 per cent., the proportion of British material incorporated in British goods to entitle them to enter under the preferential tariff arrangement. Other news that lies before us is far less welcome, for here at home, where one might with even greater reason look for assistance to be given to British production, we have certain public authorities placing orders abroad. Morecambe Corporation Electricity Committee has authorised the purchase of Continental electric meters because British manufacturers are stated to have "formed rings to protect their prices." The Hull Telephones Committee has accepted tenders for German-made cable and bronze wire, though some members reminded their colleagues that it was economically unsound to send work abroad when unemployment and high taxation prevailed at home. It was remarked that if the lower tenders were not accepted the Council would play into the hands of "rings." We turn to Glasgow for relief, for while the Tramways Committee by a majority inclined to accept a tender for German trolley wire, the Corporation subsequently gave the order to a British firm. In this instance it was explained that deliveries from the Continent were irregular, and as the present material was urgently required and could be supplied within seven days by the lowest British tenderer, the difference between £984 and £1,051 was not sufficient to justify adding to German employment and preventing the reduction of British unemployment.

In discussing the recommendations of the committees that have been recently making inquiries under the Safeguarding of Industries Act, the *Daily Telegraph* remarks:—

"There is a ground for believing that a considerable proportion of the unemployment which now exists in our midst can be traced to the unfair basis on which many foreign manufacturers compete with us in this country. They are able to carry on their industries under conditions which trade union leaders here would be the first to denounce. We are urged by every consideration to do all in our power to ensure that the British workers have at least an equal chance with the foreigners in supplying our own needs."

This should be the policy controlling the action of all who have public contracts to place in these days. To argue that we shall facilitate the re-establishment of international relations by placing orders abroad, as was done in one of the above cases, is to ignore the immediate interests of the workless million.

Overhead Lines.

Over twenty years ago French Government engineers had sufficient intelligence and foresight to realise that the advantages of electricity supply to the community in rural areas must outweigh the risk to the public on the highways, and possible injury to æsthetic amenities, so a law was enacted under which wayleaves for aerial lines alongside public roads in the country could be obtained at a small fee per post and per kilometre. As far as danger to the public is concerned, in the past our Whitehall bureaucrats strained at electrical gnats whilst swallowing, with ballot-box expediency, the motor traffic camel. The existence of so many miles of roadside power lines in rural districts has not apparently interfered with the tourist traffic in France, Italy, or Switzerland. It should be remembered, however, that in general the roads in France are wider and straighter than ours.

Reference was made by Lord Weir, in his speech at the Beama dinner, to the necessity of facilitating wayleaves for overhead lines, and as we have shown, it is fully recognised by leading authorities in the electricity supply industry, including the Councils of the I.E.E. and the I.M.E.A., that for the purpose of rural supply the existing regulations are unduly restrictive, to say the least. It is interesting to note in the Report of the Electricity Commissioners, mentioned above, that reference is made (p. 58) to the rights of the Postmaster-General in this respect, and a communication received from him by the Electricity Commissioners in August, 1923, is summarised. From this it appears that the Postmaster-General, as an act of grace, bears half the cost of protecting Post Office lines erected after those of authorised undertakers, the whole cost of fuses and heat coils, and the whole cost of a concrete partition between underground mains. The communication went on to say that Parliament had recognised "the danger inseparable from the presence of electricity power and supply undertakings on the public roads," and had required that precautions should be taken for the safety of other users of the roads; had provided for the protection of telegraphs and telephones; and had charged the Board of Trade with the duty of safeguarding the public. Presumably the word "undertakings" stands for lines.

Regarding this communication, we may point out that the Post Office has nothing at all to do with the safety of the public; its duty is to look after its own property and that alone. In our issue of September 28th, 1923, we printed an important article by Mr. W. H. Stoker, K.C., on the legal powers of the Postmaster-General, reference to which will show that compliance with his "reasonable requirements" is required by law, and that if his requirements are regarded as unreasonable—or disregarded—the difference of opinion is to be *settled by arbitration*. Undertakers should bear this in mind when they are confronted with stipulations which call for the erection of a so-called "safeguard" costing hundreds of pounds.

Electrical Christmas Gifts.—II.

Some Notes and Suggestions.

In our last issue we put forward a number of suggestions for Christmas presents which we hope have stimulated electrical dealers to a proper appreciation of the opportunities which occur at this time of the year. In the present article several more appliances are illustrated, most of them, perhaps, of more familiar appearance but none the less (or perhaps all the more) useful on this account.



Fig. 22.—The "Revo Junior" Loud Speaker.

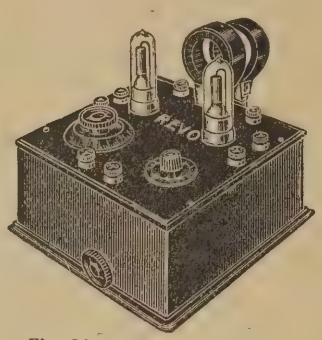


Fig. 23.—The "Revo Magna" 2-valve Set.

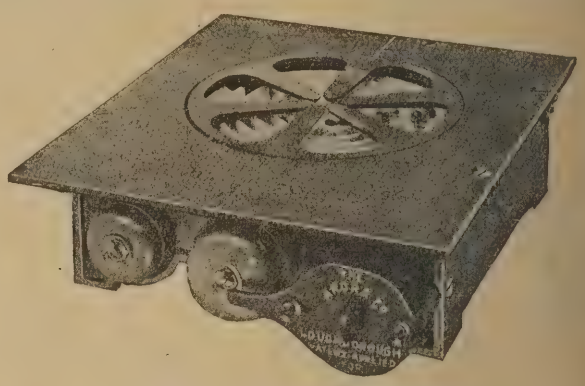


Fig. 24.—An "Arora" Boiling Plate.



Fig. 25.—The "Siemens Xcel" Vacuum Cleaner.

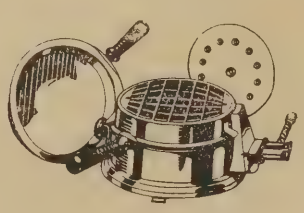


Fig. 26.—A Table Cooker.

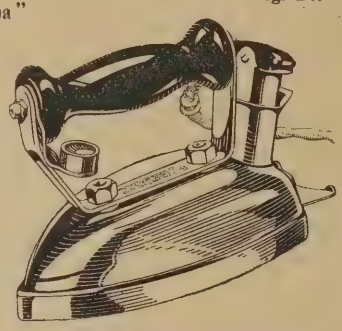


Fig. 27.—An "Xcel" Electric Iron.

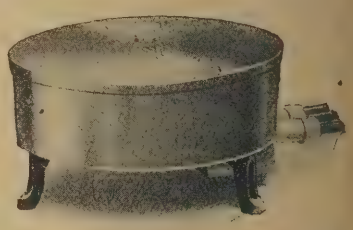


Fig. 28.—A "Carron" Boiling Plate.

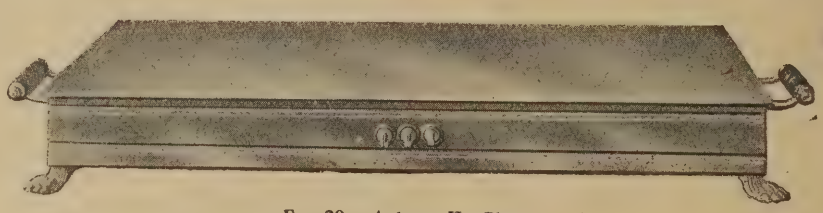


Fig. 29.—A large Hot-Plate.



Fig. 30.—A "Tricity" Shaving Pot.

We briefly referred in the preceding article to the assistance which is offered to sellers of electrical appliances by the British Electrical Development Association, and we have since received some new matter from that

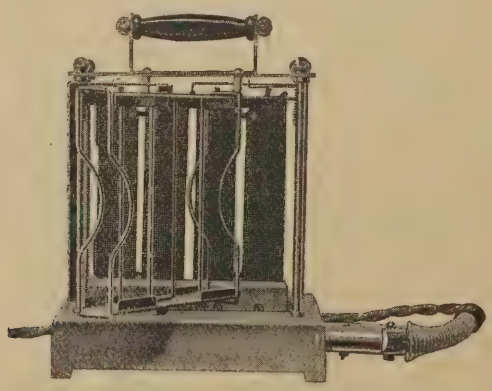


Fig. 31.—A "Creda" Toaster.

body which indicates the directions in which custom should be sought. One of the most effective means of drawing attention to electrical goods is the insertion of a seasonable advertisement in the local newspaper. For a very reasonable sum, printing blocks of very compelling advertisements can be obtained from the E.D.A. These are so arranged that matter appropriate to the particular locality in which they appear can be used with them. In this way local dealers can exercise their ingenuity to make the advertisements do the maximum amount of work for them. The bulk of the advertisements supplied by the E.D.A. deal with the question of Christmas presents from the "opposite sex" aspect. That is to say, they suggest to women what electrical gifts are likely to appeal to men, and to men what are considered appropriate presents for women. The most apt "slogan" contained in a booklet on Christmas presents which is being distributed by the E.D.A. is: "If there is a switch in your friend's house, or your own, your present should be electric." It is pointed out that electrical presents are up-to-date, useful, and practical. "Many of them weave themselves into the daily life of the recipients until the festive season comes round again, and indeed, for any of them a hundred useful commissions will be found for them in the course of the year."

So far we have treated the matter from the retailer's point of view, but we realise that a very great proportion of our readers are not retailers. Nevertheless, they are all givers of Christmas presents, and we would appeal to them to give electrical appliances first preference when choosing their gifts. In this way they will do their part in popularising electrical devices to the ultimate good of the whole of the industry, including themselves. If appliances are sold in increasing numbers, orders for generating plant, cables, &c., will be a natural consequence.

We would conclude this introduction with just one more reminder to dealers not to forget the potentialities of good window dressing during the Christmas season—and always.

Although in our last issue we illustrated many appliances which could be appropriately presented as Christmas gifts, the possibilities were far from exhausted. The suggestions sent in by manufacturers cover a very wide field, and we are thus enabled to give a further selection in this issue. As we have said, radio apparatus makers offer a large variety, and we depict two typical productions of the Cable Accessories Co., Ltd. The first (fig. 22) is a loud speaker, one of a number of patterns made by the company, this particular example being the "Revo Junior" type, which has an aluminium flare and is finished in black enamel and nickel plate. Fig. 23 illustrates the "Revo Magna" two-valve set, which is supplied complete with all accessories. A dual rheostat is fitted to enable either bright or dull-emitter valves to be used.

The boiling plate illustrated in fig. 24 is a product of the Arora Co. It has three sector-shaped elements, each of 500 W and the switching arrangement enables the whole of the loading to be used, or 1, ½, or ¾ kW as required. For the lowest heat the interlocking slide seen in the illustration is moved to the left. The appliance has a matt black finish.

There are many types of vacuum cleaner on the market; a typical machine is the "Xcel" pattern (Siemens & English Electric Lamp Co., Ltd.), shown in fig. 25. This can be provided with a number of accessories for various cleaning purposes. Another appliance supplied by the same company is the table cooker depicted in fig. 26. This is made with a single "heat" (600 W), or with three "heats"—250, 450 and 650 W. All manner of small cooking operations can be carried out with this device. Another example of electric iron is among the suggestions received from the company; this is illustrated in fig. 27.

A plain but well-designed boiling plate of the solid type is shown in fig. 28. This appliance is made by Carron Company in a number of patterns. Two ranges of loadings are provided, *viz.*, 600/750 W and 1,000/1,250 W. If desired, the larger sizes can be fitted with 3-heat switching.

The Credenda Conduits Co., Ltd., manufactures a wide range of domestic electrical appliances and a few examples are illustrated. Fig. 29 is a capacious hot-plate on which a number of dishes may be placed to be kept warm. It has a handsome finish which makes it a suitable appliance for the dining table and the elements are controlled by three snap switches. Another form of toaster is shown in fig. 31. This has a swinging reversible bread holder and a heat insulated handle. Fig. 32 is a familiar appliance, an electrically-heated saucepan. The article illustrated in fig. 30 is intended by its makers, the British Electric Transformer Co., Ltd., as a shaving pot, although the larger size (one pint, 400 W) has many other uses. It is made in copper and has a nickel-plate finish. This company also makes a warming plate for the table (fig. 33) of rather different design from that just mentioned. This is circular in shape, with a 60-W loading, and mounted on three legs. Its diameter is 7 in.

A loud speaker of very recent design, but already proved efficient, is the "Kone" pattern, illustrated in fig. 35, which is made by Standard Telephones & Cables, Ltd. (formerly the

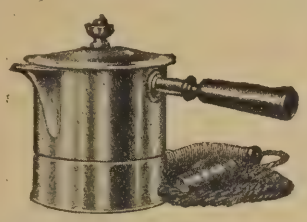


Fig. 32.—A "Creda" Saucepan.



Fig. 33.—A Tripod Warming Plate.

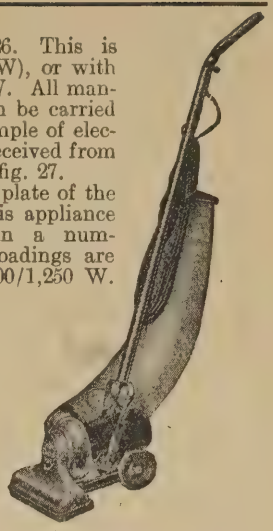


Fig. 34.—"Western Electric" Vacuum Cleaner.



Fig. 35.—The "Kone" Loud Speaker.



Fig. 36.—A Coffee-percolator Set.



Fig. 37.—A "Cosmos" Kettle.



Fig. 38.—The "Utility" Cooker-radiator.



Fig. 39.—"Cosmos" Boiling Jugs.

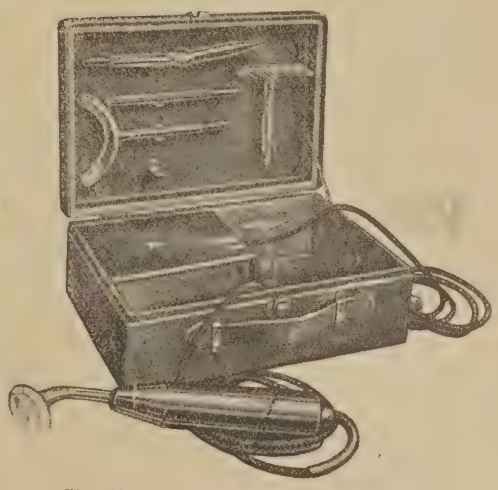


Fig. 40.—"Provita" Violet-Ray Apparatus.



Fig 41.—A "Belling" Iron.



Fig. 42.—A Combined Boiler and Griller.

Western Electric Co., Ltd.). The versatility of electrical manufacturers is exemplified in this case, the following articles being of a very different nature. Fig. 34 shows the "Western Electric" vacuum cleaner; while fig. 36 depicts a coffee percolator which is supplied by the company complete with a cream jug and sugar basin.

Another company of widely-separated activities is the Metropolitan-Vickers organisation. Although makers of the heaviest electrical machinery, they realise that the consumer is the most important unit of the electrical world, especially the domestic consumer. Hence they also produce numerous household appliances which are marketed by Metro-Vick Supplies, Ltd. Two examples are illustrated; the first (fig. 37) is a domestic kettle, and the other (fig. 39) a pair of boiling jugs of different patterns.

The device illustrated in fig. 38 serves a double purpose. Set vertically, as depicted, it is an electric heater. When placed in a horizontal position it can be used for a number of minor cooking operations. Below the elements is a space which will take a grilling dish, and a baffle plate is provided to cover the top of the elements and direct the heat downwards. The top plates are of polished aluminium, and the frame is of substantial construction. These units can be combined in pairs, threes, or fours to form efficient cookers, and the makers (Electrical Utilities, Ltd.) also provide an oven for use with these combinations.

One of the advantages of electric cooking appliances is their extreme portability; they can always be put into a convenient corner or on a table, and can be easily moved to another room if necessary. This must be our excuse for reproducing a view of yet another small cooking appliance (fig. 42). This combined boiler and griller is made by Messrs. Belling & Co. The boiling plate can be used as an open- or totally-enclosed ring, the element having three-heat control. The boiling plate cover acts as a baffle when it is required to do grilling in the "ovenette" which forms the body of the appliance. Another Belling product is the "Dinky" iron shown in fig. 41. This is a light-weight pattern with a detachable connector, with enclosed contacts, and a back rest.

Whether the effects of "violet-ray" apparatus are actually physical or merely psychological is still doubtful, but all the same it *has* effects and there is a demand for it. The "Provita" equipment supplied by the Qualitas Co., Ltd., and illustrated in fig. 40, is a good example of its kind. The generator and electrodes are contained in a leatherette velvet-lined case measuring 14 in. by 8 in. by 5 in. Five electrodes are provided—a surface "applicator," a comb electrode, an external throat electrode, a "saturator," and a rectal applicator. Several other sets are available, and there is a wide range of electrodes.

We conclude this article with an appliance of rather a larger nature than the foregoing, a "Creda" cooker (fig. 43) made by the Credenda Conduits Co., Ltd. The type illustrated is suitable for a family of from seven to ten persons. The exterior wiring and fuses are enclosed in a switchbox at the side; there is a lock on this to prevent any tampering by the children. The elements are arranged around three sides of the oven and the latter is bodily removable for cleaning purposes. The top of the appliance is fitted with two open-protected boiling plates and a 10 in. by 10 in. three-heat grill. The oven walls are double cased and lagged and the front and door are of substantial cast-iron construction. The oven loading is 2,000 W, and that of the hotplates and grill 1,500 W each.



Fig. 43.—A "Creda" Cooker.

The Electrical Trade and the British Industries Fair.

A Meeting at Birmingham.

Representatives of some of the British electrical trade organisations and the Press of the industry attended on Tuesday last week at the Birmingham Chamber of Commerce, whose Council had extended to them an invitation to visit Castle Bromwich Aerodrome—the venue of the Birmingham and Midland section of the British Industries Fair, which will again be held early in the New Year (February 15th to 26th).

Following an inspection of the aerodrome, the party lunched at the Chamber of Commerce with members of the Council of the Fair, with whom, as last year, the Birmingham Corporation is again actively co-operating in the work of organisation. The president (Mr. H. E. Parkes) presided, and supporting him were Mr. R. C. Rodgers, the chairman of the B.I.F. (Birmingham) Committee, and Mr. T. R. Martin, the vice-chairman (of the firm of Messrs. J. H. Tucker & Co.). The president accorded a welcome to the party, and invited their co-operation in assisting to make the forthcoming Fair as great a success electrically as it promised to be in other ways. The sole aim of the Birmingham Chamber was in every possible way to help British trade and commerce; and they were most anxious that the great electrical industry of the country should be adequately represented. Last year the representation was anything but satisfactory. That state of things they desired to alter, for they would recognise that it was very disappointing to many overseas buyers if anything were lacking in the electrical section.

Several letters of interest were read by Mr. Charles Stanley, the general manager of the Fair. Mr. R. A. Chattock, the chief electrical engineer of the Birmingham Corporation, wrote expressing his warm approval of the objects of the B.I.F.; they would have his warm support and co-operation in order to make the affair a great success. Mr. S. T. Allen, of the British Electrical Development Association, stated that he was strongly of opinion that the electrical industry should be adequately represented; and Mr. D. N. Dunlop (Director of the British Electrical and Allied Manufacturers' Association) wrote pointing out that nothing could be done this year in the way of bringing the Electrical Exhibition under the supervision of B.E.A.M.A. His view was that the only course open to the B.I.F. Council this year was to circularise the purely electrical firms in the "Beama," and to put the case to them as strongly as possible with a view to inducing them individually to take space. The letter to them should, if possible, give some idea of the total cost; of the expenditure to each individual firm; and if anything could be added as to the value of the Fair to electrical firms based upon their experience it would no doubt have a considerable effect.

Mr. R. C. RODGERS said it had frankly to be admitted that, whilst the Fair last year was very strong in some departments, the electrical industry was anything but satisfactorily represented. That was a source of surprise and disappointment to many overseas buyers, especially having regard to the efficiency and up-to-dateness of electrical manufacture. Already the advices received indicated that retail associations and other buyers of accessories, as well as shippers' associations, would be well represented. The gas industry had many stands, and it appeared that it would be to the advantage of the electrical industry, as well as to the trade of the country and the Empire, if manufacturers were prominently in evidence.

Mr. T. R. MARTIN pointed out that, whereas in 1924 the number of foreign buyers at his firm's stand was only 16, this year they numbered 191. It seemed to him that makers would find it good business to display their goods at the Fair for a series of years, for it was by such propaganda that enduring connections were built up. His earnest hope was that an appreciable addition would be made in the coming February to the number of electrical stands.

Mr. F. J. COLLIS, secretary of the Electrical Accessories Manufacturers' Association, said that, although he had no instructions from his members, the objects of the meeting had his sympathy, and the Council could rely upon him to do anything he could to further them.

Mr. F. HILARY JONES (a member of the Fair Council) stated he had recently been on an extensive overseas trade tour, and he assured them that in many countries, and especially in the Far East, very striking electrical developments were taking place. Although there was a good deal of competition from foreign countries, he was able to testify to the fact, from first-hand knowledge, that buyers were now realising that Great Britain was making a definite and very real attempt to recover her trade position. As to Canada, the domestic servant problem was more acute there than in this country: this meant increased reliance upon labour-saving equipment, and excellent scope for business in this domain was offered, especially if improvements could be made upon the American equipment. Having regard to the great manufacturing importance of Birmingham, he suggested that an excellent opportunity was now afforded for the display under one roof at Castle Bromwich of the electrical products of the industry.

Mr. A. H. BRIDGE (commercial editor of the ELECTRICAL REVIEW) expressed his sympathy with the movement to secure an effective electrical section at the Fair. His thoughts reverted to the fact that in the first years of the British Industries Fair no space could be afforded by the Board of Trade to the electrical industry. It was not until 1920, when the Birmingham Section of the Fair was started, that the electrical trade took a serious part in it. For a year or two the effort was fairly substantial, but subsequently, as they must remember, Wembley and the heavy cost of the magnificent electrical demonstration made there had occupied manufacturers' attention and their funds as well. Personally, he preferred the word "market" to "fair." The industry was well organised on the industrial side, and if by that exhibition the marketing and salesmanship sides could be developed, with effective propaganda work, which would serve to accelerate the rate of business, both home and overseas, real credit would be due to the Council. In 1920 and 1921, as he had said, there was a good representation of first-class electrical firms; but on each occasion he had to make his way among hardware and kindred goods in order to find the electrical products. The section was not properly organised, because it was no one's business in particular to organise it. While he was hopeful that the interests of the electrical trade would be well represented, it appeared to him that much better results would be secured if the trade, in its various phases, was housed together so as to afford facilities, in the easiest possible way, by which visitors could get in touch with the different classes of products. There were reasons for "a feeling of hopefulness" in the letter of Mr. Dunlop. If "Beama" could not do big things officially this time he was hopeful that many of the members individually (or perhaps the Association represented by Mr. Collis) would give their warm co-operation, as short as the time was, a show worthy of the electrical trade should be made in 1926. An industry with an invested capital of 600 million pounds sterling ought to have an adequate place in a great national trade event of this kind. The quality of the British product was extremely high and compared most favourably with the best of the manufactures of any country in the world. While he did not suggest that much should be done at the Fair in the display of large plant, he felt that there remained time during which arrangements could be made for comprehensive displays by the manufacturers of relatively small equipment. The manufactures of the members of the Cable Makers' Association were world-renowned for their high-class quality, and he thought that a collective exhibit such as they showed at Wembley, but of course on a small scale, would impress foreign visitors and do good to the industry.

Mr. JENNINGS, secretary of the Birmingham Corporation Electric Supply Department, pointed out that the City Council intended to give the fullest assistance to the Chamber of Commerce in the promotion of the undertaking, and so far as the display by electrical concerns was concerned, he gave the assurance that his Department was prepared to go far out of its way to assist. He hoped a concentrated effort would be made so as to ensure the creation of a real electrical section, in an area of its own. He agreed with Mr. Bridge that the British electrical industry—excellent as were its products—was somewhat lacking in marketing methods. The Americans were reaping the advantage of propaganda in various directions, and particularly in vacuum cleaners and other similar equipment. He suggested that a small committee should get to work to see what could be done to secure the industry's support.

It was decided to ask Messrs. Jennings, Martin, Collis, and Dunlop to serve on such a committee, with power to add to their number.

It was explained that there was a substantial block of space still available which could be allotted to the electrical trade where it could erect at small cost a number of suitable stands. The need for prompt action was emphasised in order to secure that space, but it was also remarked that representative collections of products to fill the simple stand or shop structures could speedily be brought together from stock.

Communications regarding space, &c., should be addressed to the Secretary, Chamber of Commerce, 95, New Street, Birmingham, or to the D.O.T. in London.

The Engineering Exhibits.

We are informed that one of the most satisfactory features of the forthcoming Fair (White City and Birmingham) is the return of numerous firms whose temporary absence during the previous two years was due to their concentration on the British Empire Exhibition. Though the two events were of an entirely different character, the Fair being essentially a trade display, many large undertakings found it impracticable to show at both; this was especially the case with engineering firms whose exhibits at Wembley throughout the summer months made considerable demands on both staff and plant. This temporary change of venue was bound to have an effect on the Birmingham Section, which deals in the main with the heavier classes of industry. It is noteworthy, however, that owing to the advent of new exhibitors, these groups were maintained at practically their former standards. Group No. 5 for instance, of the Birmingham Section, which comprises: Engineering plant; general machinery, machine tools; transmission and hauling appliances; foundry requisites; rolling mill plant; weighing, measuring, and testing instruments; and industrial equipment generally, occupied in 1924 and 1925 an area equal to that of any previous year. We are informed that it is now certain that next February, for the reasons indicated, the engineering exhibits at Birmingham will be at least three times as large as on any previous occasion.

More than 50,000 invitations to the 1926 Fair have been issued by the Board of Trade to buyers abroad, and we understand that analysis of the acceptances already to hand shows that those interested in engineering products will form a strong contingent.

Firms who wish to take space may know that ample provision has been made by the Corporation for power supply, but early application will greatly facilitate the arrangements necessary in cases where a supply is required.

We have not at hand at the time of going to Press a list of the electrical firms who have already taken space, but among the engineering exhibitors are:—Birmingham Small Arms Co., Ltd.; Blackstone & Co., Ltd.; Geo. Bray & Co., Ltd.; Coalbrookdale Co., Ltd.; Crossley Bros., Ltd.; Dennis Bros., Ltd.; Ford Motor Co. (England), Ltd.; Alfred Herbert, Ltd.; Lightfoot Refrigerating Co., Ltd.; Morris Commercial Motors; National Gas Engine Co., Ltd.; Nobel Industries, Ltd.; Relay Automatic Telephone Co., Ltd.; Ruston & Hornsby, Ltd.; Tangyes, Ltd.; Taylor & Challen, Ltd.; and Vickers-Petters, Ltd.

Canada and the Export of Power.—A prominent American hydro-electric expert recently read a paper which purported to show that it was to Canada's economic advantage to sell her surplus hydro-electric power to the United States. The opposite view was presented by Mr. Julian C. Smith, vice-president and general manager of the Shawinigan Water & Power Co., and his opinion is stated by the Toronto *Electrical News* to be "right and final." Mr. Smith showed that the interchange of commerce between the United States and Canada was decidedly in the former's favour. He also presented figures showing that although there was a temporary surplus, all the power which Canada could possibly develop would be required in from 15 to 20 years. Apart from this the export of power would aid Canada's competitors, low-priced power being a strong stimulant to new industries. Once power was exported immense vested interests would arise which would be powerful enough to prevent the stoppage of the supply when Canada required the power herself.

The Times reports that in a recent speech, Mr. Taschereau, Premier of Quebec, referring to the St. Lawrence waterways and other schemes, said:—"There are two things we will not have. One is that the waters of the rivers of this province be used to generate electric power for export to the United States; and the other that developments be carried out in the St. Lawrence River within our control that would injure the Port of Montreal." The Premier argues that the recent decision of the Privy Council established the principle that the bed of the St. Lawrence River belonged to the province as far as it is within the territory of the province. Therefore the international waterways project "cannot be carried through without the consent of the Government of the United States, of the Federal Government of Canada, and the governments interested in the Canadian provinces."

The Bradford Electricity Undertaking.

Some Recent Switchgear and Sub-Station Developments.

(*Concluded from page* 863.)

It was evident to visitors on the occasion of the inauguration of the new plant, which was described last week, that progress in the Bradford Corporation's Electricity Department had not been confined to the generating plant. The 17 metal-clad panels of Messrs. A. Reyrolle and Co.'s manufacture, comprising the main generating-station switchboard, one of which was operated by Sir John A. Snell, Chief Electricity Commissioner, when he switched in the new transformer and 49,500-volt transmission line to Thornbury, have a rupturing capacity of upwards of half a million kVA and are complete with duplicate busbars and automatic busbar indicating devices.

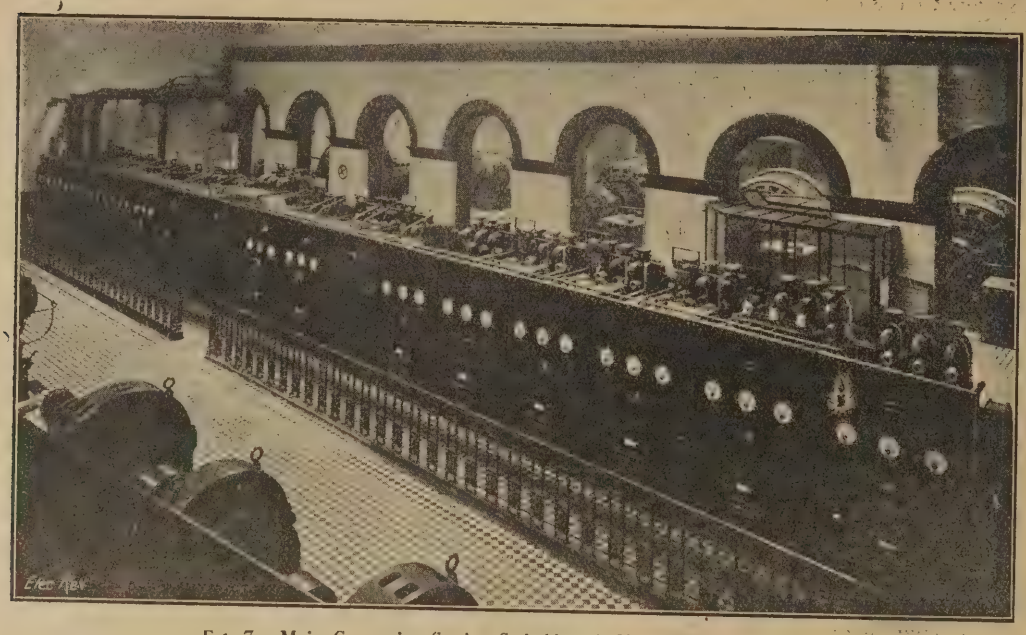


Fig. 7.—Main Generating Station Switchboard, Valley Road, Bradford.

The original installation, consisting of four panels, operated by hand wheels, at the back of a slate board as shown at the left-hand end of fig. 7, was installed at the Valley Road power station in 1921, and experience with it influenced Mr. T. Roles's decision to use metal-clad switchgear for extensions and to completely replace the existing cellular gear; fig. 7 shows the complete board to date, the extension panels at the right-hand end being electrically operated. The absence of the complete instrument equipment usually associated with generator panels, of which there are three on this board, is accounted for by the fact that an existing desk-type control board on the switch gallery proper was dismantled and re-equipped with the necessary instruments and controls, leaving only emergency operating devices and indicating apparatus upon the slate board shown in the first of the accompanying illustrations, fig. 7.

It is noteworthy that one of the panels on this switchboard, namely, that for the 20,000-kW generator, is the largest of its kind as regards carrying capacity ever manufactured in the metal-clad form, having a normal capacity of not less than 3,000 amperes at 6.600 volts. Moreover, all switchgear is consistently purchased for 12,000-volt operation, although the present operating voltage is 6.600 V. The distance energy has to be transmitted in Bradford and district has become too great for economical operation at the present pressure of 6,600 volts, and the pressure of 49,500 volts, it is claimed, is the highest which has yet been adopted for underground transmission by any municipal electricity undertaking in this or any other country. Two three-core cables, each conductor having a sectional area of 0.25 sq. in. of copper, have been laid between the Valley Road power station and the Thornbury sub-station, and in all probability they will be extended to other districts; one will act as a duplicate of the other, and each cable can transmit about 20,000 h.p., as compared with 2,600 h.p. by the same size of cable at 6,600 volts. Composite pilot and telephone cables have also been installed and on a site near the Valley Road power station, two Hackbridge transformers, each of 2,500 kVA capacity, are installed in the open air to step-up the pressure. The size and number of transformers will be increased as required; they weigh 25 tons each and special lifting tackle has been provided. The 3-phase 50-cycle oil-cooled transformers have both primary and secondary windings star connected with closed mesh tertiary windings. Secondary adjusting tappings give ± 2½ and 5 per cent., while the primary winding is arranged for series-parallel operation at either 49,500 or 24,750 volts.

In 1920 the erection of a new building on the site of the original generating station in Bolton Road was approved: The first section has been completed, and now accommodates in the basement converting plant of a capacity of 4,500 kW, while the upper floors are being utilised as the offices, workshops, and stores of the consumers' department and the electrical testing laboratory. The remainder of the original works will shortly be demolished in order that the second section of the new building may be proceeded with to provide space for additional converting plant.

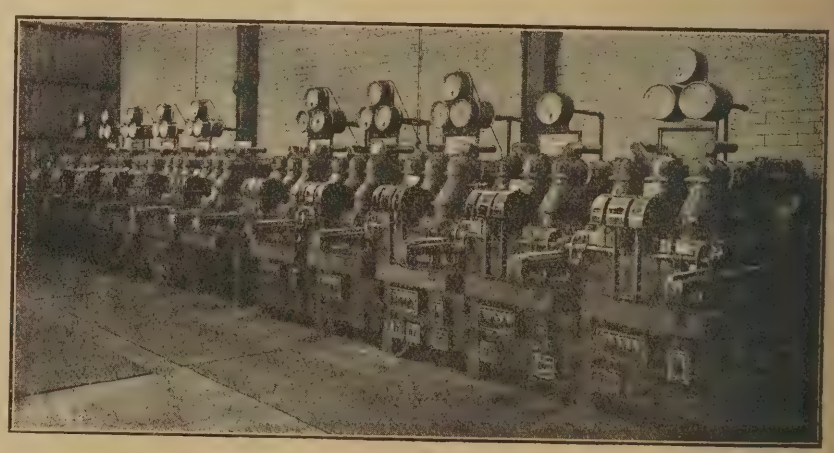


Fig. 8.—Bolton Road Sub-station Switchgear; Hand Operated.

A building in Sunbridge Road, formerly occupied by a small generating set taking steam from a refuse des-

tructor, was reconstructed about 12 months ago and 4,520 kW of converting plant installed therein, while to supplement the existing arrangements for tramway supply, a new sub-station at Four Lane Ends will accommodate two 500-kW completely automatic converters, one of which is now ready to go into service; 500-kW automatic sets are also being installed at the Thornbury and Odsal sub-stations, it being the intention that the

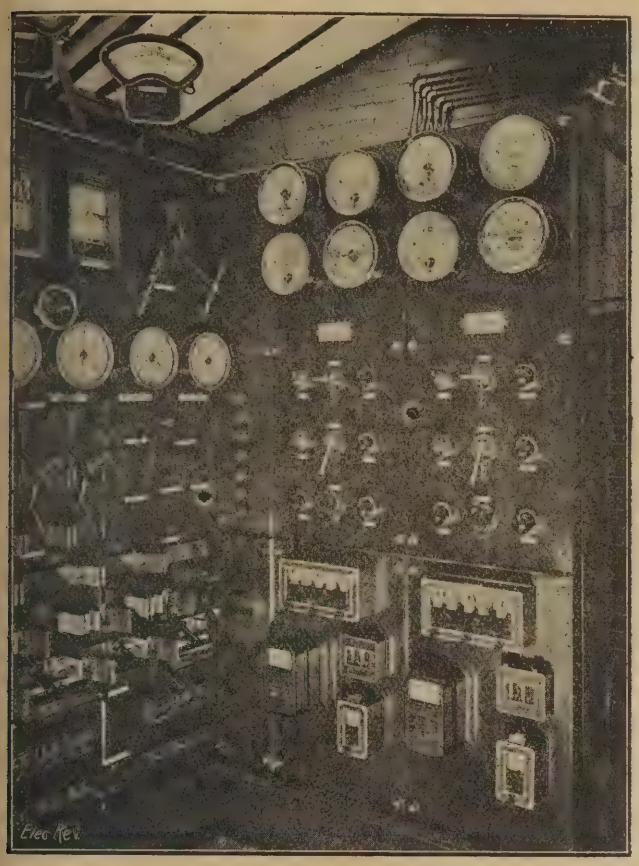


Fig. 9.—Sunbridge Road Sub-station; Remote Control Panel.

whole of the traction converting plant outside the Valley Road works shall eventually be operated without continuous attendance.

The policy of installing one make of switchgear has been extended throughout the rest of the network. At the Bolton Road sub-station a Reyrolle metal-clad switchboard of eleven panels of the single-busbar type, with a rupturing capacity of a quarter of a million kVA, controls both the sub-station equipment and also an important section of the network. As will be seen from fig. 8, this gear is of the direct hand-operated pattern and the small amount of space it occupies makes room available for converting plant in a position in the city where sites are valuable.

The reconstruction of the Sunbridge Road sub-station made it necessary to install remotely-controlled electrically-operated switchgear in the basement immediately below the machines, where any fault on the switchgear or connections would allow flame to spread and probably destroy the machines and building, owing to the strong draught through them for ventilating purposes; Reyrolle metal-clad switchgear was the natural solution of the problem.

The nine-panel board has a rupturing capacity of a quarter of a million kVA and fig. 9 shows the way in which the remote-control panels were placed at either end of the main direct-current board, a procedure rendered necessary by the small space available, being at the same time an extremely handy arrangement as regards operation.

Considerable re-organisation of the transmission and distribution systems has taken place at Bradford during the past year, and in this case also metal-clad switchgear has been installed throughout, and we understand this is now a definite policy of the Bradford Corporation. Fig. 10 shows typical static sub-station switches, indicating also a method of isolating individual legs of looped-in feeders by the use of metal-clad oil-immersed isolators.

The new traction sub-station at Four Lane Ends has been built at a point where three tramway services con-

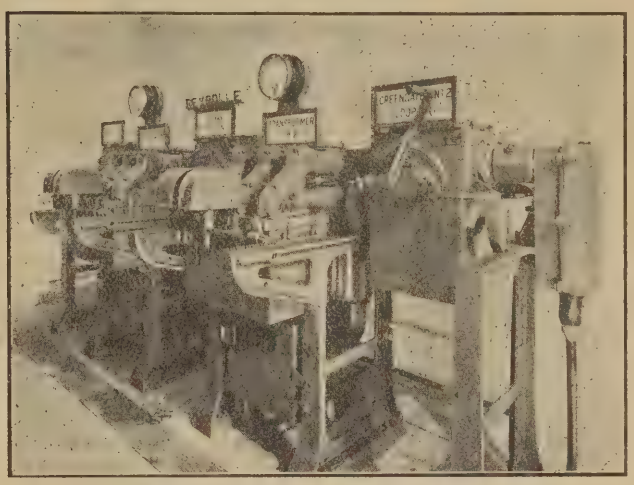


Fig. 10.—Harrogate Road Static Sub-station Switchgear.

verge towards the city, a position where the growing demand urgently required additional support. Fig. 11 is a general view of the first set installed in this sub-station, a Peebles-Reyrolle 500-kW completely automatic equipment, such as has already been installed in the Gorton sub-station of the Manchester Corporation, in various sub-stations of the Brighton Corporation, and elsewhere. The motor-converter is a standard Bruce-Peebles machine receiving three-phase energy at 6,600 volts, 50 cycles, and delivering direct current to the track at 525 volts. In addition to a considerable overload capacity specified on account of its traction duties, this machine can be run as a lighting set when neces-

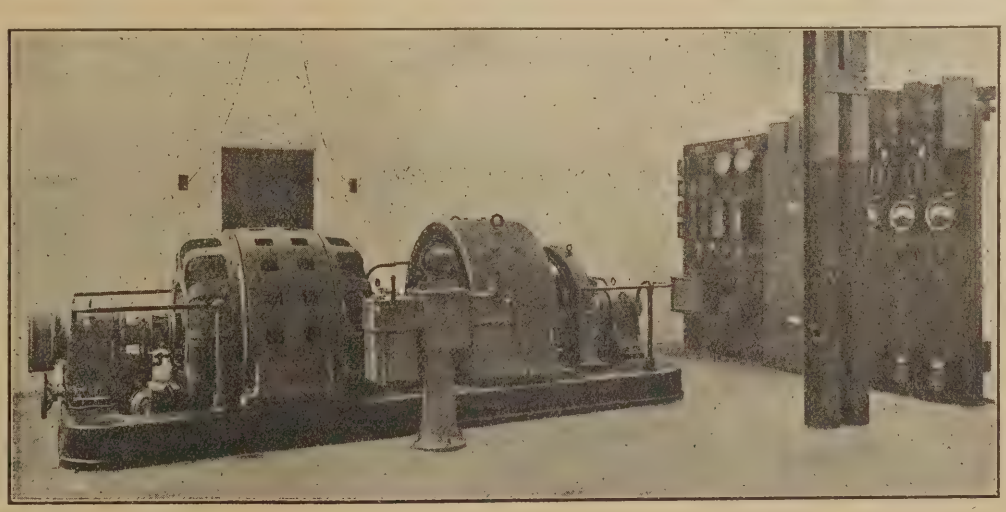


Fig 11.—Four Lane Ends Automatic Sub-station.

sary, thus making it interchangeable with a number of similar sets on the system. The automatic control gear, in common with the e.h.p. switchgear in the building, is of Messrs. Reyrolle's manufacture. Fig. 11 shows the complete automatic equipment with the choke coil and rotor short-circuiting contactors on a pedestal in the foreground. Each contactor is complete with handles

for manual operation, when necessary, the pedestal being surmounted by a synchronising voltmeter. The starting resistance and choke coils are in the basement below, the connections passing down the tubular standard.

The relay board is noteworthy on account of its simplicity, the robust electromagnetic relay used throughout, and also the neat arrangement of the connections behind the board, where the cubicle form of construction has been adopted to afford access to every individual conductor, as well as to accommodate in a dust-tight chamber the resistance and auxiliary devices.

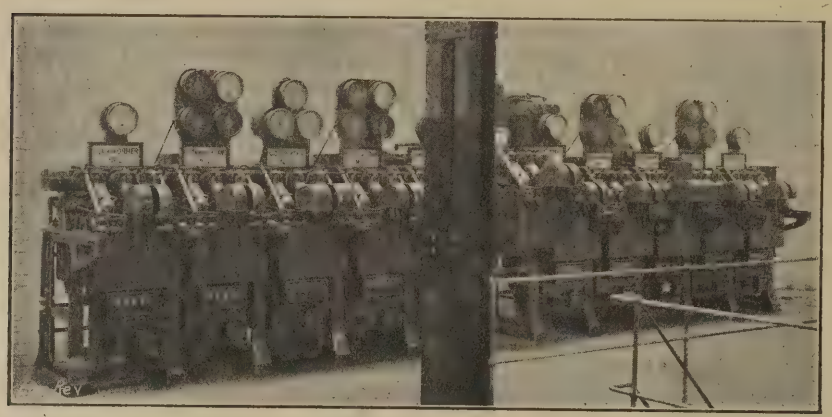


Fig. 12.—Automatic Sub-station H.P. Switchgear.

The direct-current output is communicated to the busbars through the medium of a Reyrolle reactance type circuit breaker, which combines the functions of a high-speed breaker and a low-speed closing device in one unit, and is in itself a complete machine control panel. The principle of electrical reactance has been combined with the series blow-out coils and the main circuit-opening device in an ingenious way. The apparatus is totally enclosed in a sheet-steel cubicle, to be seen in the centre of the switchboard and partly hidden by the upright girder in fig. 11; an armature is held in a given position by shunt coils throughout the whole of the time the main contacts are engaged, and is moved to the open position when the magnetisation of the series coils overcomes that of the shunt coils, the movement of the armature being further accelerated by the drop in voltage incidental upon short-circuit conditions and by a heavy throw-off spring.

The reactance incorporated in this circuit breaker limits the immediate current rush to a value of approximately half the minimum it is possible to obtain with an ordinary high-speed breaker without such characteristics. This has the effect of reducing the commutator energy at the time of the short circuit and has, in itself, provided a margin for heavier contacts capable of withstanding larger continuous loads without heating than those usually associated with high-speed circuit breakers. It is claimed that this apparatus renders rotary plant immune from flashover. Fig. 12 shows the e.h.p. switchgear for controlling the plant in this sub-station, together with an important section of the distributing network.

We are indebted to Messrs. A. Reyrolle & Co. for the photographs and details of the switchgear.

The undertaking has 15,109 consumers with a maximum demand of 31,590 kW, the plant capacity (m.o.r.) being 64,000 kW. The energy sold amounts to 69,347,691 kWh per year and the revenue to £483,385, while extensions since 1907 have involved a capital expenditure of over £1,815,000.

The Shipping and Engineering Exhibition.

A Review of the Principal Exhibits of Electrical Interest.

The Shipping, Engineering and Machinery Exhibition has weathered vicissitudes. With the lifting of the industrial cloud, hope inspires confidence, and this year's show (at Olympia, November 23rd to December 5th), which was opened by the First Lord of the Admiralty, proves that, though trade may sleep for a while, the spirit of enterprise does not; indeed, it cannot afford to do so. A slack period, by freeing the mind from the monopoly of the needs of the hour, affords it an opportunity to plan for to-morrow; it is well to be ahead of the demand.

The official recognition which has been enjoyed by this exhibition in the past has been extended, for in addition to the co-operation of the Society of Motor Manufacturers and Traders, Ltd., and of the Ship and Boat Builders' Association, the section devoted to internal-combustion engines, motor boats, yachts, &c., has been staged under the ægis of the British Marine Oil Engine Manufacturers' Association, whilst the main exhibition has, for the first time, the official support of the British Engineers' Association (Inc.). The chief officers, with one exception, remain unchanged under the presidency of Sir Charles A. Parsons, K.C.B., F.R.S., and the committee of experts is again serving under the chairmanship of Dr. H. S. Hele-Shaw. Ten lectures and papers are being delivered, and some 40 institutions and societies have arranged for official visits to the show, amongst them being the Institution of Electrical Engineers, the British Electrical Development Association (Inc.), and the Institution of Welding Engineers, whilst the entertainment of the Council and officers of the Women's Engineering Society to luncheon by the exhibition authorities was a graceful tribute to the part women are now playing in the engineering industry.

One of the most interesting features, perhaps, is the steady development of aids to navigation, and in this category radio apparatus plays no small part.

Radio Apparatus.

On the stand of the Radio Communication Co., Ltd., a model "wireless room" contains a 1.5-kW spark and

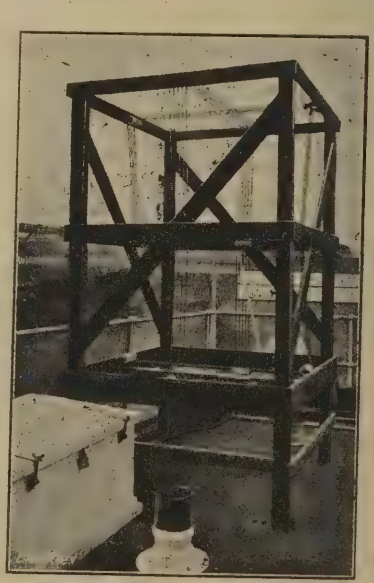


Fig. 1.—Marconi Fixed-frame Direction Finder.

c.w. transmitter and receiving apparatus, whilst other items include a ½- and ¼-kW spark installations, an

automatic calling device, a lifeboat set, and improved direction-finding equipment, some features of which were described last week; the Company's broadcasting department is also represented by a range of "Polar" receivers and accessories.

The Marconi International Marine Communication Co., Ltd., shows eight pieces of apparatus for a variety of purposes. In a model cabin is fitted a complete 1½-kW ship's installation, including both quenched-spark and valve transmitters, emergency apparatus, direction finder, and a marine receiver. The Marconi marine direction finder makes use of two small fixed-frame aerials of special construction fig. 1, instead of the large loop aerial

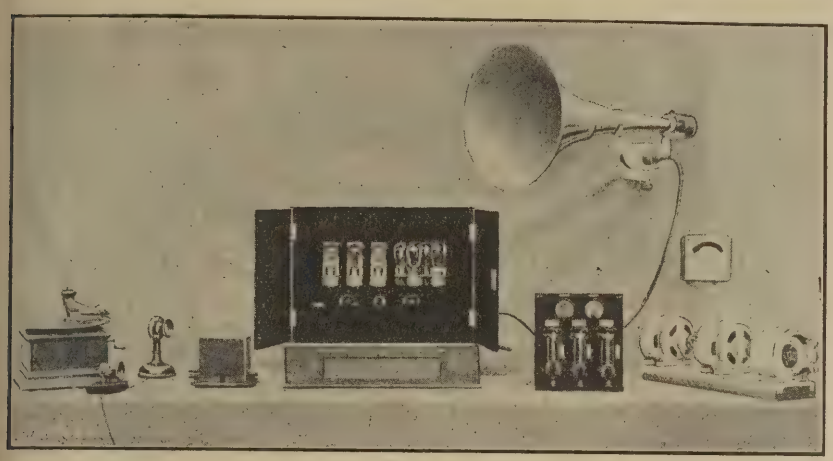


Fig. 2.—A Ship's Orchestra Repeater.

hitherto necessary. The new arrangement does away with all the difficulties encountered in supporting the aerial system with sufficient rigidity. The frame is an open teak structure, approximately 8 ft. high and 4½ ft. square. The new type effects economy both in space occupied and in cost of fitting, while making it possible to place the d.f. instrument in any part of the vessel. A ¼-kW set is exhibited in a smaller model cabin, comprising a quenched-spark transmitter and valve receiver; the transmitter can be operated either direct from the ship's mains, or from an independent storage battery.

As interference from spark telegraphy renders the reception of broadcast concerts at sea difficult, the marine receiver No. 1 (V4) has been designed for yacht owners and passenger ships. It embodies protective circuits and is adjustable for any wave-length from 300 to 3,000 metres, and will normally receive any B.B.C. station under sea-going conditions at 250 miles, and the more powerful stations at Daventry and Paris (Radiola) at 750 miles.

The band repeater for ships, fig. 2, is not strictly wireless apparatus; it comprises a broadcasting microphone, amplifier, and loud speakers to enable music played by an orchestra, or gramophone, to be reproduced in various parts of the ship. The apparatus can be installed with plug-and-socket connections on the decks and in the saloons, lounges, &c., and a generator supplies the power for the filaments and anode circuits, thus obviating the use of batteries which have to be maintained. The Marconi 4-second alarm, fig. 3, is also on view; the calling device transmits flashes of four-seconds duration, which operate the alarms on similarly equipped ships. The apparatus on the right is the 3-valve receiver and relays which cause the bell to ring.

Messrs. Auto Sundries, Ltd., exhibit broadcast receiving equipment and "Radiosun" loud-speakers, together with a range of searchlights suitable for lifeboats and similar sized vessels. Headphones and loud-speakers are also to be seen on the stand of Messrs. G. Brown, Ltd., whilst Messrs. Siemens Bros. & Co., Ltd., are showing, amongst many other items, a cabinet type ship's ¼-kW telegraph outfit that is operated from a small motor-generator, which is fed from a 50-volt battery of accumulators. The current obtained from the alternator is led through a transformer to the excitation circuit, which consists of inductances, condenser, and quenched-spark gap. An aerial variometer is provided for tuning the aerial circuit, and the receiver is a single-valve and crystal instrument with separate tuner covering all standard commercial wave-lengths of both spark and continuous-wave transmission; a regenerative reflex circuit is employed. An installation for motor lifeboats is also shown which can be operated off a small petrol-driven alternator, or by means of a motor-generator driven by current from a battery. The voltage of the alternator is transformed to 4,000 volts by a closed-core transformer, and fed to the excitation circuit, which consists of a Dubilier mica condenser, a 4-part quenched-gap, and an excitation inductance of copper strip. The receiver has one high-frequency valve, one rectifying valve, and one low-frequency valve. By means of switches the third valve may be cut out when not required, while in emergency a crystal detector may be brought into use.

A feature is a single rotating frame direction finder, which consists of a frame aerial enclosed in a tubular ring, 3 ft. in diameter, mounted on a cast-brass column, which in turn is bolted directly to the deck of the vessel. The whole of the column and ring revolves on ball bearings, and the receiver consists of a multi-valve set completely enclosed and electrically screened. This direction finder is claimed to be the only type so far produced having a watertight aerial of comparatively small dimensions that will take accurate bearings on continuous or interrupted c.w. signals, as well as on spark signals.

Electrical Switchgear.

The range of electrical switchgear exhibited by the Igranic Electric Co., Ltd., is very extensive, and includes the latest type of star-delta switch, fig. 4, fitted with a patent thermostatic overload relay movement. The switch is of the drum type; revolving arc barriers are provided between each of the fingers and construction on the unit principle provides free accessibility and easy replacement of worn parts. An interesting item is an automatic multiple-contactor self-acting starter, fig. 5, used for motors driving air compressors and hydraulic and centrifugal pumps on a direct-current supply; these panels operate at from 110 to 550 volts. Fig. 6 shows an automatic starting rheostat and speed-regulating panel which is used in connection with machine tools, printing presses, &c. Such controllers enable a considerable saving of time to be made in preparing the machine and setting up the work. Hand-operated and automatic starting panels for both a.c. and d.c. motors are exhibited, together with battery-charging panels, theatre dimmers, &c. A model lifting

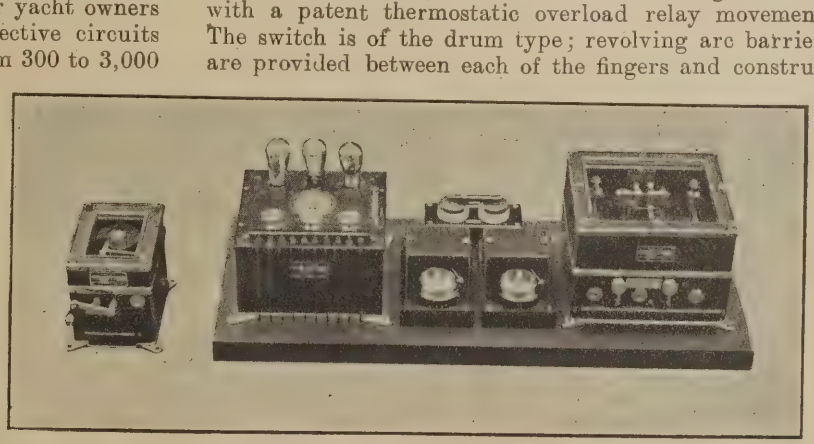


Fig. 3.—A 4-second Radio Alarm Device.

magnet is shown in addition to a range of the well-known Igranic radio devices.

"Vauxhall" switchgear is displayed by the Electrical Apparatus Co., Ltd.; also motor control gear and electricity meters. The smaller panels suitable for wall or bulkhead fixing include a miniature size for ventilating fans, &c. The heavy roller contact starters embody magnetically-operated contactors for heavy

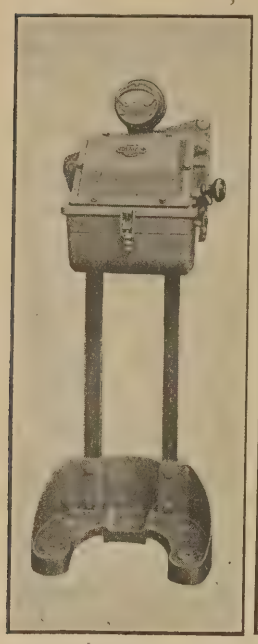


Fig. 4.—Igranic Star-Delta Switch with Thermostatic Overload Relay.

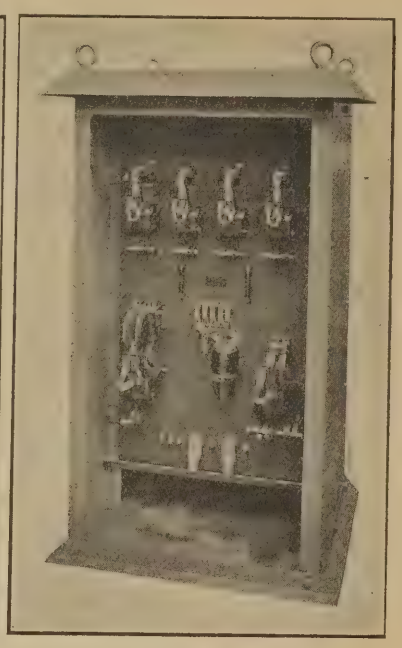


Fig. 5.—Multiple Contactor Self-acting Starter.

duty; a large size is on view in which the roller contacts have been replaced by manually-operated contactors, one for each step.

Swiss Rural Distribution Gear.

Mr. J. B. Rudkin (representing the Sprecher & Schuh Co., Switzerland) is showing gear that is of special interest in connection with the development of rural distribution of electrical energy. A 3-pole, 45,000-volt outdoor type overhead transmission line sectioning switch combined with h.p. expulsion type fuses contains no cement of any kind for the purpose of fixing the metal parts to the insulators, all such fixing being done mechanically; cement is a source of danger, since through its expansion on account of atmospherical variations, insulators may burst. The line-sectioning switch exhibited is built for mounting on the flat top of an iron transmission tower; the fuses are accessible from a platform and the switch is operated by means of a lever contained in a cast-iron case fitted with a lock and key. Unless the operating lever be moved completely to its "on" or "off" position, the cover of the case cannot be closed and locked. This simple interlock guarantees, therefore, completion of the switching operation, excludes the possibility of leaving the switch in a half open or half-closed position, and also excludes the possibility of the self-closing of the switch in a gale. Identical switches to the one exhibited are giving full satisfaction on a transmission line of the Clyde Valley Electric Power Co.

A 3-pole, 12,000-volt automatic overload outdoor type line-sectioning switch shown is fitted with a direct acting overload time-limit release and a loose handle attachment, the former being protected against the weather by metal hoods, and the

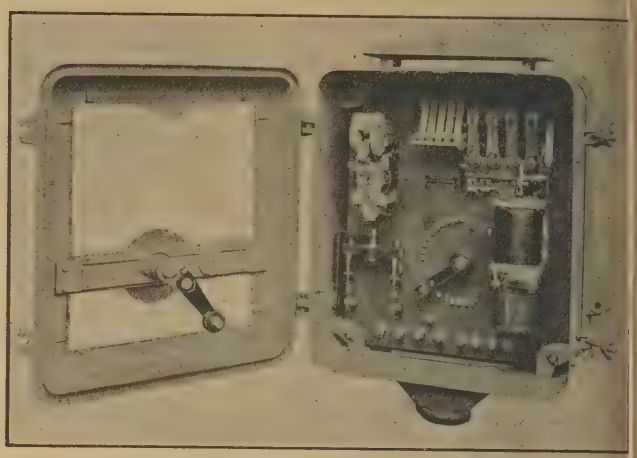


Fig. 6.—Automatic Starting Panel.

switch will, it is claimed, operate under all climatic conditions; an exclusive feature is the isolation of the tripping gear by standard post-type porcelain insulators. The mast transformer station represents a cheap self-contained outfit for supplying electrical energy to small isolated consumers, such as groups of houses, isolated farms, &c.; besides the choke coils, primary and secondary fuses, surge protecting gear can be fitted if required. Operation of the 3-pole, 12,000-volt, oil-immersed circuit breaker shown is effected by a handwheel, all active switch parts being fixed to the cast-iron cover, which in this way forms practically the base plate for the entire mechanism. The overload time-limit releases are mounted direct on top of the switch terminals. The switch is characterised by very strong construction, long break, high switching velocity, and consequently high breaking capacity.

Knife switches for switchboard mounting, nickelled to avoid tarnishing, are made in sizes up to 1,000 amp., and in others for back-of-panel mounting with the operating lever only on the front of the panel, no porcelain is used as insulating material. The contacts are fixed mechanically to iron bars which are surmounted by insulating material, and these switches are specially used for factory or mining gear so as to guard the live metal from accidental touch, being built in sizes up to 4,000 amperes.

(To be continued.)

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Hackney Propaganda.—During the ensuing winter season the Hackney Electricity Department is arranging a series of interesting lectures on electricity and closely-allied matters for the public. In the list which we have received we notice a number of well-known names. Mr. Ll. B. Atkinson is to speak on "The Romance of Copper"; Mr. A. F. Berry has tentatively chosen for his subject "Electrical Heating and its Relation to Health"; and Mr. T. H. Windibank is down for a lecture on "Some Problems in Electric Driving." Most of the lectures are to be illustrated by films which should add to the attraction. On December 10th, at the Demonstration Halls, a film entitled "Coal Heap to Consumer" is being exhibited; Alderman Mrs. Hammer is to lecture on "A Woman's Best Friend," and there will be an exhibition of electrical appliances which will also be demonstrated.

Glasgow and the Scottish J.I.C.—A committee of the Glasgow Corporation advises the Corporation not to contribute to the working expenses of the Scottish District Joint Industrial Council for the Electricity Supply Industry.

A West Ham Poster.—Mr. F. W. Purse, engineer and manager of the West Ham Electricity Department, has sent us a specimen of the first of four posters which his department is issuing. This is headed "Return to Gold Standard," and states that the one-pound note (illustrated) is now worth its face value in gold, while the electric lamp (also illustrated) is worth its weight in gold.

G.E.C. Underground Equipment.—The General Electric Co., Ltd., has recently received two repeat orders from the London Electric Railway, for complete electric traction equipments for new rolling stock. These will be precisely similar to those already supplied by the company for the new Morden extension. The orders comprise complete equipments for 48 motor coaches, 67 control trailer coaches, and five ordinary trailer coaches, bringing the total of traction equipments of this type ordered by the London Electric Railway from the company to 95 motor coach, 78 control trailer, and 55 ordinary trailer coach equipments.

The F.B.I. and Foreign Loans.—The Federation of British Industries has written to the Chancellor of the Exchequer expressing its appreciation of the removal of the embargo upon foreign loans. At the same time it is pointed out that the instability of currency in a number of countries has serious reactions upon British trade, and it is therefore urged that the Government should prohibit the floating of loans in Great Britain by these countries unless they are intended to secure the stabilisation of currency.

A "Chloride" Conference.—It is the practice of the Chloride Electrical Storage Co., Ltd., to convene periodical conferences of its sales representatives, a practice which is to be recommended in view of the useful interchange of experi-



A "Chloride" Conference.

ence which takes place. We reproduce herewith a photograph of the executive and sales staff of the company taken at a recent conference at Clifton Junction. In the centre of the group are Mr. W. S. Naylor, the managing director, and Mr. D. P. Dunne, director and sales manager.

"The Truth."—A performance of "Nothing but the Truth," which was to have been given on Friday last by Henley's Dramatic Club, was postponed owing to the death of Queen Alexandra. It will take place at King George's Hall, Caroline Street, Great Russell Street, W.C.1 (near Tottenham Court Road station), on Saturday, December 12th.

"Magnet" Christmas Gifts.—The General Electric Co., Ltd., is issuing a booklet and a brochure dealing with its plans to encourage the sale of its appliances as Christmas gifts. The booklet contains illustrated details of the domestic and radio devices that are available, while the brochure includes pictures of shop-window displays which the company is willing to supply to dealers.

A Large Electric Sign.—Messrs. Lewis, the prominent drapers, &c., have erected a very large electric sign upon the front of their Liverpool premises above their show windows.

Electrical Trades Commercial Travellers' Association.—The annual meeting of the Association was held on November 13th, when the officers were unanimously re-elected *en bloc* and fifteen new vice-presidents were appointed A letter from the Railway Clearing House was read promising substantial reductions in commercial travellers' week-end fares. A satisfactory balance sheet was presented.

British Malayan Electrical Imports.—The bulk of electrical goods and machinery imported into British Malaya continues to be of United Kingdom manufacture. The following comparative table setting out the value of imports during the whole year 1924 and the value of imports during the first eight months of the current year shows an increasing demand. Electrical development in the country is progressing and an even greater demand may be anticipated in the near future.

Country of origin.	Electrical goods and apparatus.		Electrical machinery.	
	1924.	1925. Jan.-Aug.	1924.	1925. Jan.-Aug.
	£	£	£	£
United Kingdom ...	222,545	210,819	73,583	80,456
British Possessions ...	2,470	2,903	732	908
Continent of Europe	17,672	17,401	10,983	12,934
United States ...	13,947	12,069	29,638	5,130
Japan	4,712	7,738	—	410
Other countries ...	1,940	6,182	1,286	1,365
Total ...	£263,286	£257,112	£116,222	£101,203

Social Events.—The Welfare Club of the Southport Corporation Electricity Department held their annual dinner on Tuesday, November 24th. In addition to the chairman and vice-chairman of the Committee, Mr. F. Crawford, manager of the Liverpool Branch of the General Electric Co., Ltd., and the G.E.C. Troupe of Entertainers were present. During the evening Councillor Little, a past-chairman of the Electricity Committee, presented a shield to the winner of the Departmental Bowling Handicap.

The E.T.U. London Station Engineers, No. 1 Branch, held their ninth annual concert on Tuesday evening at "The Brighton," Queen's Road, Peckham.

A B. I. & H. Housing Scheme.—In a recent letter to *The Times*, Mr. D. Sinclair, managing director of the British Insulated & Helsby Cables, Ltd., gave details of a scheme by which a number of the company's employés, with the company's assistance, have secured houses at a reasonable cost. Twenty-four employés formed a co-operative building society for the purpose of building a house for each member. This society undertook to do the whole of the work itself, and the members were accordingly chosen for their ability to contribute to the building, *i.e.*, they were bricklayers, joiners, plumbers, &c. The company undertook to purchase the materials required and also advanced the necessary funds at 5½ per cent. interest, the principal being repayable at any time by any method convenient to the employés; a mortgage on each house is held by the company to secure the loan. Each owner is free to sell his house if he wishes to do so. So far, Mr. Sinclair says, 18 of the 24 houses have been finished, and the only



A Large Christmas Sign.

This sign is illustrated herewith. It is 240 ft. in length and 30 ft. high, and employs about 10,000 "Osram" lamps of various sizes, and seven miles of wire. The work was carried out by the firm's own electricians.

Esthonian Tramway Extensions.—The *Board of Trade Journal* reports that electric tramways are superseding the internal-combustion engined cars in Reval. The cars have been built in Esthonia and the rails for the permanent way were purchased in the United Kingdom. The total amount so far expended is 60 million Esthonian marks; further extensions of the tramways will be commenced shortly.

Lead.—Messrs. James Forster & Co. state that during the week ended November 28th consumers had shown little interest in the market, and few fresh purchases had been made. The only strength continued to be derived from America, but even in that country there were indications that conditions were not quite so firm as formerly, though the price remained unchanged.

criticism which can be passed is that the builders have, if anything, been extravagant of both labour and materials, realising that they were building for themselves. Opposition was encountered from trade unions, but as they were unable to prevent men from working for themselves without pay they were unable to stop the scheme. Mr. Sinclair considers that the scheme could be adopted in many instances where public authorities and other organisations employ suitable and capable men. The method results in soundly-constructed houses costing far less than those erected in the ordinary way.

German Porcelain Price Reduction.—It is reported that the German Porcelain Manufacturers' Association has decided to reduce its prices by 10 per cent.

Siemens-Schuckert in Palestine.—The *Financial News* reports that the Siemens-Schuckertwerke is participating in a textile enterprise which is being established in Palestine, and will construct the plant. The enterprise embraces agriculture also.

Trade Announcements.—The Chloride Electrical Storage Co., Ltd., is shortly removing its London repair depôt to much larger premises at Lexden Road, Acton, which have previously been used as a garage by the London General Omnibus Co.

Mr. J. A. Collins, who has been appointed London representative for the Stella Conduit Co., Ltd., is carrying large stocks, at 39, Victoria Street, S.W.1.

The London office of Messrs. Richardsons, Westgarth and Co., Ltd., has been removed to 121-124, Abbey House, 2, Victoria Street, London, S.W.1.

Mr. Walter A. Ward, electrical contractor, Merton Abbey, S.W.19, notifies us that his telephone number is "Wimbledon 3270."

Messrs. Leonard Toomer & Co., 54, Lower Thames Street, London, E.C.3, ask for latest trade priced catalogues and terms of electrical and radio goods.

Catalogues and Lists.—The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A catalogue of "Osram" lamps. Fully illustrated and priced. Priced and descriptive leaflet dealing with ships' lifeboat-launching flood lights.

Messrs. Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester.—An illustrated and priced pamphlet dealing with the "Goltone" "high-tension battery eliminator," to be used in conjunction with radio sets from d.c. lighting mains.

The Cressall Manufacturing Co., Ltd., 40-41, Staniforth Street, Birmingham.—An illustrated and priced leaflet advertising the "Cressall" unit heater.

The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, W.1.—Publication No. 437, describing the "Marconiphone Type 21" receiving set and the "Sterling Dinkie" loudspeaker. Illustrated and priced.

Messrs. Oerlikon, Ltd., Oswaldestre House, 34-35, Norfolk Street, Strand, W.C.2.—Oerlikon Bulletin No. 49, dealing with railway electrification in Switzerland, and a new explosion-proof motor; No. 50, describing ladle cranes and their electrical equipment; and No. 51, dealing with a Brazilian electric railway.

Nobel Industries, Ltd., Nobel House, Buckingham Gate, London, S.W.1.—New edition of a pamphlet giving an outline of their associated companies and their products, including those connected with electric shot-firing, electric welding, motor accessories (lighting and starting equipments), &c.

Messrs. Ferranti, Ltd., Hollinwood, Lancs.—Effective show card of their A.F.3 intervalve transformer.

The English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2.—Publication No. 571a, fully illustrating and briefly drawing attention to the company's two-cylinder steam turbine, 20,000 kW, 3,000 r.p.m.

Messrs. Donovan & Co., 47, Cornwall Street, Birmingham.—Twenty-page price list of electric lamps, cables, switches, accessories, &c. Sixteen-page illustrated price list of "Supastone" glassware.

Bankruptcy Proceedings.—S. C. Rapson, C. L. Burrill, and A. J. Heffer, trading as the Suburban Electrical & Maintenance Co., electricians, 2, Plough Yard, Shoreditch.—The public examination of these debtors was held on November 24th before Mr. Registrar Mellor, at the London Bankruptcy Court, the accounts showing liabilities of £2,855 against assets valued at £718. The debtor Rapson stated that having served his apprenticeship to an electrical engineer, he, in 1911, borrowed £100 and commenced business on his own account. The business was successful, but was closed down in August, 1914, when he was called up as a Territorial. In March, 1922, he and the debtor Burrill commenced business in partnership at Poplar, as electrical contractors, under the above style. Witness borrowed from relatives £300 for capital; the trading was successful and in June, 1922, they were joined in partnership by Heffer, who brought in as capital £100 which he had borrowed. In March, 1923, they opened an electrical shop and stores at Shoreditch, which business they carried on under management. In November, 1924, they contracted to re-wire the west and new wings of Somerset House at the price of £2,450, but towards the completion of the contract they discovered that they had considerably underestimated the cost of labour, &c., and the contract was finally completed for £3,400, the firm's net loss being £611. As a result of that loss they were unable to meet their obligations and pressure was exercised by creditors; a private meeting was held on May 13th, 1925, when an offer of a composition of 7s. in the £ was opposed by one creditor and these bankruptcy proceedings followed on their (debtors') own petition. Witness attributed the firm's failure to lack of working capital, loss in relation to the Somerset House contract, and, in a minor degree, to bad debts. No account was kept of the drawings, but each partner took out £5 a week. Having regard to the fact that the business was started with borrowed capital, the firm had been insolvent throughout. The debtors Burrill and Heffer confirmed the evidence given by their partner and the examination was concluded.

W. G. Conway (trading as "Listron"), radio component dealer, 88-90, Chancery Lane, W.C.—The first meeting of creditors was held on November 26th, at the London Bankruptcy Court. The Official Receiver reported that it appeared that the debtor began business in November, 1924, with a small capital, and traded with success until March last, but business then declined owing to a slump. In that month he verbally agreed to supply a certain firm with 105 gross of "Listron" crystals. He actually delivered 47½ gross, and on the strength of that order he obtained boxes sufficient to enable him to complete the contract, but the customer refused to take delivery of the whole order, and that meant a loss to the debtor of £700 (inclusive of heavy advertising expenses and brought about his present position. On June 9th Listrons Ltd., was formed with a nominal capital of £500, to acquire his business, but no sale agreement had been drawn up the debtor had received no consideration, and, in fact, the company had never functioned. A private meeting of the creditors was held on June 30th, when an offer of a composition of 5s. in the £ was rejected; the landlord distrained in August, and these bankruptcy proceedings followed, a receiving order being made on November 9th on a creditor's petition. The liabilities and assets were roughly estimated at £600 and £315, respectively. A resolution was passed for Mr. Chas. Lathom, accountant, 78, New Oxford Street, W.C., to act as trustee in bankruptcy.

W. J. Lattimer, trading as W. J. Lattimer & Co., 52, High Street, Croydon, electrical engineer.—The public examination of this debtor was held recently at the County Court, Croydon. The statement of affairs showed a deficiency of £274, the assets amounting to £10. Debtor attributed his failure to lack of capital and underestimating the cost of contracts. He started business without capital in 1919, opening a shop in Lower Addiscombe Road. This was successful until he closed it down and carried on in a store at the back. The examination was adjourned.

G. F. Wood, electrical engineer, 28, Highgate Road, N.—Receiving order made November 19th, on creditor's petition. First meeting December 3rd, public examination January 19th, both at Carey Street, W.C.

D. A. Griffiths and R. L. Hughes (Griffiths & Hughes), electrical engineers, 13b, Whitcombe Street, Aberdare.—First meeting December 4th, at 34, Park Place, Cardiff, public examination January 22nd, at the Temperance Hall, Aberdare.

C. J. Tomlin, electrical engineer, 12 & 13, Henrietta Street, Covent Garden, W.C.—Trustee, Mr. D. Williams, Official Receiver, Carey Street, W.C., released November 17th.

J. Cowan (National Electric Co.), electrical engineer, 2, Gothic Arcade, Snow Hill, Birmingham.—Trustee, Mr. T. Easton, Official Receiver, 191, Corporation Street, Birmingham, released November 19th.

F. A. Fraser, Sanctuary House, 33, Tothill Street, S.W.—Application for discharge to be heard December 16th at Carey Street, W.C.

M. H. Murad (Murad & Co.), wireless manufacturer, 126, Princess Street, Manchester.—Bankrupt discharged November 2nd, 1925.

W. E. Melrose, electrical engineer, Chewton Road, Keynsham, Bristol.—Trustee, Mr. F. W. Darley, Official Receiver, 26, Baldwin Street, Bristol, released November 20th.

Dissolution of Partnership.—Bourne & Co., electrical and general engineers and contractors, 281, Wimbledon Park Road, Southfields, S.W.19.—Mr. H. F. Bourne and Mr. F. J. Tomblin have dissolved partnership.

New Derby Electricity Hall.—The Derby Corporation has established an electricity hall at 9, Irongate. Former warehouse property has been acquired and converted into a most attractive centre containing a manifold variety of lighting, heating, cooking, and power apparatus. At the back of the buildings workshops have been arranged. The formal opening ceremony was performed on November 25th by the chairman of the Electricity Committee, Alderman W. G. Wilkins, J.P. The hall was designed with excellent effect by Mr. G. M. Eaton, the scheme of colouring, in which cream and gold tints predominate, adding greatly to its artistic appearance. Model dining rooms, showing electric heating and a variety of other appliances, a lounge demonstrating various methods of indirect lighting, with illuminated flower bowls, &c., and a bedroom with electric heaters, bed warmer, bed reading lamp, &c., are among the conspicuous features of the display. From the balcony access is obtained to a demonstration lounge and model kitchen, the former having seating accommodation for 50 persons.

Local Exhibitions.—Sheffield.—The Master Cutler, Mr. T. R. Ellin, last week opened an "all-wireless" exhibition, promoted by Provincial Exhibitions, Ltd., and supported by local newspapers. The Edmund Road Drill Hall, which has the largest floor space of any building in the city, is admirably set out with stalls representing manufacturing and trading firms; the Sheffield and District Wireless Society has a stand filled with sets made by members. There are a number of competitions for amateur builders, and from a business point of view the undertaking seems likely to prove a decided success. It remains open until to-morrow (Saturday).

Blackburn.—At a Trades Exhibition held in the Public Hall last week there was a very effective display of domestic electrical appliances by the Blackburn Electricity Department.

New French Company.—A new company has lately been formed in Paris (4, Rue Cambronne) with a capital of 1,700,000 fr. and the title La Société d'Exploitation de la Téléphonie Picart et Lebas, to acquire and develop the Picart and Lebas telephone business at La Boissière (Eure et Loire).

New Belgian Companies.—Among the new concerns recently formed in Brussels are the Société de l'Electricité Industrielle Belge, with a capital of one million francs, and the Société Industrielle et Commerciale Electro-Mécanique, with a capital of three million francs.

Co-partnership in Industry. — In a letter appearing in *The Times* on November 28th, Mr. E. Garcke gives some information regarding a proposal that is to be submitted to the employés and representatives of the Brush Electrical Engineering Co., Ltd., of which he is chairman, inviting them to collaborate in forming a scheme of co-partnership between Labour, Management and Capital. Foreign competition necessitates, he says, increased output and reduced prices, but it is believed to be possible to effect economies without reduction of wages and probably also to increase profits to a small extent. Greater efficiency and economies are always possible. The utmost benefit of co-partnership cannot be secured by its adoption in any individual establishment alone, for "in specialised manufacture perhaps the main items in the costs of production are the materials purchased from other manufacturers, and if their costs, and, therefore, their prices, are high, our costs and prices are necessarily still higher, however efficient our organisation may be. Wages are in a different category, because the efficiency of labour admits of improvement by proper regard for the human element."

The Brush directors, says Mr. Garcke, will submit for consideration and discussion the main features of their proposal, and will leave the details to be settled after consultation with the various parties concerned. The main principles on which they base their action are:—

(*a*) That the two opposite postulates which are now the crucial points in dispute between Labour and Capital—namely, (1) that Labour is the sole producer of wealth, and (2) that Capital is entitled to the whole of the profit—are both fallacious; and that it is wiser to recognise that profit belongs to all who have contributed to produce it, in due proportion to their rights and deserts.

(*b*) That instead of drifting by strife towards the slow realisation of the late Lord Milner's anticipation "of Labour hiring Capital instead of Capital hiring Labour," it is better to facilitate workers becoming capitalists.

For Sale.—Bristol Corporation Electricity Department invites offers for disused plant, including boilers, economisers, coal conveyor, piping, tanks, &c. Beckenham Cottage Hospital authorities invite offers for a large and complete X-ray apparatus. Hackney Borough Council Electricity Department has for disposal surplus generating plant, including one 3,000-kW turbo-alternator with condensing plant, &c.; four 150-kW Holmes dynamos; two motor-driven fans; and three 6-h.p. motors; Ipswich Board of Guardians invite offers for surplus generating plant due to changing over to town supply; Nottingham Corporation Electricity Department has for disposal boilers, economisers, pumps, feed water heaters, &c. (See our advertisement pages to-day.)

Our Problems.—At the meeting of the Liverpool Engineering Society held on Wednesday evening Sir Peter Rylands, ex-president of the F.B.I., read a paper on "The Problems of British Industry."

Chinese Notes.—The Ministry of Communications has licensed a new electric light company which has been formed at Shunteh (Chihli province).

The Hanyang Electricity Co., Ltd., formed with a capital of $120,000 at Sanmatow, Hokai, has commenced operations with a 65-h.p. plant of Chinese manufacture.

The Ministry of Communications is installing a radio-telephone service between Tientsin and Shanghai.

A telephone company is being formed at Changteh (Hunan province) with a capital of $40,000.

The long-distance telephone services in various parts of Chekiang province have been completed. The head office of the administration is at Hangchow and the services are open to the public.

Japanese Electrical Notes.—The Odawara Rapid Transit Railway Co., Ltd., with a capital of 13,500,000 yen, of which 1,350,000 yen has been paid up, plans running an electric railway for a distance of about 50 miles from Shinjuku, Tokio, to Odawara. The line will be opened to traffic in about March, 1927.

The Hiroshima Electric Co. is shortly erecting its second Eno-gawa water power station in view of the increased demand. The station will have an output of 11,000 kW and will be completed by June, 1927. The company is also building a steam power station as a stand-by with an output of 25,000 kW.

It is understood that the Kuhara Mining Co. has decided to build water-power stations of about 100,000 kW, on the Shokawa in Giju and Toyama Prefectures.

The Shinano Electric Co. plans generating electricity on the Doi River on the upper reaches of the Shinano River by erecting two power stations, each of which will have an output of about 500 kW.

The Sennan Electric Industrial Co. is designing its second power station and will issue an inquiry for tenders within this year, so that the work of construction will be started early next year.

The Kochi Prefectural Office plans to extend its hydro-electric plant at a cost of 1,000,000 yen.

It is stated that the South Manchurian Railway authorities have practically decided to make their electrical business independent of the railways next fiscal year by establishing a company, which will be known as the South Manchurian Electric Company.

Australian Tariff Decision.—Under a recent decision of the Australian Customs Department, resistance wire for use in the manufacture of all kinds of electrical apparatus is to be admitted free under the British preferential and intermediate tariffs; under the general tariff a duty of 10 per cent. *ad valorem* will be imposed.

American Capital in Italy. — According to the *Financial News*, American interests have recently been active in Italian affairs. Messrs. Blair & Co. (Inc.) are stated to be negotiating a loan of $20,000,000 for the Piemont Water-power Syndicate and other hydro-electric interests. The Edison group is said to be negotiating to take over the telephone service of several large cities, including Genoa, Turin, and Rome; and arrangements are also being made for the issue of a dollar loan on behalf of the Turin gasworks.

New Italian Companies. — Among the new concerns recently organised in connection with the electrical engineering industry in Italy are the Società Select Electra Company, Milan, capital 250,000 lire; La Società Industrie Lampade Elettriche Speciali, Novara, capital 50,000 lire; and La Società Italiana Macchine Elettriche R. Dolfin e Cie., Milan.

Book Notices.—"The Conservation of the Nation's Vegetation," by Mr. R. W. Ascroft, M.B.E., F.R.H.S.—Considerable information and many data are given in this booklet concerning the damaging effects of smoke and soot on plant life. The results of tests for ascertaining the total deposit of impurity from the air in tons per sq. mile for the year ended March 31st, 1924, shows the figure for Rochdale as 793.86, compared with 100.92 for Rothamstead.

"*Journal* of the Institution of Production Engineers." Vol. V, No. 1, November, 1925. Price (non-members), 1s.—This is the first issue of the Institution *Journal*, the inception of which is the outcome of a difficult situation brought about by the cessation of publication of the Institution's official organ. An effort is being made to bring deserved success to the publication, which we hope will be achieved. The presidential address by Mr. R. H. Hutchinson (1925-26) is published in this initial number. He appeals to the members to adopt the slogan "Attention to detail."

"The Ego and Physical Force," by I. C. Isbyam. Pp. x+138. London: C. W. Daniel & Co. Price 5s. net.—The author of this book contributed an article to the ELECTRICAL REVIEW entitled "The Principle of Relativity Simply Explained" in 1919, and another entitled "The Principle of Quanta Simply Explained" in 1923; both are here reprinted as appendices in a work which extends these principles to explain phenomena of consciousness generally. Readers interested in such matters will find the book enlightening. The electrical structure of matter is now accepted, but the electrical structure of mind is new. The contents are cast in the form mainly of duologues, together with a monologue and a lecture, and contain abundant material for thought.

"The Mechanical World Year Book, 1926." Pp. 348+177; illustrated. Manchester: Emmott & Co., Ltd. Price 1s. 6d. net.—Engineers will find here many useful data concerning the diverse fields of mechanical engineering, including steam and hydraulic, other than structural work. The usual mensuration and logarithm tables are included, and a diary and memoranda are provided.

"Science Abstracts" (A and B). Vol. XXVIII. Part II. November 25th, 1925. London: E. & F. N. Spon, Ltd. Price 3s. each.

"An Introduction to Industrial Administration," by J. Lee. Pp. vii + 194. London: Sir Isaac Pitman & Sons, Ltd. Price 5s. net.

"Electrical Circuits and Machinery," by J. H. Morecroft and F. W. Hehre. Vol. III, Experiments. Pp. vii+165; figs. 56. London: Chapman & Hall, Ltd. Price 10s. net.

"Scientific Papers of the U.S.A. Bureau of Standards." Vol. 20, No. 509, July, 1925. Alternating Current Distribution in Cylindrical Conductors. Price 15 cents.

"Technologic Papers of the U.S.A. Bureau of Standards." Vol. XIX, No. 296, August, 1925. Price 10 cents.

"Supplementary List of Publications of the U.S.A. Bureau of Standards, beginning July 1st, 1925." Price 10 cents.

"Institution of Electrical Engineers." List of corporate and non-corporate members of the Institution, corrected to September 1st, 1925. London: The Institution.

Trade Facilities Guarantees.—Among the recent guarantees by the Government under the Trade Facilities Acts is one of £1,250,000 for the Perak Electric Power Co., Ltd., in connection with the purchase of British plant and machinery for the development of hydro-electric resources in the Malay States. The total amount of guarantees up to September 30th was £58,827,241.

Electrical Activity in Japan.—It is reported that American manufacturers have recently received further Japanese orders for generating plant, although the Government is endeavouring to foster the home industry.

Tramway Wage Increase.—The Burnley Tramways Engineering Department has increased the basic wage of employés of £2 16s. by 10s. per week, and the holidays have been extended to nine days per year, with pay.

Copper, Lead and Rubber Prices.—Messrs. F. Smith and Co. report December 1st: No change in the prices of copper (electrolytic) bars, sheets, and wire rods; h.c. wire, 9¼d., 1/16d. decrease.

Messrs. James & Shakespeare report December 1st:—Copper bars (best selected) sheet and rod, no change; English pig lead, £36 10s., 15s. decrease.

Messrs. Edward Till & Co. report December 1st:—India Rubber, Para, fine 4s. 3½d., 3½d. increase.

Lighting and Power Notes.

Australia.—THE JACKADGERY HYDRO-ELECTRIC SCHEME.—Referring to the New South Wales Ministry's decision to abandon the Jackadgery hydro-electric scheme, as reported in our last issue, the *Industrial Australian and Mining Standard* gives the following details with regard to the adverse reports:—Mr. Carter, chief electrical engineer of the Public Works Department, in a report, stated that for the initial development the cost would be over £150 per effective kW. Such a high figure might possibly be accepted were the power available continuously, but the whole estimates were based on a 30 per cent. load factor. The capital cost of a steam station of this size was approximately £30 per effective kW. For the ultimate development of 20,000 h.p. the cost would probably be reduced to the neighbourhood of £120 per kW, but even this figure was excessive, under the circumstances. No revenue could be earned from the scheme until practically the whole of £1,530,000 had been expended. The special expert committee on hydro-electric development, consisting of Mr. E. M. de Burgh, chief engineer to the Water and Sewerage Board; Mr. H. H. Dare, Water Conservation and Irrigation Commissioner; and Mr. H. G. Carter, chief electrical engineer, submitted a report on the scheme, stating that in view of the information before them, and of Mr. Carter's report, they could not recommend the Council to embark upon the scheme.

WAGGA (N.S.W.).—After long negotiations between the Municipal Council and the Public Works Department, a draft agreement has been prepared covering conditions for the supply of electricity from the Burrinjuck hydro-electric works to Wagga. Electricity will be available to Wagga by the middle of next year. The estimated saving to the Council will be £5,000 annually by using the Burrinjuck scheme instead of its own power plant, which was installed at a cost of more than £60,000.

Bath.—NEW PLANT.—The Electricity Committee has recommended to the City Council that application be made for sanction to a loan of £92,928 for a new 6,000-kW turbo-alternator and accessories, a 40,000-lb. water-tube boiler, the cost of altering periodicity and voltage transformers, and the extension of mains to further parts of the city and suburbs. It is also proposed to apply for sanction to loans of £8,500 to cover the amount overspent on mains and £15,000 for mains for future extensions.

Brecon.—ELECTRICITY SCHEME.—The Town Council is to apply for an Order to supply electricity within the borough and in the parishes of Castle Inn and Christ College. A site has been chosen for the erection of a generating station.

Burnley.—STREET LIGHTING.—The Corporation is obtaining alternative prices for the lighting of the main thoroughfares by gas and electricity.

Cleethorpes.—ELECTRICITY AGREEMENT.—The Urban District Council has received the draft of an agreement for a bulk supply of electricity to the district from Grimsby Town Council, and has forwarded it to its consulting engineer for consideration and report. The Electricity Commissioners have expressed approval of the proposed agreement.

Continental.—FRANCE.—The General Council of the Lower Pyrenees has recently decided that the rural districts not yet provided with a system of electricity supply shall be supplied by means of lines running parallel with the local tramways. It is estimated that 212 communes in the Department have already been provided for, while work is in hand on 23 other communes.

Dover.—ELECTRICITY IN BULK.—The Corporation has received an offer by Tilmanstone Colliery to supply electricity in bulk. Negotiations are in progress.

Glasgow.—PROGRESS DURING OCTOBER.—During October 154 houses were wired under the Corporation Electricity Department's scheme, bringing the total to date to 1,441, and the applications for hire of appliances numbered 512, making the total 8,415.

Guildford.—NEW POWER STATION.—At a recent meeting of the Electricity Committee, the Town Clerk submitted the formal consent of the Electricity Commissioners to the establishment of a generating station on the site in Woodbridge Road.

Hebden Bridge.—ELECTRICITY SUPPLY.—Owing to the increasing demand for electricity, the Urban District Council has instructed the electrical engineer to obtain details as to procuring an increased bulk supply, or enlarging the local generating plant.

Hoylake and West Kirby.—LOAN.—The Urban District Council is applying for sanction to the borrowing of £5,000 for mains and services.

Ilford.—LOAN SANCTIONED.—The Urban District Council has received sanction to loans of £20,000 for mains and services, and £2,000 for domestic apparatus.

WIRING OF SMALL HOUSES.—The electrical engineer is to prepare a report on a proposal to wire new Council houses at Horns estate for lighting, heating, and cooking.

Irish Free State.—CARRICK-ON-SUIR (Co. TIPPERARY).—A scheme to provide an electricity supply for the town has been postponed by the Urban District Council pending the completion of the Shannon power scheme. The estimated cost of the scheme was £8,000.

HOWTH (Co. DUBLIN).—At a recent meeting of the Urban District Council, the question of an electricity supply for the harbour area was considered. It was decided that if the Board of Works erected the lamp standards, the Council would supply the energy.

ELECTRICITY SUPPLY BILL.—In the Dail the Electricity Supply (Special Powers) Bill recently reached the Report stage. The Bill is designed to authorise electricity supply authorities to exchange electrical energy when such an arrangement will avoid capital expenditure on extension of plant, which would be undesirable in view of the Shannon scheme. The special powers are to be applicable only until the Shannon supply becomes available to the authorised undertakers concerned. The Report stage was passed.

WATERFORD.—At a recent meeting of the Corporation, a report received from Messrs. McEntee & O'Kelly, consulting electrical engineers, Dublin, upon an electricity supply for the city, was adopted. The engineers were instructed to proceed with the preparations in connection with the scheme, which will involve an outlay of over £30,000. The engineers' report stated that in accordance with the condition laid down by the Department of Industry and Commerce, the scheme would be designed for incorporation with the national Shannon scheme in due course.

Leicester.—ELECTRICITY EXTENSIONS.—Mr. T. R. Smith, borough electrical engineer, has submitted a report to the Corporation, in which he states that it is estimated that the maximum load will reach 23,000 kW in December, and that, while the bulk of this load could be carried by the existing plant at the central station, there would be no spare plant available to meet emergencies. He has therefore recommended the installation of a further generating set. This, with other proposed extensions, would involve an estimated expenditure of £343,277, made up as follows:—11,000-kW turbo-generator with condenser, £89.277; concrete cooling towers, £29,000; mains to the end of 1927, £100,000; services for the years 1925-1926, £40,000; meters, 1925-1926, £20,000; sub-station requirements, 1925-1928, £65,000.

London.—BATTERSEA.—The Electricity Committee is applying for sanction to loans of £13,000 for mains and £7,000 for services.

Melksham.—INQUIRY DECISION.—Referring to the inquiry held at the Town Hall on October 7th by the Ministry of Transport into objections raised by local landowners to the proposal of the West Wilts. Electric Light and Power Co. to erect poles on their land in connection with the supply of electricity to a large area of Wiltshire, the Minister has given an award in favour of the company.

Middlesbrough.—FIRE.—A fire occurred at the North Tees power station of the Cleveland and Durham Electric Power Co., Ltd., at Haverton Hill, on November 26th. The oil around the switchgear in the switch-house became ignited, and the heat from the flames caused some of the oil storage tanks to burst, setting the whole of the building on fire. The generating station was not damaged, but the switch-house was gutted. Some inconvenience was caused to the majority of the large industrial concerns, as the supply was cut off as a safeguard, and numerous cables were also burned. A portion of the West Hartlepool tramway and parts of Middlesbrough and the whole of Stockton was affected. The damage is estimated at many thousands of pounds. Arrangements were made to supply consumers from the Grangetown and other stations of the company.

Parliamentary Bills.—Notice has been given by the following authorities of their intention to promote Parliamentary Bills in the ensuing session:—Oldham Corporation: to extend the borough so as to include the urban district of Chadderton, to extend its area of electricity supply so as to include this district, and to alter or repeal the powers of the Lancashire Electric Power Co., to supply therein. Horley District Gas Co.: to supply electricity in certain parishes in the rural districts of Reigate and Horsham, and to erect a generating station at Horley.

Preesall.—LOAN.—The Urban District Council is applying for sanction to a loan of £1,200 for laying a cable along Sandy Lane and Cartgate.

Rochdale.—ELECTRICITY IN BULK.—The Gas and Electricity Committee has reported to the Town Council that a provisional agreement has been made between the Bulk Supply Sub-Committee and the Lancashire Electric Power Co., to take a further bulk supply from the company, and also to extend the agreement until 1940.

South-East Lancashire Electricity Advisory Board.—We regret that an error occurred in the paragraph appearing under this heading on page 857 of our last issue. The proposal that the Board recommend to the Electricity Commissioners and the Eccles and Salford Corporations that the proposed contract between Salford and Eccles be approved, was contained in an amendment which was defeated, only 6 voting for it and 26 against. Accordingly the contract has not been approved by the Board, but the matter stands adjourned.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the following authorities:—The Porthcawl Urban District Council, for the supply of electricity in its area; Wellington (Salop) Gas Co., in the urban districts of Wellington and Oakengates, and parts of the rural district of Wellington; Leeds Corporation, in the townships of Templenewsam and Austhorpe; Messrs. Callender's Cable & Construction Co., Ltd., in the parish of Chessington.

South Shields.—LOAN.—The Electricity Committee is to apply for sanction to a loan of £10,000 in connection with the "assisted-wiring" scheme.

Thornthwaite.—ELECTRICITY SUPPLY.—A company has been formed for the purpose of supplying electricity to the villages of Thornthwaite and Braithwaite. Plant has been installed at a disused lead mine, and water power will be used for generating purposes. The supply will be by means of an overhead cable.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—A *Reuter* message from Washington says that in its annual report, issued on November 22nd, the Federal Power Commission states that the greatest water-power development in American history has occurred during the last five years. Applications for power developments during this period will involve, when built, an aggregate estimated installation of 24,000,000 h.p.

Upper Airedale.—NEW SUB-STATION.—The Yorkshire Electric Power Co. has arranged to purchase land at Silsden for the erection of a sub-station which will become a main distributing centre for the north-western part of the company's area and for the supply of electricity to towns and factories in the Craven district of Upper Airedale. Mains are already being laid through Addingham and Silsden to connect with the existing mains to the east and the west, and the scheme will provide an alternative source of supply to Skipton direct from the company's system.

Walton.—PURCHASE OF UNDERTAKING.—The Urban District Council has considered a proposal to purchase the local electricity undertaking of the Urban Electric Supply Co., Ltd., and has instructed its accountants to investigate the accounts of the company with a view to purchasing the undertaking in the event of no satisfactory arrangement being made with the company for it to continue the undertaking for a further period.

Warrington.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. F. V. L. Mathias) for the year ended March 31st last show a total revenue of £108,499, as compared with £101,205 in the preceding year. Working expenses amounted to £68,709, as against £56,875, leaving a gross profit of £39,790 (£44,330), to which was added interest on investments and bank interest, making a total of £41,330. After providing for capital and other charges, a net profit of £8,294 remained, as compared with £10,753 in 1923-24. The capital expenditure during the year, which included £16,670 for mains and services, amounted to £31,279. The sales of electrical energy (excluding tramway supplies) increased from 14,518,192 to 15,600,974 kWh, and the maximum supply demanded from 6,700 to 7,300 kW. During the year the second 6,000-kW turbo-alternator was completed and put into commission.

Welwyn.—PRICE REDUCTIONS.—The Welwyn Garden City Electricity Supply Co. has announced the following reductions in the charges for electricity as from January 1st next:—Prepayment meters: From 1s. to 10d. per kWh. Domestic purposes: Summer quarters—first 25 kWh per quarter, 3¾d. per kWh, and all additional energy, 1d. per kWh; winter quarters—first 50 kWh per quarter, 3¾d. per kWh, and 1d. per kWh thereafter. Reductions have also been made in the charges for industrial and commercial purposes.

Tramway and Railway Notes.

Australia.—MELBOURNE.—We have received from the Melbourne and Metropolitan Tramways Board a copy of the report on the working of its undertaking for the year ended June 30th last. The electric tramways earned a total revenue of £756,163, an increase of £69,884 as compared with the preceding year. The working expenses amounted to £649,644, as against £576,427, leaving a gross profit of £106,519 (£115,792). This was carried to net revenue account with gross profits of £180.473 from the cable tramways and £3,224 from the motor-omnibuses, making a total of £290,217 available. Capital charges, &c., absorbed £172,705, and a balance of £117,512 was transferred to appropriation account. After meeting statutory payments to State consolidated revenue and reserves, there was a net deficit of £232,245. The number of passengers carried by the electric tramways increased from 74,091,564 to 80,435,680, and the car-mileage from 7,267,966 to 8,426,519. During the year nearly seven miles of electric tramway track was completed, and plans and specifications were prepared for the conversion to electric traction of the St. Kilda, Chapel Street, Victoria Street, and Richmond cable tramways. Six sub-stations were put into service during the year, and contracts were placed for six 1,000-kW rotary converters, with automatic switchgear, for St. Kilda, Carlton, and South Melbourne sub-stations.

Blackpool.—NEW CARS.—In connection with the Promenade tramway extension at South Shore, the Tramways Committee has decided to purchase 12 new tramcars.

Colne.—ABANDONMENT OF ROUTE.—At a meeting of the Town Council on November 26th, the engineer reported on the condition of the tramway track between the depôt and Laneshaw Bridge, and upon the cost of reconstruction. It was decided to make application to the Ministry of Transport for sanction to discontinue the light railway and to remove the rails.

Continental.—SWITZERLAND.—The Olten-Berne section of the Swiss Federal railways has now been electrified, and the official trials recently took place. The energy for the Olten-Herzogenbuchsee section is obtained from the Gothard group of power stations, while the section, Herzogenbuchsee-Berne, is supplied by the central power station at Muhleberg. The next section to be electrified will be the line between Lausanne and Geneva, while at the beginning of 1926 the section between Lausanne and Palézieux will also be completed. The Palézieux-Berne and the Winterthur-Rorschach sections will be electrified in 1927, and it is estimated that the cost of electrification up to the end of 1928 will be 80,000,000 fr. less than had been estimated two years ago.

FRANCE.—A syndicate has been formed with the object of constructing an electric railway between the Paris-Orleans railway at Bretigny and the motor-racing track at Linas-Montlhéry.

ITALY.—The steam tramway between Rome and Tivoli is to be converted to electric traction.

AUSTRIA.—The last section of the tramway in Vienna to be electrified has recently been completed and opened for traffic.

Dutch East Indies.—JAVA.—The Allgemeine Elektricitäts Gesellschaft, of Berlin, has recently dispatched the last two of the three electric locomotives which it has built for the Java State railways. The engines are stated to develop 1,600 h.p. and to be capable of hauling a train at a maximum speed of 56 m.p.h. The driving wheels have a diameter of 4 ft. 6 in., and the overall length of the engines is 46 ft.

Japan.—TOKIO.—According to *Eastern Engineering*, the revised plan for the construction of subways in Tokio, calling for y.187,000.000, was to come up for discussion by the Tokio Municipal Assembly this month. According to the new plan, construction would begin next year with an appropriation of y.5,500,000 and continue until 1938, when the entire undertaking would be completed. It is estimated that the construction costs will be about y.4,500,000 per mile. During the first year only one mile of the tube would be completed, while during 1927 and 1928 three miles would be completed. From 1928 to 1937 three and a-half miles are scheduled for each year, and about three miles for the final year. The first line of the system would be built from Shibuya to Sugamo through Tokio station, while the second would run from Ikebukuro to Susaki through Tokio station. The third is expected to be from Shinjuku to Otsuka, and the fourth from Gotanda to Oshiage, both of which would pass through Tokio station, making this station the central point of the subway system.

KOBE.—The committee appointed by the Municipal Council to investigate plans for the reconstruction of the railways running through the city has decided to support the plan of Dr. Morigaki, chief of the Kobé City Planning Department, which provides for the adoption of an underground system. According to this plan the present lines between Hiogo station and Kasugano-michi will be placed underground, but it is first necessary to obtain the approval of the Railway Department. It has therefore been decided to send seven commissioners to Tokio to negotiate with the railway authorities.

Halifax.—FARES.—The reduction of fares on the Corporation tramway, made last April, resulted in a loss up to the end of October of £14,000, and the Council is to be recommended by the Tramways Committee to revert to an increase of fares.

London.—NEW UNDERGROUND SUB-STATIONS.—Work on the construction of the new sub-station building which adjoins Lambeth North station has commenced. When completed this sub-station will house two 1,500-kW rotary converters, and will be "remote controlled" from Charing Cross. Two other sub-stations are also being erected at Balham and South Wimbledon for serving the Morden extension tube which will open next midsummer. The first-named building is nearly finished, and an overhead crane has been installed. The bedplates for the three 1,200-kW rotary converters and the ventilating plant are now being installed. Good progress also can be recorded at South Wimbledon. The building is nearly complete, and most of the equipment has been delivered and will be installed within the next few weeks.

Mexborough.—RAILLESS CARS.—The Mexborough and Swinton Tramways Co. is to promote a Parliamentary Bill to institute a new railless-car service from New Conisborough to Manvers Main Colliery, near Wath, to abolish a number of tramway routes in Mexborough, and to substitute a railless-car service.

Telegraph and Telephone Notes.

Austria.—AUTOMATIC TELEPHONY.—According to the recently-issued report for 1924 of the Austrian Post and Telegraph Department, the conversion of the Vienna telephone service to full automatic working has practically been completed, there being now 70,700 connections. Good progress in the same direction has also been made in Gratz, which has now 5,200 automatic connections, while the conversion of the exchange in Linz to automatic operation is well in hand. At the end of the year there were 376,180 miles of telephone wires in operation in the country. During the year new international telephone lines were opened between Vienna and Trieste, Prague and Trieste, and Innsbruck and Munich.

Germany.—Gale Damage.—It is reported that three of the new 400-ft. masts of the Norddeich radio-telegraph station, which is controlled by the German Government, were blown down in a gale last week.

Italy.—United States Syndicate's Deal.—The American syndicate which is negotiating with Turin and Milan for the installation of telephones in those two cities is reported by the *Financial Times* to be the Theodore Gary Company, of Kansas City, which controls the Automatic Electric Incorporated Company, of Chicago.

Submarine Telephone Cable.—The Pirelli Co., of Milan, has recently laid a telephone cable across Lake Maggiore between Intra and Laveno.

Jugo-Slavia.—Telephone and Telegraph Systems.—When the new State (the Kingdom of the Serbs, Croats, and Slovenes) was created, its telephone and telegraph lines were in complete disorder, and the entire pre-war system in Serbia had been destroyed. Consequently, the Jugo-Slavian Ministry of Posts and Telegraphs had to practically rebuild the systems. The services now rendered are adequate, and not only are all centres of the country connected by wire, but Belgrade and Zagreb have direct lines to the capitals of all the neighbouring countries, except Italy, this line extending only to Trieste. At the end of 1924, according to *Commerce Reports*, there were 14,605 kilometres of telephone lines with 27,457 subscribers, and 20,039 kilometres of telegraph lines. Since 1921 new telephone lines have been put in service between Belgrade and a number of cities, and it is said that 27 telephone and telegraph lines are now under construction.

Automatic Telephony.—The Prague telephone system is to be changed from manual to automatic; present plans call for the installation of 4,000 new instruments in the city by January 1st, 1926, and a like number in each of the city sections called Vinohrady and Smichov.

Marine Radio Operators.—Strike.—A wages dispute has arisen between the Engineering and Allied Employers' Federation (London and District Association) and the Association of Wireless and Cable Telegraphists, and a strike of ships' operators was declared on November 26th. Most of the operators are trained and supplied to the shipping companies by the Marconi and Radio Communication Companies. The Board of Trade has instructed its officials not to refuse clearance certificates to ships which cannot secure the services of operators owing to the strike. The dispute arose in consequence of a proposal to reduce wages by 22s. 6d. per month. The present commencing wage for men is £8 17s. 6d. a month, rising to £20 at the end of nine years' service.

Sweden.—Automatic Telephony.—The installation of the automatic telephone system in Stockholm in place of the old system of manual service continues. The Telegraph Board has just given an order to Telefonaktiebolaget L. M. Ericsson for another station for Stockholm with an entirely automatic service to serve 15,000 subscribers. The price will be kr. 2,300,000, and the time of delivery eighteen months.—*Reuter's Trade Service* (Stockholm).

The Telephone Service.—Leeds-Glasgow Trunk.—The Postmaster-General announces that trunk telephone communication between Leeds and Glasgow has recently been materially improved by bringing into service between those towns additional circuits in a new underground cable.

Venezuela.—Automatic Telephony.—The Government of Venezuela recently granted a concession to a Venezuelan citizen to install and operate an automatic telephone system throughout the country. Work must begin within six months.

Radio Notes.

Germany.—Aerial Regulations.—Police regulations issued for Berlin and Potsdam concerning the erection of roof aerials seem likely to handicap the development of broadcasting there. According to the *Evening News*, it is laid down that: Police permission must be obtained before a roof aerial may be mounted. The request must be made in writing, together with a plan and description in duplicate, giving all details of the proposed construction: its distance from other buildings and properties, and from high- or low-power cables. On demand, proof of the firmness of the material and construction must be given. Within three days after completion, the police must be informed in writing, and asked to test the construction. The aerial must not be used until the final permit is issued, and it must be constructed of copper, bronze, or aluminium of a certain tensility, and must pass a certain temperature test. For the puzzlement of the unlearned, mathematical formulæ are added.

Tramway Interference.—Early in 1924 the Berlin Tramway Co., in conjunction with the telegraph authorities, carried out experiments concerning the causes of interference with broadcast radio-reception, and came to the conclusion, according to *E.T.Z.*, that the chief cause of the trouble was the interruption of the small lighting current used in the tramcars. The motors themselves are also audible, but not to any objectionable extent if they are in good working order. The safest cure for the trouble, failing a complete reconstruction of the collecting gear, was found to be an increase in the lighting current from the existing value of 0.6 ampere to something like 2½ amperes. Following the publication of these results, further experiments were carried out in Halle, and it was there found that a further aid was the connection of condensers of considerable capacity between the collecting gear and earth, *i.e.*, in parallel with the lamps. When tried in Berlin, the same good results were found when condensers of some 30 microfarads capacity were employed. Experiments were next made in a number of other towns in which the tramways employ bow collectors of aluminium instead of the roller (trolley) collectors used in Berlin. In all these cases it was found that the condensers, instead of curing the trouble, produced hardly any effect at all. Inquiries made in other towns, such as Frankfort (on Main), in which the tramcars employ bow collectors fitted with carbon contact surfaces, showed that no interference with wireless reception occurs there, and this result was confirmed in Berlin and in Halle by the behaviour of experimental cars fitted with such carbon collectors. It would seem, therefore, that the best all-round cure for tramway interference would be to fit all cars with carbon collectors, an arrangement which should also meet with the approval of the tramway authorities themselves, as it would tend to reduce the wear on the overhead trolley lines. In the meantime the telegraph authorities are carrying out further experiments with a special car arranged to work with collectors made of various materials.

Paraguay.—Proposed Broadcasting Co.—Interest in radio broadcasting in increasing, and *Commerce Reports* understands that the Ministry of War and Marine has decided to purchase equipment, although the decree authorising this action has not yet been signed. The organisation of a broadcasting company, which the municipality of Asuncion has been asked to subsidise, has also been proposed.

United States.—New Stations.—The new high-power station at Round Brook, New Jersey, which will shortly be operating on a power of 50 kW, carried out experiments on part power (35 kW) during the night of November 25th-26th. The wave-length was 455 metres and the call sign W J Zee. America is preparing for international broadcasting by building at Belfast, Maine, a receiving station, a novel feature of which will be a short-wave wireless link with the high-power station. Belfast, Maine, will thus pick up the Daventry programmes and relay them on a short wave to New Jersey, which station will broadcast the programmes all over the United States.—*Daily Mail.*

Safer Aerials.—Following several fatal accidents in New England due to the improper erection and construction of radio aerials, the Worcester (Mass.) Electric Light Co. has offered to make a free inspection of outside strung wires upon request of the owners. About fifty aerials have been inspected in one month from the standpoint of eliminating the hazards of too close proximity to primary and street-lighting circuits, attachment to company poles, and dangerous relationship to other wiring, says the *Electrical World*. The Hartford (Conn.) Electric Light Co. has announced to its employés that to encourage constant watchfulness against aerials attached to the company's poles, or erected over any of its wires, the company will pay after verification $5 to any employé reporting such an installation.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Aberdeen.—December 16th. National Committee for the Training of Teachers. Electrical works in connection with two hostels and subsidiary buildings at Kittybrewster, Aberdeen. Specifications from Mr. J. A. O. Allan, architect, 25, Union Terrace, Aberdeen.

Ashford.—December 14th. Electricity Department. Concrete engine foundations, concrete cooling pond, reinforced-concrete road, steam and small electric circulating water pump, fuel-oil pump, oil-purifying plant, fuel-oil storage tanks, &c. (November 27th.)

Australia.—Sydney.—February 1st, 1926. Municipal Council. Bunnerong power house equipment. Six 25,000-kW turbo-alternators, 18 100,000-lb. per hour boilers, &c., and 33,000-V switchgear. (November 13th.)

Melbourne.—April 12th, 1926. State Electricity Commission of Victoria. Plant for the Sugarloaf and Rubicon hydro-electric scheme, consisting of turbo-generators, transformers, switchgear, cranes, and accessory plant.*

Victorian State Railways. January 20th, 1926. Automatic battery-charging equipment.* January 13th. Double recording wattmeter.*

Banff.—December 14th. Town Council. Electrical work in connection with the new Town Hall. Specifications from Town Clerk.

Dublin.—December 8th. Dublin Port and Docks Board. Electrical supplies for 12 months. Mr. E. H. Bailey, secretary, Port and Docks Office, Westmoreland Street.

(*Continued on page 903.*)

St. Marylebone Revisited.

Post-War Extensions of a 45,500-kW London Generating Station.

THE normal rated capacity of the generating plant in the St. Marylebone Borough Council's electricity works is now 45,500 kW. This West London station, situated quite close to the power house of the Central Electric Supply Co., Ltd., contains five 2,000-kW tandem d.c. Parsons steam turbine sets, installed during 1905-6 when the station was built and the undertaking purchased by the Council was taken over from the Metropolitan Electric Supply Co. Two 3,500-kW, 3-phase, 6,600-V, 3,000-r.p.m. Oerlikon turbo-alternators were added in 1913, whilst the post-war extensions consisted of two 8,000-kW, 3,000-r.p.m. sets (one G.E.C. and one Oerlikon) installed in 1921-2 and a 12,500-kW, 3,000-r.p.m. G.E.C. set which was erected during the current year on a site formerly occupied by four 500-kW d.c. Parsons sets in the original lay-out, which have been scrapped.

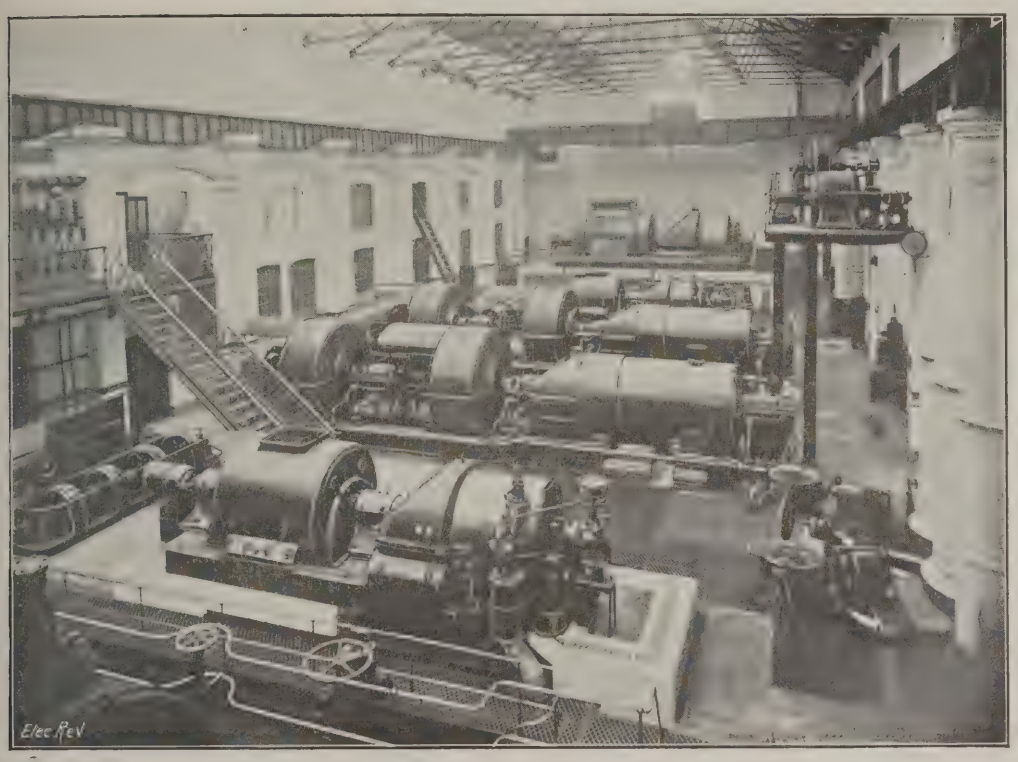


Fig. 1.—View of Half the Turbine House at St. Marylebone.

This set is to be seen at the far end of fig. 1; it is capable of a max. continuous output of 19,550 kVA at 0.8 p.f. when the steam pressure is 20 lb. lower than that specified, the exhaust opening being designed to take advantage of vacuum conditions up to 28½ in. In connection with the publicity given to the road transport of the alternator from Witton, the handling of this 70-ton machine at the generating station was dealt with by a 3-motor, 60-ton overhead travelling crane, supplied by Messrs. Herbert Morris, Ltd.

The turbines installed during the post-war extensions are built for a stop-valve gauge steam pressure of 340 lb. per sq. in. and a total temperature of 680 deg. F., but until sufficient high-pressure boiler plant is available they have been adapted to run efficiently at 190 lb. pressure.

The surface condensers for the three large turbines, by Messrs. Worthington-Simpson, maintain a vacuum of 27½ in., bar. 30 in., when supplied with circulating water at an inlet temperature of 80 deg. F. The air-extraction and condensate-discharge pumps for each set are driven by duplicate motors with Wigglesworth clutches.

The two G.E.C. alternators have external ventilating fans, also provided with duplicate motors and clutches, and the 8,000-kW alternators are fitted with Heenan and Froude closed-circuit air coolers, the 12,500-kW alternator having a Premier cooler. The addition of coolers has brought about a marked improvement in the temperature of the turbine house, and they are effective "silencers."



Fig. 2.—The other Half of the Turbine Room, showing D.C. Switchboard.

A new wing, fig. 4, parallel to the existing boiler house contains two 40,000-lb. and two 60,000-lb. Babcock & Wilcox cross-type marine boilers, with Hopkinson mountings, constructed for an ultimate working pressure of 350 lb. per sq. in. and a total temperature of

700 deg. F. Each boiler has a superposed steel-tube economiser, induced-draught fan, steel chimney, Davidson volute soot and grit catcher, and Underfeed forced-draught travelling grate stokers, and similar stokers have been installed under six of the original boilers, increasing the grate area and nominal steaming capacity from 18,000 to 22,000 lb. per hour. A feature of the larger boilers is the introduction of dampers to control the superheat temperature. During the war period another six of the original battery of twelve boilers were fitted with Underfeed stokers with external forced-draught plant, and coke breeze, which was then obtainable at reasonable prices, was largely burnt at this station. There are also two 20,000-lb. Babcock marine-type boilers with chain-grate stokers, which were added during the interim period before the first post-war extension programme was proceeded with. Some of the induced-draught boiler fans are driven by motors mounted on staging in the turbine room, as shown in figs. 1 and 2. Wright draught gauges and Gordon Mono CO_2 and CO recorders have been fitted for the original as well as for the new boilers.

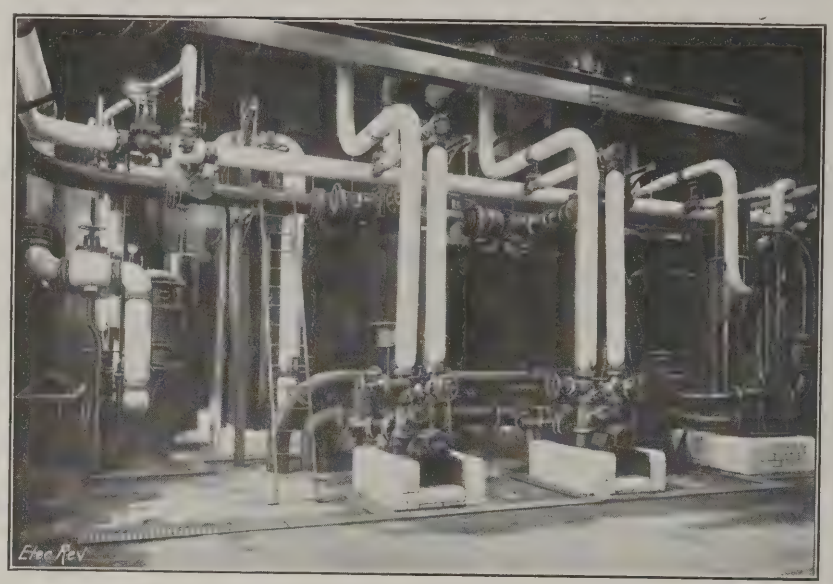


Fig. 3.—Part of New Boiler Feed Pump House.

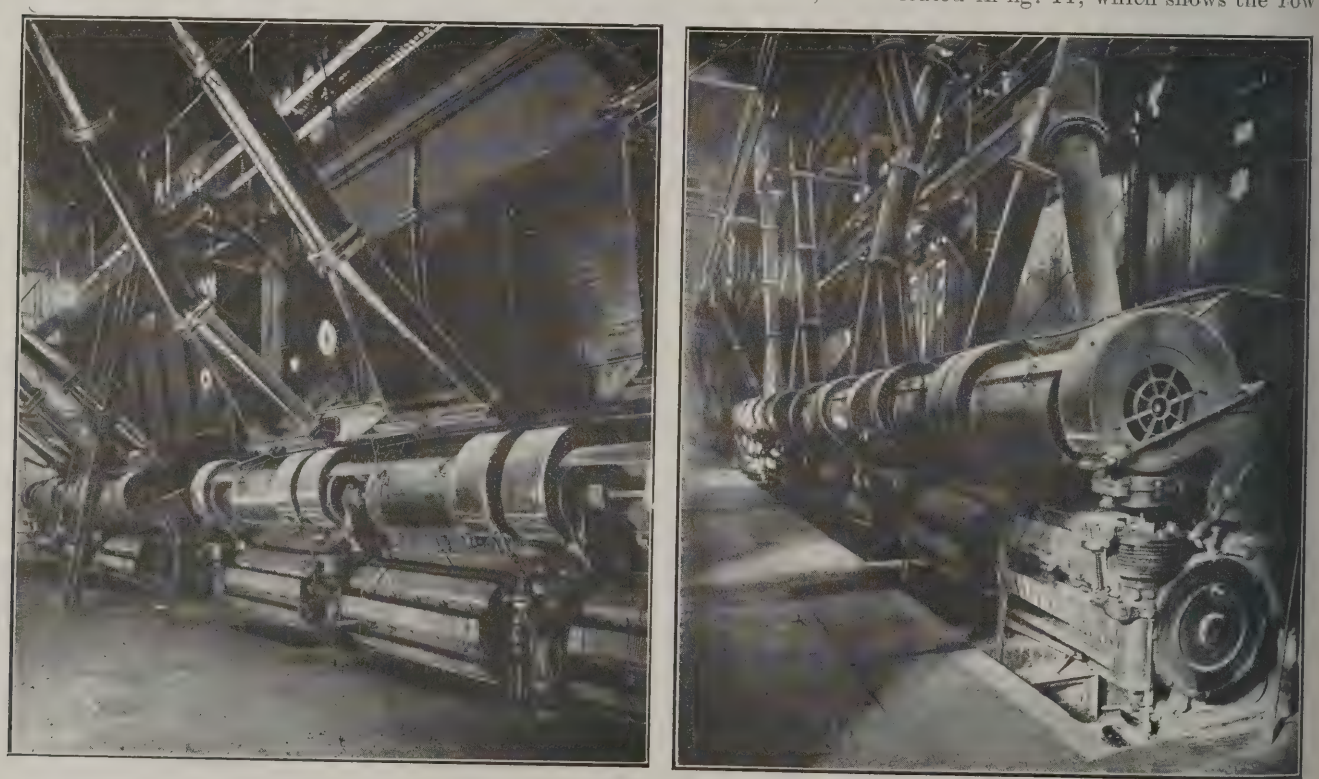
The clinker and ashes are conducted from the ash hoppers into a trough in the basement and carried to an 80-ton reinforced-concrete bunker by a water-flushing system installed by the Underfeed Stoker Co., Ltd. This system has been also extended to the original boiler house to replace a drag conveyor. The motor-driven non-chokable pumps are shown in fig. 10, and the complete absence of noise, dust, and fumes is a satisfactory feature of such plant, particularly in a generating station situated in a densely-populated residential area; although these advantages are slightly offset by a small percentage increase in the weight of ashes discharged to barges in the Regent's Canal alongside, the requirements of the site justify this minor addition to the running costs.

The steam mains are so laid out that steam from the high-pressure boilers can be supplied to the low-pressure steam mains by cross-over connections fitted with reducing and straight-through valves, the l.p. mains being fitted with relief valves to guard against excess pressure.

Fuel is drawn from overhead bunkers in the original boiler house, which are filled from barges alongside by a 20-ton per hour travelling electric crane and a bucket elevator, and a 5 ton, 4-motor, 60-ton per hour travelling electric lever-type crane having a 65-ft. jib, and balanced luffing gear by Messrs. Babcock & Wilcox; it is erected on a raised gantry, as shown in fig. 11, and discharges through an Avery 3-ton weighing machine to the belt conveyor. In view of the importance of minimising noise and dust, suction plant was tried for this duty, but the system did not come up to requirements and has been removed.

The practice of erecting cooling towers on the boiler-house roofs, as indicated in fig. 11, which shows the row of fans in the towers, has been again followed, and two large forced-draught towers have been installed by the Clyne Engineering Co., of Manchester. The smaller tower is of 420,000 and the larger of 1,800,000 gal. per hour capacity. The total tower capacity is now 3,100,000 g.p.h., and, we understand, forms one of the largest forced-draught installations in the country.

Condenser circulating water is also drawn from the Regent's Canal, and provision has been made for any



Figs. 4 and 5.—Views of Parts of the New (left) and Original (right) Boiler Houses.

turbine set to be run on either tower or canal water. The discharge pipe line to the canal has been extended a distance of 960 ft. from the intake dock, thereby more than doubling the condensing capacity of the canal, which is now capable of dealing with loads up to 15,000 kW with a considerable saving in electricity used for

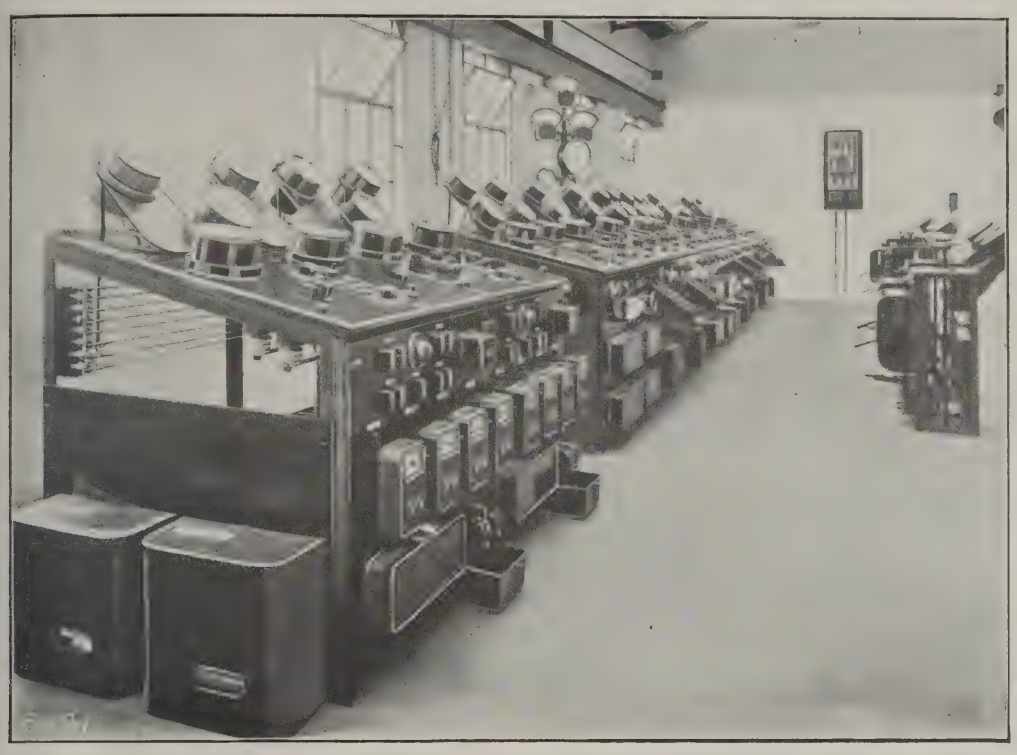


Fig. 6.—Main Switch Control Desk, Bulk Supply Panels in Foreground.

auxiliaries. Blakeborough motor-driven valves are used for all circulating-water mains from 27 in. upwards. Patterson " Chloronome " apparatus has been provided for treating the canal water, and a Bowes-Scott & Western 46,000-g.p.h. water-softening and filtration tower in reinforced concrete is in course of erection (to the left of the crane in fig. 11) for dealing with the make-up to the cooling towers and for boiler-feed purposes.

In the centre of the new boiler-house wing is a large feed-water pump room, fig. 3, which accommodates four 15,000- to 20,000-g.p.h. turbine pumps, and two sets of 300,000-lb. Weir de-aerating plant; the hot wells (scaled for turbine testing); feed-water heaters (into which all steam pumps exhaust); Lea recorders for measuring the condensate; and forced-draught fans for the original boilers. Overhead are water-treating and reserve tanks for the make-up feed water, a mixture of artesian well and canal water being found most suitable.

With the exception of the steam feed pumps and a stand-by steam-driven extraction pump for the 12,500-kW turbine set, all auxiliary plant is electrically driven, there being a total of 177 motors aggregating 6,378 h.p.

Attention is given to combustion details, and instructive records show the benefits of close supervision. This undertaking has a large lighting, heating, and cooking load, and the influence of weather conditions, particularly during the construction period of the last few years, in a measure delayed full benefit being obtained from these additions until the reserve margin of steaming and generating plant had been increased. Yearly improvements are shown, and their cumulative effect will shortly give more favourable returns, as can be seen from the following.

There is only one private generating plant left in the area, and terms have been agreed to for its replacement. St. Marylebone is a purely residential and shopping centre in the heart of the West End of London, and notwithstanding the handicap of £1,000,000 paid for goodwill, has steadily improved its position: 74 per cent. of consumers are obtaining supply at 25 per cent. below, and a further 14 per cent. at 16 per cent. below, pre-war prices; the remainder are at or about the same level. Hire and hire-purchase schemes have also largely assisted, and further developments may shortly be introduced in this direction.

An agreement has been entered into with the Cen-





Figs. 7 and 8.—Two Views of the Ferguson-Pailin High-Pressure Switchgear at St. Marylebone.

tral Electric Supply Co. for purchase and reciprocal supply in bulk up to 10,000 kW (15,000 kW in emergency), this move being influenced by the setting-up of the London and Home Counties Joint Electricity Authority and the possibility of transfer of the generating station "without adequate return being obtained for the capital expended." The agreement is determinable at any time after 1931, and it will be of interest to observe what course will be pursued when further plant is required.

There is space for extension of the boiler house into the Council's Works Department's yard, which adjoins, and the site can be further extended by the purchase of small property in the vicinity; this, however, would raise the problem of alternative accommodation for the dishoused, and is not likely to be pursued for a time. The turbine room will house another four 12,500-kW sets by the displacement of existing d.c. plant, and there is ample room for switchgear at the rear of the present d.c. switchboards, shown in fig. 2, which would be removed. The d.c. sets are now used mainly as reserve plant, and for all practical purposes three-phase, a.c. generation has been adopted.

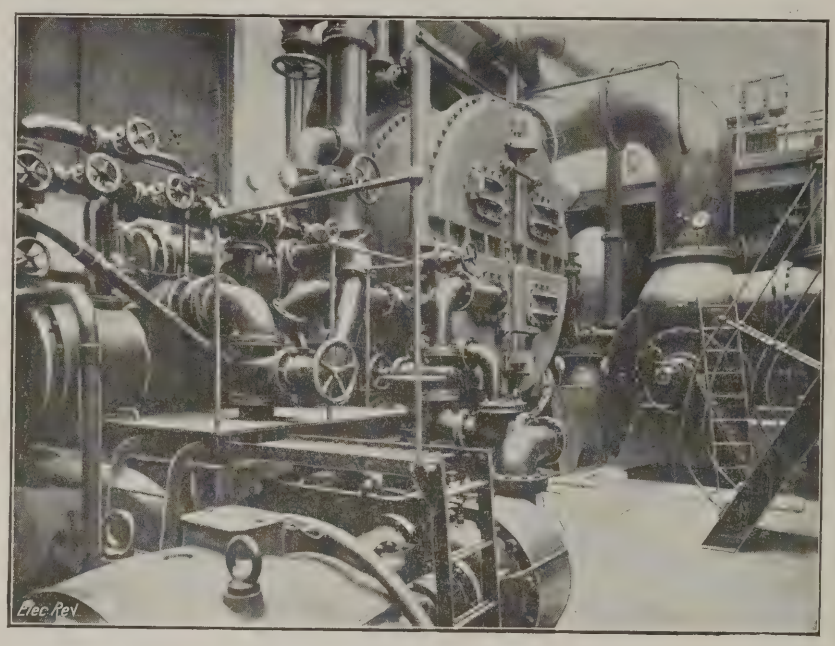


Fig. 9.—Condensing Plant for New 12,500-kW Set.

Mention should be made of the interesting installation of e.h.p. remote-operated, armour-clad, compound-filled switchgear, consisting of 17 duplicate-busbar units, manufactured by Messrs. Ferguson, Pailin, Ltd.,

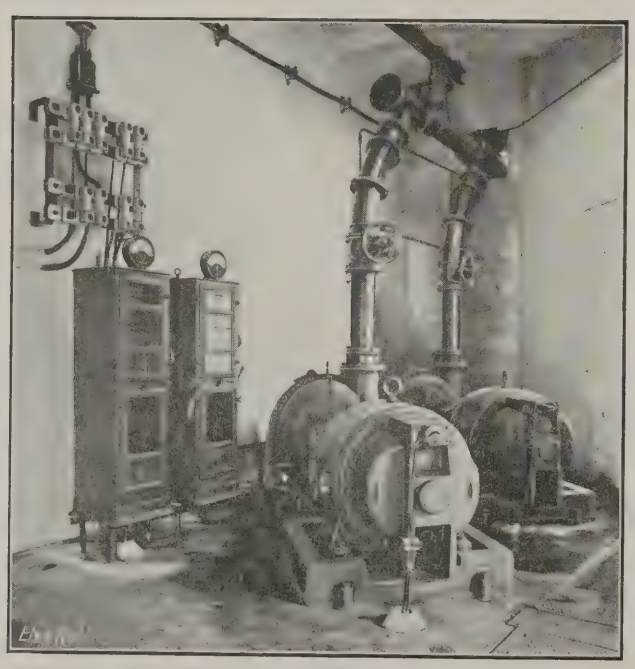


Fig. 10.—Non-Chokable Ash Pumps.

which have been erected on the ground floor, figs. 7 and 8, on sites formerly used as a workshop and general office, with a desk board and exciter pillars in a control room above, fig. 6, overlooking the engine room; the small board in the foreground controls the bulk supply.

These large switches have a rupturing capacity of 750,000 kVA and replace, in part, the original cubicle gear. Armour-clad equipment of the same make is in use in the sub-stations, with truck-type cubicle gear for transformer stations on consumers' premises, and the l.p. switchgear for the rotary converters.

A new spacious workshop, stores, and administrative block includes, on the top floor, a mess room with steam and Jackson electric cooking equipment, men's locker room, lavatories, shower baths, and a testing laboratory.

There have been considerable additions to the rotary-converter plant: Two 2,000-kW, 375-r.p.m. G.E.C. sets have been installed at the generating station, and four 1,500-kW, 500-r.p.m. Metropolitan - Vickers and one 2,000-kW, 375-r.p.m. G.E.C. sets in the two sub-stations, together with e.h.p. transmission and l.p. feeder extensions from and to these centres. The e.h.p. cables have been supplied by the British Insulated and Helsby Cables, Ltd., and the l.p. cables by the Enfield Cable Works, Ltd. Beard - Hunter and Ferranti-Hawkins protection is used for the e.h.p. system, and Merz-Price protection for the alternator cables.

Large stores and drapery establishments have been, or are in process of being, changed over to a.c. supply, each supplied from a looped e.h.p. service with Scott-connected air-cooled Berry transformer groups, in some cases up to 1,500 kVA capacity. To minimise transformer losses, arrangements have been made for transferring these installations to the 3-wire d.c. service when the businesses close down.

During the year ended March, 1919, the maximum load was 10,070 kW and the energy sold amounted to 16¼ million kWh, whereas the maximum load recorded last winter totalled 28,003 kW, and the output 50.7

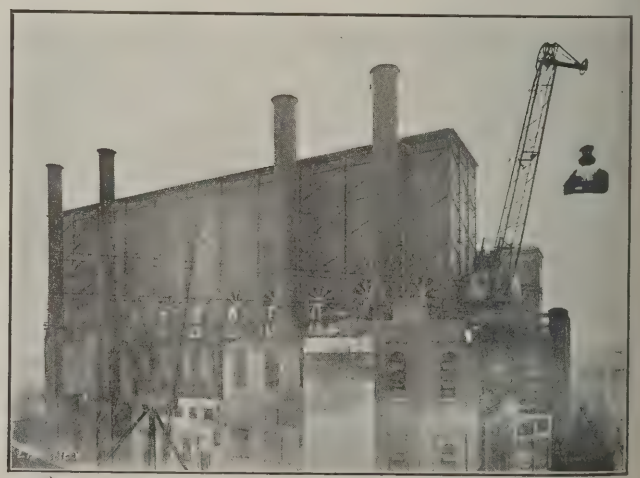


Fig. 11.—Forced-Draught Cooling Towers.

million kWh sold; it is expected this winter to reach 32,000 kW, with sales approaching 60 million kWh, surely a record in progress for an undertaking in this category without the support of large industries.

Bulk supply to Hampstead accounted for 6,270 kW and 13.3 million kWh of the output of 1924-5.

We are indebted to the chief engineer, Mr. C. H. Smyth, and his chief assistant, Mr. F. B. Leonard, for the details set out above.

Contracts Open and Closed.

(*Continued from page 898.*)

Edinburgh.—December 14th. District Board of Control. Electrical and heating work at Bangour Mental Hospital new X-ray building. Specifications from Mr. J. D. Gibson, surveyor, 60, Frederick Street, Edinburgh.

Exeter.—December 11th. Electricity Department. One 3,000-kW steam turbo-alternator and accessories. (November 20th.)

London.—ISLINGTON.—December 17th. Electricity Committee. One 75-kW a.c. motor and d.c. generator, with starters, switchgear, &c., and three 5,000-kVA Scott-connected transformers, &c. (November 20th.)

December 9th. Electricity Works. Twelve months' supply of electrical and engineering stores, including cables, meters, transformers, lamps, fires, wires, &c. (See this issue.)

H.M. OFFICE OF WORKS.—December 18th. Electric wiring in conduit of the western annexe, &c., at the British Museum. (See this issue.)

Manchester.—December 8th. Tramways Committee. Permanent-way special trackwork. Specifications from Mr. H. Mattinson, general manager and chief engineer, 55, Piccadilly, Manchester.

December 8th. Board of Guardians. Electric motors for Crumsall Institution. Particulars from E. Hargreaves, Superintendent of Works, Union Offices, All Saints, Manchester.

Motherwell.—The Education Authority of the county of Lanark is shortly to issue schedules for the various works, including the electric lighting of the new schools and schoolhouse at Glenboig. Mr. John Stewart, master of works, 20, Albert Street, Motherwell.

New Zealand.—WELLINGTON.—January 26th, 1926. Public Works Department. 50,000-V switchgear for the Waikato electric power scheme; transformers for the Lake Coleridge power scheme.*

South Africa.—JOHANNESBURG.—January 28th, 1926. S.A. Railways and Harbours. Eleven 4-ton electrically-driven wharf jib cranes and 7 electric capstans for Durban Harbour. Secretary to the Tender Board, S.A.R. Headquarters, Johannesburg.—*S.A. Mining and Engineering Journal.*

Thornton.—December 13th. Urban District Council. Electricity Department. Supplying, laying, jointing, and coupling-up complete of an electricity supply system. (November 20th.)

Uruguay.—February 23rd, 1926. State Electricity Supply Works. Porcelain insulators and accessories.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Ashford (Kent).—West Ashford Board of Guardians. Accepted:—

Installing electric light at the Institution (£647).—C. Hayward & Sons.

Australia.—SYDNEY.—Electricity Supply Committee. Recommended:—

33,000-V lead-covered cable (spec. 936) (£11,433).—Noyes Bros. (Sydney), Ltd.

Maximum demand indicators (spec. 955) (£6,231).—Edison Swan Electric Co., Ltd.—*Tenders.*

BRISBANE.—Tramways Trust.

42 traction motors.—Australian General Electric Co., Ltd.

Bexhill.—Electricity Committee. Recommended:—

1,250-kW converter, with h. and l.p. cabling (£4,700).—Bruce Peebles and Co., Ltd.

New d.c. switchboard and switchgear (£2,522).—A. Reyrolle & Co., Ltd. Cable.—(£74 and £421).—Enfield Cable Works, Ltd.

Bristol.—The contract for the Corporation scheme of electricity extensions, at an approximate cost of £1,000,000, has been placed with Vickers, Ltd., in conjunction with the Metropolitan-Vickers Electrical Co., Ltd., subject to the approval of the Electricity Commissioners.

Calne.—Town Council. Accepted:—

Laying cables, &c. (£1,571); in connection with the electricity scheme.—Siemens Bros. & Co., Ltd.

Glasgow.—Tramway Committee. Accepted:—

Switches.—W. McGeoch & Co., Ltd.

Carborundum blocks.—W. Gray & Co.

The manager recently reported on the offers received for the supply of trolley wire, and it was moved that the offer of Messrs. W. M. McIntyre & Co. (for German wire), amounting to £984, being the lowest, be accepted. There was an amendment that the offer of Messrs. Thomas Bolton & Son, amounting to £1,051, being the lowest British offer, be accepted. Eleven voted for the motion and eight for the amendment. When the recommendation to purchase German trolley wire came before the Council last week it was stated that the deliveries from the Continent were irregular, and as the Department was in want of the material and it could be obtained from the contractor who submitted the lowest British tender within seven days, it was decided to accept this tender.

Hull.—The Corporation Telephone Committee on Wednesday last week decided to accept two tenders for German-made cable and wire. In one case the price per ton was £66, against £81 the lowest British tender, and in the other case the price quoted for four tons of bronze wire was £369, against £414 the lowest British offer. Mr. Mallory said that the makers of the German wire would have the advantage of a royalty from their Government. It was also urged that it was economically unsound to send work abroad when taxation, consequent upon unemployment, was high in this country.

The Lord Mayor said that if the Corporation was not disposed to accept tenders for foreign goods, it should restrict tendering to British firms.

Irish Free State.—The following contracts were among those placed by the Controller of Stores, Department of Posts and Telegraphs, from October 28th to November 22nd:—

Telephone fuses.—Phœnix Telephone & Electric Works, Ltd.

Heat coils.—Walters Electrical Manufacturing Co., Ltd.

Telephone headgear receivers.—British L. M. Ericsson Mfg. Co., Ltd.

Telephone cords.—Phœnix Telephone & Electric Works, Ltd.; London Electric Wire Co. and Smiths, Ltd.

Telephone keys.—Phœnix Telephone & Electric Works, Ltd.; Sterling Telephone & Electric Co., Ltd.—*Irish Builder and Engineer.*

Installation of two telephone exchanges.—Standard Telephones & Cables, Ltd.

London.—GENERAL POST OFFICE.—Accepted:—

60,000 telephone switchboard lamps.—General Electric Co., Ltd.

500 fuseboards.—Edison Swan Electric Co., Ltd.

Fifty 120-watt generating sets for telephone service.—Stuart Turner, Ltd.

ADMIRALTY.—Accepted:—

6,000 terminal blocks, 4,600 switches.—Edison Swan Electric Co., Ltd.

PADDINGTON.—Borough Council. Accepted:—

Three years' maintenance of the Council's electric lighting, power, telephones, &c., in the Town Hall and other buildings.—Cunningham, Ltd.

UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON, LTD. Equipment for semi-automatic sub-station at Lambeth North in connection with the Kennington loop line:—

Two 1,500-kW rotary converters, &c.—British Thomson-Houston Co., Ltd.

Morecambe.—In a recent report to the Electricity Committee, the borough electrical engineer stated that the British prices for electricity meters were greatly in excess of those quoted by Continental firms, and he asked for instructions as to the purchase of these. The Committee has authorised him to purchase meters in the most economical market, despite a feeling of regret at taking such a course under the present circumstances of British trade.

Manchester.—Electricity Committee. Accepted:—

Heating installation, Polygon depôt.—Henry Tattersall, Ltd.

Two 500 kVA static transformers for Hetherington & Son's sub-station.—General Electric Co., Ltd.

Nottingham.—Tramways Department. Accepted:—

Ten covered low-loading type double-deck railless cars, each seating 52 passengers.—Railless, Ltd.

Salford.—Tramways Committee. Accepted:—

Eight pairs of tramway points (£676).—Hadfields, Ltd.

Twelve tramway crossings (£324).—Thermit, Ltd.

Electricity Committee. Accepted:—

914 yd. e.h.p. lead-covered cable (£914).—W. T. Glover & Co., Ltd.

Sheffield.—Electric Supply Committee. Accepted:—

Two 500-kVA Scott-connected transformer sets; one 250-kVA and six 100-kVA single-phase ditto (£2,002).—British Electric Transformer Co., Ltd.

Six 11,000-V switch-fuse sets (£452).—A. Reyrolle & Co., Ltd.

Stoke.—Electricity Committee. Accepted:—

Wiring offices in Broad Street, Hanley (£110).—J. Bagguley & Son.

Willesden.—Electricity Committee. Recommended:—

1,000-V Megger testing instrument.—Evershed & Vignoles, Ltd.

Forthcoming Events.

Nottingham Society of Engineers.—Friday, December 4th. At Victoria Station Hotel, Nottingham. At 7.15 p.m. Annual dinner.

Electrical Power Engineers' Association (Southern Division).—Friday, December 4th. At E.L.M.A. Lighting Service Bureau, 15, Savoy Street, W.C.2. At 7 p.m. Lecture on "Some Principles of Electric Illumination," by Mr. W. J. Jones.

Society of Engineers.—Monday, December 7th. At Burlington House, W. At 5.30 p.m. Ordinary meeting.

Institution of Electrical Engineers.—Monday, December 7th. At the Institution, Victoria Embankment, W.C. At 7 p.m. Informal meeting. Discussion on "Design and Performance of Protective Relays," to be opened by Mr. C. L. Lipman.

(Irish Centre, Dublin).—Thursday, December 10th. At Trinity College, Dublin. At 7.45 p.m. Paper on "The Mechanical Winning of Peat," by Mr. J. Lindsay.

(North Midland Centre).—At the Hotel Metropole, King Street, Leeds. At 7 p.m. Paper on "An All-Electric House," by Prof. S. P. Smith.

(Scottish Centre).—Tuesday, December 8th. At the Royal Technical College, Glasgow. At 7.30 p.m. Paper on "Electricity in Mines," by Major E. I. David.

(Dundee Sub-Centre).—Thursday, December 10th. At the University College, Dundee. At 7.30 p.m. Paper, "Some Features of Telegraph Engineering," by Mr. J. K. Murray

(East Midland Sub-Centre).—Tuesday, December 8th. At the College, Loughborough. At 6.45 p.m. Address by Mr. F. J. Moffett, Chairman of the South Midland Centre.

(North-Western Centre, Students' Section).—Tuesday, December 8th. At Milton Hall, Deansgate, Manchester. At 7.30 p.m. Paper on "The Treatment of Overhead Expenses," by Mr. F. C. Lawrence.

(London Students' Section).—Friday, December 11th. At the Institution, Victoria Embankment, W.C. At 6.15 p.m. Paper on "The Rotary Converter Automatic Sub-station," by Mr. F. J. Lane.

Institution of Electrical Engineers—(*continued*).

(South Wales Branch).—Saturday, December 12th. At the South Wales Institute of Engineers, Park Place, Cardiff. At 6 p.m. Paper on "The Selection, Lay-out and Maintenance of Electrical Equipment at Collieries," by Mr. J. A. B. Horsley, Chief Electrical Inspector of Mines.

Glasgow Corporation Electricity Department Engineering Society.—Monday, December 7th. At Welfare Hall, St. Andrew's Cross Works. At 7.45 p.m. Open night. Mains Section.

Royal Society of Arts.—Monday, December 7th. At John Street, Adelphi, W.C. At 8 p.m. Cantor Lecture, "Coal Ash and Clean Coal," by Dr. R. Lessing. (Lecture III.)

Institute of Transport.—Monday, December 7th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 5.30 p.m. Paper on "Some Financial and Political Aspects of Highway Development," by Mr. A. Hacking.

Association of Mining Electrical Engineers (London Branch).—Tuesday, December 8th. At the Engineers' Club, Coventry Street, W. At 6.30 p.m. Paper on "Mining in Other Countries," by Mr. H. M. Morgans.

Radio Society of Great Britain.—Wednesday, December 9th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 6 p.m. Informal meeting. Talk on "The Acoustics of the Headphone and Loud Speaker," by Mr. A. E. Bawtree.

Institution of Engineers-in-Charge.—Wednesday, December 9th. At St. Bride Institute, Bride Lane, E.C. At 7.30 p.m. Paper on "Oil Fuel for Commercial Purposes," by Mr. J. V. Stevens.
Saturday, December 12th. Social dance.

Junior Institution of Engineers.—Friday, December 11th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 7.30 p.m. Presidential address by Mr. J. S. Highfield.

Physical Society of London.—Friday, December 11th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary scientific meeting.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the address of a firm known as "LUXTON GREEN," of London, makers of electric soldering plant.

Notes.

Prevention of Accidents.—Arising from the president's address on October 6th, the Board of Control of the National Association of Supervising Electricians has appointed a special committee to go into the question of accidents, their causes and means of prevention, with a view to the publication at a later date of a "Safety Code," which, instead of being an ornamental one, shall be of a practical nature. The Board would be glad to receive details of any accidents, not only fatal and reportable ones, but minor accidents that have occurred in the electrical industry. All information will be treated confidentially, and replies should be addressed to the secretary, Mr. A. Brammer, marked "Accidents."

London Traffic Inquiry.—At the continued inquiry held by a sub-committee of the London Traffic Advisory Council at the hall of the Institution of Civil Engineers on November 26th into the traffic facilities of North London, Mr. F. Pick, assistant manager of the Underground Group, gave further evidence. He stated that, in his opinion, the first step towards relieving the position would be the construction of a tube from Finsbury Park to Golders Green, but that the Underground Group had not the financial resources to construct a tube. He agreed that if protection were given to the Group, it would consider an extension of the tube from Finsbury Park. The inquiry was concluded, and the Committee will submit its recommendations to the Minister of Transport in due course.

Educational Notes.—NORTHAMPTON POLYTECHNIC INSTITUTE.—The annual prize distribution took place on Wednesday evening. The prizes and certificates were presented by Lord Montague of Beaulieu. To-morrow (Saturday) evening the members' and students' conversazione will be held from 6.30 to 10.30 p.m.

SCHOLARSHIPS IN ENGINEERING.—The Governors of Loughborough College invite applications for the award of five open scholarships in the Faculty of Engineering, each of the value of £75 per annum. The scholarships are open to British subjects, over 16 years of age on October 1st, 1926, situate in any part of the Empire, and are tenable at Loughborough College for the period of the full diploma course. The entrance examination for the session 1926-27 will take place on May 27th, 28th, and 29th, 1926. Particulars and application forms may be obtained from the College Registrar, to whom all forms of application must be returned not later than March 1st, 1926.

B.E.S.A. Revised Publication.—A revised edition of the British Engineering Standards Association Publication No. 77, Standard Pressures for New Systems and Installations, has just been issued. The original document was published in 1921, and laid down two standard low pressures, 220 V d.c. and 240 V a.c. At the time an effort was made to standardise one low pressure only for both d.c. and a.c. circuits, but this was not then found to be possible. The Electricity Commissioners, the Institution of Electrical Engineers, and the large industrial and supply organisations have since been consulted, also the local Committees of the B.E.S.A. abroad, and the proposal for one pressure has met with very general approval. The new document lays down 230 V for both d.c. and a.c. as the standard low pressure for new systems. It is hoped that the new standard pressure will be employed in this country for all new systems and installations. Copies of the new specification (No. 77-1925) may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1. Price 1s. 2d., post free.

Swansea Electrical Dance.—The annual South Wales Electrical Engineers' dance took place at Swansea, on November 20th, and proved a great success, attracting guests from Swansea district, Cardiff, and other parts of South Wales. The Patti Pavilion was decorated by the Parks and Electricity Departments, the lighting, by means of fairy lamps, mood light, and other devices, being very effective. The music provided by the Manhattans Band was broadcast through the Swansea station.

Glasgow Fire Alarms.—The Glasgow Corporation fire master has been authorised to purchase 20 new telephones to replace those at present rented from the Post Office, and to have each of the fire alarms fitted with a special bridge designed by his staff, the telephones and bridges to cost £200. A special lamp, designed and made by the Inspector of Lighting for lighting the street fire alarms, is to be fitted to all the street alarms.

London's Electricity Supply.—L.C.C. RETURN.—The annual Return relating to electricity supply in the London and Home Counties Electricity District was issued by the London County Council last week. It contains a mass of detailed statistical information regarding the subject, and deals with an area of 1,797 square miles, containing a population of over eight million souls, in which there are 89 authorised distributors. Whereas the issue for 1922-23 comprised 59 pages, that for 1923-24 is increased to 71 pp. It will be reviewed in an early issue.

Electrolytic Tungsten.—In *Zeitsch. für Elektrochemie*, No. 31, 1925, Van der Liempt describes the results of some researches made by him in the electrolysis of, and plating with, tungsten. Tungsten metal is obtained in the form of powder electrolytically by means of an electrolyte consisting of sodium or other alkali tungstate in a fused condition, using as anode either graphite, tungsten metal, or tungsten carbide. As cathode, either a second element of similar composition to the anode may be used or, if the bath container is of metal, this may be made to serve. The material recommended for the bath material may be one of the following: calorised iron, iron-chromium or nickel-chromium alloy, or quartz or other fire-resisting material. The most favourable temperature of the fused electrolyte appears to be from 700 to 1,000 deg. C.; and the current density about 15 amperes per square decimetre. The product, consisting of tungsten metal, is about 99.3 per cent. pure, the impurities consisting of silicon and reduced alkali metal. The electrolyte should be either neutral or very faintly acid.

For plating with tungsten a porcelain bath container is recommended, with a tungsten plate as anode, and a copper plate, or the article that it is desired to plate as cathode. In this case the electrolyte may be weakly acid, which results by mixing 38 per cent. Na_2WO_4, 32 per cent. Li_2W_4, and 30 per cent. of WO_3. The optimum current density lies between 20 and 80 amperes per square decimetre, and the most suitable temperature is round 1,020 deg. C. Copper and nickel are both very suitable cathode materials, and if it is desired to plate objects made of another metal, a preliminary plating either with copper or nickel is recommended. To obtain a thick coating of tungsten the operation must be prolonged, or repeated until the desired thickness is reached.

It is believed that this discovery, often unsuccessfully sought for, is of great technical importance. It would, of course, be much less expensive to accomplish if it were possible to deposit tungsten from a water or acidified water solution of a salt of tungsten. Experiments in that direction have been conducted with various tungsten salts, including the chloride, the double oxalate and cyanide; and various solvents, including acetone and glycerine, without success. A small deposit of tungsten was obtained in the glycerine bath containing tungsten chloride, but although conductivity was increased by the introduction of dry hydrochloric acid gas into the bath, no results of a practical character were obtained. In the present state of knowledge therefore, the only method of plating with tungsten is from a molten electrolyte, such as has already been described.

The "Panatrope."—The "panatrope," a new musical reproducing instrument which operates on a light wave system, synchronising electrical reproduction with electrical recording of sound, had its premier presentation on November 11th at the Æolian Hall. The instrument has been developed by the Radio Corporation of America, the General Electric Co., the Westinghouse Electric & Manufacturing Co., and the Brunswick-Balke-Collender Co.—*Reuter's Trade Service* (New York).

Coal, Power, and By-products.—Under this title a paper was read by Mr. T. R. Wollaston, M.I.Mech.E., before the Manchester and District Association of the Institution of Civil Engineers last week. The author proclaimed himself as unorthodox, advocating a deep and hot fuel bed in a boiler furnace, with the correct proportions of primary and secondary air to produce perfect combustion, and claiming that gas, oil, or coal could be burnt with from 5 to 10 per cent. excess air and a CO_2 content of 18 per cent. He urged that a radical change in boiler design was necessary, and put forward some designs of his own for firing boilers with producer gas.

Wave Power in Australia.—Following the recent demonstration by Mr. Percy Bates of his invention for the utilisation of wave-energy on the shore—the motion being transmitted to hydraulic pumps and then transferred to a water-turbine coupled to an electric generator—a number of city business men have decided to take steps for the formation of a company, to be known as Bates Wave Power (Australia), Ltd., with a capital of £100,000.—*Daily Telegraph* (Sydney).

A Large Lighting Installation.—The accompanying illustration is of the chapel of the famous Roedean School, Brighton, which has recently been equipped with electric lighting. The installation, comprising about 1,800 lights, has been completely wired on the "Kaleeco" system, and it is said that the work was entirely completed in seven weeks, from the date of order to the date of completion, without previous notice. The work was carried out entirely by Messrs. V. G. Middleton & Co.,



Church Lighting at Brighton.

Ltd., the consulting engineers being Messrs. Couzens and Brown. The supply is taken from the Brighton Corporation system at 8,000 V, 3-phase, 50 periods, and is transformed on site to 230 V for distribution to the various buildings. A previous record installation carried out by the same contractors was Marlborough College, where some 2,000 lights were also wired on the same system.

Finsbury Technical College. — STREATFEILD MEMORIAL LECTURE.—The eighth annual lecture was to be delivered by Mr. F. H. Carr, C.B.E., F.I.C., at the College yesterday, the subject being "The Scientific Basis of Industry." Sir William J. Pope, K.B.E., F.R.S., was to preside, and constructive proposals were to be put forward for the foundation of a monotechnic in London to be devoted to the training of chemical engineers, utilising for the purpose the buildings of Finsbury Technical College.

Characteristics and Uses of Ground Gears.—In a paper presented before the Institution of Mechanical Engineers, Mr. H. F. L. Orcutt set forth the peculiar features of the ground gear and made suggestions for its use in engineering work for which it may be specially adapted. He said the two outstanding characteristics of ground gears were extreme accuracy and the possibility of making a straight-tooth spur-gear of material with any desirable physical properties. The gear grinding machine was the only instrument which would produce straight-tooth gears to run quietly at high speeds. Moreover, gears with the teeth finished by grinding had special characteristics of great importance to the mechanical engineer. These characteristics were of such a nature that they made possible new developments in power transmission. Any number of gears in motor-car gear-boxes were in use carrying a load of over 3,000 lb. per in. of face. As a contrast, many electric railway gears were in use carrying loads of only 1,200 lb. per in. From tests it seemed that quiet running could be secured with high-grade gearing at practically unlimited speeds if the teeth were accurately ground, not overloaded, and the gears correctly mounted. A peripheral speed of 3,000 feet per minute was commonly in operation with quiet running, and it was reported that there were in use ground gears transmitting considerable power at a peripheral speed of no less than 10,000 and even 20,000 ft. per min. Direct comparative tests had been made which demonstrated that gears accurately and smoothly finished had a longer life than those which were inaccurately or roughly finished; and actual service tests had shown that railway transmission gears with ground teeth outlasted all others. An important application of ground gears was beginning to interest electrical engineers. The ground gear had many features which made it especially applicable as a direct reduction unit between the motor and axle of electric locomotives. It was simple, smooth running, quiet, would stand very high speeds, could be of small dimensions, had a high factor of safety and long life. So far as it had been applied it had demonstrated its safety and life and smooth running. It had not, however, been made use of with dimensions and speeds outside those specified usually for soft steel. So far as was known, the ground gear was not used by any electrical engineer in ordinary engineering speed reductions, so commonly demanded where a direct motor drive was employed. There was a very large possible application in this particular direction. The ground gear for motor drives would certainly replace in many instances helical gears, laminated gears, fibre gears and chain drives, in many cases saving in first cost as well as giving an equally quiet and a more lasting service. Whether ground gears would be used for turbine transmission very extensively or not it was impossible to say. They had been in service for some time, but only to a limited extent. Gear grinding on large diameters with fine pitches had not been very much developed. It was no exaggeration to state that gear tooth grinding opened a new era of practical progress in power transmission.

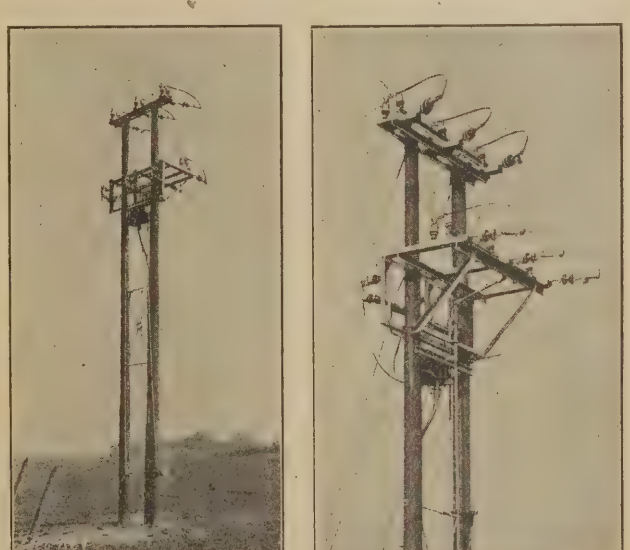
The Betrayal of the Megohm.

I am the mighty megohm, guarding close
The confines of high voltage, and I keep
Within these insulating bonds the path
Of surging current for the use of man.
From the lean busbar leops the potent force
Ready to serve or break him, and my task
Ever the sleepless watch upon the mains.
Day, night, from dawn to sunset and beyond
Through each full cycle moves the restless power,
Nor stops nor weakens but to leap more strong.
From the peak load's fury and the dire strain
Of overload, deliver me!—That hour
When every molecule is stressed to stand
The fell transformer's pressure, when the song
Of every spinning turbo gathers sound
More menacing and strident down the line.
I see the switchboard in the house of power,
I watch the 'meter's hand across the dial,
I feel the shock of every new machine
Switched in to meet the load. And then I call
On every molecule to stand and hold?
And if some fail me—the dread leakage path,
The guileful current seeping through those pores
To mine undoing. . . .
Then alas, betrayed,
Impotent, broken from these treacherous wounds
I fail, and dwindle and am nought. Now comes
The Megger whom erstwhile I had defied,
To mark my failure and record my shame!

—A. G. H. DENT.

Austrian Electrical Congress.—The 22nd annual meeting of the Union of Austrian Electricity Supply Undertakings was recently held in Gratz, when among the papers read was one on "Safety Precautions in High-Pressure Electrical Installations," by Herr F. Hartmann, and one on "The Value of Lighting Technics for Central Stations," by Prof. J. Ondracek.

Poletype Switches.—A feature of an electric tranmission line, for which the contractors were Messrs. W. T. Henley's Telegraph Works Co., Ltd., is indicated in the two accompanying illustrations, which show an "H" terminal pole that has been equipped with three 11,000-volt, triple-pole, air-break, horn-type isolating switches manufactured by Messrs. Electric Control, Ltd., of Glasgow. The two horizontally-mounted switches are for isolating the two separate supplies, which are received at the terminal pole from two separate power stations. The vertically-mounted switch is for isolating the tap-off,

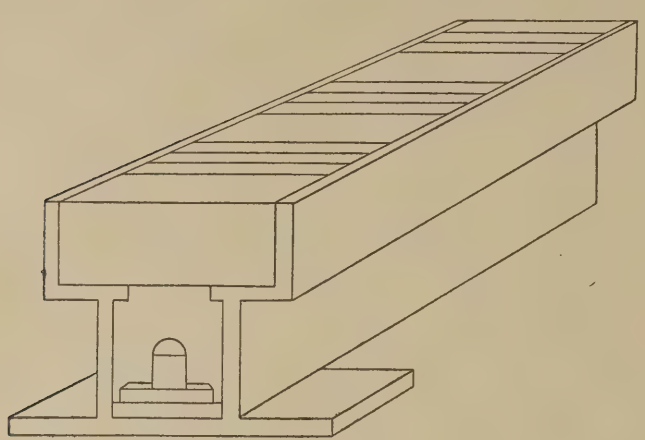


Pole-mounted Isolating Switches.

which leads through a pole-type tri-box to an underground cable supplying a colliery. Seeing that the two power lines approach the terminal pole with an angle between them of approximately 60 deg., the compact result obtained by the combination of horizontal- and vertically-mounted switches is particularly interesting. As will be seen from the illustrations, all three isolating switches are operated from the ground level by means of quadrants and levers, and padlocks are provided for locking the switches either in the "closed" or "open" position.

A Road Surface Traffic Guide.—To provide an efficient means of guidance for traffic round dangerous corners, Mr. R. F. Brown, surveyor, Great Clacton, has invented an ingenious device known as the "Illuminated White Line." It consists of a wrought-iron "square" channel trough, with a flanged top in which are fitted alternately laminated white marble, reinforced, and prism-glass pieces, giving the effect of a permanent white line. In the trough under the "white line" elements is arranged a system of electrical illumination produced by the Electrical Installation Co., London. The apparatus is manufactured in sections of convenient lengths and is about 3½ in. in width and 5 in. deep. It is intended to be suitably installed where required in the roadway with its top (marble and glass) surface level with that of the road. It will resist, it is claimed, heavy road traffic, by virtue of the lamination and reinforcement of the marble, and special lenses which, it is said, result in a powerful beam of light.

The first installation using this device was recently completed and tested, with satisfactory results, at the very important cross roads on the North Central Road and Golders Green Road, Hendon. It is said that the "white line" when illuminated at night is visible to a vehicle driver very many yards before he reaches it. The electrical installation at Hendon is automatically controlled for switching on and off and for lighting-up time variations. The device is manufactured by Messrs. Haywards, Ltd., London.



"White Line" Device.

Appointments Vacant.—Clerk and solicitor (£1,500) for the London and Home Counties Joint Electricity Authority. Assistant Engineer for the East Grinstead U.D.C. Electricity Department. Assistant in the Mains Department of the Southport Corporation Electricity Works. Charge Engineer for the Stalybridge, Hyde, &c., Joint Board. Shift Charge Engineer for the United Alkali Co., Ltd.; Commercial Assistant (£500) for the Croydon Corporation Electricity Department. (See our advertisement pages to-day.)

Telephotography.—The claim that it is possible to broadcast pictures in the same way as music is broadcast was put forward by Mr. Thorne Baker during a recent lecture before the Royal Photographic Society. In the demonstration the resulting picture was similar to those which appear in newspapers, and the time taken for the transmission was three and a half minutes.

Mr. Thorne Baker is reported to have said that the receiving instrument which he had designed could be operated by any intelligent boy or girl and could be used by anyone possessing a valve receiving set. The cost of the sensitised paper for each picture should not exceed a penny, and by the method which he had demonstrated it would be possible to broadcast pictures of people or of events.

High-Voltage Cathode Rays.—In a preliminary communication to *Science* of November 13th, Dr. W. D. Coolidge mentions that Lenard succeeded in getting electrons from a cathode-ray tube out through a thin metal window into the air; the voltage employed was that necessary to produce a 3-cm. spark between small spheres. The window consisted of a piece of aluminium foil 0.00265 mm. thick and 1.7 mm. in diameter. With a specially-designed hot-cathode, high-vacuum tube, it has been found possible to operate with as much as 200,000 volts and several milliamperes, using a window 8 cm. in diameter. The maximum range of the electrons in the air in front of the window has been measured approximately; for an aluminium window 0.0254 mm. thick, it is given by the equation: Range (cm.) = 0.254 × kilovolts (max.) − 17.8. The lowest peak voltage at which there is appreciable intensity in front of and close to the window is 70 kilovolts, and the maximum range at the highest voltage used, 250 kilovolts, is 46 cm. The luminosity of the air in the path of the discharge is very beautiful, especially at the higher voltages, where, due to scattering, the beam is seen to spread out and bend round until it finally extends more than half as far back of the window as it does in front of it. The appearance is then that of a solid ball of purple glow with its centre a little in front of the window.

Calcite crystals, upon being rayed, fluoresce strongly in the orange and remain highly luminous for several hours after raying. In addition to this, they may show bright bluish white scintillations. These have been observed while the crystal is undergoing bombardment and for as long as a minute after raying. By slightly scratching the rayed surface of the crystal with any sharp instrument, the scintillations may be produced for as long as an hour after raying. Many liquids and solids undergo marked chemical changes under the influence of the high-speed electrons. For example, castor oil changes rapidly to a solid material. Crystals of cane sugar turn white in colour and, upon subsequent gentle heating, evolve considerable quantities of gas. An aqueous solution of cane sugar becomes acid to litmus upon being rayed.

The effect on organised tissues is very pronounced, as may be seen from the following examples. When a portion of the leaf of the rubber plant (*Ficus Elastica*) is rayed with 1 milliampere for as long as 20 seconds, the rayed area becomes immediately covered with white latex, as though the cell walls had, in some way, been ruptured. An exposure of as little as 0.1 milliampere for 1 second produces a visible colour change with subsequent drying out of the rayed area to a depth corresponding to the penetration of the rays. The ear of a rabbit was rayed over a circular area 1 cm. in diameter with 0.1 milliampere of current for 0.1 second. Within a few days the rayed skin became deeply pigmented and the hair came out. Seven weeks after the treatment new hair appeared.

Fruit flies, upon being rayed for a small fraction of a second with 1 milliampere, instantly showed almost complete collapse, and in a few hours were dead. Bacteria have been rayed and an exposure of 1/10 second has been found sufficient to kill even the highly-resistant spores of *b. subtilis*. The phenomena of luminescence, phosphorescence, thermo-luminescence, and change of colour which take place as a result of electron bombardment from the tube are very striking and easily demonstrated, and many substances which could not be brought into a vacuum can be subjected to electron bombardment in this way.

Recent Progress in Illuminating Engineering.—The opening meeting of the Illuminating Engineering Society on November 26th, presided over by Mr. J. Eck, was as usual devoted to the presentation of reports on progress and to the exhibition of novelties. Before proceeding with the business, the chairman moved a resolution expressing sympathy with His Majesty King George and the Royal Family in the bereavement they had sustained in the death of the late Queen Alexandra; and referring to her interest in light and health, as exemplified by her encouragement of the introduction of special lamps for medical treatment from Denmark. A very interesting and comprehensive set of novelties were shown, the first item being the "Dia" long-burning flame arc, shown by Captain Risch. One of these was hung from the dome of the lecture hall, forming the sole means of lighting the room during the first part of the proceedings. The special design of the globe obviates the tendency for fumes to deposit and obscure the light. The lamp is stated to operate at 0.18-0.22 W per candle and to have a burning period with one pair of carbons, of 120 hours. Mr. Groom demonstrated the ingenious Mutochrome projector, whereby, with the aid of a number of lenses equipped with colour-filters, a series of dovetailed patterns and colour effects can be thrown on the screen. One obvious application of the apparatus is in the design of wallpapers, &c. Mr. A. Cunnington illustrated by a lantern slide a new illuminated name-plate erected outside Putney railway station, which is seen by the passengers before the train enters the station. A new cubicle integrating photometer was sent by Col. Kenelm Edgcumbe, and Mr. Sack showed a form of motor-headlight in which partially colour-sprayed lamps are used. This appears to be a simple and effective means of mitigating the glare difficulty. Other exhibits included various new forms of reflectors and lighting units. Mr. J. Horstman gave a demonstration of a series of automatic time switches.

After some discussion of the exhibits, Mr. Gaster presented, in abstract, his report on "Recent Progress in Illuminating Engineering." This served to show how rapidly the activities of the Illuminating Engineering Society are growing. Mr. Gaster made special reference to the work of the Committee on Illumination working under the Department of Scientific and Industrial Research, which is doing good work in regard to methods of lighting for various difficult factory processes. The concluding section of the report dealt with developments abroad, and it was shown how striking was the growth of the illuminating engineering movement in the chief Continental countries. The moral is the need for a strongly-supported illuminating engineering society in this country to express the national views in lighting matters, and the desirability of this country continuing to take a leading part in these international gatherings. The next meeting is to be held at the premises of the E.L.M.A. Lighting Service Bureau, when the report of the Committee on Progress in Electric Lamps and Lighting Appliances will be presented.

B.E.S.A. Specification.—At the request of the Radio Society of Great Britain and the Ebonite Manufacturers' Association, a Standard Specification for ebonite suitable for panels for radio reception purposes, has been drawn up by the British Engineering Standards Association. It is anticipated that this will go a long way towards eliminating the doubtful qualities of ebonite from the market. The composition of the standard ebonite is rigidly specified, and adequate mechanical and electrical tests are laid down. A recommended list of sizes and

thicknesses of panels is included, and while it is realised that the size and shape of panels will necessarily vary in accordance with variations in the progress of design of receivers, every endeavour has been made to cover all reasonable requirements suggested by the trend of present-day design. By making use of the recommended sizes as far as possible, the full benefits of standardisation will accrue to purchaser and manufacturer alike. Copies of this specification (No. 234, 1925) may be obtained from the B.E.S.A., Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d. post free.

A Lifeboat's Wireless Equipment.—The forty-foot lifeboat in which Captain G. E. Hitchens and four companions are to sail round the world has left London. The object of the 38,000-mile voyage is to demonstrate in a practical way how a lifeboat can be fitted for a long cruise, without involving the crew in serious hardships, and to test the value of wireless equipment to a crew in such circumstances. The *Elizabeth and Blanche* has, therefore, been fitted with the latest type of Marconi lifeboat set, which will be subject to exacting tests under actual service conditions. The Marconi ¼-kW lifeboat set has received the full formal approval of the Board of Trade and the Post Office, and consists of a quenched-gap transmitter and a valve receiver, the latter being arranged for directional reception (though this is in excess of the actual Board of Trade requirements, and the standard non-directional receiver is supplied if required).



Radio Apparatus on the "Elizabeth and Blanche."

The power for the transmitter is supplied by a small petrol plant, and in actual tests with this apparatus installed in a lifeboat, signals have been received by ships at distances up to 175 miles, and were reported to be steady and clear; and communication was maintained for one hour in daylight with a land station 300 miles away. The directional receiver will be a valuable aid to navigation, and the power plant for the transmitter will also be used to work a small searchlight which can be controlled by a Morse key, so that it can be employed for flashing signals if necessary; and also to provide illumination for the wireless compartment and the boat. In addition, the *Elizabeth and Blanche* will carry a Marconi marine receiver of the 4b type, which employs two valves, is adaptable to every wave-length used for commercial purposes, and will therefore enable the crew to receive messages of meteorological and navigational importance, time signals, &c., over long distances. The vessel is provided with a standard Parsons 2-cylinder, 14-16-h.p. petrol-paraffin engine for propulsion.

Institution Notes.

Institution of Electrical Engineers.—SOUTH-MIDLAND CENTRE.—In consequence of the lamented death of Her Late Majesty Queen Alexandra, the annual dinner of the Centre, which was to have taken place on November 27th, has been postponed until Wednesday, January 13th, 1926.

INFORMAL MEETING.—At the informal meeting on Monday, November 23rd, with Mr. J. Coxon in the chair, Mr. E. E. Tasker opened a discussion on "The Testing of Large Electric Plant," but the title of his paper did not convey the importance of the method which he described. The system of testing is one developed in Sweden and is mainly an elaboration of the Hopkinson test, but obviates the need of two identical machines. Mr. Tasker showed that a considerable number of difficulties were always entailed in arranging a full-load test of machines corresponding to the normal service conditions, especially when testing large sets. The no-load and short-circuit heating test was used to a large extent but did not give exact results, as the method was founded on the combination of two separate tests which both showed a deviation from the actual conditions. Synchronous machines could be tested as over-excited synchronous motors; the losses in the armature could be adjusted to correspond to the right values, but the method had a great disadvantage in that the field winding was loaded to a greater extent than under normal conditions. A method had been invented by Mr. Liljenroths for testing synchronous machines, on the following lines:—Let them suppose that any machine was electrically connected to a system without being mechanically connected to any other machine, either as a driving motor or as a load-carrying generator, and that this machine was run at no load at normal speed. If the conditions of the system were altered so that the speed of the machine was increased, the machine would continue to run at no load. While this increase of the motor speed was taking place and the machine thus being accelerated, a surplus of electrical energy had to be supplied to the rotating parts of the machine in order to obtain the necessary kinetic energy, *i.e.*, the machine would during this time work as a motor, the load being the rotating masses of the machine itself. If the alterations occurred comparatively quickly, the machine could easily be fully loaded. If, on the contrary, the alteration of the system was made so as to decrease the speed, the rotating masses of the machine would have to return the energy to the system and the machine would during this period work as a generator on the system. It was quite evident that if such alterations were made to take place successively and were of short duration, the machine would work alternatively as a motor and generator, with the result that—although not mechanically loaded in any way—it would be on the average fully loaded. Mr. Tasker then described the practice of using a generator of, say, 55 cycles, or 5 cycles more than the frequency of the machine under test, and of about 15 per cent. of the output. The current of this machine superimposed and interrupted on the current to the other, produced all the conditions of load. He explained the practice of applying the test to d.c. machines, and asynchronous and synchronous motors. Numerous diagrams and test sheets as well as lantern slides of machines were exhibited.

Institution of Engineering Inspection.—On January 15th, 1926, a paper will be read by Messrs. B. P. Dudding, A.R.C.Sc., F.Inst.P., and G. T. Winch (of the Research Laboratories of the General Electric Co., Ltd., on "The Characteristics of Electric Lamps in Relation to their Testing.

Royal Society.—NEW OFFICERS.—At the meeting on Monday last Sir Charles Sherrington retired from the office of president, which he has held for five years, and was succeeded by Sir Ernest Rutherford, O.M., who is at present visiting his parents in New Zealand. The following officers were elected: Treasurer, Sir David Prain; Secretaries, Mr. J. H. Jeans and Dr. H. H. Dale; and Foreign Secretary, Sir Richard T. Glazebrook. The Copley medal was awarded to Prof. Einstein in recognition of his brilliant work in developing his theory of relativity, which, itself under test a few years ago, is now fully accepted and is used as a test for the validity of other theories. The Sylvester medal was awarded to Prof. A. N. Whitehead, and the Hughes medal to Mr. F. E. Smith.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Mr. R. B. MITCHELL, the Glasgow city electrical engineer, has been invited, as president of the I.M.E.A., to attend a conference of the International Electrotechnical Commission in New York next April, and the Electricity Committee recommends that this visit be authorised by the City Council and that Mr. Mitchell's expenses be defrayed.

Mr. A. J. HENNING, of H.M. Dockyard, Portsmouth, has been appointed assistant engineer in the Portsmouth Corporation electricity supply mains department.

Mr. W. THYNE, chief clerk of the telephone service in Sheffield, who is returning to Glasgow to take charge of the office where he began his career, has been presented with a musical cabinet by the telephone staff. He has been in Sheffield for 27 years.

Mr. C. G. RANSLEY, for many years district manager of the Guildford District of the Post Office Telephones, retires on December 19th, after completing 45 years in the telephone service. He will be succeeded by Mr. R. U. TUCKER, of Birmingham.

Messrs. Premier Electric Heaters, Ltd., of Birmingham, have appointed Mr. JAMES C. STEWART, of Glasgow, as their representative for the Glasgow and Edinburgh districts.

Councillor J. HEWITT, J.P., has been elected chairman of the St. Helens Electrical Supply Committee, and Col. NORMAN PILKINGTON, D.S.O., deputy-chairman.

At the works of the Liverpool Electric Cable Co., Ltd., Bootle, Liverpool, on November 9th, Mr. WILFRID S. TAYLOR, who has resigned his position as managing director of the company, was presented by the employés with an oak writing desk and chair. Mr. T. H. Tweedle, works manager, who made the presentation, referred to the good feelings which had always existed between Mr. Taylor and the employés.

Mr. A. DUPONT, managing director of the Compagnie Française des Câbles Télégraphiques, of Paris and London, since 1916, has been elected president to folow the late Mr. E. May.

Mr. PHILIP DEBELL TUCKETT has been appointed a director of the Chelsea Electricity Supply Co., Ltd., in the place of the late Major W. F. Woods. Mr. Tuckett is chairman of Edmundsons' Electricity Corporation, Ltd., and a director of the City of London Electric Lighting Co., Ltd. He is also a representative on the London Joint Electricity Authority.

Mr. J. H. ASDELL, M.Sc., has been appointed manager of the Electrical Department of Messrs. Parker, Winder and Achurch, Ltd. Mr. A. A. Merris will continue duties as outside manager.

Obituary.—MR. J. F. JOHNSON.—Mr. Josiah Francis Johnson, manager, General Engineering Division of the South Philadelphia Works of the Westinghouse Electric and Manufacturing Company, died suddenly of cerebral hemorrhage on November 12th. Mr. Johnson, who was 46 years of age, entered the service of the company in 1905, when he was engaged in the shop testing of steam turbines. Passing through other positions, he subsequently became engineer of the Turbine Department, which position he held until 1923, when he took up the duties which he was fulfilling at the time of his death.

MR. G. Y. ALLEN.—Mr. George Young Allen, who was killed in a railroad accident in America on November 12th, was technical assistant to the manager of the Radio Department of the Westinghouse Electric and Manufacturing Company, and he had been directly concerned with many of the technical developments and commercial applications of radio, particularly carrier current. He was born in 1893. He was engaged in research work for the Western Electric Co., after graduation, and at the outbreak of the war was made "radio aide" to the U.S. Navy Engineering Bureau. He entered the Radio Department of the Westinghouse Company in 1919. Mr. Allen was a member of the Institute of Radio Engineers, the American Institute of Electrical Engineers, the National Electric Light Association, and the Associated Manufacturers of Electrical Supplies. When he met his death, he was returning from the fourth annual Radio Conference called at Washington by Secretary Hoover, where he represented the radio manufacturing industry in the design of the technical features of the new radio law to be presented for congressional action by Secretary Hoover.

M. A. CHARLIAT.—The death is reported from Paris of M. Alexandre Charliat, founder and director of the Paris Ecole d'Electricité Industrielle.

MR. R. O. BLACKALL.—It is with feelings of deep regret that we have to record the early death of another X-ray pioneer. Mr. Reginald O. Blackall, who began his work in this direction at the London Hospital, which he joined in the year 1902, was a sufferer from X-ray dermatitis for many years. He continued his duty notwithstanding that his fellow workers were sorely stricken, Mr. E. Harnock losing both arms and Mr. E. Wilson his life. Subsequently Mr. Blackall lost both his hands, but only after he had the satisfaction of knowing that later workers would not need to be subject to the same dangers as had stolen unawares upon himself and others. In 1920 he had to retire and he was given a Carnegie Hero Fund award and grant and a pension from the London Hospital. Mr. Blackall was only 44 years of age.

DR. H. W. NICHOLS.—Dr. Harold W. Nichols, who died recently at Maplewood, New Jersey, U.S.A., was connected with the Bell Telephone Laboratories. He took a prominent part in the transatlantic radio-telephone tests in 1923 and was awarded the Fahie Premium of the Institution of Electrical Engineers for a lecture upon this subject.

MR. E. D. M. SCRIVENER.—We regret to announce that Mr. E. D. M. Scrivener, joint managing director of Messrs. Taylor, Tunnicliff & Co., Ltd., died on November 29th at St. Bartholomew's Hospital, London, after a short illness.

New Companies Registered.

Banting & Tresilian, Ltd. (209,862).—Private company. Registered November 23rd. Capital, £1,000 in £1 shares. Objects: To carry on business as mechanical and electrical engineers, manufacturers of and dealers in articles required for or used in connection with general, electrical and civil engineering, &c. The permanent directors are:—P. E. Banting, Warren Garth, The Drive, Belmont, engineer (chairman); A. E. Tresilian, Norvic, Salisbury Avenue, Cheam, engineer (both directors of P. E. Banting (Tubes), Ltd.). Qualification, 1 share. Remuneration as fixed by the company. Registered office: 64, Victoria Street, S.W.1.

Harry Morser & Co. (Wireless), Ltd. (209,943).—Private company. Registered November 26th. Capital, £1,500 in £1 shares. Objects: To acquire the business of a manufacturer of and dealer in a specially-designed headphone and of wholesale wireless equipment and appliances carried on by H. Morser, at 94, Hatton Garden, E.C. The directors are:—H. Morser (chairman and managing director), 69, Church Road, Richmond, Surrey; H. W. D. Gallwey, Winchester House, Kingston Hill, Surrey; H. E. F. Connolly, 10, Nutley Lane, Reigate, Surrey. Qualification, 10 shares. Secretary: H. E. F. Connolly. Solicitors: Agar, Hutton & Co., 21, Wigmore Street, W.1. Registered office: 94, Hatton Garden, E.C.

Power and Lighting Cables, Ltd. (209,977).—Registered as a private company on November 27th, with a nominal capital of £10,000 in £1 shares. The objects are to acquire the business of manufacturers of and dealers in cables (submarine and otherwise), telegraphs, telephones, and electrical plant, wire drawers, rubber manufacturers, &c. The subscribers (each with one share) are:—A. Blackwood, 74, Twyford Avenue, Acton, W.3, electrical engineer; W. F. B. Bartram, 36, Holland Park, W., electrical engineer. The first directors are to be appointed by the subscribers. Solicitors: Warren and Warren, 14, Bedford Row, W.C.1. Registered office: 42-3, Craven House, 121, Kingsway, W.C.2.

Official Returns of Electrical Companies.

Shipshape, Ltd.—D. W. Henley, of 73, Basinghall Street, E.C.2, incorporated accountant, was appointed receiver and manager on November 20th, under powers contained in debentures dated November 12th, 1925.

Humavox, Ltd.—E. P. Warner, A.C.A., of 75, New Street, Birmingham, was appointed receiver and manager on November 14th, under powers contained in first mortgage debenture dated November 6th, 1925.

Cross & Cross, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated November 9th, 1925, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Midland Radiotelephone Manufacturers, Ltd.—Debenture dated November 4th, 1925, to secure £4,000 charged on the company's undertaking and property, present and future. Holder: C. Furber, Amblecote House, Brierley Hill, Staffs.

Greenwich Cable Works, Ltd. — Satisfaction in full on October 27th, 1925, of mortgage dated October 8th, 1921, securing £3,000.

Rangoon Electric Tramway and Supply Co., Ltd.—Satisfaction to the extent of £8,314 on May 8th, and to the extent of £1,166 on May 20th, 1925, of debenture stock dated February 1st, 1906, to January 15th, 1924, securing £250,000. (Notice filed November 18th.)

Sloan Electrical Co., Ltd. (61,528).—Capital, £60,000 in 10,000 preference and 50,000 ordinary shares of £1 each. Return dated July 22nd, 1925. 5,000 preference and 40,000 ordinary shares taken up. £38,500 paid. £6,500 considered as paid. Mortgages and charges, nil.

Birmingham District Power and Traction Co., Ltd. (19,077).—Capital, £700,000 in 250,000 preference and 450,000 ordinary shares of £1 each. Return dated June 2nd (filed September 15th), 1925. 146,846 preference and 412,934 ordinary shares taken up. £559,780 paid. Mortgages and charges, £300,308 4½ per cent. first debenture stock.

Sheffield Electric Power Co., Ltd. (106,880).—Capital, £2,000 in £1 shares. Return dated December 31st, 1924 (filed August 1st, 1925). Two shares taken up. £2 paid. Mortgages and shares, nil.

T. M. Johns & Co., Ltd.—Particulars filed of £1,500 debentures authorised November 10th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Standard Telephones and Cables, Ltd. (formerly the Western Electric Co., Ltd.) (106,921).—Capital, £1,000,000 in £1 shares. Return dated May 19th, 1925. All shares taken up. £656,000 paid. £344,000 considered as paid. Mortgages and charges, nil.

Shanghai Electric Construction Co., Ltd. (86,795).—Capital, £500,000 in £1 shares. Return dated June 17th, 1925. 499,609 shares taken up. £416,609 paid. £83,000 considered as paid. Mortgages and charges, nil. Return of allotments made up to July 29th, 1925, shows a further 391 shares allotted for cash.

Eagle Electric Light and Power Co., Ltd.—Satisfaction in full on July 18th, 1925, of debentures dated July 18th, 1922, securing £750. (Notice filed November 17th, 1925.)

Bucks. Electric Wire and Engineering Co., Ltd.—Mortgage dated November 5th, 1925, to secure £1,000 charged on certain land and premises in Stantonbury, Bradwell, Bucks. Holders: Mrs. H. Kibble and A. J. Kibble, 23, Thompson Street, New Bradwell, Bucks.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.

Presiding at the meeting of this company on Friday last, Mr. C. H. Gray said that the gross profit amounted to £330,695, an increase of £10,287 over the preceding year. The sales showed an increase of about 10 per cent. over last year which, considering the general state of trade during the past twelve months, was very satisfactory. The sales of the French factory also showed a satisfactory increase; the result of its trading for the year being considerably better than that of 1924. The net profit was £108,481, from which £60,000 had been transferred to the reserve fund. The fact that the French Exchange had further depreciated from 82.17½ fr. to 103.52½ fr., was a factor to be taken into account in relation to their assets in France. Sooner or later this aspect of the balance sheet would have to be dealt with and when there was evidence of stability in the franc, the subject would have their careful consideration. In the course of his review of the accounts the speaker said that the stock values amounted to £355,953, or £30,221 more than last year's figures, due to an increase of stock in certain special directions. With reference to the present year they had had detailed reports from all sections of the company's business, which included buying, manufacturing, costing and selling. The number of employés was about 5,000, and the distinct progress made, as compared with last year, showed that there had been good team work. Some sections had been profitable, in others the loss was noticeably less than last year, and there was only one case where apparently there was no improvement, and that was at the works at Burton. They believed that that was a passing phase. The combined sales from Silvertown and Burton showed an increase over last year of 9 per cent. in cash value, and in view of the fact that during this year slightly lower selling prices prevailed in most cases, they calculated that the volume of the business had increased by about 12 per cent. Their foreign branches showed an improvement in their accounts, having, as a whole, made a profit on their sales. The submarine department had been increasingly busy during the year; their cable ship, the *Silvergray*, had had a considerable amount of

repair work to do, and in addition had successfully carried out the laying of a new cable for the French Government between Marseilles and Tunis. In referring to the Buying Department, the chairman alluded to the lower price of coal, and the cotton market, and he added that as far as rubber was concerned, during the year under review they bought fairly well, which partially accounted for the profit made. As to the future there appeared to be a belief that the demand was overtaking the supply. However that might be, this question of the purchase of rubber was one which had the close attention of the directors, and would require to be treated with the utmost care. With reference to their Persan Works, the result of the past year's trading was a small loss but was distinctly better than was the position during the previous year. Trading in France at the present moment was extremely difficult owing to the fluctuations in the exchange affecting the value of the franc. It would be a great boon to traders generally if that value could be stabilised, by the French Government's putting its financial house in order, which, they were told, could only take place when the French people consented to be taxed higher than they were at present, and pay their debts. The Palmer Tyre section of the business was more satisfactory than it had been for some years. The selling expenses showed a much lower ratio to the turnover than hitherto, and would, they anticipated, be still lower in the course of the current year. With reference to the labour employed at Silvertown, they were in the same position now as at the end of last year, the same basis of rates of pay being in force. No friction of any sort had arisen with the workers during the year; the isolated cases for inquiry brought forward by them, had been settled speedily and amicably. With the varied nature of their work it was very difficult to compare one year with another as regarded the output per worker, but they thought that on the whole there was a slight improvement in that respect. Their activities during the year generally had resulted in a considerably better trading year than the last, which went some way to justify the optimism of Major Darwin, who at the darkest period of the company's fortunes, pinned his faith to their ultimate success. But they had to remember the old adage that "one swallow does not make a summer," and that they had difficulties before them both internally and externally, which they would have to deal with as best they could. Col. Jarvis seconded the motion. Replying to a short discussion the chairman said the board would be delighted to declare an interim dividend when it saw clearly its way to do so. It was impossible to say what limitation was to be placed on the reserve fund, because their ideas on that subject might change as they depended on the value of their French assets. The board had no wish to maintain it at too high a figure, but at the moment it thought it wiser not to pay more than a 5 per cent. dividend and to use the balance of the profits in strengthening the reserve. The report was adopted.

Western Telegraph Co., Ltd. The annual meeting of the company was held on November 26th, the chairman, Sir John Denison-Pender, G.B.E., presiding. In moving the adoption of the report and accounts (*vide* our last issue, p. 869), the chairman said that the receipts, which had had a downward tendency since 1920, had increased, in spite of the low value of the Brazilian milreis, which had, however, recently improved. The general reserve had been debited with the cost of a very important renewal of cable, some 550 miles, at a cost of £131,278, replacing the last remaining portion of the original cable laid in 1874 between St. Vincent and Pernambuco. The chairman expressed his thanks to the staff for their assistance in effecting economy in expenses. The new cable ships, the cost of which had been debited against the maintenance ships' fund, had been thoroughly tested on repairs and found satisfactory. The company followed the practice of augmenting the pensions granted from the Associated Companies' pension fund; this cost £10,000 during the year under review. The negotiations for a wire between Paris and London had made little headway, but it was hoped that the French would admit the justice of their application. The Italian cable to South America had been opened for traffic, but it was too early to say what the effect of that competition would be. South America was undoubtedly a great field for development, and the company had a well-equipped and efficient system which was giving satisfaction to its clients. So far, the Argentine radio station had had no effect upon the company, being engaged upon the cheaper class of traffic. In concluding his speech, the chairman briefly referred to the recent International Telegraph Conference, the formation of the International Cable Companies' Association, and the appointment of the Earl of Bessborough to the board.

A quarterly dividend of 5s. per share, tax free, has been declared by the company.

Venezuela Telephone and Electrical Appliances Co., Ltd. The report for the year ended June 30th last shows a profit of £35,033 (including £116 surplus from corporation profits tax provision). After meeting loan and debenture interest and income tax, there is a balance of £24,940, which it is proposed to distribute as follows:—Dividends of 8 per cent. on the cumulative preference and ordinary shares; £800 to first debenture sinking fund; £10,000 to reserve for depreciation and renewals; and £5,390 to undivided profits account. An increased demand for service was experienced, and to meet this demand further capital is needed. It is therefore proposed to double the capital by the issue of 70,000 each of £1 preference and ordinary shares; this proposal will be put before the shareholders at the annual meeting on December 15th.

Barcelona Traction, Light and Power Co., Ltd.—It is announced that the whole of the company's 7 per cent. 50-year prior lien "A" bonds outstanding on June 1st, 1926, will be redeemed on that date at 110 per cent. A quarterly dividend of 1¾ per cent. has been declared on the cumulative preference shares.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Argentine Light and Power.—134,189 7 per cent. preference shares of £1 each, fully paid, Nos 865,812 to 1,000,000.

Singapore Traction Co.—93,739 ordinary shares of £1 each, fully paid, Nos. 1 to 93,739; 152,890 7 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 152,890; £200,000 6 per cent. first mortgage guaranteed debenture stock, issued at 94½ per cent., £20 10s. paid.

Burmah Electric Tramways & Lighting Co., Ltd.—The receipts for the year ended July 31st last amounted to £50,023, and after deducting expenses, taxation, &c., and adding £4,672 brought forward, £2,899 profit on exchange, and £1,591 interest on investments, there remained £29,129. It was proposed to place £11,605 to general reserve and depreciation, to pay a final dividend of 4½ per cent. on the ordinary shares (making 7½ per cent. for the year), and to carry forward £2,824. The previous year's dividend was 5 per cent. The meeting was to be held on Wednesday last.

Electrolytic Zinc Co. of Australasia, Ltd.—A gross profit of £510,073 was recorded for the year ended June 30th last, after transferring £140,000 to the depreciation reserve, and the net profit was £375,380, which sum was raised to £474,301 by the balance brought forward. The main building programme, it is reported, has been completed, and the production of metals is said to have been satisfactory during the past year.

John I. Thornycroft & Co., Ltd.—A final dividend of 3 per cent. is recommended on the preference shares, making 6 per cent. for the year, and it is proposed to distribute 5 per cent. on the participating preferred ordinary shares in respect of the year ended July 31st last. Last year no dividend was paid on the preferred ordinary.

Johnson & Phillips, Ltd.—It is reported that the company will shortly offer to its shareholders 100,000 new £1 ordinary shares at 40s. each, new capital being required to cope with the company's expanding business. The proportion of allotment will be one new share to each five already held.

Drake & Gorham, Ltd.—The report for the year ended June 30th last shows a net profit of £2,902, as compared with £3,842 in the preceding year. To this is added £283 brought forward, making £3,186, of which £3,000 is put to reserve and the balance carried forward.

Melbourne Electric Supply Co., Ltd.—A dividend of 5 per cent. actual, free of tax, has been declared on the consolidated ordinary stock for the six months ended August 31st last, making 10 per cent., free of tax, for the year.

Chloride Electrical Storage Co., Ltd.—An interim dividend of 5 per cent., tax free, is announced. A similar dividend was paid last year, since when the ordinary capital has been increased by a bonus issue.

New Issue.—*Lancashire Electric Light and Power Co., Ltd.*—Letters of allotment and of regret were posted by this company last week in connection with the recent issue of preference and ordinary shares.

Rees Roturbo Manufacturing Co., Ltd.—The report for the past year reports an increased turnover resulting in a profit on trading of £2,628. In the preceding year there was a loss.

Public Announcements.—*Kaministiquia Power Co., Ltd.*—For the information of the public and to comply with the Stock Exchange requirements, this company made an announcement of its capitalisation, objects, &c., in the *Financial Times* of December 1st.

Singapore Traction Co., Ltd.—A similar announcement by this company appeared in *The Times* and *Daily Telegraph* of the same date.

Pennsylvania Water & Power Co.—A dividend of $2 per share has been declared in respect of the quarter ending December 31st.

Yorkshire (West Riding) Electric Tramways, Ltd.—A final dividend of 3 per cent. has been declared on the 6 per cent. cumulative preference shares.

Globe Telegraph & Trust Co., Ltd.—A quarterly dividend of 5s. per ordinary share has been declared.

Stocks and Shares.

MONDAY EVENING.

THE advent of December quickens the flow of new issues anxious to make their appearance before the Christmas holidays. As the end of the year comes into sight, there is invariably an impression that money may become a little tighter, and this has the effect of arousing emulation in the minds of borrowers who want to place their issues upon as good terms as possible. It is said that several of the electrical and cable equipment companies contemplate joining the hosts of those

who are now appealing for public subscriptions to their shares. Provided that the companies follow the example of Johnson and Phillips and offer new shares at prices that will afford present proprietors a bonus upon their holding, there is not likely to be much complaint amongst shareholders at the willingness of their directors to take advantage of the abundance of money available for subscription to new issues, provided that these are of sound character.

The campaign continues for the sale of bonds and other securities in American utility companies. Two or three further prospectuses have reached us during the past week, offering what may be soundly-secured investments in various United States corporations that deal with such public services as electric lighting, power and traction. It would appear, therefore, as though the efforts of the vendors of these bonds to place the stock amongst British investors, are meeting with success. It may be reiterated that while so many useful openings are presented in this country for employment of capital in electrical channels which, besides proving good investments, serve to give employment to our people as well as to circulate the money in this country, the home investor will be better advised to confine his attention to companies in which there is a Stock Exchange market on this side, and which operate here.

The London & North-Eastern Railway, before the London Traffic Advisory Committee, said that the electrification of its suburban lines had been under consideration for nearly three years. Estimates worked out to £80,000 per mile for the electrification only, and the total cost would probably be nearer £100,000 a mile when other things were taken into account. These estimates made no allowance for rolling stock. The directors, therefore, regretted that they could not adopt the scheme prepared for the extension of the electrified system to Wood Green. North-Eastern ordinary stocks stand low in the market, and the Company's attitude is not difficult to understand. Home Rails are dull, though Central London assented ordinary at 67 is a point higher on the week.

St. James' Electric Supply ordinary are the fraction better at 15¼. County ordinary recovered to 58s. 3d., and Bournemouths to 59s. 6d. The new Richmond Electrics rose to 8s. premium before reacting sixpence. Lancashire Electrics lost a similar amount; active dealings are in progress in the new shares. The preference can be sold at 2s. premium, and the ordinary at about the same profit. The issues were well oversubscribed. Quiet regret is expressed at some of the conclusions recorded in the annual report of the Electricity Commissioners. The statement mentions that many schemes are delayed pending some definite action on the Weir Committee's report. Progress is tantalisingly slow in the matter of grouping adjacent districts in order to provide them with adequate electric power at a rate cheap enough to act as a real stimulus to industry. Meanwhile as the Home Authorities dally, the vendors of American Utility securities are vigorously engaged in the attraction of British capital into power schemes in the United States.

Metropolitan-Vickers are steady at 27s., on the announcement that the company, in conjunction with Vickers, has secured an important contract connected with the Bristol Corporation's project of electrical extension. Johnson & Phillips eased off to 57s. 6d.: it is said that the company is about to offer 140,000 new ordinary shares, at 40s. each, to its shareholders. Five old shares will give the right, according to report, to an allotment of one new share at £2, thus ensuring a comfortable bonus. General Electrics, ordinary and preference, are both rather firmer, but Edisons shed a few pence, and declines have occurred in British Aluminium and British Insulated.

No news had transpired up to Monday night to account for the strength of International Automatic Telephones. The price has further advanced to 36s. Automatic Telephones are ninepence up, at 52s. United River Plates eased off to 7½, at which price the shares can be bought. Oriental Telephones also are a little lower.

A drop to 22s. 6d. in Marconis followed the appreciation of the serious nature of the strike amongst some of the wireless operators. Holders of Marconis had already experienced a little uneasiness in regard to the dividend outlook. A good many Marconis have been sold recently in order that the money might be spent in the more popular rubber shares. The concatenation of adverse circumstances combined to depress the market and the spirits of the proprietors. Canadian Marconis fell to 5s., and Radios have been very weak, though rallying from the worst.

Venezuela Telephone & Electrical Appliances ordinary changed hands at 22s. on the issue of a report which foreshadows a possible offering of new shares. The company is paying 8 per cent. on the ordinary and preference, and the report exhibits excellent progress. Argentine Tractions are quiet: Brazilians show no change: Barcelonas have been fluctuating between 31 and 29½. In Mexicans, the only alteration is a 10s. rise in the Light & Power Company's first mortgage bonds.

Eastern Telegraph ordinary shed 2½ points upon the closing-up of a deceased account, the rest of the Eastern group remaining passive. Anglo-American deferred strengthened to 24¾. The Engineering shares, with their allies, are tolerably firm, although a recent speech by Lord Furness was not calculated to arouse optimism in regard to the immediate outlook for trade. The rubber share market manages, by reason of the strength of raw rubber, to absorb widespread interest and to demand increasing amounts of capital that have frequently to be drawn from realisations of stocks and shares in other markets of the Stock Exchange.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. 1923.	Dividend. 1924.	Price Nov. 30. 1925.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	£1	13	14	59/6	+6d.	4 14 1
Brompton Ordinary	1	10	10	1⅝	—⅛	*6 8 1
Charing Cross Ordinary	1	14½	15	2 7/16	—	6 8 1
do. do. 4½ Pref.	1	4	4½	17/6	—	5 2 10
Chelsea	1	12	12	2	—	6 0 0
City of London	1	15	15	47/-	—	6 7 4
do. do. 6% Pref.	1	6	6	28/-	—	5 4 4
Clyde Valley	1	8	8	27/6	—	5 16 4
County of London	1	15	15	58/3	+1/3	5 3 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	23,6	—6d.	5 19 2
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	32/6	—	6 3 0
Kensington Ordinary	5	14	15	13	—	5 15
Lancs. Light and Power	1	7½	7½	26/-	—6d.	5 15
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5⅝	—	5 6 8
Metropolitan	1	10	11	38/6	—	5 14 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	22/6	—	6 4 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22,6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	15⅛	+⅛	5 15 8
South London	1	15	15	2 5/16	—	5 17 1
South Metropolitan Pref.	1	7	7	1½	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	18/9	—	6 8 1
Westminster Ordinary	1	15	15	45/-	—	6 13 4
Whitehall Elec. Invst. 7% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	30/-	—	6 6 8

HOME RAILS.

Central London Ord. Assented Stock	4	4	67	+1	5 19 5
Metropolitan	4	5	70	—½	7 2 10
do. District	8½	8½	47	—	7 8 11
Underground Electric Ordinary	10	Nil	Nil	2⅜	—	Nil
do. do. "A"	1/-	Nil	Nil	7/6	—6d.	Nil
do. do. Income Bonds	6	6	98	—	*6 2 5

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref. Stock	6	6	103	—	5 16 6
do. Def.	1½	1½	24¾	+¼	6 1 3
Automatic Telephone	1	3	6	52/-	+3d.	2 6 2
Chili Telephone	5	6	5	6 5/16	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6⅜	—	7 8 2
Eastern Extension	10	10	10	18¼	—	*5 9 7
Eastern Tel. Ord. Stock	10	10	177⅜	—⅜	*5 12
Globe Tel. and T. Ord.	10	10	10	18¼	—	*5 9 7
do. do. Pref.	10	6	6	11	—	5 8
Great Northern Tel.	10	22	22	34½	—	6 8 6
Indo-European	25	7	8½	45⅛	—	*4 13 5
Marconi	1	10	10	1⅛	—⅛	9 17 10
Marconi Marine	1	10	7½	⅞	—	8 11
Oriental Telephone Ord.	1	12	12	42/6	—6d.	*5 12 11
United R. Plate Tel.	5	8	8	7⅜	—⅛	5 6 8
Western Telegraph	10	10	10	17⅝	—	*5 13 6

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	3 3/16	—	7 14 5
do. do. 2nd Pref.	5	6	6	3 7/16	—	8 14 6
do. do. 5% Deb. Stock	5	5	74½	—1	6 14 3
British Electric Traction Ord.	6	6	122½	—	4 18 0
do. do. 6% Pref.	6	6	106	—	5 13 2
Brazil Traction 100	4	4	78	—	5 2 7
Brit. Columbia Elec. Rly. Pcc. Stock	5	5	89½	—	5 11 9
do. do. Preferred	96/-	96/-	97½	—1	*4 17 11
do. do. Deferred	129/5	129/5	115½	—	*5 12 7
do. do. Deb.	4¼	4¼	77½	—	5 9 8
Lond. & Sub. Trac. 5% Pref. 1	2½	Nil	4/6	—	Nil
London United Tram. Deb. Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds —	5	5	63½	—	7 17 6
Mexican Light Common 100	Nil	Nil	31½	—	Nil
do. Pref. 100	Nil	Nil	6 ½	—	Nil
do. 1st Bonds —	5	5	72	+½	6 18 11
Yorkshire (West Riding) 1	5	—	18/9	—	5 6 8

MANUFACTURING COMPANIES

Babcock & Wilcox 1	12	12	52/-	—	*4 12 4
British Aluminium Ord. 1	5	10	38 -	+6d.	5 5 3
British Elec. Transformer Pref. 1	Nil	7	1		
British Insulated Ord. 1	15	15	3⅝	—⅛	4 2 9
Brush Ord. 1	10	10	25/6	—	7 16 11
Callenders 1	15	15	3 5/16	—	4 10 7
do. 6½% Pref. 1	6½	6½	23/9	—	5 9 5
Crompton Ord. 1	Nil	Nil	18/9	—	... ...
Edison-Swan 4/-	10	10	8/3	—8d.	4 17 0
do. 5% Deb. Stock	5	5	8¼	—	5 19 1
Electric Construction 1	10	10	33/9	—	6 6 0
Enfield Cable, Pref. 1	7½	7½	1½	—	6 0 0
English Electric 1	5	5	20/3	—	4 19 0
do. do. Pref. 1	6	6	21/-	—	5 14 3
Gen. Elec. Pref. 1	6½	6½	24/-	+¼d.	5 8 4
do. Ord. 1	5	7½	28/6	+6d.	5 5 3
Henley 1	15	16	3⅜ xd	—	4 11 5
do. 4½% Pref. 5	4½	4½	4¼	—	5 6 0
India-Rubber 1	5	5	1⅛	—	*4 9 0
Johnson & Phillips 1	10	10	57/6 xd	—1/3	3 9 7
Met-Vickers, Ord. 1	8	8	27/-	—	5 18 6
do. Pref. 2	8	8	2⅜	—	6 14 9
Siemens Ord. 1	—	7½	35/-	6d.	4 5 9
Telegraph Construction 12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Industrial Germany in 1924-5.

THE Department of Overseas Trade has issued a report on the economic and financial conditions in Germany in 1924-25 by Mr. J. W. F. Thelwall, M.C., Commercial Secretary to H.M. Embassy in Berlin, together with a report on the industries in the occupied territories by Mr. C. J. Kavanagh, Commercial Secretary at Cologne.*

The fact is recalled in the former report that of raw materials Germany through the war lost most in coal and ore, the latter being a definite loss to be balanced by imports. Besides coal, which is at present being over-produced, there is a very large output of lignite, the use of which was much extended during the time of the shortage of pit coal, and which is also a great factor in the generation of electric power. The power development of the country is in process of evolution and will eventually, it is claimed, be based upon oil derived from coal distillation and electricity from water power. A process of distillation commercially profitable for both coal and lignite is considered to be probably only a matter of time having regard to the experiments being carried out.

Competition with England.

Coming to consider the part which German industry is to play in the world, particularly with respect to England, it is mentioned that during the past year Germany has had some notable successes in competition for foreign orders for railway work, constructional equipment, and shipbuilding. A careful consideration of all the circumstances leads to the conclusion that the two points which are decisive in the long run in a comparison between the two countries, are organisation and labour. In numerous cases when Germany and England meet in open competition the former receives the award on account of its lower tender. On the question of the relative position of the two countries from the standpoint of taxation, it is submitted that, when all allowances are made, it is probable that the ratio of total taxation to total national income was no greater in Germany in 1924-25 than in the United Kingdom. When, however, the tax revision now being discussed has been passed by the Reichstag, the former will almost certainly be paying less. In the matter of fuel and power, the report considers that the advantage lies with the Germans, who have large supplies of lignite and cheap electricity at their disposal, and whose pit coal, if the pit-head price is about the same as in England, can be more cheaply transported owing to special railway rates and excellent inland waterways. This raises the question of transport in general, and here the Germans are said to be much better off; not only have they special rates for coal, but also for many other kinds of raw materials and manufactured articles. Moreover, production is assisted by reduced rates for raw material, and the export trade is promoted with the aid of preferential rates between inland stations and the outlet ports. A further factor which often enables the Germans to compete successfully in external markets is the existence of a difference between the inland and the export prices. Being secure behind a wall of high tariffs and import prohibitions, producers habitually charge high prices at home and lower ones abroad, thus assuring for themselves as large profits as possible in the markets free from competition, and capturing as much trade as they can where competition exists. The absence of rivalry within the country, apart from protection, is due to the close organisation of industries, which thus indirectly helps exports; and in some cases the syndicates also grant export premiums. With regard to Government subsidies, either direct or indirect, the only cases which are known refer to production and apply to shipbuilding and the agricultural industry and the makers of machinery for this branch.

Hydro-Electric Works.

A separate section of the report deals at some length with the question of the production of pit coal and lignite, imports and exports, the costs of production, sale prices, the Westphalian Coal Syndicate and other matters. This is followed by a consideration of the situation of the utilisation of water powers in the individual States. Bavaria occupies the leading position in this respect. According to statements made by the Bavarian Government, the average capacity of the total water power within this State, developed and undeveloped, amounts to 2,000,000 h.p., capable of yielding 12,000,000,000 kWh per annum. Down to the present time plant for 540,000 h.p. has been completed, or, say, 27 per cent. of the total available. In addition installations representing 50,000 h.p. are in course of construction, and preparations are in progress for the establishment of a further 145 installations of a total of 400,000 h.p., so that about one half of the total available water power in this State is in process of exploitation. The second position is assumed by Baden, where the State owns water power capable of producing an annual average of over 800,000 h.p., of which 200,000 h.p. has already been brought into use. The Minister of Finance announced in March, 1925, that it was hoped to arrive at an arrangement by which the Baden central system would be connected with the 200,000-V system of one of the largest lignite power stations on the Lower Rhine, while in the South it was intended to effect a connection with the Swiss stations. It was thus hoped that by the end of 1925 there would be a continuous supply from the Central Alps through Baden to the lignite station on the Lower Rhine that would make it possible to distribute and adjust enormous quantities of electrical energy. The transmission system of Baden has already been linked up, *via* Mannheim, with the works in the Palatinate, and a similar connection with the Wurtemberg system will soon be made. In Wurtemberg the State is reported to have at disposal water power amounting to an average of 250,000 h.p., and of this some 100,000 h.p. has already been put into use. In the case of Prussia a group of power stations based partly on lignite and partly on water is in process of establishment in the area between the southern part of Hanover and the Main, the latter being undertaken jointly with canalisation schemes of the Lahn, the Moselle, and the Saar, and a connection running from the Weser to the Main. After referring to water power utilisation in the Thuringian States and in Saxony the report proceeds to discuss the use of electricity derived from steam power in Western Germany, Central and Eastern Germany, Saxony, &c.

Electric Railways.

Apparently very little has to be recorded regarding the conversion of steam lines to electric traction. It is, however, mentioned in the part dealing with Bavaria that the Munich-Garmisch section has been converted and set in operation. This line brings the total length of electric railways throughout Germany up to about 432 miles, although it is stated that considerable additions will be made in the course of this year. In the case of Baden the Minister of Finance stated a few months ago that negotiations were then about to begin with the Reich Railway Company on the subject of the electrification of the lines passing through Baden.

Electrical Imports and Exports.

According to an appendix dealing with the imports of merchandise, the imports of machinery, vehicles, vessels and electrotechnical articles amounted to 189,871 tons of the value of 140.4 millions of marks in 1913, and to 190,565 tons and 120.9 millions of marks in 1924. On the other hand, on the basis of pre-war values, the exports of electrical goods, including machinery, are returned at a value of 240 millions of marks in 1924, 254.9 millions in 1923, 234.8 millions in 1922, and 290.3 millions in 1913. Passing on to a consideration of the shipbuilding, textile, aniline dye and motor car industries, the report comes to the question of the aluminium and glass and porcelain industries.

Aluminium and Porcelain.

It is recalled that in 1913 the annual production of aluminium in Germany only amounted to about 800 tons, the only works in the country being at Rheinfelden, the property of a Swiss firm; and about 15,000 tons of the metal had to be imported to assist in meeting the demand. During the war and in the absence of French bauxite the Germans decided to build large power stations on the lignite mines for the purpose of smelting the bauxite drawn from the large deposits which exist in Istria and Dalmatia. With the assistance of the Reich the Ver. Aluminium Werke was formed, and this concern constructed three works at Horrem near Cologne, Bitterfeld, and Rummelsburg, near Berlin. In addition the Erft Werke was constituted in 1916 and established an aluminium works at Grevenbroich on the Erft, while in 1917 the Ver. Aluminium Werke built the Lauta works. The industry was built up during the war on the lignite areas because the use of power from these sources could be effected very rapidly, but since the end of the war the industry has begun to move towards the cheaper water power in South Germany. Soon after the close of hostilities the works at Horrem and Rummelsburg were shut down; those which are now in operation are the Erft works with a capacity of about 12,000 tons per annum, the works at Bitterfeld and the Inn works, also with an annual capacity of about 12,000 tons. The actual production in 1924 was 20,000 tons, but is expected to be exceeded this year owing to the increasing use of aluminium in place of copper. The branches which work up the metal employ 35,000 persons and their annual consumption is put at about 24,000 tons.

Concerning the porcelain industry the report states that the production in 1924 is privately estimated at 80,000 tons, as compared with 56,000 tons in the previous year. The industry employs from 50,000 to 55,000 persons, 10,000 of whom work in the manufacture of technical porcelain, in which product Germany is said to have held the leading position until recently. The exports of insulating porcelain for telephones and telegraphs are returned as having amounted to 9,686 tons in 1913, whereas in 1924 the quantity was only 6,964 tons and in the first half of 1925 the tonnage exported was only 3,148.

Iron and Steel.

Some forty pages of the report by Mr. Kavanagh are devoted to the mining and metallurgical industries, particularly in Rhenish Westphalia. While the extensive information given on these branches will no doubt be found very useful for purposes of reference, it can only be regarded as a record of the past. Conditions in these industries change so rapidly that what was correct a few months ago may be no longer applicable. Even the statistics are old, whereas to-day not only is the production of iron and steel in Germany in 1924 known in England, but also the output brought down to the end of October, 1925. This backwardness is no fault of the author of this well written section and it is not peculiar to Germany. It can only be explained by the slowness of Government departments in this country, which do not possess and never will possess the zeal for prompt publicity which characterises private enterprise in any sphere of activity.

* Stationery Office, 5s. net.

An Engineering Exhibition at Cardiff.

On November 26th an excellent display of engineering equipment, mainly for colliery work, was opened at the Cardiff Drill Hall, under the auspices of the South Wales Institute of Engineers; it is to close to-morrow (Saturday). Electrical equipment for coal mines figures prominently in the exhibition, many types of switchgear, coal-cutters, conveyors, &c., being on view. Among the firms which show switchgear are MESSRS. A. REYROLLE & CO., LTD. (through Messrs. Haslam & Stretton, Ltd., their agents). Mining type pillars are exemplified by a 200-A, 3,300-V, 3-phase unit (fig. 1) which has qualified for service by passing the Sheffield University tests. The equipment is in two separate parts, a circuit breaker and a bus-bar chamber; the former part is movable and the latter fixed. Provision is made against all possible accidents by interlocking devices. It is possible to link up these units to form complete switchboards. A smaller type of pillar incorporating many of the features of the larger type is shown. The stand also bears examples of the company's gate-end switches fitted with heavy-current mining-plugs for use with coal-cutting machinery. These plugs are mechanically interlocked with the switch operating handle, preventing their withdrawal while the switch is on.

The "CEAG" MINERS' SUPPLY CO., LTD., has a representative collection of its lamps. Prominent among these is a gas-detecting lamp. In this the glass which encloses the electric lamp also houses a tiny oil-burner which is lighted electrically. By means of this, it is claimed, 1½ to 5 per cent. gas in the

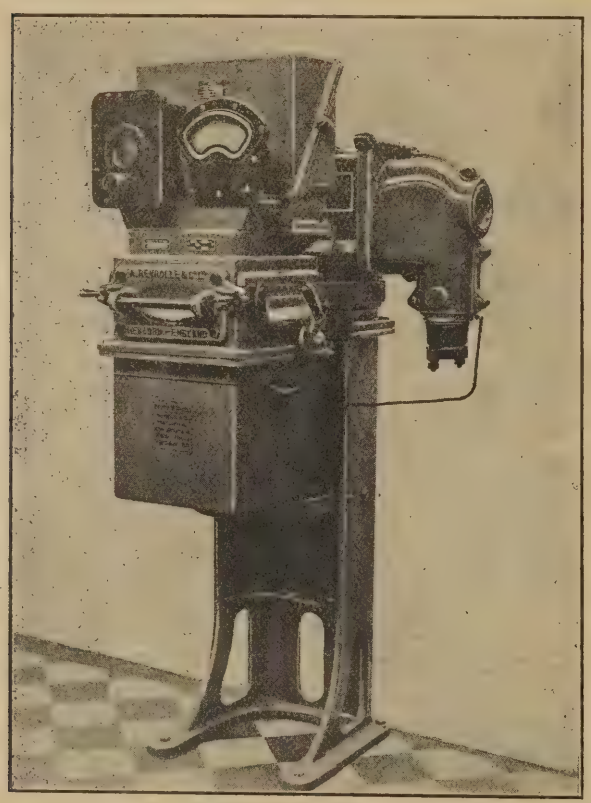


Fig. 1.—A Reyrolle 200-A, 3,300-V Mining Type Pillar.

atmosphere can be detected. A bayonet type of lid for lamp-accumulator cases is shown; this facilitates the dismantling and re-assembling of the lamp when cleaning it. Another accumulator lamp which is shown has a concentrating projector fitted in a swivelled head permitting the beam to be projected in any desired direction.

MESSRS. OLDHAM & SONS, LTD., also show miners' lamps, and one interesting feature of the display is a working model of a boy operating a machine for removing the accumulator lids and replacing them, to show the ease with which this is done. The company also shows a bulb-testing device, an arrangement which tests miners' lamps for shock, candle power, ampereage, &c. A number of accumulator batteries for mining and general applications are also displayed, as well as the "Oldham" stone-dusting machine.

MESSRS. HASLAM & STRETTON, LTD., who have already been mentioned, represent several firms, including the following:—British Arca Regulators, Ltd., whose section includes automatic regulators for the control of pressure, temperature, humidity, electrical pressure, &c.; the system was described in our issue of August 3rd, 1923 (p. 194). The De Laval Chadburn Co., Ltd., purifiers for lubricating and insulating oils. Messrs. Evershed & Vignoles, Ltd., contribute a set of their testing sets, including the "Meg," "Bridge-Megger" and "Megger" for high-resistance tests, and the "Ducter" and "Continuity Tester" for low resistances. This section of the exhibit also contains an example of the "Dionic" water tester for ascertaining the amount of impurity present in boiler feed or condensate. Filtrators, Ltd., shows plant for the prevention of the formation of scale in boilers, and Messrs. Spencer-Bonecourt, Ltd., have an exhibit drawing attention to their waste-heat boilers, &c. The Twiss Electric Transmission, Ltd., has an example of outdoor switchgear, a three-phase air-break switch with choke coils and horn tips mounted on poles.

MESSRS. JOHN DAVIS & SON (DERBY), LTD., show "Derby" miners' lamps and mine signalling equipment. A charging rack for lamps and a lamp-unlocking device are included in the display.

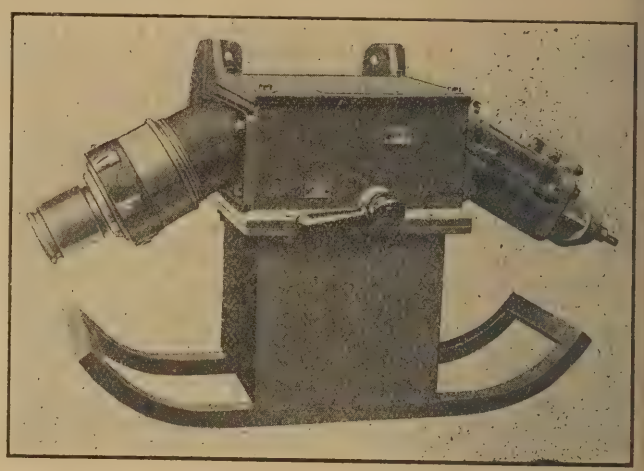


Fig. 2.—An "S & C" Gate-End Switch.

MESSRS. E. BENNIS & CO., LTD., have a model boiler front fitted with a chain grate stoker and a chain bucket coal elevator, in addition to a sprinkler stoker and self-cleaning compressed air furnace, and a section of "Liptak" flat arch.

MESSRS. SWITCHGEAR & COWANS, LTD., have a representative display of their mining-type apparatus. This includes a range of ironclad oil-immersed draw-out pedestal units showing the consecutive stages of construction. The main object of the exhibit is to demonstrate the reliability and safety of the equipment, as well as the ease with which the units can be coupled up and extended. The company's oil-immersed switchgear is represented by:—(i) The draw-out type with bus-bars, fitted with draw-out isolating plugs and a complete system of interlocks; (ii) the non-draw-out type, for wall or pedestal mounting separately, or, with a bus-bar chamber, for unit switchboards; (iii) gate end switches for the control of coal-cutter circuits (as illustrated in fig. 2); and (iv) combined oil-circuit breaker and transformer for tapping the power mains for colliery lighting. The first two classes are made in flameproof or non-flameproof form, while the last two classes are made flameproof. The internal mechanism and fittings of the switch portion are common to all four classes so that spare parts are reduced to a minimum. On the draw-out units the correct sequence of operations is ensured by means of simple mechanism providing a complete series of interlocks. The gate-end switch illustrated is a three-phase unit fitted with time-limit overload protection and also the Williams-Rowley system for ensuring adequate



Fig. 3.—An Anderson & Boyes Coal Cutter.

earth continuity throughout the system, including the coal-cutter. This equipment trips the switch if the earthing becomes inefficient, if the trailing cable is damaged, or if an attempt is made to withdraw the pommels from the switch or cutter. Other apparatus shown by the company includes induction regulators and boosters, colliery lighting transformers, &c.

The display of the ELECTRO-MECHANICAL BRAKE CO., LTD., consists mainly of controllers of flame-proof construction specially designed for use in mines. The principal exhibit is a steel-cased explosion-proof controller which incorporates a number of valuable features. The contact fingers are of ample cross section, and are fitted with renewable tips which are maintained in position by compression springs. The drum shaft and finger bar are mica insulated throughout, and the

drum is easily removed by the slackening of four bolts in the top plate. An indestructible arc shield which can be swung out of the case is fitted and ample wiring space is provided. An exhibit of note is a steel-cased air-break electric battery mining type controller, similar to that fitted on the locomotive which was recently awarded the £1,000 in the Markham competition. A type of controller for non-fiery mines is also shown. Other apparatus displayed includes three-position sealing and dividing boxes for mounting on the company's controllers.

The exhibit of MESSRS. ANDERSON, BOYES & CO., LTD., comprises three coal-cutting machines, two of which are electrical. The first is a 17-in. chain coal cutter suitable for long-wall, short-wall, or heading work, and the motor can be either d.c. or a.c. The gear head, motor and haulage gear are independent units and are fitted compactly together. The machine is steel-clad throughout and absolutely flame-proof. The machine illustrated in fig. 3 is an electric arc-wall cutter. This is the long-wall machine adapted to chain haulage. The haulage chain is led up each side of the machine, like two flexible arms, to embrace a specially-constructed gear head. When the machine is run into a heading, the jib can cut under power to either hand according to the pick setting.

On MESSRS. MAVOR & COULSON'S stand several types of coal cutter are shown. Two of these, one electric, have a height of only 12 in., enabling them to be employed in very thin seams. The electrical machine is of the chain type arranged to cut at floor level to a depth of 4 ft. The machine can be converted into a bar-type cutter, or into a compressed-air driven machine in a simple manner. An "abbreviated" shaker-conveyor driven by a three-phase motor is shown. An electric putter which is exhibited is described as a "missing link." It is a simple, compact and portable haulage gear rated at 8-10 h.p. It is primarily intended for mines in which the service between the coal face and auxiliary haulage is conducted by hand tramming and horses. Another machine on view is an electrically-driven air compressor, and the company also shows a selection of its controllers and other switchgear.

MESSRS. COWLISHAW, WALKER & CO. also exhibit examples of coal-cutting machines. The "Output Imp" cutter, similarly to the "M. & C." machine mentioned above is designed for thin seams, cutting at floor level, with a "reach" of 3¼ ft. An electrically-driven arc heading machine shown has a chain jib 7½ ft. long; the motor is wound for 500 V a.c. The firm also shows a d.c. longwall chain cutter with a 4-ft. overcutting chain jib. A belt conveyor, a three-phase oil-immersed controller, and a three-phase gate-end panel are further exhibits.

BRITISH BROWN-BOVERI, LTD., shows principally motors and switchgear. One item is a 20-h.p. three-phase induction motor with a built-in starter. The latter, including resistances and switch elements, is mounted on the shaft in place of the usual slip rings, and thus slip rings, brushes, and brush-lifting and short-circuiting gear are eliminated. An example of the firm's automatic pressure regulator is shown, as well as a typical pattern of its 3,000-V switches. This is fitted with three built-on overload relays which act directly on the tripping mechanism. This stand also bears an "A-S" refrigerating machine.

MESSRS. GENT & CO. have a miscellaneous collection of their products. This includes examples of the firm's mine signalling apparatus, telephone apparatus, and the "Pul-Syn-Etic" time-keeping system. A distance water-level recorder and indicator is exhibited. Another device which is shown in operation is a "staff locater" which enables the manager of a works to call a number of members of the staff by combinations of coloured lamps, operated by push-buttons, which are fixed in various parts of the works. A great deal of radio apparatus appears; this includes a 4-valve receiving set built of the firm's own components, headphones, loud speakers, coils, transformers, &c. A navigation-light indicator with means for switching on duplicate lights is another interesting exhibit.

MESSRS. A. E. SMITHSON & CO., LTD., include in their display a number of small electric tools, including a French planing machine which employs a rotary steel cutter driven by a 1.1-h.p. motor fitted in the body of the machine with the switch conveniently situated near the rear handle.

Electric haulage gear is shown by a number of firms, including CARRON COMPANY (a 25-h.p. worm-geared main and tail haulage gear with a rope speed of 6 m.p.h.) and JOHN MILLS & CO. (driven by a 50-h.p. B.T.-H. induction motor through a 5 to 1 reduction gear; motor speed 726 r.p.m.).

In addition to the foregoing many firms show equipment for steam plants, collieries, &c., as well as general engineering products, a full description of which is precluded by lack of space.

A Review of the Electrical Industry.

By A. G. ELLIS.

(*Abstract of Chairman's Address*: NORTH-WESTERN CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

IF I touch on matters which may appear to be outside the purview of this Institution, I do so with the feeling that the Institution has broadened its basis from that of a purely scientific society by interesting itself in all matters vitally affecting the industry; and rightly so, since the Institution represents the corporate activity and voice of the electrical profession. In no times, as compared with the present, has the medium for corporate speech and action been so necessary, especially since the recent "discovery" of electricity by the politicians, who persist in the idea that this healthy 50-year-old child is still "in its infancy."

The vision of a completely electrified Britain should be our perpetual incentive. With abundant cheap electric power there would be a great demand for electrical appliances, both domestic and industrial, which would be highly standardised and produced in large quantities at low prices: our position in competition with foreign manufacturers would be enormously improved and markets, both at home and abroad, would naturally extend, filling the factories and contributing in no small measure to the reduction of general unemployment.

The carrying of the electric power supply on to the land throughout the country and its systematic and thorough application would increase the total food production and decrease the amount of imported food. Further, the widened range of cheap power supply would have the effect of transferring works and population to the country, enabling people concerned in industry to work and live under conditions fit for human beings and, in the course of time, eliminating that hideous product of modern civilisation—the large manufacturing town.

The anticipated new legislation with regard to electricity supply will again bring electricity prominently to the public notice, and the electrical industry would be well advised to take the opportunity of concurrent action in the education of the public. The occasion would be opportune for a widespread national campaign organised, I suggest, jointly by the Electrical Development Association (which is already doing excellent propaganda work), the I.M.E.A., the B.E.A.M.A., the newly-formed Women's Electrical Association and the I.E.E., to carry the gospel of electricity to the multitudes.

There is no difficulty in raising money for electricity supply undertakings. The capital expenditure on electricity supply has practically doubled during the past five years, and the dividends of the supply companies have shown a steady increase, now averaging over 6 per cent.

The increase in energy sold for the past year (March, 1924-March, 1925) has been roughly equal to the total increase for the four preceding years put together, which is a most encouraging result. The new plant involved has been almost exclusively of home manufacture, and, I believe, it would not require a great increase on this figure to rid completely the electrical and allied industries of unemployment.

So far as the manufacturers are concerned, there is no doubt that they are ready to meet any demands for new plant put upon them due to speeding up of electrical development. During the past five years great strides have been made in "heavy" electrical manufacture, and it may safely be asserted that the British manufacturer has caught up his "angle of lag" of some ten to fifteen years, and is now in phase with the American and Continental manufacturers. This is testified by the important orders secured by British manufacturers in the Colonies and in Russia, against American and Continental competition.

Recent progress relates principally to large turbo-generators and e.h.p. transformers and switchgear and automatic and supervisory control of stations. This country has recently exported a 50,000-kW, 1,800-r.p.m. turbo-generator, and 35,000- and 40,000-kW units, for 1,500 r.p.m., also for export, are in hand. In transformers and switchgear for pressures of 100 kV and over, British manufacturers have recently built, for export, apparatus aggregating over half-a-million kVA.

At home we have outdoor sub-station installations of British manufacture in operation at 66 kV and 33 kV, some of the latter plant having withstood for several years the most severe test possible for outdoor electrical apparatus, *viz.*, the climate of Manchester.

Testing transformers of 300 and 500 kV, for commercial testing of cables and insulators, have been built and are in successful operation, and 1,000,000-volt testing transformer equipment is under construction.

Perhaps the most remarkable development for some years is the automatic sub-station equipped for wholly automatic or remote supervisory control. The first automatic sub-stations in this country were put down only three years ago and the

excellent service obtained is vouched for by the engineers concerned and by the rapid spread of this type of plant. As an illustration of the saving in space and buildings, I might mention a subterranean station which is being put down in London, containing two 300-kW rotary converters with fully automatic control. This sub-station measures 28 by 15 feet and is entered through a manhole in the pavement, 5 by 3 ft.

Rotary converters up to 4,500 kW for 1,500-volt d.c. traction load, with automatic control gear, have been supplied to the Colonies. These machines are capable of being ready for supplying direct current in two minutes after receiving the starting impulse.

However, in many lines of standard electrical machinery and apparatus, under present conditions, the British manufacturer compares unfavourably with the American and German manufacturers. The reason is not far to seek; it is the advantage derived from the much greater total volume of electrical manufactures in those countries. The cure for this is to boost up the total electrical business in England, and get the benefits of manufacturing in larger quantities. To achieve this we have to look to expansion of the home market. We are already in the position of exporting about one-third of our total electrical manufactures, whereas the United States export only about one-tenth of their total, although the total cash value of the American and British electrical exports is about equal.

Of the total exports of electrical machinery and apparatus (including cables) from five leading industrial countries in 1924 (amounting to £53,000,000), Britain supplied 29 per cent., United States 31 per cent., and Germany 27 per cent., while France and Switzerland were practically responsible for the remaining 13 per cent. Thus, we are at present securing practically an equal share of the world's total electrical business with the United States and Germany; and, although our proportion has shown a slight increase during the past few years, no increase of great magnitude is to be expected in the near future.

Competition in the colonial markets is very keen and will become still more severe as soon as our principal competitors, America and Germany, no longer absorb the bulk of their electrical manufactures in their home markets, as they do at present.

Intimately bound up with this matter is the imperative necessity of cheaper cost of production of electrical apparatus. Without entering into the complexity of factors which are involved in this question, I consider that the keynote is quantity production; and herein the important factors with which we are concerned are:—(1) increase in demand and (2) standardisation.

(1) *Increase in demand.*—In the industrial field further application of electricity to mills and collieries is making steady progress, judging by the number of industrial electric motors turned out annually. No great expansion is to be looked for, however, until a general industrial revival sets in in earnest. There are, however, new fields of application, such as electric ovens for bakeries, to be exploited. An intensive programme of railway electrification would react favourably on the development of public electricity supply by widening the field of distribution and improving the load factor, due to the running of transmission lines through all districts touched by the railways.

In the domestic field the supply authorities are going out to create and develop the demand. The importance of the heating and cooking load as a means of improving the load factor renders the consumer taking power for these purposes as well as lighting, the most valuable for the supply undertaking to cultivate.

Development of rural electricity supply for agriculture is a field which is at last receiving in this country the attention it deserves. The politicians have already started dragging electricity into their schemes of land policy, so it behoves the engineer also to get busy.

Nearly one half the total area of Great Britain is farm land, comprising nearly half a million farms and small holdings. At present there are in Great Britain only about 400 farms electrically equipped, though it is anticipated that this number will be doubled in another year.

Here we lag far behind other agricultural countries, which are jointly responsible for about 1,000,000 electrically equipped farms throughout the world. There is thus, awaiting exploitation in this country, an enormous new field, of which the potential total demand for electrical energy is estimated at between 500 and 1,000 kWh per annum.

Apart from the problem providing a cheap and abundant power supply, the principal matters calling for present consideration appear to be:—

(1) The education of the farmer in electricity, and the electrical engineer in agriculture.

(2) Close co-operation between the supply undertakers, the Commissioners, and the Post Office to remove any difficulties in the way of the running of inexpensive overhead transmission lines.

(3) The manufacture of simple and inexpensive switch and transformer installations for tapping the h.p. transmission lines.

(4) An adequate system of hire-purchase and maintenance of electrical plant for farm installations.

Cheap power supply is largly dependent on the cost of transmission lines and tapping them. Any revision of existing rules and regulations should be in the direction of facilitating the obtaining of wayleaves for, and simplifying the standard of construction of, overhead h.p. transmission lines, rather than of framing special regulations, and it is to be hoped that the Electricity Commissioners will exercise a beneficent influence in this direction. Certain regulations are no doubt requisite to ensure the general safety of the public and livestock, but they should be as simple and unrestricting as possible. It can surely be left to the common sense of electricity undertakings which are pushing for rural supply, to see that any lines and installations they put down are both safe and sightly, constituting, as they do, one of the best forms of propaganda.

(To be concluded.)

The Work of the Electricity Commissioners.

The Fifth Annual Report.*

During the period covered by the fifth annual report of the Electricity Commissioners, which was issued last week, active consideration has been given by the Government to the question of the intensive development of electricity supply in Great Britain on a large scale for the industrial requirements of the country and the service of rural communities, and as a means of lessening the volume of unemployment. In July, 1924, the policy of the late Government with regard to electricity supply was outlined by the Chancellor of the Exchequer.

Following this pronouncement, the Commissioners were authorised to retain Messrs. Merz and McLellan to investigate and report upon the financial and practical aspects of a scheme of complete standardisation of frequency. The report, which embodied a suggested programme showing in detail how the change-over might be effected in a large non-standard area, was made to the Commissioners in November, 1924, and was duly submitted to the Minister of Transport with the recommendations of the Commissioners for the consideration of the new Government.

The Commissioners were also authorised to confer with the Incorporated Municipal Electrical Association, the Incorporated Association of Electric Power Companies, and the Provincial Electric Supply Committee of the United Kingdom as to the formulation by their constituent members of main transmission schemes; and with the Cable Makers' Association and the British Electrical Development Association as to the constitution of a distribution and, if necessary, a house-wiring organisation for the development of rural supplies in accordance with two trial schemes the outlines of which had been prepared by the Commissioners.

In consequence of the change of Government in the autumn of 1924, further consideration of the last-mentioned matters and of the numerous schemes of local development received by the Commissioners from authorised undertakers had necessarily to be deferred pending a decision by the new Government as to the policy to be followed. With the latter end n view, the Government appointed a Committee under the chairmanship of Lord Weir of Eastwood to consider the general question of the immediate and future electrical development of the country, the Chairman of the Electricity Commissioners acting as technical adviser to the Committee. At the date to which this report is made, the investigations of the Committee had not been concluded.†

While these important investigations preliminary to a decision on policy were in progress, the Commissioners necessarily felt constrained from proceeding with the initiation of new schemes of reorganisation, and attention was largely concentrated upon the concluding stages of schemes for certain Electricity Districts which were in an advanced position at the commencement of the period under review.

An outstanding feature of the administrative work of the Electricity Commission during the past year was the completion and publication of a return of authorised undertakers, and of a return of engineering and financial statistics in a comparative form. The Commissioners propose to issue a similar statistical return for the two years 1923-24 and 1924-25 at as early a date as possible, and to publish an annual return thereafter.

Authorised Undertakers.

On March 31st, 1925, the number of local authorities, companies and persons in Great Britain holding statutory powers relating to the supply of electricity was 568 (England, 275 l.a. and 191 c.; Wales, 38 and 14; Scotland, 25 and 25; total for Great Britain, 338 l.a. and 230 companies). The number of separate undertakers was 565.

* H.M. Stationery Office; price 2s. 6d. net.

† The Committee presented its Report to the Minister of Transport in May, 1925.

Generation of Electricity.

The monthly returns rendered to the Commissioners in respect of the generating stations of authorised undertakers in Great Britain, including the voluntary returns in respect of generating stations owned by railway and tramway authorities, and by a number of non-statutory undertakings, show that the total energy generated amounted to 7,415,375,529 kWh, the fuel consumed being 7,892,396 tons of coal, 95,436 tons of coke breeze, and 54,410 tons of oil. Of the total energy generated 6,047 million kWh was produced by authorised undertakers and 1,368 millions by traction and non-statutory undertakings. As compared with the previous year, the returns show an increase of about 11 per cent. in the number of kWh generated, and an increase in the consumption of coal and coke of about 6 per cent. The consumption of oil fuel showed a decrease of about 19,000 tons, a reduction of about 24 per cent. on the consumption during the preceding year. Continuous progress has been made since 1920 in the more economical utilisation of fuel for the generation of electricity in Great Britain.

Of the 584 stations dealt with, 255, or 43.7 per cent. of the total, generated less than 1,000,000 kWh each during the year under review, while 434 stations, or 74.3 per cent. of the total, generated less than 10,000,000 kWh each. There was an increase of 43 in the total number of stations submitting returns, partly attributable to the fact that certain authorised undertakers owning more than one generating station submitted a separate return for each station instead of a consolidated return for the undertaking as a whole, as in former years. The actual number of new stations which came into operation was 23.

Although it has been the consistent endeavour of the Commissioners since 1920 to bring about the supersession of small-scale generation in a multiplicity of stations, they have nevertheless found themselves in the position of having no alternative but to sanction the establishment of further small generating stations in various parts of the country.

The provision of such stations has proved to be the only method of meeting, for some years to come, the demand for electricity which has been shown to exist in a number of rural and other isolated areas, and in the exercise of their duty of promoting the supply of electricity the Commissioners have felt constrained from taking a course of action which would have debarred the initiation of local development for an indefinite period pending the establishment of comprehensive transmission and distribution systems from which bulk supplies could be made available over wider areas than hitherto.

While the supersession of small stations has not proceeded as rapidly as the Commissioners had hoped, since the establishment of the Commissioners in 1920, local generation has been discontinued at 54 small stations, and 21 other stations have been relegated to the position of standby.

Consumption of Electricity.

With regard to the sale of electricity in Great Britain by authorised undertakers, the energy sold in the calendar year 1924 by local authorities was 3,167,387,569, an increase on 1923 of 14.8 per cent., and by companies 1,830,575,684, an increase of 15.8 per cent., the total being 4,997,963,253. As compared with 1923, the sales of electricity thus showed an increase of 15 per cent.

On the basis of the Census Return for 1921, the energy sold by authorised undertakers in 1924 represented an average consumption of the order of 117 kWh per head of population in the whole of Great Britain. This figure does not take account of the supplies generated at the stations of railway and tramway authorities, or of the further large supplies generated privately at stations belonging to industrial and commercial organisations, and accordingly provides a partial measure only of the *per capita* consumption.

(*To be continued.*)

Electricity and Housing Schemes.

An Interesting Discussion at the Public Works Exhibition.

In a paper presented by Mr. R. Hardie, of Glasgow, under the auspices of the Incorporated Municipal Electrical Association, at the Congress arranged in connection with the Public Works, Roads and Transport Exhibition, the author discussed the uses of electricity for housing and institutional purposes; he remarked that we had almost, if not quite, reached the point when "everyone wanted electricity," and the task on which electrical men were to-day engaged was to demonstrate that the electricity supply cable which had perforce to be led into a building for lighting could at the same time be usefully employed for cooking, heating of apartments, ironing, and even water heating. "All-electric" houses could be erected and equipped as cheaply as the nineteenth-century house, with its coal range and coal fires within, and disfiguring exterior chimneyheads. Let housing authorities, therefore, co-operate with us in the provision of houses meeting modern scientific requirements; let us divorce ourselves from traditional practice, and provide "twentieth-century houses." It was unreasonable to expect supply undertakings to extend their distributors, erect sub-stations and lay services, for merely lighting demands, lasting at most for a few hours daily in the winter only. The cost to the undertaking of giving the supply would in some measure depend upon the distance from the generating station. For example, in a Glasgow suburb, five miles from the generating source, the cost of laying high- and low-pressure mains, service cables, meters, and providing sub-stations amounted to £20 per house—a considerable sum. Most of the houses started with electric lighting and an iron; gradually, some installed fires and cookers, and the demand reached 545 kWh per annum per house in 1924.

This average figure was still increasing and illustrated the uneconomic nature of a purely lighting demand from a scheme such as this. The Municipal Buildings at Glasgow had an annual consumption of close on a quarter of a million kWh per annum, of which 14,000 kWh represented cooking alone. The main heating was done by central heating systems. Some hundreds of electric fires were scattered throughout private rooms, offices, &c., where additional local heat was required, and also numerous special heating installations, *e.g.*, an equipment for the city bacteriologist to maintain for 24 hours daily a temperature of 60 deg. F. in the animal house. In one of the City hospitals they were arranging for the installation of electric heaters supplementary to the hot-water radiators, mainly for use during the night. Electricity for these would be supplied at a price making its use competitive and attractive.

Perhaps one of the most interesting and useful recent applications of electricity was the "ultra-violet" treatment. Installations were in use in hospitals, children's clinics, and infirmaries, where it had been established beyond doubt that the treatment had been extremely beneficial. A particularly happy example of co-operation between officials was to be seen at Poplar, resulting recently in electricity superseding in turn coal and gas for heating weekly 4,000 gallons of water at the public baths. A steam-electric equipment might be considered the ideal combination for any large kitchen, *i.e.*, steam for boiling operations and electricity for baking, roasting, grilling, &c. The electric kitchen was rapidly growing in favour with professional caterers, the managements of restaurants, clubs, &c., whose judgment on the value of electrical equipment must carry weight with those who did not claim to possess specialised knowledge of such matters.

In advocating a change-over to electricity for street lighting, Mr. Hardie said the expenditure could probably be recovered in a short time in reduced policing costs. He pleaded with borough surveyors and those authorities who licensed electric signs not to make their restrictions more onerous than necessary, consistent with public safety.

Discussion.

The development of electricity, said the Chairman, Mr. R. B. MITCHELL (Pres. I.M.E.A., and city electrical engineer, Glasgow), in its domestic aspect promised to grow even more rapidly in future than it had done in the past, and the formation of an Electrical Association for Women suggested that the interest in electricity was becoming still more general. Mr. Mitchell expressed his appreciation of the fact that the Congress Committee had seen fit to include an electrical paper in its programme.

Opening the discussion, Mr. G. W. KEATS (borough electrical engineer, Woolwich) said that his Council had erected 670 "all-electric" houses. The whole of the tenants were satisfied with them so far as the Council could see, but they had found the lack of tuition of the ladies occupying the houses as to the uses of electricity a very great problem. Ladies who had been educated to cook by gas were not yet quite efficient to teach cooking by electricity, which was a subject at some of the L.C.C. schools. Unless they educated girls, who were the women of the future, they would be in difficulties the whole time.

Mr. S. H. MORGAN (borough surveyor, Rochdale) said his Council was now building "all-electric" houses, and he would like to know what, in Mr. Hardie's experience, was the cost of servicing an all-electric house. He took it that the mains were laid free. At what price per kWh did electricity become an economical proposition for heating and cooking in houses? All the figures in the paper were based on a cheap supply.

Mr. T. FROST (Wolverhampton) commented on the unusually large number of ladies present. He was all in favour of trying to electrify houses, particularly the poorer houses.

Mr. J. LEADBEATER (borough electrical engineer, Hampstead) referring to the cost of wiring as set out in the paper, said he noticed that the screwed-barrel work, by direct labour or contract, seemed to be done at a lower price than one could get anything done for in London. He had had about 1,000 contracts in the last twelve months, and he did not get any done for less than 22s. per point with slip-barrel and grip fitting.

Mr. C. KEELING (Heanor, Derbyshire) asked for the cost of service to a cottage, and how it compared with the cost of gas.

He thought that was a great question for the working class. The cost for cooking and heating seemed to be out of the reach of the average working man.

Mr. OSBORNE (Welwyn Garden City) said that at Welwyn, so far as middle-class houses were concerned, there was very great interest in the development of electricity for cooking, heating, and other domestic purposes. The Council was very anxious to extend the use of electricity, particularly to the working-class houses. In that class of house, to get a return for overhead expenses, they had to make something in the nature of a fixed service charge, and then sell the remaining energy at a very closely cut rate, for heating and cooking. This was satisfactory from the point of view of the Council and the consumer. They kept their flat rate up deliberately, the object being to encourage the use of electricity for purposes other than lighting. They did not see why the man who only used electricity for lighting should get it more cheaply and advantageously than the man who used it for other purposes as well. He suggested that a meter should be designed which would give so many kWh at a contract high rate, after which the meter would automatically set itself, and the rest of the kWh would be obtained much more cheaply. He thought that such a meter would enormously increase the use of electricity amongst the working class. They would get a greater diversity of load, for the habits of the middle and working classes were different, and both types of consumer would not need power for cooking at the same times of the day.

Mr. L. L. ROBINSON (borough electrical engineer, Hackney) said he dealt with a population, a large percentage of which was really poor. He did business most easily with the poorer people, who seemed to find it necessary to economise by using electricity. Apparently this was because the poorer housewife had to do her own housework, and so needed mechanical help, whereas the richer woman could afford to keep servants. As a result of putting installations in the poorer houses on the free wiring installation prepayment system, they had found that one had to charge rather a high price per kWh; he was almost ashamed to say that at Hackney they charged 8d. per kWh for lighting and 1½d. for cooking and heating, but those prices compared favourably with those of gas. The question of the day was: How on earth can people afford to burn gas? As to the meter suggested by Mr. Osborne, it would be perfectly easy to design one which would simply change gear after a number of revolutions, but there would have to be a large number of different gears in the meter. The number of units which would have to be supplied at the high rate would depend on the installation, but they would have to get over the difficulty of a quarterly fixed charge on all kWh not based on the flat rate. With regard to water heating, he wanted to expose the fallacy (advanced by those interested in the supply of gas) that with gas 80 per cent. of the heat of the coal went into the water, and with electricity only 15 per cent. With water heating in an ordinary geyser, of the 80 per cent. of the heat in coal, only a little went into the water. In the case of electric heating with a thermal storage tank, 90 per cent. of the energy went into the water. He had recently tested several types of water heater; some of them used 30 kWh per week in radiation losses. One English type used 20 kWh, but a Swiss type only used 10 kWh. Mr. Robinson emphasised the value of careful lagging, and proceeded to say that his charge of 0.6d. per kWh for water heating was found to be fully competitive with gas. He disparaged the idea of charging less than 1d. for cooking, on the ground that a little reserve should be kept for developing the cooker. In conclusion, he asked if it were not a fact that the gas offices in Glasgow had had to be lighted by electricity because it was unhealthy for the staff to work in gas-lighted rooms?

Mr. H. E. FOLKES (surveyor to the Lye Urban District Council) stated that his Council had lately considered lighting the streets by electricity instead of gas. He asked for advice as to the methods of fixing the lamps, and what was a reasonable charge per lamp for eight months?

Councillor Mrs. GREGORY (West Ham) asked why flats which had been erected at Glasgow to re-house slum dwellers had not been lighted with electric light. West Ham Council was going to build flats, and hoped to have not only electric light, but cooking also. She paid 1½d for cooking and heating. Comparing a year's bill for electricity with a previous year's figure for gas, she found she had saved 2s. 6d. As to educating women, at West Ham they asked women with electric cookers to allow an official to bring to her house another woman in order to illustrate to her the working of the cooker. In most cases this was gladly done.

Mr. S. P. COLLINGE (borough engineer, Sunderland) asked if the whole of the water at the Poplar public baths mentioned by Mr. Hardie was heated by electricity. He said that the Town Council of Sunderland had been converting the street lighting from gas to electricity at the rate of 200 lamps per year. This would have taken some time to complete, so the Council obtained sanction to a loan from the Unemployment Grants Committee for converting the whole of the lamps and laying mains in about 80 streets. It was not putting many new standards up, but was mostly using the old gas pillars, with swan necks.

It was observed by Capt. L. J. Kettle (city electrical engineer, Dublin) that at the Gas Conference that morning the president of the Institution of Gas Engineers had said that all sorts of impartial public authorities were acting on the assumption that electricity should be given the monopoly for lighting and other purposes. The gas company was a very good customer of the Dublin authority, but with regard to the aspect of the question dealt with by Mr. Hardie, they all kne that electricity was cheaper. In many of the big industri cities the industrial part of the supply was so big that t domestic supply was a very small part of the total output. Dublin they had no such industrial load, and were th compelled to go very closely into the question of economy wi the domestic supply. Ladies, in his experience, needed ve little education in the use of domestic electrical appliance For flashing signs, gas could not compete with electricity, b he thought it should be a penal offence to put up anything the character that was seen in Piccadilly Circus.

Mr. A. W. BLAKE (electrical engineer, Willesden Urban Di trict Council) said that during eighteen months his Counc had converted 3,000 gas street lamps to electricity. The ol standards were used and the total cost was about £30,00 With regard to tariffs for domestic work he explained that h system, where the consumer had been connected for two three years, was to take the average current supplied durin that time, add 10 per cent., and then halve the total, for ligh ing. The consumer was asked to sign an agreement to pa this minimum charge, and then everything else used for othe purposes was charged at 1d. per kWh. A difficulty with in stalling electricity in the poorer districts was that so much the wiring was unfortunately badly done. They must ge down to the problem and remove a lot of the weaknesses o domestic electricity, and get the ladies to help them.

Closing the discussion, Mr. MITCHELL said there wa 800 all-electric houses in Glasgow. That number might hav been added to, but for the fact that the areas in which th Corporation was now building were outside the area of th municipal supply. At the present time there were 7,000 elec tric fires on hire from the Electricity Department. The wirin on the housing schemes was so cheap because of the extrem competition by small contractors. The wiring was done whe the house was in shell form, which made progress very muc easier; one house was like another, and a great deal of th work could be done before going on to the site. Speaking o the ultra-violet ray treatment, he said he was sure it woul develop to a very great degree, especially as regarded the cur of rickets in children. The percentage of cures was practi cally 100 per cent. They had a good deal of it in Glasgow where it was carried out by the Public Health Department and they were crying out for more. He had not, so far found it necessary to supplement the existing mains in orde to extend the domestic supply.

Mr. HARDIE, in his reply, agreed that something woul have to be done in the way of educating people in the uses o electricity. In this connection possibly the new Women's Elec trical Association would be able to suggest something. Fo reasons beyond his control he had had in the last two years several ladies in his house operating the electric cooker. N instruction had been given them, but they experienced no diffi culty. It was necessary to get away from the idea that some thing like a year's training was necessary before one could operate an electric cooker. He believed in instructing the older children. At present the cost of electricity at Glasgow for purposes other than lighting was ¾d., and for lighting it was 4½d. per kWh. They had a fixed charge and a low running rate of ½d. for power, which applied to any consumer, although he must be a generous user of electricity. He was quite satisfied that they could compete with gas at a price of 3s. 7d. per 1,000 cubic feet, even at the rate of 1d. per kWh. The cost of giving service to a house depended upon its distance from the generating station, but he had given an average figure of £20. He agreed that the question of a prepayment meter was one of the problems they would have to tackle. They had to get the working-class houses changed over from gas to electricity, and follow the gas undertakings in that they had installed thousands of slot meters. As to the new flats mentioned, it was out of the question to lead a double supply to them. Cost was the most important factor, and the Housing Committee had considered that the class of tenant would not be too well able to handle electric equipment. But Mr Mitchell had arranged in connection with some future schemes to install penny-in-the-slot meters.

The Underground Railway and Snow.—The Underground Railways, by the use of snow appliances, were able to run "almost uninterrupted" services of trains, except for slight trouble in the exposed section between Edgware and Golder's Green, during the snow fall last week. On the District Railway during the night trains were run on the outer sections, fitted with special ice-scrapers and snow brushes in order to keep the rails clear of non-conducting elements. The trouble is not so much snow or ice, but a combination of the two of the consistency of sleet. Snow, unless lying several feet thick, can be removed by the shoes and the wheels of the trains; ice, being brittle, is susceptible to concussion and can be removed quite easily, but sleet is tenacious and adheres to the rails. Heating the rails by electrical means has been tried, but without appreciable success. The company is experimenting with an oil-spraying machine which ejects warm oil over the surface of the current rails; by this means moisture is unable to lie on the rails, and the formation of ice is prevented. In addition to the special trains which are operated for the removal of sleet, about one-third of all service trains are fitted with sleet brushes of hard steel which can be adjusted to scrape along the surface of the rails to remove any obstruction.

Legal.

Unprotected Machinery.

AT the Scunthorpe Police Court last week the North Lincolnshire Iron Co., Ltd., was summoned for not having the gears of an electrical overhead travelling crab securely fenced as required by the Factory and Workshop Act; in consequence of this neglect an employé named Branson was killed.

For the prosecution Mr. C. J. Paterson, Inspector of Factories, described the case as one of the worst there had been in that district for years.

A brother of the deceased, Robert Ernest Branson, said deceased's job was to look after the crab, and if the travelling wheels were running hot, to put grease in.

Capt. A. Walker, shirt manager, stated that he had never given the deceased instructions to grease the crab.

For the defendants, Mr. F. Beverley said no instructions had been given the deceased to do any oiling when the machinery was in motion, and if the orders of the management were carried out the machinery was safe.

The magistrates fined the company £50, and also allowed five guineas special costs.

Lapish v. Braithwaite.

THIS matter came before the Lord Chancellor and Lords Atkinson, Buckmaster, Carson, and Blanesburgh, in the House of Lords on November 26th and 30th, on the appeal of the plaintiff, Mr. J. B. Lapish, from the verdict of the Court of Appeal reversing a judgment for £10 given in his favour by Mr. Justice Bailhache. The aim of the plaintiff and appellant was to establish the liability to penalties of Alderman A. Braithwaite, of Leeds, for having acted and voted as an alderman while certain companies with which he was connected had large contracts with the Leeds City Council.

After hearing Mr. Maugham, K.C., for the appellant and Sir John Simon, K.C., for the respondent, their Lordships reserved judgment.

The Postmaster-General v. Ford.

AT the Marlborough Police Court, on November 26th, Mr. R. M. Ford appeared on an adjourned summons for establishing, installing, and working a wireless station without a licence. Defendant pleaded "Not guilty," and after hearing the evidence, the magistrate (Mr. Mead) dismissed the charges of "establishing and installing" the station, and proceeded with that of "working" it.

The defendant said that the Act under which he was summoned did not define the term "message." He contended that musical performances could not be regarded as "messages."

The magistrate found the defendant guilty, and fined him £10 with £10 costs.

In response to defendant's request Mr. Mead agreed to state a case with a view to an appeal, and he gave defendant 14 days in which to pay the penalty, or, in default, he would be imprisoned in the second division for 11 days.

Holdway & Mardlin v. Capon.

IN the Whitechapel County Court, on November 20th, before Judge Cluer, Messrs. J. H. Holdway & Mardlin, electrical engineers, Enfield Wash, N., sued T. C. Capon, Hambury Street, E., to recover a balance of £15 for the wiring of seven lighting points, and an electric motor. There was a counterclaim for £4 for having the armatures of the electric motor rewound, and £2 15s. for extra work done.

Mr. HOLDWAY, in evidence, said that the work was completed in about three weeks, but he had only received £2. He denied that the wires were connected wrongly, or that there was any short circuit as the result of the way in which he had done the work. He also supplied an electric motor to the defendant and charged £8. It was in good condition, although second-hand.

The defendant said that plaintiff offered to do the work for £5 10s., but put in a bill for £17; no lamps or shades were supplied. A number of faults had developed; the armature of the motor was being rewound and would cost over £4, and various other items had to be supplied which the plaintiff had contracted to supply.

Judge CLUER said he thought that the plaintiff was entitled to a good deal more than he had been paid; £12 would be a reasonable figure. He would also allow £5 for the counterclaim.

Judgment was entered accordingly with costs.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

THE Court of Appeal, consisting of the Master of the Rolls and Lords Justices Warrington and Sargant, on November 26th delivered judgment upon the appeal of the plaintiffs in this case from the judgment of Mr. Justice Lawrence in the Chancery Division.

The plaintiffs, the owners of Letters Patent Nos. 9 to 44 of 1912, for an invention of "Improvements relating to Synchronous Dynamo-electric Machines," granted to Emanuel Rosenberg, brought the action for an injunction and the usual ancillary relief, alleging that the defendants had infringed the patent by the manufacture, sale and use of rotary converters constructed in accordance with the plaintiffs' specification. In particular the plantiffs complained of the sale towards the end of the year 1923 by the defendants to the West Hartlepool Corporation of two 300-kW rotary converters.

The defence was a denial of infringement and a plea that the plaintiffs' letters patent were invalid upon the ground of prior publication and prior general knowledge and that the plaintiff's patent was bad for want of subject matter.

Mr. Justice LAWRENCE, after hearing a mass of expert technical evidence, held that the plaintiffs' patent was bad for want of subject matter, and but for that invalidity the defendants would have been guilty of infringement. From this result the plaintiff company now appealed.

Lord Justice SARGANT read the judgment of the Court. He said the invention was for improved arrangements for starting a rotary converter. There were two alternative methods—the first and that to which the invention related was to use a separate starting motor fixed on the same shaft as the synchronous motor but actuated by some sort of power independent of the alternating current which was ultimately to be drawn from the main to actuate the rotary converter itself; the second method was to connect the synchronous motor or rotary converter to the mains either directly or through a reducing transformer and to permit it to start itself. That method had disadvantages. Having dealt at length with Rosenberg's specification and his claim and also with Tesla's publication in the United States in 1891, on which the defendants mainly relied in their plea of anticipation, the Lord Justice said that he thought that there was invention in what Rosenberg had done and on the view the Court took on his claim I the issue of infringement must almost necessarily be decided in the plaintiffs' favour. On the view which the Court had taken on the true construction of Rosenberg's claim the judgment of Mr. Justice Lawrence must be reversed with costs of the appeal and of the trial and the plaintiffs granted the injunction and the usual relief which was claimed in the statement of claim—the plaintiffs must elect whether they would have damages or an inquiry as to damages.

Counsel for the plaintiffs said they would ask for an inquiry as to damages.

Counsel for the defendants asked for a stay of the injunction if the defendants decided to appeal to the House of Lords.

The Master of the Rolls said that it was not the usual practice to grant a stay in order to facilitate an appeal to a higher Court.

In reply to the Master of the Rolls, Counsel for the plaintiffs said that his clients would be satisfied with an undertaking by the defendants to alter their machines in such a way that they would not infringe.

Dublin and Lucan Electric Railway Co., Ltd.

IN the High Court of Dublin, before Mr. Justice Johnston, last week, an application to adjourn the petition for the winding up of the Dublin & Lucan Electric Railway Co. for a fortnight was granted. It was stated that there were certain negotiations at present proceeding, which might save everybody a great deal of difficulty. Mr. H. J. Moloney, B.L., who appeared for the first debenture holders, said that a provisional liquidator had been appointed, and he was in charge of the assets. He would be in a better position at the end of a fortnight to say whether he would apply for a final winding-up order or not.

False Pretences Charge.

AT the Halifax Police Court, on November 26th, William Waters, electrician, was sentenced to three months' hard labour for obtaining money by false pretences. It was stated that he obtained 17s 6d. from a woman shopkeeper on the pretence that he came from the Halifax Corporation Electricity Department, offering to put in an electric lighting installation, six lights, for £4, the price being so low (he said) because the cable was already laid in the street. He secured a deposit for 10s. and later another of 5s. He asked for £1, but got only a further 2s. 6d. as the work was not completed. Three charges of similar frauds at Kirkstall, near Leeds, were taken into consideration. It was said that the man obtained Leeds Corporation electricity application forms and in the Halifax case crossed out "Leeds" and substituted "Halifax."

London Electric Supply Corporation Fined.

AT the Greenwich Police Court on November 30th, Mr. Dummett, the magistrate, gave his decision in the case reported in our last issue (p. 879), in which the London Electric Supply Corporation, Ltd., was summoned at the instance of H.M. Inspector of Factories for failing to adequately protect a transformer, the death of an employé resulting.

Mr. DUMMETT said that the terminals were not sufficiently protected, although the transformer was in a cage; some further, local, device was necessary. He imposed a fine of £5, with 15 guineas costs, in respect of the first summons, and the maximum penalty of £100 on the second. The company gave notice of appeal.

Parliamentary News.

(By Our Special Parliamentary Reporter.)

Directional Wireless.—On November 24th, Sir P. CUNLIFFE-LISTER informed Mr. Ramsden that a Committee was appointed on July 8th last to "advise the Board of Trade regarding the development in the United Kingdom of the service of wireless direction finding stations, wireless beacons and similar aids to navigation, and the location and types of such stations to be maintained." The Committee, which consisted of representatives of the Departments concerned and of the shipping industry, was a standing advisory committee dealing with concrete cases, and its conclusions or reports would not ordinarily be published.

Interference with Broadcasting.—On November 24th, Mr. DAY asked the Postmaster-General whether his attention had been drawn to the nuisance experienced by broadcast listeners owing to the interference of the Northolt G.P.O. wireless station, and whether this nuisance could be rectified.

SIR W. MITCHELL-THOMSON said that some interference with broadcast reception was caused by the Northolt station prior to November 7th, but, as the result of continuous experiment, the conditions had been much improved and the "broadcast" wavelengths were now practically clear of interference from that station.

Railway Stoppages.—On November 24th, Mr. CAMPBELL asked the Minister of Transport how many stoppages had taken place on the Underground Railways of London within the last three months owing to failure of current; whether these stoppages were becoming more numerous; and whether any remedial action could be recommended to the companies concerned to minimise the inconvenience to the public.

Colonel ASHLEY said he had brought this matter to the notice of the railway companies concerned, and was informed that no stoppages or delays owing to the failure or the temporary reduction of the current had occurred during the last three months on the Metropolitan Railway, and that there had been three such delays on the Metropolitan District and London Electric Railway Company's systems in all. Of these, one was due to circumstances of an exceptional nature, and the other two were attributable to an abnormal quantity of leaves in the river affecting the supply of condensing water. Works were already in progress to overcome this difficulty.

Low-Temperature Carbonisation.—On November 24th, Mr. SMITHERS asked the Secretary for Mines whether he could now inform the House what steps had been taken to make the low-temperature carbonisation of coal a commercial success.

Colonel LANE-FOX said that a great deal of research had been, and was being, undertaken at the Fuel Research Station, and an offer had been made to test free of charge plants which claimed to have solved the problem of low temperature carbonisation. Promising results had been obtained in a number of cases, but so far as he knew no plant had yet been working on a commercial scale for a long enough period to enable any definite judgment to be formed.

Rating of Machinery.—On November 26th, during the discussion on the report stage of the Rating and Valuation Bill, the House of Commons, in a "free" vote, by 324 to 106, agreed to the clause which unrates industrial machinery.

The Severn Scheme.—On November 26th, Colonel WOODCOCK asked the President of the Board of Trade how many reports had been made in connection with the Severn tidal-power scheme; if he was still satisfied that he was justified in continuing the expenses incurred in connection with the inquiry; and what was the total amount spent up to date and the total estimated cost of the inquiry.

SIR PHILIP CUNLIFFE-LISTER said that leaving out of account the report on tidal power of the late Water Power Resources Committee, which drew attention to the desirability of investigating the practicability of utilising the Severn tides for power purposes, two reports had been made by committees. The first of these dealt with the nature and probable cost of the necessary investigations; the second was concerned merely with the preliminary question whether it would be possible actually to erect a barrage in the Severn. The conclusions reached were such as to justify the continuation of the inquiry. The cost incurred to date was £2,597. The total cost of the complete inquiry had been estimated at from £70,000 to £90,000.

Amplifiers in Parliament.—On November 30th, Mr. WELLS asked the First Commissioner of Works whether, in view of the success which had attended the use of amplifiers in the House of Lords, he would consider the installation of similar apparatus in the House of Commons.

The Under-Secretary of the Home Department, who replied, said that the better acoustics of the House would not justify such an installation.

Broadcasting Parliament.—The question of broadcasting special debates or speeches was again raised by Mr. SMITHERS on November 30th, who said that there was a growing desire among the public to hear Parliamentary proceedings.

Major HENNESSY, replying for the Government, said that no decision could be taken on the subject until the general question of the future of broadcasting had been settled.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

To the Friends of "C. H. W."

Nearly a year ago the electrical community had a severe shock in the untimely death of Mr. C. H. Wordingham, whose end was undoubtedly hastened by his continuous efforts on behalf of various forms of activity in connection with the welfare of his profession, at a time when he should have been taking it easy after a previous illness. During the last few years of his life he spent a material proportion of his time in voluntary work, trying to help on movements connected with electricity, and by doing so he undoubtedly reduced his opportunity and capacity for earning and putting aside as much money as many men of his standing could do.

In view of these circumstances his widow, Mrs. Wordingham, has started a boarding and day school and holiday home for young children at the house "Beechwood" in Ridgeway Road, Redhill, at which many of his friends received hospitality in the past. Perhaps, therefore, some engineers and others connected with electricity, who have little growing "responsibilities," especially those who have work overseas, might care to bear in mind this school when a choice has to be made, or might put in a word with their friends for the same purpose.

Many men must miss the cheery word and old-fashioned doggedness of C.H.W., so perhaps some of them might see their way towards lending a hand to those he has left behind him.

Theodore Rich.

Westminster, *November 23rd*, 1925.

Assisted Wiring Schemes.

I have been very much interested in reading Mr. J. Edgar's paper on "Assisted Wiring Schemes," which he gave to the E.D.A. Conference in London last week, and am looking forward to the night when Mr. Edgar will give this lecture before the North-East Coast E.D.A. Conference.

First of all, I should like to compliment Mr. Edgar on his enterprise, and wish all engineers were as pushing in the advancement of the electrical industry.

I also read with great interest the discussion which took place after the paper was read, especially the views of Mr. L. G. Tate.

It has been thought that electrical contractors are antagonistic to supply engineers. This is not the case by any means, and electrical contractors are very anxious indeed to work harmoniously with the supply authorities' engineers, but they have to face a very grave danger, *not* from the engineers, but from the City and Borough Councils. The engineers generally are not Socialists, but we never know when the composition of a Council may change after an election, and the great dangers contractors have to face are the Socialistic policies of Councils.

Again, after satisfactory arrangements have been made with one engineer, that engineer, if he is an exceptionally capable and enterprising man like Mr. Edgar, is likely to advance and be appointed to a large authority. A different engineer may be appointed and the arrangements may not be so satisfactory.

If the Socialistic element is predominant on a Council and powers are given to the undertaking to trade, then the Socialists will soon see that all the work is done by direct labour.

I instance a town close to South Shields, namely, Gateshead. If, at the present time, the Gateshead Corporation was supplying electricity, everything would be done by direct labour. Fortunately, the supply is by private enterprise. The Gateshead Corporation is a Socialistic body, and practically all work is carried out by direct labour.

Again, we come to Mr. Edgar's neighbour, Sunderland. Here we have another phase, and a very serious one indeed, but it affects another branch of the industry, namely, the electrical wholesalers. In Sunderland, the Corporation Supply Department is having hired wiring work carried out by contractors, but is factoring the material itself, to the detriment of the wholesalers.

It is well known that the Socialist policy is to have all enterprises undertaken by the State or the Municipality, and I am quite certain that the ultimate aim of the Socialists, if they get into power, which they may do quite soon, will be to endeavour to take over the large power undertakings and for the State to supply in bulk and the Municipality to distribute and carry out all work in connection with the undertakings, right up to the lamps.

It is easily seen that this affects everyone in the industry, and it is admitted that private enterprise is responsible for the advancement of any industry, and wherever the State has undertaken a commercial venture, it has been unsuccessful.

I contend that it is up to every electrical man to do his utmost to encourage private enterprise and prevent the State or the Municipality trading to the detriment of the taxpayers or ratepayers.

It is interesting to note the great electrical development on the North-East Coast by that model of enterprise, the

Newcastle Electric Supply Co., Ltd., and its subsidiary undertakings. These undertakings are an example, not only to this country, but to the world.

I also contend that the municipal engineers and contractors should co-operate and see if some arrangements cannot be made so that they can work in harmony for the good of all and at the same time see that the contractors are protected against the Socialistic tendencies of municipal bodies. It is the Socialistic element of such bodies that the contractors are afraid of, and very much afraid of, and *not* the engineers, and I cannot understand how it is the engineers do not look at it in this light and realise the contractors' position. The contractors are as anxious as, if not more so than, the engineers for the advancement of the industry, and this cannot be attained by Socialistic methods, but success is assured if private enterprise is allowed full scope.

I should very much like to hear the views of other electrical men regarding this great and important question.

The whole matter affects general economic principles, and is of vital importance to the country at large.

R. E. Robson.

Newcastle-on-Tyne, *November 28th*, 1925.

Rural Electricity Supply.

It is not my intention to prolong the correspondence on this matter, and, as I stated in my last letter, I am not entering into the particular merits or demerits of the case in regard to overhead lines, but if Mr. Fennell has mis-stated his points in the same way as he has mispresented my last letter, then I can readily appreciate his making no headway. He appears to lash out at all who dare record any opinion in opposition to his own.

I would direct Mr. Fennell's attention again to my letter and ask him where I advocated compulsory application of the I.E.E. Rules, and also where I suggested "subsidy" as a remedy?

Mr. Fennell's cheap sneer at West Ham is unworthy of him, and as I stated, and would again repeat, such references only weaken his case.

Even although Mr. Fennell scorns "subsidy," which I have never suggested, he apparently asks for subsidy in another way by asking other authorities to bear an expense which is legally his own.

I venture to suggest that if he will confine his correspondence to arguments instead of abuse, he will find a greater acceptance, and I shall be glad to give him my co-operation in attempting to modify any irksome restrictions which retard progress.

Fredk. W. Purse,
Engineer and Manager.

Electricity Department,
West Ham, *November 23th*, 1925.

The Electro-deposition of Cadmium.

We are extremely interested in Mr. E. W. Lewis's very lucid article on "Electro-Deposition of Cadmium and its Alloys," but feel there are one or two points which require amplification in order to present the case a little more clearly to the average non-techical reader.

It may be accepted that the deposition from a cadmium ammonium sulphate bath is hardly commercial enough in its character to allow for widespread application.

The degradation of the peptone in the bath to amino acids necessitates the frequent filtration of the solution and the addition of further peptone, and since no indication is given in the colour of the deposit of the necessity of further additions, the ordinary working plater would be somewhat in the dark as to when to filter the bath and replenish with peptone.

From our experience the ideal solution is one made up of cadmium potassium cyanide, caustic soda, and various colloid additive agents. Such a solution will work continuously with small additions, say an occasional addition of potassium cyanide to maintain the minimum amount of free cyanide in the solution. The additive agents are not affected by electrolysis, being in a mildly alkaline solution, and the resulting deposit is of a silky texture of extremely fine grain which will take a very high polish.

We cannot agree with Mr. Lewis's contention that electro-deposited cadmium is more resistant to tarnishing than silver. Our experience has been that the sole objection to the metal is the rapidity with which it oxidises and so causes a black mark on any body coming in contact with it. A highly polished cadmium surface, if rubbed with the hand or with a clean duster, will give a black mark, and in view of the poisonous nature of the metal its general application for those purposes for which silver is at present preferred is restricted.

Another interesting point raised is the ease with which cadmium alloys with steel. According to the Udylite patent this can be accomplished at 250 deg. C., but we have found that it progressed quite easily in the cold, and a highly polished steel article which has been cadmium plated, shows every sign of the metal's having gone right through the surface of the steel, when the cadmium is removed by means which leave the original polish of the steel undimmed.

Regarding the deposition of cadmium alloys, this is not a commercial proposition at the present moment. The bath requires frequent analyses to maintain the balance of the two metals in it; also frequent analyses of the deposits are necessary to ascertain if the correct alloy is being deposited. In view of the fact that the ordinary working plater has no means whatever of judging from the colour of the deposited metal whether the correct amount of cadmium is present in the deposit or not, we feel that such a process is only applicable to those works which employ several chemists and have facilities for making frequent analyses both of the solution and deposited metal.

For **W. Canning & Co., Ltd.**
(Ernest R. Canning, *Managing Director.*)

Birmingham, *November 25th*, 1925.

The Cost of Living in Bombay.

With regard to "Sales Engineer's" query in your issue of October 9th last, I may say that he will find the equivalent of £300 a year at home hopelessly inadequate in such an expensive city as Bombay is at present.

Taking the standard value of the £ sterling at fifteen rupees, his salary will be Rs. 375 per mensem; and the amount he will have to spend regularly at the end of each month will be as follows:—

	Rs.
Boarding house, chummery, or as a paying guest in a private household	250
Servant	35
Dhobi (washerman)	10
	295

This leaves him with a balance of 80 rupees to pay for clothes, amusement, club subscriptions, doctor's fees, &c., and his savings (save the mark) will invariably be an overdraft at the bank.

As I have been twenty years in India and most of that time has been spent in Bombay, I can certainly say that it is the most expensive city in India to live in, as I have had occasion to compare notes with friends in other parts of the country.

No single man who intends coming out here should do so under less than 550 Rs. per mensem; and a married man with two or three children should not attempt it under 1,200 Rs. (these are minimum figures). The rents of the houses in decent localities are prohibitive, and it is not unlikely that the prices will be still further increased when the rent control is abolished at the end of the coming year. Small flats are as rare as gold dust, and moderately sized ones cannot be obtained under 250 to 300 rupees per mensem.

Some optimists declare that the prices of commodities are coming down. If that is so, I can only say, as a married man, that the reduction is so small as to be almost negligible.

All those who propose coming to India should remember that they do not come out here for the benefit of their health, and if they are not to be compensated by a comparatively reasonable increase in salary which will enable them to save a little and allow them to indulge in a fair amount of sport, which is absolutely essential in such a trying climate, it would be far better if they remained at home, where their prospects of longevity will be greatly increased.

Free medical attendance is provided for their employés by Government, railways, and certain firms of standing, and they also have a pension or provident fund scheme. These are very important matters, and the prospective immigrant would be well advised to make inquiries regarding them before signing any agreement.

If any of your readers wanting further information on the subject will communicate with me, I shall be very glad to supply it.

Bombay-ite.

[On behalf of our readers who are interested in this subject, we thank our correspondent for his valuable information.

We shall be pleased to forward letters to him. Similar data from other parts of the Empire overseas would be welcome.—Eds. Elec. Rev.]

Salaries of Combustion Engineers.

I have read with considerable interest and astonishment Mr. Wade's letter regarding the salary of a combustion engineer as compared with that of a shift engineer.

I do not wish in any way to underestimate the value of combustion engineers, but as a shift engineer in charge of one of the largest and most modern generating stations in this country, I strongly object to my own rank being belittled.

I have always been of the opinion that a shift engineer worthy of such a name is also a combustion engineer, but combustion engineers are not shift engineers.

My experience in large power stations has also shown me that the combustion engineer is responsible to the shift engineer or charge engineer (which is the same thing), therefore why should he be paid more money than the person to whom he is directly responsible?

Combustion engineers are only necessary because the shift engineer has not the time to devote to this part of his plant and not because he (the shift engineer) is not capable of doing this work as Mr. Wade insinuates.

We have a combustion engineer, but I sign the coal sheet and am responsible for the efficiency of the station as well as the reliability and continuity of the supply.

Shift Engineer.

November 28th, 1925.

International Critical Tables.

THE National Research Council of the United States has contracted to publish the "International Critical Tables of Numerical Data of Physics, Chemistry and Technology." The work of compiling the tables was undertaken by the Council at the request of the International Union of Pure and Applied Chemistry, with the endorsement of the International Union of Pure and Applied Physics, and under the auspices of the International Research Council. The material contained in the tables has been collected and critically evaluated by some 300 co-operating experts, including chemists, physicists, and engineers of many countries. The editorial expenses have been contributed and the work of the co-operating experts is practically gratuitous. The whole undertaking represents a money value of at least $570,000, of which the returns from subscriptions will represent only a minor part. The scope of the material collected covers all the available information of value concerning the physical properties and numerical characteristics of pure substances and mixtures of definite composition, the important classes of industrial materials, many natural materials and products, and selected data for selected bodies or systems, such as the earth and its main physical sub-divisions and the solar and stellar systems. In addition to their wide scope, the tables will contain many novel features of arrangement; for example, in many cases it will be possible to ascertain readily what substance or material of a given kind has a maximum, a minimum, or a given value for any particular property. The principal language employed will be English; but much of the explanatory text, &c., will be given also in French, German, and Italian. The work will be issued in five volumes, and the editors are making every effort to compress the material which has been collected into the available 2,500 pages. All volumes will be bound in a uniform reinforced buckram binding, and will be delivered to all advance subscribers as issued, with packing and carriage charges prepaid. The work will be published at the price of $60 for the five-volume set; but until the appearance of Volume I (early in 1926), individuals who are members of a recognised scientific or technical society, and educational institutions, public libraries, government departments, research laboratories, and the libraries of industries, will have the right to subscribe at the rate of $35 for the set of volumes. Application should be made to the National Research Council, B and 21st Streets, Northwest, Washington, D.C., U.S.A., on forms provided.

Trade-mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 18th:—

Condit. No. 459,269. Class 5. Wire. No. 460,614. Class 8. Radio telephonic and telegraphic receiving and transmitting apparatus.—Autoveyors, Ltd., 84, Victoria Street, S.W.1.

Superducon. No. 455,490. All goods in Class 8.—The Dubilier Condenser Co., Ltd.

Utix. No. 460,721. All goods in Class 8.—Ripaults, Ltd., 1, King's Road, St. Pancras, N.W.1.

Chaseway, No. 461,496. All goods in Class 8.—The Chase Electrical Manufacturing Co., Ltd. (in liquidation), 184, Fleet Street, E.C.4.

Enoni. B No. 461,830. Class 8. Instruments and apparatus, and parts thereof, for use in radio-telephony and telegraphy.—Osram Gesellschaft, 11-14, Ehrenbergstrasse, Berlin, O.17. (British representatives: Cruikshank & Fairweather, 65-67, Chancery Lane, W.C.1.)

Radiax (lettering and design). No. 462,951. Class 8. Apparatus and parts thereof for use in radio-telegraphy.—Radiax, Ltd., 4, Percy Street, W.1.

Maxel. No. 463,051. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—F. E. Pither, 38, Mortimer Street, W.1.

Objections against any of the following may be entered within one month from November 25th:—

Byfunken. No. 458,190. Class 8. Headphones for use in connection with radio-telegraphy and telephony.—H. Byford, 39, Charterhouse Chambers, Charterhouse Square, E.C.1.

Louden (lettering and design). No. 457,898. Class 8. Thermionic valves for use in radio-telephony.—Fellows Magneto Co., Ltd.

Etherac. No. 459,851. All goods in Class 8, except crystals and coils, for use in radio-telephony.—S. Guiterman & Co., Ltd., 35-36, Aldermanbury, E.C.2.

R.I., Ltd. (lettering and design). No. 461,207. Class 8. Instruments and apparatus for use in radio-telephony.—Radio Instruments, Ltd.

Vono. No. 462,215. All goods in Class 8.—E. Vaughan, Duport Foundry, Dudley Port, Staffs.

M.S.S., Ltd. (lettering and design). No. 462,378. Class 8. Philosophical and scientific instruments, and apparatus for useful purposes.—Mark Shaw and Sons, Ltd., Milnsbridge Ironworks, Huddersfield.

Beacon (lettering and design). No. 460,796. Class 13. Electric lamps (ordinary).—The Baybrook Electric Co., Ltd., 15-16, White Cross Place, Wilson Street, E.C.2.

Nerka. No. 463,011. Class 13. Sparking plugs.—La Société Nerka, 21, Rue Le Peletier, Paris (British representatives: Reginald W. Barker & Co., 56, Ludgate Hill, E.C.4.).

Electrolysis.—The Perth Corporation Tramway Committee is to repudiate liability in respect of a claim of £56 by the Post Office authorities for damages to their cables by electrolysis.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

6,686. "Electric cables." British Insulated & Helsby Cables, Ltd., and G. H. Nisbett. December 15th, 1924. (241,628.)

11,554. "Means for breaking electric circuits." W. B. Whitney, E. B. Wedmore, and British Electrical & Allied Industries Research Association. May 9th, 1924. (242,318.)

16,129. "Telegraph typewriters." Kleinschmidt Electric Co. Inc. April 3rd, 1924. (231,815.)

18,437. "Illuminated advertising devices." S. Fisher and W. E. F. Fitzgerald. August 1st, 1924. (242,334.)

18,540. "Electric fuses." V. Hope. August 5th, 1924. (Cognate application 3,338/25.) (242,338.)

18,570. "Magnifying apparatus for telegraph signals and circuits associated therewith." J. H. M. Christensen. August 5th, 1924. (242,340.)

18,624. "Wireless telegraph and telephone aerials." C. S. Franklin. August 5th, 1924. (242,342.)

18,743. "Receivers, particularly of the loud-speaking type." S. E. Witt. August 6th, 1924. (242,350.)

18,744. "Receivers, particularly of the loud-speaking type." S. E. Witt. August 6th, 1924. (242,351.)

18,809. "Electric resistance elements, particularly for use with electric radiators." P. M. Edinborough and Metropolitan-Vickers Electrical Co., Ltd. August 7th, 1924. (242,353.)

18,817. "Electric protective systems." A. Reyrolle & Co., Ltd., H. W. Clothier, and R. W. Biles. August 7th, 1924. (242,354.)

18,818. "Electric protective systems." A. Reyrolle & Co., Ltd., and R. W. Biles. August 7th, 1924. (242,355.)

18,819. "Insulated electric cable joints." British Thomson-Houston Co., Ltd. (General Electric Co.). August 7th, 1924. (242,356.)

18,844. "Apparatus for the electric transmission of signals to a distance." Siemens & Halske Akt. Ges. August 8th, 1923. (220,323.)

19,078. "Acoustic devices." Western Electric Co., Ltd. (Western Electric Co. Inc.). August 11th, 1924. (Patent of addition not granted.) (242,362.)

19,422. "Voltage regulation of dynamo-electric machines." A. H. Railing and J. P. Huggard. August 16th, 1924. (242,368.)

20,054. "Testing systems for telephone circuits." Western Electric Co. Ltd. August 25th, 1923. (220,963.)

20,664. "Electrical reverse-current cut-out apparatus." M. J. Railing, C. C. Garrard, and W. Wilson. September 2nd, 1924. (242,381.)

20,859. "Magnetic structures and method of manufacture thereof." Western Electric Co., Ltd. (Western Electric Co. Inc.). September 4th, 1924. (Addition to 188,688.) (242,384.)

21,986. "Terminals or couplings for electric wires." Fuller's United Electric Works, Ltd., and A. P. Welch. September 17th, 1924. (242,391.)

22,576. "Apparatus for recording telephone conversations." A. E. O'dell (Telegraphon Akt. Ges.). September 24th, 1924. (242,396.)

22,818. "Electric switchboards." Switchgear & Cowans, Ltd., and G. H. Neep. September 27th, 1924. (242,398.)

23,846. "Electric lampholders." J. W. Wyatt and J. Kipling. April 17th, 1925. (242,408.)

24,773. "Electric switches." J. A. Crabtree. October 18th, 1924. (242,417.)

25,560. "Electrical condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.). (H. R. Van Deventer). October 27th, 1924. (242,423.)

25,566. "Electrolytic condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (H. R. Van Deventer). October 27th, 1924. (242,424.)

25,573. "Variable electric condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (242,425.)

26,925. "Coated filaments for thermionic discharge tubes." General Electric Co., Ltd., and C. J. Smithells. November 11th, 1924. (242,438.)

26,945. "Electric heating device for beds, cars, and like locations." S. H. H. Barratt. November 11th, 1924. (242,439.)

27,328. "Shock-absorbing supports for thermionic valves." M.-L. Magneto Syndicate, Ltd., and F. R. F. Ramsay. November 15th, 1924. (242,443.)

28,430. "Switches and circuit arrangements for telephone systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. November 27th, 1924. (Addition to 219,740.) (242,457.)

29,587. "Electrical heating elements." W. Guy-Pell. December 9th, 1924. (242,465.)

29,999. "Electromotor for refrigerating machines." B. Bischof and C. Haccius. December 13th, 1924. (Convention date not granted.) (227,096.)

1925.

1,288. "Electromagnetic percussive tool." N. Japolsky and M. Kostenko. January 16th, 1924. (227,849.)

3,155. "Headlights for motor-cars and the like." I. Cassan. February 7th, 1924. (228,904.)

3,351. "Holders for thermionic valves." S. W. Cole. February 6th, 1925. (242,486.)

4,077. "Systems of electrical distribution." British Thomson-Houston Co., Ltd. March 14th, 1924. (230,805.)

4,810. "Combined plug-and-socket devices for electrical services." Santon, Ltd., and H. C. Sanders. February 21st, 1925. (242,495.)

6,189. "Coilholders for use in connection with wireless or other electrical apparatus." E. Wainwright and H. A. L. Machen. March 6th, 1925. (242,500.)

7,220. "Electric service boxes." Callender's Cable & Construction Co., Ltd., and W. J. Howard. March 17th, 1925. (242,509.)

9,556. "High-tension circuit-breaker." N. Japolsky. May 14th, 1924. (234,067.)

12,512. "Thermionic valves." J. Hawadier. May 26th, 1924. (234,480.)

14,179. "Method of and means for frequency transformation in electrical phenomena." C. Lorenz Akt. Ges. June 7th, 1924. (235,185.)

14,473. "Moulded electrically-insulating bodies having projecting ribs or screens." International General Electric Co. Inc. June 3rd, 1924. (235,196.)

14,346. "Electric switches." British Thomson-Houston Co., Ltd. June 3rd, 1924. (235,188.)

15,023. "Construction of the cabs of electric locomotives." Soc. Anon. des Ateliers de Secheron. July 8th, 1924. (236,908.)

15,596. "Electric magnetos." International General Electric Co. Inc. June 16th, 1924. (235,603.)

15,738. "X-ray tubes." Naamlooze Vennpotschap Philips Gloeilampenfabrieken. June 18th, 1924. (235,892.)

16,666. "Electromagnetic talking machines." Vox Maschinen Akt. Ges. June 28th, 1924. (236,237.)

17,029. "Controlling devices for electromagnetic talking machines." Telegraphie Ges. System Stille. July 3rd, 1924. (236,571.)

17,030. "Magnet carriers for electromagnetic talking machines." Telegraphie Ges. System Stille. July 3rd, 1924. (236,572.)

17,135. "Electric transformers." British Thomson-Houston Co., Ltd. December 31st, 1924. (241,843.)

17,365. "Portable electric lamps." Benjamin Electric, Ltd. July 5th, 1924. (236,595.)

18,982. "Electric hand-irons." O. Graetzer. December 1st, 1924. (242,565.)

23,423. "Automobile lamps." G. O. J. P. Christiansen. September 20th, 1924. (240,181.)

The

Electrical Review

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The All-Electric House.

THE Institution of Electrical Engineers is to be congratulated upon the paper which was presented to it by Dr. S. Parker Smith on Thursday last week. That the subject was of general interest was attested by the large attendance of members, and the only regrettable circumstance was the curtailment of the discussion, which promised to be more than ordinarily instructive. It is a long time since an I.E.E. discussion was adjourned, or since any complaint was raised to the effect that it was too brief, but on this occasion that opinion has been expressed to us not only privately but also by way of our "Correspondence" columns. It is an old-standing difficulty—shall the Elder Brothers of the fraternity dine first and meet at 8 o'clock, or meet at 6 and dine at 8? That the latter alternative is less objectionable to the majority of the members who attend the meetings seems clear, for the Council took an informal vote on the matter by post-card some years ago, and did not subsequently change the hour from 6 o'clock. It is significant of the feeling amongst the Younger Brothers that at the Informal Meetings, which commence at 7 o'clock, the discussion goes on till half-past nine, suggesting that the members concerned think less about dinner than about the debate.

It is seldom that so good a paper is submitted, and therefore all the more regrettable that it was not fully discussed. Readers of it may demur to its contents on the grounds that the electrical equipment of the house was super-normal, that the admirable tariff of the Glasgow Corporation is not paralleled in many towns, and that the capital outlay was not stated. But the data are given in full and can be made the basis of deductions with regard to differing conditions, and we trust that Dr. Parker Smith will give further particulars about the cost of his installation. Incidentally, it was interesting to note that he used cab-tire-sheathed cable throughout.

It is true that the author treats the all-electric house as a whole, and including the cost of the extra wiring and the electrical apparatus permanently installed, estimates that the total cost of the house was 3 or 4 per cent. more than that of a house equipped with ordinary coal and gas appliances and electricity for lighting only. So far as a new house is concerned, this is a per-

fectly sound basis of comparison, for when one is building a house, one does not take out the cost of the gas-piping and electric wiring separately—they are integral parts of the house, like the water-pipes. Moreover, as he points out, and as the Electrical Development Association proved long ago, a house designed for electric heating can be built and equipped with the necessary apparatus more cheaply than one designed for coal fires. This is a fact which ought to be effectively impressed upon builders and architects, especially in areas where electricity is available on a reasonable tariff. But if someone would furnish reliable data for the cost of fitting an existing house with electric heating and cooking equipment, using alternative systems of wiring, the information would be useful to many people.

As an example of thoroughness in the adoption of electrical methods, the paper is unique, for the author does not merely use all manner of electrical appliances—he has studied them in detail and puts forward a standard of efficient practice which deserves close study. The installation of separate meters for the different services afforded a means of obtaining valuable information regarding the consumption; it will be seen that heating, including water heating, accounted for four-fifths of the total consumption, and three-quarters of the total cost.

It would appear, therefore, that complete electrical heating is commercially practicable only where a very favourable tariff is offered, as the author clearly implied in his remarks at the Institution. It is true that he stated that the total cost was practically the same as he had experienced in a similar house using coal, gas, and electricity, with less return for the outlay; true, too, as he says, that few householders really know what they are paying for lighting and heating by gas and coal, to say nothing of the consequential expense for labour, re-decoration, &c., and we may add that the adoption of electrical methods generally implies the simultaneous adoption of a much higher standard of lighting and heating, though the user may not be fully conscious of the fact. But it is clear that electrical men will do well to restrain their enthusiasm when advising new consumers, particularly with regard to the continuous heating of rooms and water heating, lest they create too optimistic an impression in the first instance which will be rudely dispelled by the heating bills.

The North Wales Dam Accident.

The report of the inquest on the victims of the wash-out at Lake Eigiau, which we print elsewhere in this issue, leaves little doubt as to the facts of this lamentable occurrence. The concrete wall of the dam was founded on clay, into which it should have been carried to a depth of 6 feet; but at the part where the water broke through beneath the wall, the trench was probably only 1½ feet deep. During the past summer, which was exceptionally dry, the clay was exposed and may have been partially dried and fissured, permitting the returning water to percolate beneath the wall. The head of water was not great, and had the dam been carried down to the specified depth it might well have stood for a century; the concrete was admittedly of poor quality, permitting leaks which necessitated repeated attention, but these had nothing to do with the failure of the foundation, and the fact that the wall over the breach, 60 ft. in length, stood without support for many days before it collapsed suggests that it was of ample strength for the purpose.

The responsibility, then, rests primarily upon the head of the official whose duty it was to see that the plans were duly carried out—believed to be a Mr. Wilson, who is now dead—and secondarily upon the consulting engineers who supervised the work. But most unfortunately it happened that when the section of the dam where the failure occurred was built, the work was stopped, and remained suspended for two years; that section was neither certified nor paid for, and when the work was resumed from the point where the original contractors had left off, another firm of engineers was in charge of it.

It appears that the circumstances were altogether exceptional, and it is unlikely that any similar instance will ever be met with. The jury recommended that dams should be made subject to Government inspection, but whether the defect in the Eigiau dam would have been discovered by this means is very doubtful. As a rule, the engineers in charge of such work, having their reputations at stake, may be trusted to take every possible precaution to ensure the safety of the structure, and we cannot doubt that if the work on the Eigiau dam had followed the normal course the faulty section would have been detected and rebuilt at the time. The moral of the accident seems to be that continual inspection by an expert supervisor is indispensable.

While we doubt the efficacy of Government inspection during construction, there is much to be said in favour of an official inquiry in case of failure, such as those held by the Board of Trade in connection with boiler explosions and railway accidents, and it is probable that the question of instituting machinery for the purpose will be seriously considered.

Modern Electric Cookers.

In following closely the developments which are being introduced into the design and construction of electric cookers, an article on which has been appearing in our columns and is concluded in this issue, it appears to us that the greater part of the attention of the manufacturers is being directed to the demand of the supply engineer for apparatus calling for less maintenance than has been the case in the past, and in which repairs may be effected with a minimum of time spent on the consumer's premises; these requirements refer almost entirely to the hob plate elements.

To meet the first need, the enclosed boiling plate is being advocated, and it is generally assumed that by adding to the protection of the elements in this manner, the efficiency of the plate from the point of view of energy consumption is appreciably reduced. It would be interesting to know exactly how far the user gains or loses in the overall efficiency; few data are available, and it seems that the whole question is still in the "matter of opinion" stage. We hope that it will soon be possible to lay down definitely how far protection may be given to the elements without the overall efficiency of the cooker suffering in consequence. The figures given by Dr. Parker Smith in his I.E.E. paper for the efficiency of boiling rings were rather startling, and call for explanation.

With regard to the consideration of effecting repairs on the premises, there is a tendency to construct the elements in unit form so that the whole may be replaced "on the spot," and the defect repaired in the workshop. It is noticeable that in some designs this practice results in the actual elements being inaccessible. We think that the ideal unit would be an interchangeable one, in which the element spirals or bars and the connections were easy to examine and replace.

Germany and International Co-operation.

A good deal of hard thinking is taking place in Germany regarding the future of international trading. What is more natural, considering the need of capital and all the consequences thereby entailed? But while hard thinking as the outcome of anxiety is to be expected, it is unaccompanied by boastful bombast heralding schemes for world expansion such as we heard so often in the old days, and will not be objected to by the most suspecting Britisher. Yet the situation as it develops will require careful attention.

At the annual conference of the Central Verband der Elektrotechnischen Industrie last month, in Berlin, Dr. Carl Fr. von Siemens, the president, portrayed the economic future in very gloomy colours, and a later speaker, a former Minister of the Reich, indicated combination of works producing the same classes of articles as the direction in which salvation lay. It is anticipated, for example, that if the big Westphalian iron and steel trust becomes effective there will be, with an output of 6,000,000 tons of steel, an economy of £2,000,000 in the cost of keeping stocks. This, however, indicates no

material departure from the procedure which used to be characteristic of German organisation; it is periodically examined and advocated here with special reference to particular lines of electrical manufacture, and it has been practised on a small scale by British firms.

But the discussion at the Central Union went further than to deal with internal re-organisation; it included the subject of international economic co-operation. Dr. Meinhardt, of the Osram Company, prepared his hearers by remarking that new times required new ways, such as a combination extending beyond the German frontiers. While German electrical exports were not unfavourable, this section of outside trade was not doing well when compared with the pre-war period, and what it desired was to secure its share in the requirements of the world. International understanding had been the aim of the electric lamp makers, and he found everywhere abroad a disposition for international co-operation, in which the lamp agreement of 1924 had shown the way to other industries. Dr. Meinhardt went on to say that price-fixing for the world did not form part of that agreement, the organisation in each country being left to regulate prices for itself. The lamp combination allowed them to hope that in a short time that branch of industry would be able to substitute a serviceable and uniform pattern for the confused mass of types and sizes. The experience of a year's working of the agreement had been that the German factories were able to supply their customers at prices which were less than 70 per cent. of the pre-war price.

We may quote one other speaker—Herr Deutsch, of the A.E.G., who likewise advocated a horizontal construction of German industry. He was not in favour of syndicates which would have a price-increasing effect, but he desired to see a complete combination of similar kinds of works in a new company. In the first place, the combination should be of a German national character; secondly, it should be extended so as to be of European scope; and, thirdly, become international by the inclusion of the United States, thus bringing in the world markets. When such a stage had been reached it would not be possible to set aside the next problem of the question of the United States of Europe, which would be regulated both politically and economically. Herr Dutsch finally went so far as to express the opinion that the question of horizontal combination with the abolition of Customs duties and the creation of the United States of Europe, would come into prominence in the next ten years.

The Internal Combustion Boiler.

The mystery of Mr. Oscar Brunler's boiler efficiency is not in any way elucidated by his recent paper before the Institute of Marine Engineers. This boiler, as our readers will remember, consists of a vessel in which steam is generated by a flame burning in actual contact with the water. Oil is used as fuel, and the air for combustion has, of course, to be supplied to the flame at a pressure somewhat higher than the steam pressure in the boiler. The products of combustion and the steam generated leave the boiler as a mixture of which slightly less than half is steam, the remainder being incondensable gases. So far as the utilisation of this steam-gas mixture is concerned, the inventor appears to realise that any engine or turbine employed would have to exhaust at atmospheric pressure because of the practical impossibility of maintaining a vacuum, but this fact is regarded as of minor importance. Practical considerations, however, may be neglected for the moment in view of Mr. Brunler's reiterated claim for net efficiencies of over 100 per cent. for his apparatus. He gives "data" of tests which have been carried out during the past months by different authorities," purporting to show an efficiency of 109 per cent. with an unlagged boiler, but does not give the names of the "authorities" who arrived at so remarkable a result. He "could add a series of test figures showing efficiencies from 95 per cent. to 120 per cent.," and his faith in such figures is shown by his statement that "when facts and theories clash it is best to discard theory." With this pronouncement we cordially agree, but we would suggest that before discarding theory, Mr. Brunler should make allowance for the power absorbed in compressing the whole of the combustion air to 120 lb. per sq. in. before forcing it into the boiler, a little point which seems to have been overlooked, in the case of the test quoted.

Until we have a test of the boiler carried out by some authority whose name will inspire confidence, it is useless to follow Mr. Brunler into his theories as to how efficiencies of more than 100 per cent. can be explained. We can only agree that "time and science which never stand still will bring the solution of this phenomenon," though we think the solution, when found, will turn out to be something much more prosaic than Mr. Brunler anticipates. The boiler, however, has other properties almost as remarkable as its efficiency. "Only a few weeks ago," the paper states, "we ran boiler trials with feed-water which was mixed with 150 lb. of lime per ton of water, and after more than a week's run the boiler was inspected and the plates were perfectly clean and free from any incrustation." It would appear, from other portions of the paper, that this boiler was 3 ft. in diameter by 4 ft. 8 in. high, with a maximum capacity of 11,000 lb. of steam-gas mixture per hour. Supposing the boiler to have been worked for only 50 hours during the week, at an average steaming rate of only 3,000 lb. of steam per hour, the 150,000 lb. of feed-water would carry nearly 4½ tons of lime into the interior. One would have thought that this would have been enough to make a perceptible deposit in so tiny a boiler, but where the lime went is one of the mysteries which we must leave "time and science" to explain. The blow-down cocks may have been working overtime.

Electricity Supply in Rural Areas.

The fifth annual report of the Electricity Commissioners confirms our own frequently-expressed opinion with regard to "the demand which has been shown to exist" in rural areas. The words quoted above are derived from paragraph 19, page 10, of the Report. The North Somerset Electric Supply Co., Ltd., appears to share this view, and is giving practical effect to it, for Parliament last week confirmed the North Somerset Electricity (Extension) Special Order, 1925. The company therefore now holds statutory powers over the following areas*:—The City of Wells; the Borough of Glastonbury; the Urban Districts of Clevedon, Highbridge, Midsomer Norton, Portishead, Radstock, and Shepton Mallet; the Rural Districts of Axbridge, Clutton, Long Ashton, and Wells (except three parishes); twelve parishes in Shepton Mallet, R.D., six in Frome R.D., one in Bath R.D., and one in Keynsham R.D.

We understand that the scheme of distribution for this area, which includes approximately 450 square miles (288,000 acres), will cost well over a quarter of a million sterling, and we congratulate the company on its not adopting the "wait and see" policy. We should like to see other undertakers quoting their statutory areas (for general supplies) in acres or square miles. It is to be regretted that this information was not included in the Electricity Commissioners' Return of Electricity Supply Undertakings. It is very instructive to compare the extent of operations in different parts of the country, and by means of acreage one can obtain a fairly good idea of the relative sizes of territory. For instance, it is easily found without the aid of a map that the territory of the North Somerset Electric Supply Co., Ltd., is more than one quarter of the whole county, and indeed it covers more than one quarter of the area of the East Midlands Electricity District.

The engineering proposals of the company are based upon the taking of a bulk supply from the Corporation of Bristol, and embody a general scheme of rural development for the supply of electricity over a large area to a number of small towns and villages.

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*See map on page 925.

Electricity Supply in Great Britain.—VII.*

Dorset and Somerset.

STATUTORY powers for the supply of electricity have either been granted or applied for in respect of the hatched areas on the maps here reproduced.

A large portion of Somerset is included in the Lower Severn Electricity District as provisionally determined by the Electricity Commissioners, but Dorset does not yet form part of an Electricity District.

In the list of authorised undertakers given below (whose areas of supply are wholly or partly in either Dorset or Somerset) it will be seen that there are no Power Companies.

Local Authorities.

Bath Corporation.
Bristol Corporation.
Dorchester Corporation.
Lyme Regis Corporation.
Taunton Corporation.
Weymouth Corporation.

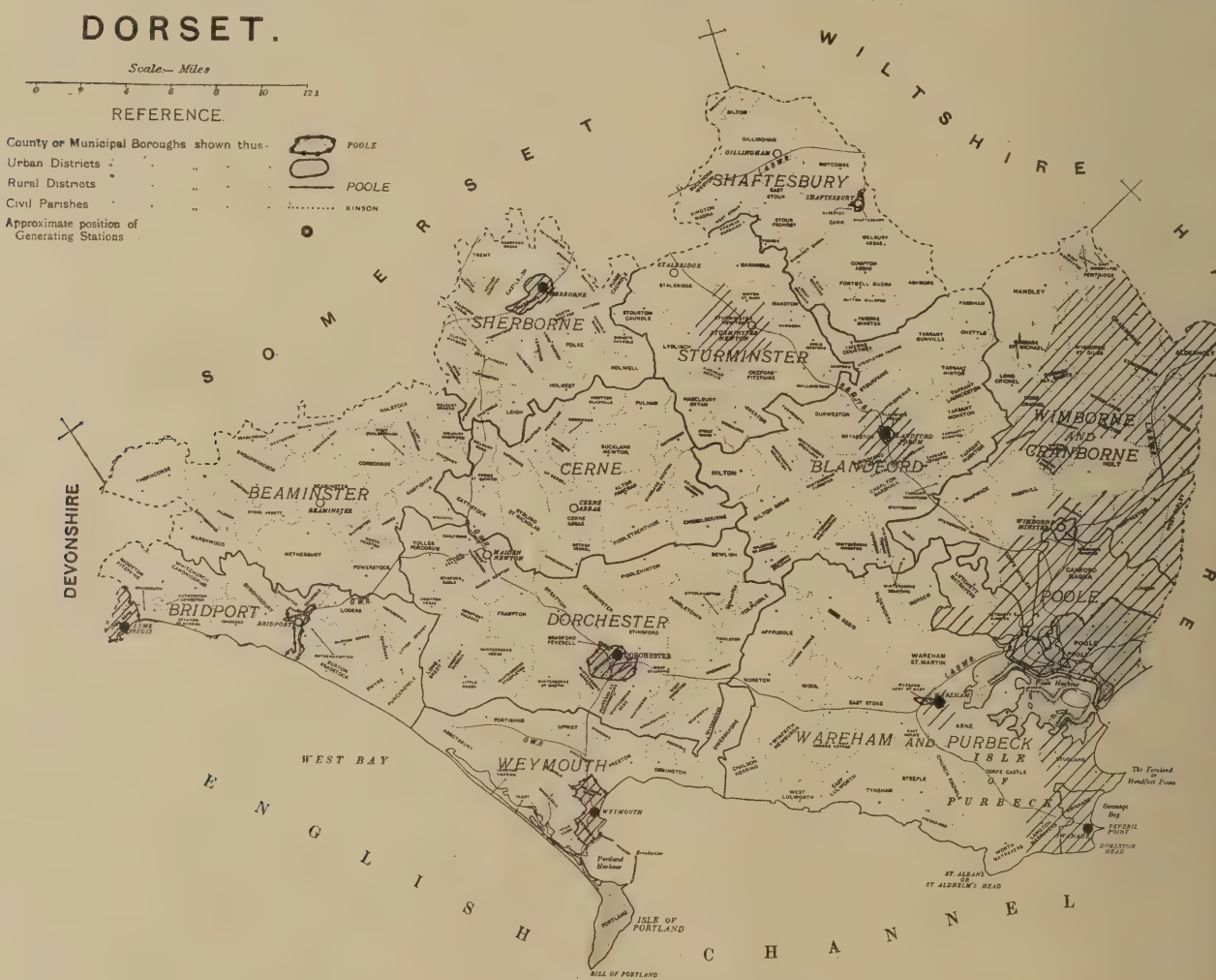
The Shepton Mallet Gas Company (Electric Lighting) Act, 1905, was revoked in July, 1924, in so far as it relates to the supply of electricity, but the area concerned remains hatched as it was immediately applied for by the North Somerset Electric Supply Company, Ltd., whose Special Order has now been confirmed.

The 1921 Census gives the following particulars for the Administrative Counties of Dorset and Somerset and the associated County Borough:—

Acres.	Persons.	Resident families.	Buildings not containing dwellings.
1,663,206	693,870	166,568	11,479

These maps were prepared for the 1917 Boundary Commission, and are used here by permission of the Controller of H.M. Stationery Office. They are obtainable from Messrs. Edward Stanford, Ltd., price 6d. The following alterations have taken place since 1917:—

(1) The name of the Parish of Road is now spelled Rode.
(2) The Urban District of Burnham has been re-named Burnham-on-Sea.



Electricity Supply in the County of Dorset.

Companies.

Blandford Forum & District Electy. Supply Co., Ltd.
Bournemouth and Poole Electricity Supply Co., Ltd.
Bridgwater Dist. Elec. Supply & Traction Co., Ltd.
Burnham and District Electric Supply Co., Ltd.
Edmundson's Electricity Corporation, Ltd.
Mid-Somerset Electric Supply Co., Ltd.
Minehead Electric Supply Co., Ltd.
North Somerset Electric Supply Co., Ltd.
Sherborne Electric Supply Co., Ltd.
Swanage Gas and Electricity Co.
Wareham Electric Supply Co., Ltd.
Weston-super-Mare & District Elec. Supply Co., Ltd.
Yeovil Electric Light and Power Co., Ltd.

(3) The Parish of Melcombe Regis has been merged into the Parish of Weymouth, which is now co-extensive with the Borough of Weymouth.

(4) Part of the Parish of Easton-in-Gordano has been added to the County Borough and Parish of Bristol.

(5) Part of the Parish of Colehill has been added to the Urban District and Parish of Wimborne Minster.

(6) The Parish of Alcester and part of the Parish of Cann have been added to the Borough and Parish of Shaftesbury.

(7) Parts of the Parishes of Bishop's Hull Without, St. James Without, St. Mary Magdalen Without, Trull, and West Monkton have been added to the Borough of Taunton. The added parts have been amalgamated with the Parishes of Bishop's Hull Within, St. James Within, St. Mary Magdalen Within, and Wilton to form the Parish of Taunton, co-extensive with the Borough.

(8) Part of the Parish of Symondsbury has been added to the Borough and Parish of Bridport.

* Parts I-VI of this series appeared in the ELECTRICAL REVIEW of October 9th, 16th, 23rd, and 30th, and November 13th and 20th, 1925.

Electrical Progress in India.

Lines of Future Development.

(By An INDIAN ELECTRICAL ENGINEER.)

IT is a characteristic of India, in common with other Eastern countries, that it offers ample scope for the modern to flourish side by side with all that stands for the ancient. On the roads the Rolls-Royce flits past the palanquin; in the home the electric lamp outshines, but has not ousted, the old-time oil lamp. Thus we find, in a country industrially one of the most backward, a remarkable development in certain branches of electrical engineering. When completed in the early part of this century, the Sivasamudram (Mysore) hydro-electric scheme ranked as the biggest venture of the kind in the British Empire. It was the more remarkable in view of the fact that the supply was transmitted over a distance of 92 miles to Kolar Gold Fields. At the present time the biggest hydro-electric project ever handled by a British firm is the one for the Bhira station of the Tata Power Co. The plant consists of five sets, each consisting of twin Pelton wheels of 15,000 h.p., driving an 11,000-V, 21,900-kVA alternator.



Electricity Supply in the County of Somerset (*See p. 924*).

IT is a characteristic of India, in common with other Eastern countries, that it offers ample scope for the modern to flourish side by side with all that stands for the ancient. On the roads the Rolls-Royce flits past the palanquin; in the home the electric lamp outshines, but has not ousted, the old-time oil lamp. Thus we find, in a country industrially one of the most backward, a remarkable development in certain branches of electrical engineering. When completed in the early part of this century, the Sivasamudram (Mysore) hydro-electric scheme ranked as the biggest venture of the kind in the British Empire. It was the more remarkable in view of the fact that the supply was transmitted over a distance of 92 miles to Kolar Gold Fields. At the present time the biggest hydro-electric project ever handled by a British firm is the one for the Bhira station of the Tata Power Co. The plant consists of five sets, each consisting of twin Pelton wheels of 15,000 h.p., driving an 11,000-V, 21,900-kVA alternator.

The Hydro-Electric Possibilities.

The hydro-electric resources of the country were systematically explored by Mr. J. W. Meares, M.I.E.E., and his Commission, the report of which is well known to electrical engineers in this country. As is pointed out in this report, it is regrettable that the sources of hydro-electric power are in many cases located far from centres of industry. Hence development of this power must be slow unless the Government of India adopts the bold policy of making energy available in anticipation of demand. While there are grave risks attached to such a course, it is well known that in India, as in other places, the availability of cheap electric power not only fosters old industries, but often gives rise to new ones. A case in point is that of the Sivasamudram scheme, which in its initial stages depended entirely upon the Kolar Gold Fields for its load, but now supplies the greater part of its output to other industries, some of them entirely new, in Bangalore and Mysore. The case of Bombay is somewhat similar, *mutatis mutandis*, to that of Bangalore, it being generally agreed that the cotton industry there has been revolutionised by the advent of hydro-electric power supply. The first Tata hydro-electric scheme was completed in 1912; it was followed by the Andhra Valley and other Tata power schemes, the aggregate power available amounting to about a quarter of a million kW. Combined with cheap labour, the new source of power supply has been an important factor in the competition that the mills of Bombay are offering to those of Lancashire.

A number of schemes are in course of development in various parts of India at the present time. In the Western Ghats, near Bombay, as well as further south in Malabar and Cochin, surveyors are busy. Mysore is turning her attention to the harnessing of the famous 1,000-ft. Gersoppa Falls with a view to utilising them for electro-metallurgical and other purposes. In North India, the Punjab is the centre of interest from the point of view of hydro-electric resources.

Electric Traction Developments.

The Great Indian Peninsula Railway, admittedly one of the most efficient lines in the country, gave the lead in the matter of electrification. The first stage, now nearing completion, is mainly intended for urban service. A much larger scheme, involving the electrifi-

cation of 300 miles of main line, is now under consideration. The B.B. and C.I. Railway, another of the lines converging into Bombay, has electrification plans in view, while many other railways, notably the B.N. Railway and the S.I. Railway, in Bengal and Madras respectively, have ambitious schemes of their own. As regards the tramways, in many of the greater towns only the question of finance stands in the way of carrying out urgently-needed extensions. The tramway has also a great scope in the moderate-sized towns, of which so many are still without any organised public conveyance service. In certain congested areas of Bombay and Calcutta there would appear to be some scope for the railless electric 'bus in view of its greater flexibility. Progress in the application of electric battery trucks is very encouraging, particularly at harbours and railway termini.

Power Supply in Small Towns.

A field in which great possibilities exist is that of electricity supply in the smaller towns both for lighting and power purposes. In view of the fact that the development of hydro-electric power all over India must take a considerable period, and that many of these towns are even now ready to become consumers of electric power, it is clear that the small generating plant has ample scope in India. There are, of course, some obstacles to be overcome, such as the conservatism of the people and the ignorance of local authorities with regard to electrical matters. But there is consolation in the fact that there is no well-established competitor like a heavily-capitalised gas industry to impede the progress of electrical development.

Small industries connected with agricultural products, such as oil and rice mills, and tea- and coffee-curing works, are a feature of the economic life of India. There has been no serious attempt made as yet to introduce electricity into these, which, be it noted, are scattered over the country often at great distances from the large cities. The advent of electricity in the small town will bring electricity supply nearer to these industries. The problem is very complex and beset with many difficulties, but, if successfully tackled, would yield much fruit. With regard to the demand for electricity for such domestic uses as cooking, heating, &c., there is not anything like the scope which exists in Western countries. The principal consumers would be the large hotels and the more up-to-date bakeries, and these would by themselves constitute a class worthy of consideration.

A Few Remarks on Selling.

By "SALES MANAGER."

MUCH has recently been written on the question of selling, and naturally it is a question of such magnitude that it would be impossible to treat the subject fully in a short article of this description. I propose, however to deal generally with the question on the lines of a salesman's worth, and methods generally adopted in connection with sales, not from the point of view of selling over the counter, but more especially in connection with plant.

Before proceeding on the lines mentioned above, I would draw the reader's attention to an article appearing in this journal on November 20th, headed "When Salesmen Sell the Business," from which the writer appeared to imply that a sales organisation from the sales manager down, simply thought of nothing else but turnover at any cost, having no regard to the balance-sheet, whereas I can assure "Cost Consultant" that the selling organisation, although realising that a turnover must be obtained, also realises that the turnover must show a profit; if it does not, then there will soon be a new selling staff, or at least a new sales manager.

From a broad aspect, and to suit the purpose of this article, I will divide a manufacturing business into two departments, referring to them as production and selling, as it would take far too much space to deal with all the various departments which are necessary in a concern to keep production and selling functioning in an efficient manner. In any case I think it will be agreed that there are two essentials in a manufacturing concern, *viz.*, to produce the article and to sell it.

At this point there are two further aspects to be taken into consideration: (1) Is there a market for which we have to find an article? or (2) Is there an article for which we have to find a market? Probably if we went back many, many years, we might say to the commencement of selling, then we should have to admit that it was in practically all cases a question of creating the market, but to-day we must consider both aspects, although it is difficult to draw an actual dividing line. As an example, I would quote that there is a market for electric lamps, irons, transformers, &c., and the articles are being produced—on the other hand, when a turbine was first produced, there was no market for it, for the simple reason that the reciprocating engine had been more or less perfected, whereas the turbine was far from perfection. Probably at some period all things could be treated on the same level, *viz.*, from the point of view of creating the market, but I have taken these two cases to show that the salesman who has to create his market must possess a far greater imagination and be a far better salesman than the man who has his market already made for him, for, in the first case, the man has to see the possibilities of the imperfected article, which I think everyone will agree is extremely difficult. Now, where the article is perfected and the salesman simply has to sell in ordinary competition, he need not possess the same qualifications. Where one has to sell practically identical articles at the same price, which is often the case to-day, then the personality of the salesman is the chief consideration.

Viewing the question from these two points, I think everyone will agree that where one has to create the market and sell, as against purely selling, then the former is by far the more difficult problem; consequently any man possessing the qualifications, or I think I might say gift of being able to create the market, and also to sell at a profit, is worth far, far more than the salesman who merely sells a standard article in competition.

I do not wish to imply that it is an easy matter to sell a standard article in competition, as I know from experience it is a difficult matter, but simply to point out that the man who can create the market and sell at a profit is not only of tremendous value to a concern, but is surely a super-salesman.

Passing to the question of methods generally adopted in connection with sales, we all realise, of course, that the percentage of importance of production and selling is "fifty-fifty." It is, therefore, essential for the efficient working of a concern that the general manager be absolutely unbiased, for if he is 70 per cent. production and 30 per cent. sales, or *vice versa*, then the concern must suffer. Some of us may wonder why a general manager's salary is so much more than that of the sales manager or the works manager, but if we consider the matter for a moment, the answer is obvious, for, to be a successful general manager, the qualifica-

tions of works and sales manager must be combined fifty-fifty. "Cost Consultant" recently referred in these columns to the question of final price-fixing being left, more or less, to the sales manager, irrespective of profit or loss. If final price-fixing is left to the sales manager, then the concern is asking for trouble, for it is obvious from previous statements that final price fixing is purely a matter for the general manager (or someone representing him), not for the man responsible for production or selling—otherwise the production man would simply say at the end of the year, if the balance-sheet showed a loss: "Sell at higher prices," whereas the selling man would say: "Produce at less cost," and where would the general manager be when called upon by the board to give an explanation? Would it not be a question of the resignation of the general manger, for the simple reason that he was obviously incapable of holding the position, if the foregoing situation arose?

Now we come to the correct method of deciding prices, and as we are reckoning that we have to create the market; we have little or no guidance as to selling price—the main responsibility again devolves on the general manager, and he must be satisfied that the article is being produced at the best possible figure; he has, of course, all costs tabulated as regards works, overhead, &c.; then he gathers from the sales manager the probable cost of this department, and arrives at the selling price. By this means, if normal profit is not being made, assuming the turnover is being maintained, it is up to the general manager to decide as to whether the production costs are too high, or the selling prices too low, and then take the necessary action to correct the conditions which exist.

Where the market already exists, prices are more or less established, the bulk of the orders going to the concern with the best selling organisation. It has been said that we are a nation of shopkeepers; perhaps we are, but then most things revolve round buying and selling.

Modern Electric Cookers.

A Review of the Recent Improvements in Electric Cooking Stoves.

(*Concluded from page* 846.)

An unusual method of housing the oven elements has been adopted by the General Electric Co., Ltd., in its recent production, the H5670 model, fig. 16. As in other designs of cookers by this firm, the elements are arranged for heating from the sides. They are made up in unit form in a rectangular frame, which is lowered vertically into a chamber between the shell and the lining at each side of the oven. The top of the frame or element unit is accessible after the hinged hob plate is lifted, and consists of a flat plate, which acts as a terminal board and secures



Fig. 16.—"Drop-in" Oven Elements.

the frame in the chamber. Fireclay bars, on which the nichrome element spirals are wound, are placed horizontally across the lower end of the frame, and rigid bar connections are employed from these to the terminals. The bars are easily removable from the frame, out of position, by releasing two bolts and wing nuts on each. The overall dimensions of this cooker are 25½ in. by 18½ in. by 15½ in. In another G.E.C. model, H5700, the element bars are attached to fixed rigid connecting rods. The oven, boiling and grilling-plate elements are separately fused and controlled. The clear oven cooking space is 14 in. high, 16 in. wide, and 16 in. deep. The full oven consumption is 2,400 W and the total loading for the stove is 8,000 W.

While it seems to be the general practice to install top and bottom oven elements with unequal loadings, it is interesting to learn that in the latest "Cosmos" cooker the makers have provided similar elements with equal capacities, having concluded from experiments and trials that it is unnecessary to have different heat values at the two parts. If this claim can be substantiated, a considerable advantage is gained by the fact that the two elements are interchangeable, a desired feature from the point of view of production and maintenance. Fig. 17 illustrates the bottom elements of the

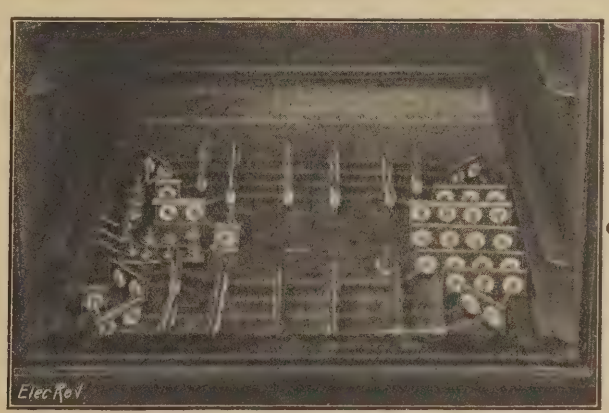


Fig. 17.—Bottom Oven Elements.

"Cosmos" cooker. The oven linings are easily removable to facilitate the effecting of repairs and replacements. This cooking apparatus is provided with an ample-sized hot cupboard placed between the oven top and the hob.

A recent addition to the field of electric cookers is the "Revo Family" model, fig. 18, manufactured by the Cable Accessories Co., Ltd., which is designed to suit a family of up to eight people. The oven is constructed in sections welded together, and has a capacity of 1.7 cu. ft. A novel feature in this cooker is the provision of a warming chamber, 17 in. wide by 15 in. deep and 6 in. high, situated as in the previously-mentioned

cooker between the oven top and the hob plate. This should result in the inevitable waste heat from both the oven elements and the hob plate units being utilised. The top plate is hinged, and when raised exposes the wiring to the boiling and grilling plates. Solid strip

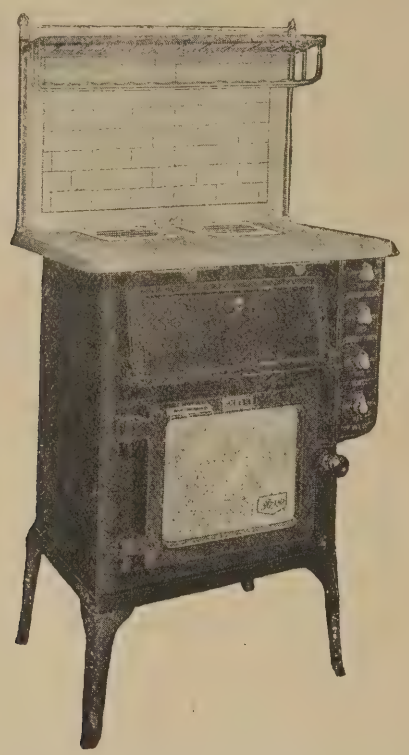


Fig. 18.—Cooker with Hot Cupboard Under Hob.

copper of heavy section is employed, supported, where necessary, by glazed porcelain insulators. The "Revotherm" boiling plate of this range is of the "semi-open" type; a heavy-gauge resistor is supported by steatite insulators, as near to the base of the



Fig. 19.—Construction of a Modern Cooker.

utensil as possible, and is permitted to radiate directly on to the latter in two directions. Immediately above each spiral is arranged a bar of the cast grid, which is of heavy section. This bar, it is claimed, effectively protects its adjacent spiral from damage by viscid liquids. Apart from the radiant heat utilised, a high percentage of heat is claimed to be conducted by causing the insulators carrying the spirals to make intimate contact with the grid casting. Each plate is carried by means of an easily-adjusted suspension system, and the removal of a plate is immediately effected by the loosening of three milled nuts. No contact is made with the top plate casting, and concentrated heating, it is claimed, is assured. The grill is constructed for three-heat regulation, low heat being available for quickly warming the hot cupboard.

The British Electric Transformer Co., Ltd. (Tricity), has recently introduced a range of three electric cookers specially designed to meet the requirements of hiring and housing schemes. The smallest of these, fig. 19, is claimed to be of particularly limited overall dimensions for a total loading of 5,000 W. Although in other models the makers have introduced either or both of the semi-enclosed and closed types of boiling plates, in this design only semi-enclosed plates are employed. Two plates are provided, one arranged with a 3-heat control and the other a single heat control. The 3-heat plate is arranged so that the medium heat is obtained in the centre of the plate. The element spirals are wound and housed on a grid-shaped fireclay base held in a light metal frame, two plates forming a



Fig. 20.—Hob with Closed and Semi-Enclosed Plates.

complete unit. The latter is held in position by means of four sockets in the base of the frame, which accommodate plugs projecting from a supporting platform underneath. The hob is hinged and provided with protecting plates arranged in grid form with the bars covering the elements. The spirals are placed so that radiant heat will reach the cooking receptacle obliquely from them. The bottom surfaces of the bars are concaved to present a maximum of area to the elements. The fireclay base is slotted to enable spilt liquids to pass through. An unusual accommodation for the grilling plate places it underneath the boiling units. It is of similar construction to the latter, except that the fireclay is not slotted, being, of course, inverted in this case. Two hooks at the back and a front screw hold it in position. The makers advocate top and bottom oven elements, and these are arranged so that they are distributed over the whole surface of the top or bottom, as the case may be, it being considered advisable to have a large element at a low temperature. These elements are built up in unit form of probably unique construction. The spirals are threaded through mica strips, suitable holes being provided with nickel eyelets. The micas are held width vertically in a sheet-metal frame which covers the surface. The oven linings are of plenished steel and the sides and top and bottom sections are all easily removable. The bottom plate is turned over at the edges, which fit suitably shaped runners, thus affording protection to the elements against spilt liquids, &c. The shelf runners consist of round metal

rod elbowed and riveted at each end. The main terminals for the cooker are at the back immediately under the hob plate, and rigid copper strip busbars are carried between the boiling and grilling plates to sub-main terminals at the front, from which nickel connecting rods are taken to the various element units. The element terminals are of pure nickel, and the sub-main terminals are nickel-plated. An interesting point about this small cooker is that the hob plate presents a dull black surface which, it is claimed, is partially

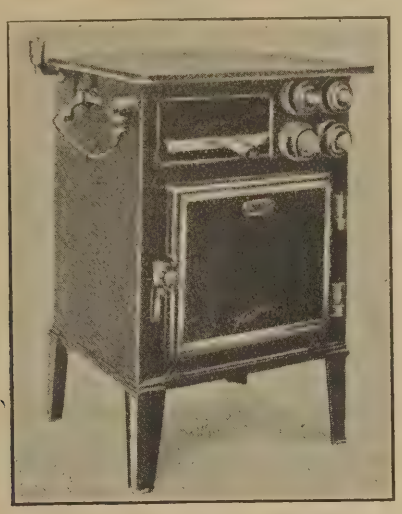


Fig. 21.—Combined Cooker and Water Heater.

rust-proof. The enclosed boiling plate adopted by this firm is constructed of mica strip-elements suitably insulated and clamped in iron frames, the whole being housed in a round metal inverted case. The plug and socket method of securing this plate is employed as in the case of the smaller model. In every cooker provision is made for a thermometer if required, the oven door being drilled and bushed. Fig. 22 illustrates the housing of one of each of the closed and semi-enclosed types of boiling plates in the intermediate cooker.

A novel departure from the standard methods of cooking by electricity in relation to the position of the elements has been adopted by Messrs. Geipel and Co. in the "Quead" cooker, which was described in our columns on August 21st, page 319. In this apparatus, it will be recalled, the source of heat is nearer the centre of the oven, and consists of two vertically-disposed elements adjustable horizontally so that they can be brought near to the meat for grilling or moved apart for roasting.

Much attention has of late been given to the question of water heating for domestic purposes, and in some directions this has been attempted in co-operation with the apparatus for ordinary electrical cooking. Such a combined cooking and water-heating apparatus is made by Messrs. Turner & Co., Ltd. A cylindrical boiler stands vertically next to the oven, and the water is heated by means of elements arranged in a central copper cylinder so that water circulation is set up. Another design of cooker incorporating water-heating equipment is made by Messrs. Archibald Low & Sons, Ltd. In this case, fig. 21, a copper tank is placed under the boiling plates and is so constructed that whenever the boiling plates are in use the water in the tank is being heated. An immersion heater is installed for quick heating. It is claimed that the effect of utilising heat from the hob plate units is to increase the overall efficiency of the cooker by 25 per cent.

The Shipping and Engineering Exhibition.

A Review of the Principal Exhibits of Electrical Interest.

(*Continued from page* 892.)

A "Shipping" Exhibition, opened by Mr. W. C. Bridgeman, First Lord of the Admiralty, would naturally be expected to have a marine atmosphere, and a pleasing feature was the demonstration of the extensive use that is now being made of electricity, not only for the purpose of driving auxiliary machinery aboard ship, but also in the building of ships themselves.

For instance, amongst the heavier machine tools shown many were arranged to be electrically driven, and it was satisfactory to note that in most cases the motor had been allowed for in the design of the standard machine, and not merely added as an extra. Such machines were to be seen on the stands of Messrs. C. A. Hunton & Son; Sumner, Vaughan & Co., Ltd.; Henry Pels; and the United Machine Tool Co., Ltd., particularly. An interesting machine made by the last-named company is an electro-mechanical toggle lever riveter having a direct motor drive, and operated in conjunction with an electric rivet heater. The smaller type of portable hand tool, such as drills, screw-drivers, grinders, riveting and chipping hammers, &c., was exhibited by F. Gilman (B.S.T.), Ltd., the Vidal Engineering Co., Black & Decker Mfg. Co., Ibbetson and Co., and the Kango Co., Ltd. S. Wolf & Co., Ltd., had electro-pneumatic patterns on view in addition, while S. H. Morden & Co., Ltd., make various attachments (for example, a miller for trimming wood) which are driven by a flexible shaft so that the tool can be used some distance away from the driving motor.

A noticeable point was the number of firms displaying electric welding plant, amongst them being the Quasi-Arc Co., Ltd.; G. D. Peters & Co., Ltd. (Wilson plastic arc and resistance systems); Allen-Liversidge, Ltd. (arc and resistance); the Consolidated Pneumatic Tool Co., Ltd. (spot, seam, tape and butt), and Alloy Welding

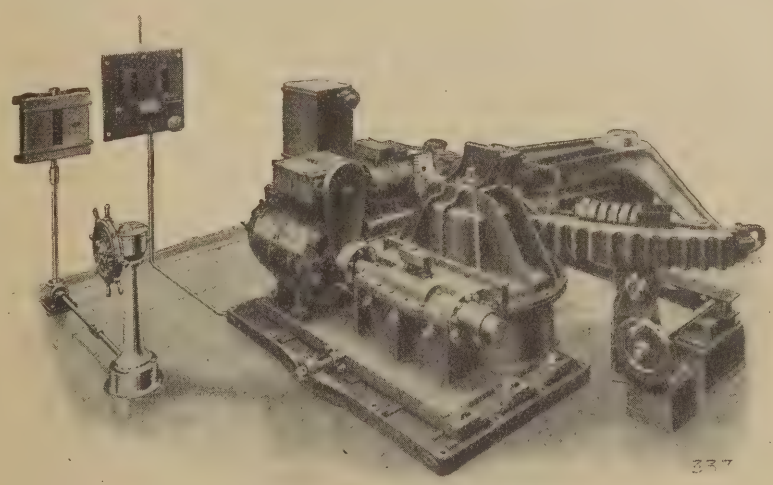


Fig. 7.—Donkin-Scott All-electric Ship's Steering Gear.

Processes, Ltd. (d.c.), which also owns the patents of the Daysohms a.c. welder.

Ships' Auxiliary Plant.

A good deal of the auxiliary plant in the engine room and of the deck machinery also is driven electrically

nowadays, especially aboard oil-engined vessels; amongst the fine display of Laurence, Scott & Co., Ltd., in addition to electric winches, gear for ships' windlass, motors and control gear, the direct-acting steering gear illustrated in fig. 7 claims an advantage in that no make or break of current takes place, operation being by the promotion and stoppage of the flow of current in permanently-closed circuits, which eliminates sparking and burnt contacts and therefore reduces renewals.

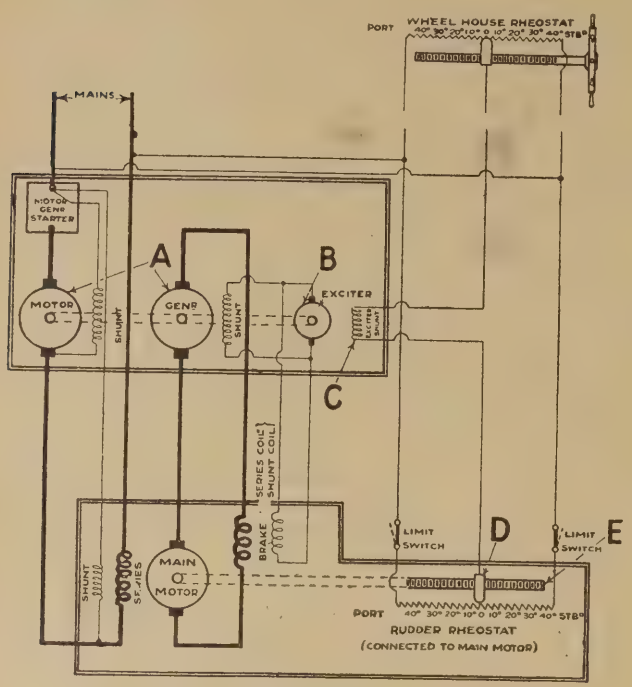


Fig. 8.—Steering Gear Diagram.

Referring to fig. 8, a motor-generator (A) takes current from the line, and runs all the time at sea. The generator supplies current at a varying voltage to the main motor connected directly to the steering gear, and to provide the varying excitation of the generator a small exciter (B) is connected on the shaft of the motor-generator, the motor end of which is started from the ship's mains by means of an automatic starter which will only open the circuit during a total failure of voltage, and automatically re-starts the motor when the voltage is restored. A drop in voltage, even to 25 per cent. of the full-load voltage, does not affect this gear, except to slow it down. The control of the steering gear is effected on the Wheatstone bridge principle, one resistance (forming two legs of the bridge) being in the wheel house, and another resistance (forming the other two legs) in the steering-engine compartment. The exciter field winding (C) takes the place of the galvanometer, and the resistance in the two rheostats is varied by a slider carried on a nut (D), which is fed backwards and forwards by a lead-screw (E). The screw of the rheostat in the wheel house is connected, generally with equal gears, to the wheel, so that any movement of the wheel displaces the slider, and thus upsets the electrical balance so that current flows through the exciter field winding. The other rheostat is mounted on the main steering gear motor, by which it is driven by reduction gearing. The result of current flowing in the exciter field (as referred to above) is that the exciter supplies current to the generator shunt; this machine then supplies the main motor armature, the voltage depending on the degree of displacement of the wheel rheostat and the consequent strength of the generator shunt.

The movement of the main motor armature moves also the rudder rheostat in such a sense as to bring its slider into coincidence with the new position of the wheel rheostat slider; by the time these two coincide, the exciter field winding has lost its current, the generator its excitation, and the main motor has lost its armature current, so that the whole system comes to rest. The voltage of the generator (and therefore the speed of the main motor) depends on the difference in position between the two sliders, so that for large degrees of helm the movement starts quickly, but tends to ease down gently as coincidence is nearly reached. Though the main motor thus slows down towards the end of its travel, it does not consequently lose its torque, as the generator can supply a big current at low voltage for completing the movement. When the wheel-house rheostat is hard over, the rudder rheostat still has a little way it can go, supposing that the rudder is being driven further over by the sea. The effect of a step or so over-run in this manner is to reverse the current in the exciter field winding, and therefore to bring the main motor back again to the same angle indicated by the wheel. As an additional precaution, limit switches are provided. The mechanical portion of this gear is made by Messrs. Donkin & Co., Ltd.

A crane motor fitted with the Scott "floating-brake" system of control for series-wound machines is shown in fig. 9, being a combined electro-magnetic and mechanical system. The brake is controlled by a small shunt winding, only used for full lifting and lowering, and a heavy series winding which (when energised) attracts the steel armature against the pressure of suitable springs, thus releasing the brake. The "floating" or low-speed steps of the controller, with the starting resistance in circuit, divert current from the series winding of the brake to such a degree that the pressure of the springs begins to overcome the opposing magnetic force and puts the brake partially on. In this condition the brake is "floating," the speed of the motor depending on the amount of current diverted from the series winding of the brake. The floating action on any braking step of the controller is nearly independent of the amount of load lowered, and is self-corrective, so much so that the braking surfaces can be treated with plumbago so as to diminish the co-efficient of friction without appreciably increasing the speed-control effect of the brake. The action is automatic and steady, for if the friction of the brake increases, the current taken by the motor and brake coil also increases, slightly easing the brake. If the friction decreases, the current in the brake coil decreases, and the braking action automatically increases.

Electric deck gear was also to be seen on the stands of the Sunderland Forge & Engineering Co., Ltd., and A. Harper, Sons & Bean, Ltd., and several firms showed air compressors and blowers suitable for ships' use. Oil filters and purifiers were well represented, five different

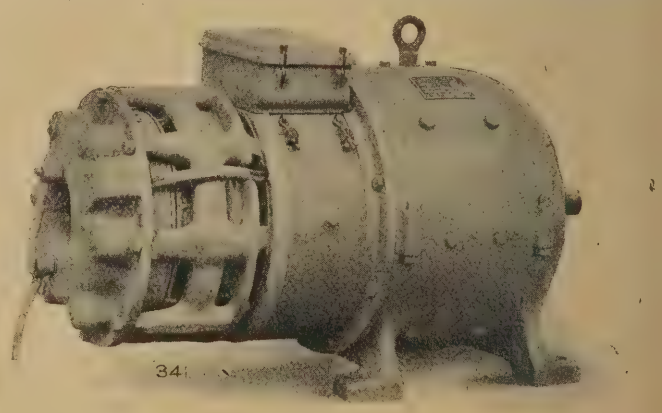


Fig. 9.—Crane Motor with Floating Brake Control.

makes of electrically-driven, centrifugal machines being noticed; electricity generating sets, driven mostly by internal-combustion engines, but including a few steam sets, and suitable for ships' auxiliary service or country house lighting purposes, were to be seen on at least 16 stands; one of the oil engines shown by the Parsons Motor Co., Ltd., was of 105 h.p. at 750 r.p.m. with six cylinders, coupled direct to a Brush 44-kW alternator with an exciter on the shaft extension. C. A. Parsons and Co., Ltd., in addition to transformers and an oil-tight terminal tapping, turbine blading (one sample being 42 in. long), samples of generator windings, &c., exhibited a geared turbo-dynamo of 100 kW running at 3,000 r.p.m.; the impulse turbine speed is 10,000 r.p.m., so that the speed ratio of the gear is 3⅓, and the steam conditions are 200 lb. pressure, 162 deg. F. temperature, and 27½ in. vacuum, the steam consumption being 19.8

lb. per kWh, which is reasonable for so small a plant. The weight of the set is 3.4 tons, including the bed-plate, which incorporates an oil reservoir and cooler.

Aids to Navigation.

Most interesting is the steady development of aids to navigation, which invariably have electrical features, the tendency being to make such devices more or less automatic. Besides loud-speakers, headphones, and a

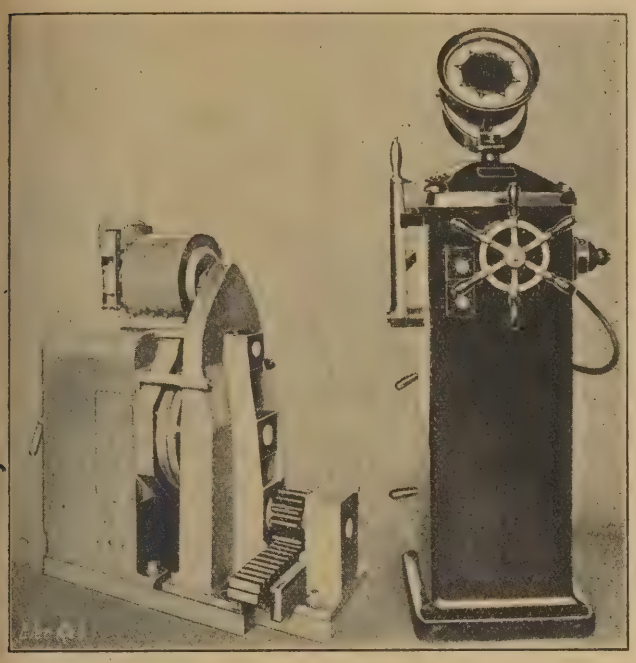


Fig. 10.—Two-unit Sperry Gyro Pilot.

loud-speaking telephone for ships, S. G. Brown, Ltd., showed a British gyro compass employing what is known as "liquid control" and with which is associated a different type of repeater for each particular purpose in navigation.

The Sperry Gyroscope Co., Ltd., demonstrated automatic steering equipment, including a gyro pilot (bridge and wheel house units), helm angle transmitter, and indicator. The master compass is mounted on a turn-table and, when moved, represents a change of heading of the ship which is electrically transmitted to all the compass auxiliaries, and also to the contact mechanism inside the bridge unit of the gyro pilot. This unit controls the starting and stopping of the power unit and will move the improvised rudder instantly, which in turn operates the helm angle transmitter, causing the helm indicator to show the rudder movement. Single-unit gyro pilots have been installed in nearly 100 merchant vessels, and on this occasion the new two-unit gyro pilot, fig. 10, made its *début;* it differs from the single-unit type in so far as the contact and power units are separated, the former being on the bridge, while the latter is connected direct to the throttle of the steering

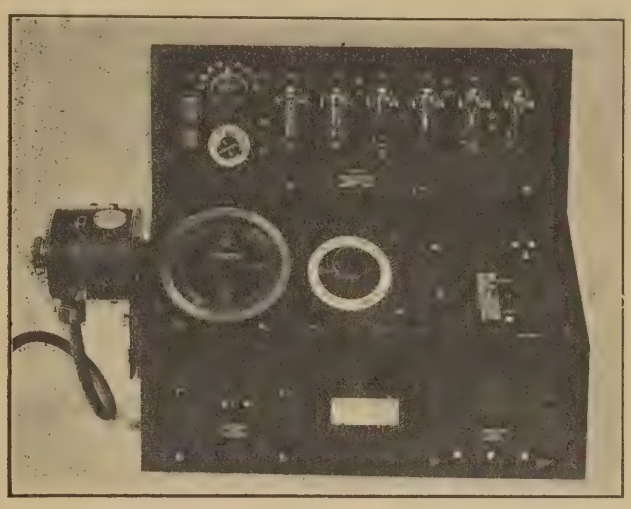


Fig. 11.—Direction Finder and Repeater.

engine. It is thus independent of the telemotor gear and the lost motion which invariably exists in that system; it also makes available duplicate and separate steering control on the bridge. The company's gyro compass equipment includes steering and bearing repeaters, a course recorder, and a repeater combined, with a Marconi radio direction finder as shown in fig. 11. A large percentage of the errors made in fixing the position of a ship by wireless d.f. are due to errors in the compass and reading it; the repeater enables the wireless operator to read the true bearing of any station at sight and is particularly advantageous at long range, in which case the error is proportional to the distance.

(To be concluded.)

The Problem of British Industry.

In the course of a paper which he read on December 2nd, at a meeting of the Liverpool Engineering Society, Sir William P. Rylands, J.P., said that there were three main factors underlying the great problem of British industry; the sociologic aspect, the economic effect of fluctuating currency, and the economic effect upon Great Britain of the war. No solution could be satisfactory which did not take these three factors into account.

Taking the first—the sociologic aspect, Sir William said that it was true that profit was the mainspring of national economic success and prosperity, but it was important to realise that the object was the prosperity of the people as a whole and not the advantage of a few. The war and the post-war period introduced a condition under which the standard of living was definitely raised, and the people of this country were reluctant to allow this to be reduced. It was thought by the workers that the ability of industry to pay these wages at that period indicated that wages could be kept up permanently, although the reply, of course, was that to maintain them we were living on our capital. The pound had been restored to its gold basis, but we had incurred a burden of eight thousand millions of national debt, a great increase in industrial capital, and a serious rise in local rates. If the producers produced only as much as they did before the war, it was inevitable that they must consume less if these burdens were to be sustained. The maintenance of a higher standard of living could only be achieved by substantially increased production—so substantial that the speaker felt that without a change in our economic policy it would be unattainable for many years to come. He was satisfied that in this country the Communist movement had not yet taken deep root, and it was important that we should not confuse the comparatively small Communist element with the vast number of men who cast their votes for Labour candidates from more rational motives. The theoretical Socialists pointed to the vast unsatisfied demand which existed in this country. There was, no doubt, an unlimited demand, while workless men stood idle, and there was evidence of unlimited capital available where there was a reasonable prospect of its profitable employment. The Socialists not unnaturally claimed this as evidence of the failure of the existing capitalistic system, a failure which could not be denied. Their only reply was that their system was as perfect as an imperfect world would allow; that it alone was suited to the peculiar conditions of Great Britain, and should not be changed; and for the rest that Socialism would even more lamentably fail.

Turning to the economic effect of a fluctuating currency, the speaker said that as the value of a currency fell there was a corresponding rise in the cost of all commodities imported into the country, and the world's values, in terms of the currency, were immediately adjusted. The cost of living in this country, however, was affected only to a limited degree by a change in the world's values. Wages and profits were ultimately governed by the internal value of currency, and until the cost of living rose there was no impelling necessity to increase wages. The exact converse was to be expected where the currency of the country appreciated in value, as it had in Great Britain. The return to the gold standard had raised the world's value of the pound by ten per cent., making the real cost of manufacture at least ten per cent. higher than it was 18 months ago. It would readily be appreciated how immensely this had increased the difficulties of our unsheltered industries. On the other hand, sheltered and quasi-sheltered industries, which escaped competition from the Continent, had been able to maintain their prices, wages, and standard of profit, thus greatly affecting the cost of living in this country. For this unsatisfactory condition there were three possible remedies.

viz., an increase in the gold value of Continental currencies; a decrease in the gold value of British currency; or a drastic reduction in wages and profits in the sheltered industries. The speaker considered that the first two remedies were impracticable, and it appeared unlikely also that the sheltered industries would willingly forego the advantages which they enjoyed; it would therefore seem that we must either adopt the policy of *laissez faire*, and hope that time would provide a solution of our difficulties, or examine the effect of any possible change in our economic policy with the object of sheltering unsheltered industries.

The principal economic effect upon Great Britain of the war was the aggregation of the huge national debt in addition to the large debenture and other debts incurred by industry during the same period. This had led to very heavy taxation, which necessarily came largely out of the pockets of the working man. If, therefore, as a result of our war debt, a large share of production was taken to pay interest, the workers engaged in industry must either produce more, or their standard of living must be definitely lowered. It was immaterial whether this increased production was for export or for home consumption, and when we reflected that the export trade of this country in volume was substantially less than before the war, it was clear that the home production must be vastly larger. The speaker believed that the key of the puzzle lay in the velocity of circulation of the purchasing power of the community. In this respect wages were far in advance of profits. If, therefore, wages were high, the "kinetic" energy of the aggregate purchasing power was incalculably increased. If wages were low, they were wholly absorbed in providing food and the bare necessities of life, to a great extent imported from abroad. He thought it a matter for congratulation that so many of our people were manifestly enjoying a relatively high standard of living, and he would regard a reduction with regret. Could we seriously hope to develop an increased export trade sufficient to meet our economic necessities? Throughout the world there was a definite tendency towards the development of national industry, and it was not easy to feel confident that we would be able in the future to do much more than maintain our present position, and there were grounds for apprehension lest, with the increasing industrialism of the world, our export trade would be conducted with ever-increasing difficulty. In a country which was completely self-contained there would be no limit to the standard of living which the people could enjoy, except in their capacity to produce. The United States had to some extent achieved this ideal, and consequently the standard of living there was higher than in any other part of the world. It might be definitely affirmed that the volume of a nation's foreign trade was not a matter for congratulation, but rather a measure of the disadvantage which it endured. These reflections suggested that we should seriously consider whether we had been right in the past in regarding our foreign trade as the first interest of the country, or whether it might not now be desirable that that general policy should be reviewed, and we should regard the development of the home trade as the first consideration. There was no doubt that that policy had been pursued by other countries with success. The solution of the problem of British industry must not be sought by regarding the interest of profit and finance as the first consideration. The prosperity of the working community demanded the utmost amount of employment, the highest possible wages, and the greatest velocity of circulation of purchasing power, by which means alone would the community be most amply provided with the amenities of life.

Russian Electrical Notes.

Swedish Telephones in Russia.—A Moscow dispatch published in Sweden announces that the Soviet Government has permitted the Low-Pressure Trust to enter into an agreement with the Svenska Telefon Aktiebolag L.M. Ericsson, under which the former takes over the exclusive right to manufacture and sell automatic telephone equipment on the Ericsson system in the Soviet Union, Afghanistan and Mongolia, together with the right of working all the Ericsson patents in Esthonia, Lithuania, and Latvia. Moreover, the Swedish company will supply all the equipment for automatic exchanges in Russia and will grant a long term credit. An inquiry made by the representative of a Stockholm newspaper elicited the statement from Mr. E. O. Sandberg, director of the company, that no confirmation of the telegram had then been received, although the company had carried on negotiations during the summer with the Low-Pressure Trust in Moscow. This information, which was published in Sweden on November 3rd, is now confirmed by the Moscow newspapers.

Suburban Railway Electrification. — The board of the State Planning Commission has approved a scheme submitted by a committee for the introduction of electric traction on the Northern and Moscow-Kazan railways between 1927 and 1929. The expenditure is estimated at 28,900,000 roubles, of which it is proposed to provide 4,000,000 roubles in the current fiscal year. Each train is to be composed of a motor car and two trailers, each capable of accommodating 160 persons. Each motor car is to be equipped with four 200-h.p. motors, and the speed is to be 28 miles per hour as compared with about 20 miles at present with steam locomotives. It is proposed to obtain the electrical equipment in the first place from abroad, and offers are said to have already been received; subsequent plant will be made at Russian works.

The Financing of Electrification Works. — One of the directors of the Electrical Bank states that a total of 51.3 millions of roubles was provided out of the Budget for electrification works in the year ended with September, 1925, this amount comparing with an average of 28 millions in the past three years. Besides this sum the bank issued credits for a total of 27.6 millions down to September 1st. These figures will be surpassed in the new financial year as the Supreme Council of National Economy has made application to the State Planning Commission for the insertion in the budget of a total of 150 millions for electrical works, while the bank itself expects to grant loans to the extent of from three to four times the amount of its capital.

Production in the Past Year.—According to the provisional figures prepared by the General Electric Commission, the production of the electrical manufacturing industry during the year ended September 30th, 1925, represented a value of 62,700,000 roubles or an increase of 83 per cent. over the year 1923-24. In the case of the machine construction works the output reached 12,400,000 roubles or 111 per cent. more than in 1923-24, while the output of the low-pressure works rose from 3.5 million roubles in 1923-24 to 8.4 million roubles in 1924-25. The value of the production of the cable works increased by 50 per cent. and that of lamps by 105 per cent. The number of workers employed rose by 26 per cent., although the adoption of improved mechanical methods in the lamp factories permitted of a reduction in the number of persons employed there. The output of the porcelain works was increased by 136 per cent., although the number employed rose by only 3 per cent. As to the value of the turnover in 1924-25, it is stated that the sales amounted to 82,100,000 roubles, as compared with 42,900,000 roubles in the previous year. The value of the sales grew quarter by quarter and, despite the expansion in the production, the demand exceeded the supply. During the year the prices of a number of products were reduced, particularly in the case of lamps, but the prices of machines were not lowered and are not expected to be reduced. The financial situation of the trusts remained strained throughout the year owing to the extension of the production without sufficient working capital.

Petrograd Lighting Situation.—As a result of delays in the delivery from abroad of the new sets of turbines for the Krasnya October station, the existing stations supplying Petrograd are fully loaded, and it has been necessary to set in operation again isolated generating plants of a combined capacity of 20,000 kW in order to cope with the demand.

Development in the Ukraine.—It is reported from Kharkoff that the commission on the electrification of the Ukraine has decided that it is necessary to construct stations in the districts of Krivoi Rog and Zaporozjen of capacities of 15,000 and 20,000 kW respectively. In the future these two stations would serve as steam reserves for the projected Dnieper hydro-electric works.

Low-pressure Apparatus. — The Low-Pressure Trust is experiencing a constantly growing demand for telephone, telegraph, and radio apparatus, &c. The orders received in September are stated to have reached record figures at a value of 6,300,000 roubles, or more than the total turnover in 1923-24. It is intended to extend the productive capacity of the various works so as to be able to meet the requirements.

Reductions in Lamp Prices.—The board of the Supreme Council of National Economy has made reductions in the wholesale and retail prices of the various kinds of incandescent lamps. At the same time the board has drawn the attention of the General Electrical Commission to the unsatisfactory quality and high cost of lamp glass, circumstances which considerably hamper a reduction in the costs of production, and it is added that the lowering of prices must not result in impairing the quality of the lamps.

The Accumulator Trust.—The value of the output of the Accumulator Trust in the year 1924-25 is reported to have been 1,724,000 pre-war roubles. The production during the current year is expected to reach a value of 2,960,000 roubles.

An Extension Fund.—As a result of the growing demand for electrical energy the General Electrical Commission has decided to create a special fund for extensions of works and the provision of new equipment. An inquiry is now being made as to the sources which are intended to be drawn upon in order to feed this fund, into which it is also proposed to pay the amounts set aside by different undertakings for the purpose of redemption.

October Production.—The value of the production of the various electrical trusts in October, which was the first month of the new financial year, is returned at 7,310,000 pre-war roubles, of which 6,096,000 roubles is credited to the State Electrical Trust, 975,000 roubles to the Low Pressure Trust and the balance to the Accumulator Trust. The output represented 84.5 per cent. of the production fixed under the programme.

The Volkhoff Hydro-Electric Works. — The progress in connection with the large hydro-electric works known as the Volkhoff station has been so considerable that it is expected that two turbo-generator sets will be set in operation next May and a full supply inaugurated in October, 1926. The main transformer stations in Leningrad, which are to be supplied by this station, have been practically completed, while the smaller sub-stations will soon be finished, together with the Leningrad cable network.

Reviews.

High-Pressure Electricity Transmission and Distribution.*

In view of the rapid development that is taking place in electricity transmission and distribution in all parts of the world it is nowadays not an easy matter for electrical engineers, young or old, to keep themselves fully posted with the progress that is being made. It is for this reason that the international conferences that are now being held almost annually are of value in that they form a common platform for the interchange of experiences and ideas of leading electrical engineers from all parts of the globe. Moreover, to those unable to attend the conferences, the very complete records of the proceedings that are subsequently published afford a means of digesting, as opportunity offers, the various solutions of the many difficult problems that beset all engaged in the work of electricity transmission and distribution, while at all times they form valuable additions to the electrical engineer's reference library.

A case in point is the volume which has lately reached us containing a complete record of the proceedings of the second International Conference on Large Electricity Distribution Undertakings at High Pressure which was held in Paris towards the end of 1923. In contradistinction to the World Power Conference held at Wembley last year, which dealt with all aspects of the subject of power, the Paris Conference was devoted to the single subject outlined above, which, however, embraces so many sub-subjects—if one may use such a term—that if it did not exceed the importance of the Wembley gathering, it is to the electrical engineer at least equal thereto. Some idea of the ground covered by the various reports and papers presented, all of which, together with the subsequent discussion thereon, are printed *in extenso* in the *Transactions*, may be obtained from the following summary of the particular questions allotted to the 1923 Conference :—

The Construction of High-Pressure Transmission Lines.
Insulators for Extremely High-Pressure Work.
The Construction and Working of Open-Air Transformer Stations.
The Selection of Transmission Pressures.
The Value Ratio between Kilometric Industrial Insulation High-Pressure Lines and the Service Pressure.
High-Pressure Cables.
Making Known the Dangers as well as the uses of Electricity.

Having published an account of the proceedings of the Conference at the time, and for reasons of space pressure, it is impossible for us now to refer to each of the fifty odd reports and papers presented, and hence a summary, and a brief reference to some of the more important contributions, must suffice. In the first section—that devoted to Current Generation and Conversion, there were only two papers, both, curiously enough, by American authors, one dealing with Outdoor Transformer Station Practice in the United States and the other with Recent Improvements in Oil Interrupters. On the subject of Transmission Masts and Conductors, there were altogether eleven contributions, four being from French authors, three from Italian and Swedish, and one British, this being by Messrs. E. B. Wedmore and W. B. Woodhouse, on "Recent British Investigations into Overhead Line Construction and the Material Employed." Insulators—Their Composition, Microstructure and Properties, brought together nine papers, in which American, French, Italian and British-Spanish practice was outlined, the subject giving rise to a lengthy and valuable discussion. Equally varied in experience and practice were the eight papers on Underground Cables which emanated from Dutch, French and Italian engineers, and from the British delegates, Messrs. P. V. Hunter and E. B. Wedmore, who dealt exhaustively with the question of the Heating of Conductors Embedded in the Ground.

Only one paper was submitted on the question of Educating the Public as to the uses of Electricity, this being by a Dutch author, who dealt at considerable length with the methods adopted in Holland in teaching children both the uses of electricity and the dangers associated therewith, the paper being notable for some very curious illustrations. Section II of Part 3 of the proceedings will doubtless be regarded by some readers as one of the most important as it includes particulars of the rules and regulations in force, or projected, in France, Switzerland, Holland, Belgium, Poland, Russia and Great Britain, in regard to the establishment of electricity transmission lines at very high pressures with the object of securing the public safety, many useful suggestions being made in the subsequent discussion. Three authors—American, French and Italian—gave their ideas with regard to transmission pressure standards, while the wide range of international experiences recorded in Part IV, which deals with The Operation and Protection of High Pressure Transmission Lines and with Pressure Measurements, is evidenced by the fact that the authors represented seven countries. The final paper was one by M. E. O. Meyer, of the Strasburg electricity station on "The Means of Communication in Electrical Undertakings," in the course of which he alluded to the prominent part wireless telephony is likely to play in the not-far-distant future.

*The verbatim report of the second High-Pressure Conference, held at Paris, November, 1923. Edited by J. Tribot Laspière, General Secretary of the Conference. Pp. 1159; fully illustrated. Paris: l'Union des Syndicats de l'Electricité. **Price, 120 fr.**

The Conference was attended by electrical engineers from no fewer than twenty countries, Great Britain being represented by delegates from the Institution of Electrical Engineers, the British Electro-Technical Committee, and the Electricity Commissioners, as well as by eight independent members, and a useful feature of the volume is an alphabetical list not only of the names of the authors of the papers, but also of all who took part in the discussions. Furthermore, their addresses are also given, thus affording any electrical engineer who may desire additional information on any particular point an opportunity of communicating direct. The *Transactions* are printed throughout in French, and in view of the fact that various languages were used during the meetings, the work of compiling the report is a tribute not only to the editing capabilities of M. Jean Tribot Laspière, the general secretary of the Conference and of the Union des Syndicats de l'Electricité, and his staff, but also to the translators. Altogether there are nearly 1,200 pages in the volume, which also includes approximately 400 line and photographic illustrations, rendering it, as we have already said, a valuable work of reference to all interested in electricity transmission and distribution at high pressures.

C. J. W.

Primer of Costing. By R. J. H. RYALL, F.C.W.A. Pp. viii + 115; 27 charts and forms. London: Sir Isaac Pitman and Sons, Ltd. **Price 5s. net.**

When one of the leading cost consultants in the Kingdom, Mr. R. J. H. Ryall, writes a Primer of Costing, one's interest is naturally aroused. It would appear, at first sight, that not only is it late in the day for a primer on this important subject to be written at all, but also that, from the pen of one who is so well placed in the profession, a treatise on advanced costing was to be expected.

A glance at the first chapter is, however, sufficient to dispel any such misapprehension, for one is reminded that there is, so far, no authoritative terminology of costing; that no two firms treat certain items of cost in exactly the same manner, particularly their items of establishment expenses; moreover, that this is the first primer of costing that has been published in this country.

That many people think they know all there is to know about costing, when they have scarcely probed beneath the surface, is only too clearly demonstrated by the fact that many firms, professing to have the soundest of costing systems, possess, in actual fact, a most unwieldy object which gives them some figures now and again, and which has been evolved by means of a series of spasmodic additions and minor revisions, introduced by generations of men. If some of these would study this primer, forget for a while the supposed glories of their own pet systems, and begin to think carefully upon the precepts and first principles herein laid down, their trade and industry would be the better fitted to withstand the ever present competition that it is called upon to face.

The preface tells us that the book is written for cost clerks, and particularly for those who contemplate sitting for the examinations of the Royal Society of Arts. The author is too modest. The work should be read by everyone interested in costing, for it cannot fail to give him a clearer view of the beginning of things; to those who depend upon costing in their business, its perusal is a necessity.

The book takes the reader through each stage of costing and outlines the steps needed in cost finding, cost control, and cost estimating. Each point is dealt with simply, but effectively, in language that is straightforward and to the point. There are no diversions into abstruse theories and no endless complications. Twenty-seven forms and charts illustrate the text and these in themselves are most valuable, for they are obviously designed by a practical man who understands that the workshops require, in all cases, the simplest possible form that will effectively serve its purpose. If such forms as these are employed, there can be no doubt in the workers' minds as to what they are expected to enter, where they are meant to write it, and why it is asked for. Therein lies one of the problems of the cost accountant. It is easy to make complicated original records, which are invariably filled in wrongly and cause the men in the shops to waste their time trying to find particular spaces. Sooner or later, information will be required which is not found to be immediately available from the existing records, with the result that a further form has to be added. After a while, many extra forms are introduced and more or less conscientiously filled in, but only used when particular information is required. Files, bearing all this matter, are stacked up, and the clerks have to spend large portions of their time on work, only a small portion of which is actually useful. The correct design of forms in the first case, by one really familiar with actual requirements, saves endless waste. All cost accountants would do well to have a periodical "stocktaking" of their forms, in order to weed out duplicated or superabundant information.

Another point in this book that attracts attention is that Mr. Ryall has got away from engineering in his main and in most of his other examples. So many of the text books on costing, and particularly those that come over from the States, make it appear that the one, and perhaps the only, field for costing is the engineering industry. Here we are told of the cost of buttons in ready-made clothing and other homely necessities of life. It is, to say the least of it, bracing. The reader will find that "something different" to stimulate his interest.

Almost every term used is defined. Terms need defining nowadays, for the standardisation of terminology proceeds but

slowly, and is, so far, a long way from being an accomplished fact.

There are many points upon which we feel we should like the author's opinion and which we should like to see treated in his book, such as a simple calculation of machine rates, examples of the executive uses of costs, the relation of estimating to costing, an example of cost analysis—but we must remember that it is a primer we are reading, and we can only admire the restraint of the author in refraining from treating at length the higher branches of costing before the "grammar" is understood. To have touched upon the points enumerated would have meant departure from a general treatise on costing and the introduction of examples drawn not only from particular industries, but from particular factories. We must, therefore, in this connection, look forward to the day when the author sees fit to deal with costing in its more advanced and more particularised aspects.

"A system of cost accountancy must be devised to fit the business and not the business to the system," is a sound warning to those inclined to rely on ready-made systems.

The notes in the concluding chapter are of great importance. They deal with the routine and procedure of work in a cost department, and here, for the first time, we think, is laid down the correct fundamental duties of cost clerks. It would be well if every firm studied the "progressing" of work in its offices. Clerical work is too often looked upon as an unnecessary evil. Paradoxically enough, little attention is paid to the question of wasted effort in this sphere. It would surprise many a manager to find what saving could be made by detailing just what each of his clerks is expected to do, how and when he is to perform each of his duties and what is the value of his work.

There is an appeal in this book to many different classes, chief amongst which are:—

(*a*) The Manufacturer, who prides himself upon the adequacy of his own costing system, for he may recognise that even in his cherished methods there may be some important error of principle.

(*b*) The Cost Accountant, who is absorbed in the routine of his costing and in the tabulation of results and statistics, for, if nothing more, it will be refreshing to him to think of the why and the wherefore of the first principles.

(*c*) The Consumer, who may be searching for knowledge of what the other half of the world does, for he will be given a concise survey of how manufacturers and distributors should endeavour to give equitable prices instead of making him pay for wastages.

(*d*) The Technical Man, who is responsible for design and economic manufacture, for then he will be shown what benefits he should expect in return for the shop records which he sends to the cost department; and

(*e*) The Student, for whom the book is essentially written.

We have no hesitation or fear in recommending Mr. Ryall's Primer of Costing to anyone who falls within any of these classifications, and we heartily congratulate the author upon the production of a readable book which fills a long-felt want in the literature of costing.

Legal.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

THE judgment of the Court of Appeal in favour of the plaintiffs and appellants was recorded in our last issue. Later, Mr. TREVOR WATSON, for the defendants, said that their Lordships' refusal to grant a stay of the injunction had led to a serious question regarding the defendants' current contracts. They had, however, obtained the plaintiffs' permission to deliver machines on order, and had agreed to pay the plaintiffs 10 per cent. on the value of the starting motors and rotary converters so delivered.

Sir Duncan Kerly, K.C., confirmed this and the Master of the Rolls acquiesced.

International Wireless Manufacturers, Ltd.

IN the Companies Winding-up Court on December 1st, Marconi's Wireless Telegraph Co., Ltd., petitioned for an order for the compulsory liquidation of International Wireless Manufacturers, Ltd.

It was stated that the plaintiffs were judgment creditors of the respondent company, the amount of the debt and costs being £247. The company's capital was £100, but, a few months after it was formed, debentures for £4,000 were issued.

Counsel for the respondent company asked for an adjournment until the first petition day in February next, as the company hoped to raise fresh capital.

In this case Mr. Justice Romer earlier in the day made a compulsory order, the company not being represented, but on it being explained that the absence of representation was due to inadvertence, his Lordship granted the adjournment to which the petitioners consented.

Unprotected Electrical Apparatus.

AT Accrington on December 2nd, the Broadoak Print Works, Ltd., Accrington, a branch of the Calico Printers' Association, was fined £10 for a breach of the Factories and Workshops Acts, 1901 to 1911.

Mr. H. TOPHAM, H.M. Inspector of Factories, said the case was the sequel to an accident to James Carter, electrician's labourer, who was found in a drying-room unconscious with his neck against a portable electric standard. He died soon afterwards. Adequate precautions had not been taken to prevent the standard from becoming electrically charged.

For the defence it was submitted that every precaution had been taken.

British Thomson-Houston Co. Litigation.

IN the Chancery Division on Friday (December 4th), Mr. Justice Tomlin heard a motion by the British Thomson-Houston Co., Ltd., for an injunction restraining infringements of its patents relating to electric lamps by E. A. Siderman, R. H. Wood, and Walter Thomas Smith, Ltd.

Mr. TREVOR WATSON, for the plaintiffs, said they had obtained injunctions against a large number of small retailers, that being the only method of preventing the importation of foreign lamps. But the multitude of injunctions had made importers exceedingly wary, and as a result there was a considerable and highly-organised business in these lamps which made it very difficult to get evidence. The manner in which it was carried on was this: The importers sent the lamps to a warehouse, and they could not be got from there except by telephone. The importers had appointed a number of retail dealers, and they also were very wary and would not treat with anybody who was not known to them. Nor would they treat except by telephone messages. They never kept any stock, they said, and got lamps from the warehouse in response to telephonic orders. If a particular retailer was stopped by injunction the principals had no difficulty in appointing another. Thousands of pounds' worth of foreign lamps were sold every week, and the Board of Trade returns showed an enormous importation of these lamps. This was the first occasion on which the plantiffs had been able to track a retailer to the actual warehouse, and the defendants were two retailers and the people who appeared to be in charge of the warehouse.

The evidence as to purchase was contained in affidavits. One witness said that on November 16th he went to Albany Wharf, Albany Street, N.W., the gates of which bore the name Walter Thomas Smith, Ltd. He told a man that he wanted to buy some foreign electric lamps, and was referred to Siderman at Grafton Street, Tottenham Court Road, as they did not deal with small orders there. At Mr. Siderman's he was informed that all business must be strictly confidential and nobody must be told the price which he had paid, nor was he to tell anybody in the street what he had got in his parcel. No lamps, said Mr. Siderman, were kept on the premises, and customers must telephone their orders. He obtained the lamps that he wanted. Another witness said he followed a messenger with lamps from Albany Wharf to Grafton Street, and a further witness swore that Walter Thomas Smith, Ltd., paid the rates of the wharf.

There was no appearance for the defendants and his Lordship granted the injunction asked for.

IN the Chancery Division on December 4th, Mr. Justice Tomlin granted an injunction on the *ex parte* motion of the British Thomson-Houston Co., Ltd., restraining the London Electric Lamp Co., of Sandcroft Street, Kennington, S.E., from infringing its patents for leading-in wires for electric lamps and gas-filled lamps. His Lordship said the injunction would be over last Tuesday (December 8th).

Manchester Electrical Engineers' Dance.—We do not know whether electrical engineers are more enthusiastic about dancing than, let us say, lawyers or physicians, but it is noteworthy that three large annual functions are now devoted to this form of amusement.

Of these, the Manchester or Northern dance was held last Friday, December 4th, at the Midland Hotel, and was attended by some 260 engineers and their friends. Unhappily, the very dense fog which prevailed all day caused a number of notable absentees, but those who succeeded in surmounting this difficulty spent a most enjoyable evening. It is well known that what Lancashire does to-day, the rest of England will do to-morrow, and readers in Birmingham and London (where they also dance) may care to note the unusual nature of the Manchester programme. A dinner was served at 9.15, following the first three dances, so that the guests might secure that "after supper" feeling early on. After a few more dances, a cabaret show was given, and still later an exhibition dance was performed by the professional exponents attached to the Midland Hotel.

The distribution of gaily coloured favours in the shape of hats, parasols, balloons, &c., added greatly to the general amusement, and Mr. G. H. Fawcus (the hardworking hon. secretary) and his colleagues who carried out the executive work which such a function requires may congratulate themselves heartily on a very successful evening.

Electricity in an Ancient Setting.—The Hastings Corporation is to supply electricity to Rye and Winchelsea and has agreed to preserve the "old-world" appearance of these historic towns by adopting street fittings to fit in with the surroundings.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The Christmas Holidays.—The ELECTRICAL REVIEW for December 25th will appear one day in advance of the usual time of publication owing to the Christmas holidays. The attention of advertisers is therefore called to a notice appearing in our advertisement pages to-day. Alterations to existing trade advertisements for that issue must be received by Wednesday, December 16th, but copy for Official Notices, Situations Vacant, &c., will be in time if delivered at 4, Ludgate Hill, E.C., by 5 p.m. on Monday, December 21st. Correspondents and other contributors to our editorial pages are also requested to bear the earlier publication arrangements in mind and to forward their articles and news items without delay.

The Shannon Scheme Dispute.—At a special meeting of the Free State Labour Party and the Trade Union Congress in Dublin last week, it was decided to treat the Shannon project as "black." A resolution was passed condemning the rates of wages offered, declaring that the Free State Government's policy must be fought, and instructing trade unionists not to work on the scheme. Senator O'Farrell said that the Government was endeavouring to impose "slave-like conditions of labour," and asserted that the Government would never be able to carry the scheme to a successful conclusion, for competent workers would not accept the terms. Mr. Tom Johnston said he found that if 50 per cent. more than the amount allowed for the cost of labour under the Shannon scheme—£90,000—were expended, the scheme would still be economic, and would not involve an increase in taxation or charges for electricity.

Recent Contracts.—Members of the Federation of British Industries have recently received important contracts, among which are a number of orders for valves, including those for the Arapuni (New Zealand) hydro-electric scheme, secured by Messrs. J. Blakeborough & Sons, Ltd.; electric locomotive hoists for railways in China, India and Brazil, and two electric luffing jib cranes for the Nitrate Railways Co., Ltd., ordered from Messrs. Ransomes & Rapier, Ltd.; and the supply of steelwork for sub-station buildings in connection with the electrification of the Bombay, Baroda and Central India Railway, by Messrs. Wm. Bain & Co., Ltd.

E.D.A. Activities.—We have received some further examples of the advertisements which the British Electrical Development Association is inserting in newspapers and periodicals during the current winter. These are very attractive, but their chief value lies in their adaptation to the class of paper in which they appear. This is an important matter which is not always considered by advertisers, who are often content to let the same advertisements do for journals which cater for widely-separated interests.

Works Visit.—During the recent annual meeting in Birmingham of the Coke Oven Managers' Association, a party of members paid a visit to the Witton Works of the General Electric Co., Ltd. The Magnet Club was put at the visitors' disposal for the day, and they were entertained to luncheon by the company, Dr. A. H. Railing being in the chair. At the luncheon Mr. P. T. Nicholson, president of the Association, expressed the members' thanks to the company.

Salford Tramway Dispute.—About 150 men employed at the Frederick Road tramway depôt of the Corporation Tramway Department, ceased work on November 26th following the suspension of two men and three youths. The terms provisionally agreed upon by the Department and the trade union officials for the settlement of the dispute were accepted by the men later, and they resumed work on December 3rd. During the strike the normal tramway service was fully maintained, with the exception of a few cars awaiting repair.

Safeguarding Iron and Steel.—Efforts are being made to secure the imposition of an import duty on foreign iron and steel. The Civil Research Committee has investigated the position and is expected to issue a report shortly. On December 2nd a number of representatives of the industry, including Sir Arthur Dorman, Sir Frederick Mills, and Mr. Peach, met the Unionist Safeguarding Committee and presented the case for the inclusion of the iron and steel industry in the provisions of the Safeguarding of Industries Act. The Committee expressed itself as being in favour of the scheme and promised to bring the matter to the attention of the Government.

Local Exhibitions.—TODMORDEN.—On December 1st an electrical exhibition was opened at the Todmorden Town Hall. Councillor J. Jackson (chairman of the Electricity Committee) presided, and said that town life could not be what it ought to be until electricity was used exclusively for heating, lighting and cooking.

BURNLEY.—In addition to opening a special showroom in Manchester Road, the Burnley Electricity Committee has decided to organise an electrical exhibition in the centre of the town, and a committee has been appointed to make the necessary arrangements.

BACUP.—The Corporation has decided to hold an electrical exhibition in the town in February next.

Rubber Industry.—On Monday last, at the meeting of the Institution of Rubber Industry, held at the Engineers' Club, London, Dr. S. S. Pickles, chairman of the Rubber Research Association Library and Information Bureau Committee, read a paper on "The Importance of an Adequate Intelligence Service for the Rubber Industry."

Textile Mill Electrification Contracts.—Several important contracts for electrical driving and direct-geared turbine driving of textile mills, both at home and abroad, are being executed by the Metropolitan-Vickers Electrical Co., Ltd. The principal home contracts include the Victoria Cotton Mills of Messrs. J. & J. Hayes, Leigh, Lancashire; the Park Lane and the Greenbank No. 1 and No. 2 mills of Messrs. John Hawkin and Sons, Preston; the Rishton Mill of Messrs. O. & J. Folds, Ltd., Burnley; and the Bleach & Dye Works of Messrs. John Welch & Sons, Chinley. The equipment of the Victoria Mills includes a 2,000-kW, 3-phase, 2,200-V, 3,000 r.p.m. turbo-generator, and motors totalling about 3,000 h.p. The electrical equipment in hand for the three mills of Messrs. John Hawkins and Sons includes motors totalling over 3,500 h.p.; for the Rishton Mill motors totalling about 500 h.p. are being supplied; and the equipment now being installed at the important works of Messrs. John Welch & Sons includes two generators of 250 kW and 50 kW respectively, and motors totalling about 400 h.p. An order for a new mill at Sao Paulo, Brazil, includes motors totalling 730 h.p. and transformers with an aggregate capacity of 2,100 kVA. Other contracts for Brazil include motors totalling over 1,200 h.p. for use in eight different mills.

Lead. — Messrs. James Forster & Co. state under date December 5th :—" If the fall in America continues, as from all indications appears to be probable, prices must recede further here as there is not sufficient demand in this country or on the Continent to absorb American lead as well as the large supplies from Australia and elsewhere."

British Insulated Change of Name. — THE BRITISH INSULATED & HELSBY CABLES, LTD., has, by extraordinary resolution, passed last Friday, decided to change its name to British Insulated Cables, Ltd.

The British Industries Fair.—*Reuter* (Montreal) reports that many Canadian manufacturers will send exhibits to next year's British Industries Fair. Through the good offices of Mr. F. W. Field, the Senior British Trade Commissioner, considerable interest has been aroused in the Fair in Canada.

Trade Announcements.—MR. R. CHILDS has retired from his partnership in Erlco at Reading, and Messrs. Bravey and Blackmore, the remaining partners, are carrying on the firm. Mr. Childs is opening business as an electrical engineer at Station Road, Henley-on-Thames, and asks for copies of catalogues and lists.

MESSRS. GEORGE H. SCHOLES & CO., LTD., Manchester, announce that they have made an alteration in their "Sanco" joint box, and have reduced the price.

Catalogues and Lists.—MESSRS. BLACKSTONE & CO., LTD., Aldwych House, W.C.2.—An illustrated folder dealing with an unchokeable pump with various forms of drive.

BRITISH INSULATED & HELSBY CABLES, LTD., Prescot, Lancashire.—Catalogue P.192, containing full details and illustrations of pole transmission line equipment. A great deal of useful technical information regarding transmission-line design is given at the end of the publication.

MESSRS. R. A. LISTER & CO., LTD., Dursley, Gloucestershire.—An illustrated catalogue, with price list, of small electric lighting and power plant, including switchboards, batteries, and other auxiliaries.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Pa., U.S.A.—Motor Application Circular No. 7,378, dealing with the use of electrically-driven machinery for handling materials. Illustrated.

THE IGRANIC ELECTRIC CO., LTD., 147, Queen Victoria Street, E.C.4.—Leaflets Nos. 920 and 925, dealing, respectively, with oil-immersed and air-break, hand-operated, star-delta starters.

MESSRS. FALK, STADELMANN & CO., LTD., 83-93, Farringdon Road, E.C.1.—A showcard advertising the "Efesca" regenerative aerial tuner; also a catalogue (No. 563) of "Efesca" signs, lanterns, and reflectors. Illustrated and priced.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Folder O.S. 3793, containing particulars and prices of "Osram" radio valves; a circular letter dealing with the company's counter service; also Leaflet O.S. 3,794, describing "Osram" decorative lamp outfits.

MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2.—A priced pamphlet describing the "Dakol" daylight unit.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—December price sheet of electrical materials and appliances.

MESSRS. CUNNINGHAM, 169-171, Edgware Road, W.2.—An illustrated price list of radio receiving sets.

THE ELECTRICAL EQUIPMENT & CARBON CO., LTD., 109-111, New Oxford Street, W.C.1.—List No. M.7, containing illustrations, specifications, and prices of d.c. and a.c. motors.

THE WATLIFF CO., 87, Cambridge Road, Kilburn, N.W.6.—A net trade price list of commutators for small motors and generators, including automobile and fan machines.

BRITISH BROWN-BOVERI, LTD., Trafalgar House, Waterloo Place, S.W.1.—An illustrated pamphlet advertising the company's turbo-alternators, and the "Brown-Boveri Review" for November, describing work carried out by the company's Swiss principals.

THE VISCO ENGINEERING CO., LTD., 162, Grosvenor Road, S.W.1.—Publication No. 243, containing an illustrated description of the company's cooling towers.

THE MULLARD WIRELESS SERVICE CO., LTD., Nightingale Lane, Balham, S.W.12.—A display carton for shop windows advertising "Mullard" radio valves.

MESSRS. R. ROBERTS, LTD., 53, Newton Street, Birmingham.—An illustrated trade price list of radio components.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—A series of cardboard cut-outs advertising "Mellovox," "Baby," and "Dinkie" loud-speakers, and a window card advertising Marconi valves.

THE EAST LONDON RUBBER CO., LTD., 29-33, Great Eastern Street, E.C.2.—An illustrated price list of Christmas presents, including a number of electrical appliances.

Bankruptcy Proceedings.—W. R. SQUIRE, 11, Steward Street, Spring Hill, Birmingham, electrical engineer.—The public examination of this debtor was held on December 2nd, at the Court House, Birmingham. The statement of affairs showed liabilities expected to rank of £67 and a deficiency of £41. Debtor said that he commenced business as an electrical engineer in 1907. The business was discontinued in March, 1916, when he was employed on munitions, and he subsequently joined the Navy. In April, 1919, he recommenced business as an electrical engineer with a capital of £140, and was successful until May, 1923, but by reason of certain loss he found it difficult to continue. The examination was closed.

D. A. GRIFFITHS, Abercwmboi, and R. L. H. HUGHES, Aberdare, Glamorganshire, lately trading in partnership at Aberdare as Griffiths & Hughes, electrical engineers.—The first meeting of creditors was held on December 4th at Cardiff. According to the statement of affairs, there were gross liabilities of £509, of which £472 was expected to rank, and assets of £30, leaving a deficiency of £442. Debtors attributed their failure to losses on contracts through underestimation and trade depression. The Official Receiver remains trustee.

M. BREINGAN, electrical manufacturers' agent, 57, Robertson Street, Glasgow.—Public examination December 21st, at Mr. Sheriff Fyfe's chambers, County Buildings, Glasgow. Meeting of creditors January 18th, at the Faculty Hall, St. George's Place, Glasgow.

W. P. YOUNG, trading as W. P. Young & Co., and the Leicester Tanning Machinery Co., Sanvey Gate, Leicester, mechanical and electrical engineer.—An application for the discharge of this debtor was heard on December 3rd, at the Castle, Leicester. The discharge was granted subject to debtor's consenting to judgment for £50.

E. O. HENSTOCK, electrical engineer, 21, Old Road, Brampton, Chesterfield.—Receiving order made December 2nd, on debtor's own petition.

W. R. J. WHITE, electrical agent, 29, Great Pulteney Street, W.C.—Bankrupt discharged subject to consenting to judgment for £50 being entered against him by the Official Receiver (£50 paid to the Official Receiver in lieu of entering up judgment).

L. N. STRIBLING and A. E. SETTERFIELD (Stribling & Setterfield), electrical engineer, 17, Market Place, Margate.—Trustee, Mr. A. H. Ward, Official Receiver, 10, Burgate Street, Canterbury, released November 30th.

H. WILSON, electrical contractor and decorator, 1057, Grangefield Avenue, Thornbury, Bradford.—Last day for proofs for dividend December 18th. Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford.

J. N. DAVENPORT and L. A. HACKETT (Davenport, Hackett and Co.), electrical engineers and contractors, 36, Spring Gardens, Manchester, and Albert Mills, Albert Street, Manchester.—Last day for proofs for dividend, December 18th. Trustee, Mr. A. Grierson, 21, Spring Gardens, Manchester.

NEWMAN & Co., radio and electrical engineers, Radio House, 17, Shepherd's Bush Green, W.—Receiving order made November 25th, on creditor's petition. First meeting, December 10th; public examination, February 19th, both at Carey Street, W.C.

A. A. WATMOUGH, carrying on business together with W. HURWORTH in co-partnership as Hurworth, Watmough & Co., electrical engineers, 41, Town Street, Horsforth, and 1, Back James Street, Harrogate.—Application for discharge to be heard December 21st, at the County Court House, Leeds.

R. L. FOGGIN (Tithebarn Radio Co., Crosby Radio Co., and High Bridge Radio Co.), 63, Tithebarn Street, Liverpool, 75, Crosby Road North, Waterloo, Liverpool, and High Bridge, Newcastle-on-Tyne.—Last day for proofs for dividend, December 16th. Trustee, Mr. E. D. Symond, 11, Dale Street, Liverpool.

Dissolution of Partnership.—PECOVER & ADEANE, furnishing manufacturing ironmongers and electricians, 9 and 10, Bathurst Street, Hyde Park Gardens, W.—Mr. F. T. Pecover and Mr. H. Adeane have dissolved partnership. Mr. Pecover will attend to debts and will continue the business under the same style at the same address.

Company Liquidations.—BURY ELECTRIC PLANT CO., LTD.—Winding up voluntarily. Liquidator, Mr. T. S. Smith, of Messrs. C. R. Scholes & Co., Silver Street Chambers, Bury. Meeting of creditors December 11th, at the liquidator's offices. Particulars of claims to the liquidator by December 31st.

GALLETTI'S WIRELESS TELEGRAPH & TELEPHONE CO., LTD.—A meeting of creditors is called for December 14th, at the Liquidator's Offices, 36, Walbrook, E.C. Particulars of claims to be sent to the Liquidator, Mr. H. J. Page, by December 31st.

Private Arrangements.—MORRIS KELLY, 12, Jackson's Row, Deansgate, Manchester, wholesale and retail wireless storekeeper.—A meeting of the creditors of the above was held on December 2nd, when Mr. Gillett presented a statement of affairs as at November 26th, which showed liabilities of £1,209, all due to unsecured trade creditors, and there was an estimated deficiency, subject to the costs of realisation, of £749. Mr. Gillett said that there had been several judgments, and accordingly, for the protection of the assets, a deed of assignment was executed in his favour. Unless something like 10s. in the £ were forthcoming, the creditors would probably decide on bankruptcy. The debtor started the business at 12, Jackson's Row, Deansgate, as a wholesale and retail wireless storekeeper, on April 14th, 1923. Previous to that, he had been a photographer, commission agent, &c. The debtor had informed Mr. Gillett that his capital was £100, and he also borrowed £250 from a son. The debtor had no offer or scheme to put forward. At the present moment he was contemplating starting in another business. It was resolved that the deed of assignment already executed should be registered, and that an offer should be accepted of 10s. in the £, payable at 3, 6, 9, and 12 months, the whole 10s. to be guaranteed, failing which the estate would be dealt with in bankruptcy.

The following are creditors:—

	£		£
Lever, E. J.	230	Ripaults, Ltd.	41
Dundas Fox, W.	117	Palatine Accumulators Co. ...	43
Toubkin, J.	24	Forms Co.	28
Houlman, L.	33	Watnell Wireless Co.	29
Manchester Building Hardware Society, Ltd.	24	Battery Co.	109
Erewash Electrical Wire Co. ...	22	S. D. H. Manufacturing Co. ...	141
Turncock, G.	20	Corby Engineering & Wireless Co.	20

Deed of Assignment.—A. B. WAKELING and F. D'A. WRAY (Wakeling & Wray), electricians, 22, Paragon Street, Hull.—Particulars of claims by December 18th, to the Trustee, Mr. W. G. Hall, National Provincial Chambers, Silver Street, Hull.

The Scottish Lighting Bureau.—We reproduce herewith a group photograph of some of those who attended the 10th Illumination Design Course at the Scottish Electric Lighting



A Group at the Scottish Lighting Bureau.

Service Bureau, Glasgow, from November 24th to 26th. Mr. Bush, of E.L.M.A., Mr. Langlands, chairman of the Lighting Service Bureau, and Mr. H. E. Hughes, the district engineer, are in the centre of the picture. The Bureau is doing splendid work and the lectures and demonstrations are being well attended.

New Italian Companies.—Among the new electricity supply undertakings recently formed in Italy are the following:—La Società Elettrica Salentina, Bari, capital 100,000 lire; La Società Elettrica Marosticense, Marostica, capital 500,000 lire; La Società Imprese Elettriche de Santa Lucia del Mela, capital 97,000 lire; La Società Distribuzioni ed Utilizzazione Energia Elettrica "Interanna," Terni, capital 500,000 lire; La Società Produzione Elettrica "Ape," Polizzi Generosa, capital 360,500 lire; and La Società Imprese Elettriche Siculo-Lombarde, Milan, capital 100,000 lire.

A new company has been formed in Rome with a capital of 100,000 lire and the title La Società Vettura Auto-elettriche Italiane to construct electric motor vehicles.

Indian Electrical Imports. — In the course of a report which he has recently submitted to the Department of Overseas Trade, Mr. T. M. Ainscough, O.B.E., Senior Trade Commissioner in India, states that the imports of electrical machinery into India during the six months from April to September were valued at Rs.96 lacs, as compared with Rs.98 lacs in the equivalent period of last year.

Book Notices.—"Memorandum of the Chief Engineer of the Steam Users' Association for the Year 1924." Manchester: Taylor, Garnett, Evans & Co., Ltd.—In this publication a detailed report is given of the proceedings of the deputation which interviewed the Home Secretary to lay before him the views of the Steam Users' and Kindred Associations, with regard to the boiler section of the 1924 Factory Bill. Considerable information is given regarding recent introductions of apparatus and methods and observations made in combustion practice. The Ljungström-Howden preheater is described. The results of much research by the Association are recorded, including experiments on strains in various boiler parts.

"Wireless Annual for Amateurs and Experimenters." Pp. xv+179; illustrated. London: Iliffe & Sons, Ltd. Price 2s. 6d. net.—In this issue the space formerly devoted to special articles has been curtailed in favour of matter to which amateur radio-telephonists constantly need to refer. The list of amateur transmitting stations in all parts of the world is, we believe, the first of its kind published, and is as up-to-date as possible. The tabulated lists of regular transmissions, both in Morse and telephony, are also valuable for reference, and the sixteen pages of typical receiver diagrams, with notes, and information regarding valve characteristics, finding and rectifying faults in receivers, data and tables have been compiled by well-known men. Articles on the work of the International Broadcasting Bureau and a comparison of the broadcasting regulations and conditions in different countries of the world are included, while the glossary of technical terms, the list of wireless societies, the classified directory of manufacturers, and other useful information contribute to make this publication a handy book of reference.

"Miscellaneous Publications of the U.S.A. Bureau of Standards." No. 64. Price, 15 cents; and No. 68. Price, 5 cents. —The latter is an illustrated pamphlet showing the correct adjustment for motor vehicle headlights.

Social Events.—Callender's Anchor Cable Works Operatic Society (Leigh) attracted crowded audiences to the local Hippodrome recently, when it produced with marked success the Gilbert and Sullivan fairy opera, "Iolanthe." The opening night was under the patronage of the Mayor and Mayoress, who sent their hearty congratulations to the principals, chorus and orchestra. On the following Friday night, when the house was packed with school children, the opera was preceded, as a token of respect to the memory of the late Queen Mother, by the singing of two verses of her favourite hymn, "Abide with Me," followed after one minute's silence by the National Anthem.

The Belfast branch of the General Electric Co., Ltd., recently held a supper-dance as a send-off to the Magnet Social Club which the staff has formed. Advantage was taken of the occasion to present a grandfather clock to the manager of the Irish branches, Mr. W. R. E. Boyd, while Mrs. Boyd was given a dressing set. The Lord Mayor of Belfast, with his wife and daughter, Mr. G. B. Hanna, M.P. Parliamentary Secretary of the Northern Ireland Ministry of Home Affairs, Mr. J. L. Dawson, manager of the Belfast branch, and Mr. Johnston Wright, the city electrical engineer, were present at the function.

A Cooking Inquiry.—The following is a copy of a letter received by Mr. R. B. Mitchell, engineer and manager of the Glasgow Corporation Electricity Department:—

Since electricity's so cheap;
And gas so very dear,
I wish to know what I should pay
To get the big gas stove away
And do our cooking here
By electricity. Please say
Good Mr. Engineer.

Unemployment.—The number of unemployed registered at the Employment Exchanges on November 30th was 1,165,100, a reduction of 9,445 on the week. The figure was also 25,154 lower than that of a year ago.

The Finnish Electrical Market.—According to *Commerce Reports*, the use of household appliances in Finland has been gradually developing, and it is expected to become a considerably more important market in the future, particularly in view of the Imatra hydro-electric scheme. Although the native electrical engineering industry is being fostered, the bulk of specialised apparatus, including domestic appliances, is imported. German appliances have the greatest sale, but there are many Swedish manufactures on the market.

New Zealand Preference for British Goods.—The *Board of Trade Journal* states that the new Customs regulations, which are to come into force on April 1st next, provide that the following classes of goods shall receive the benefit of the British preferential tariff on importation into New Zealand:—(a) Goods wholly Empire produced, (b) goods wholly Empire manufactured from Empire materials, (c) goods wholly Empire manufactured from unmanufactured raw materials and/or such partly-manufactured materials produced outside the Empire as are permissible. In the case of goods not fulfilling these conditions, preference will be granted where 50 per cent. of the factory cost of the goods is represented by Empire labour and/or materials, provided that the final process of manufacture is performed within the Empire.

A Stoker Contract.—Harrington travelling-grate stokers, constructed by Riley Stoker Co., Ltd., of London, have been adopted for the new power station at Kirkcaldy, designed by Messrs. Kennedy & Donkin, consulting engineers.

An E.D.A. Film Display.—The British Electrical Development Association is arranging an exhibition of films dealing with various aspects of electricity at Australia House, Strand, W.C.2, on December 18th, between 7.30 and 9.30 p.m. Tickets for the event may be obtained from the director and secretary of the Association.

The Czecho-Slovakian Electrical Industry.—The *Board of Trade Journal* for December 3rd published a summary of the proceedings at a recent meeting of the Czecho-Slovak Federation of Industries. It is stated that the electro-technical industry had expected the realisation of an extensive electrification scheme in Slovakia. The scheme was, however, only partly carried out, and Slovak firms therefore had to look for markets in Bohemia, Moravia and Silesia, but they were unable to compete with Czech firms owing to the high freight rates and higher cost of production in Slovakia. The tariffs imposed by neighbouring countries also allowed little export trade to be done, but in spite of those difficulties, the industry had a normal year. The cable industry had a satisfactory year owing to the large number of orders from sugar factories, and as soon as the Housing Law is enforced a further improvement is expected. On the other hand, the proposed erection of several new telephone exchanges in Slovakia did not materialise and slow progress is being made in this direction.

A Swiss Company's Thirty Years. — The Motor Columbus Gesellschaft, of Baden, which has assisted financially in the establishment of electric power stations in Switzerland and many foreign countries, recently celebrated the completion of 30 years' existence. The concern has now a capital of 60 million fr.

Russian Orders for Germany.—According to German statements attributed to the president of the Russian State Electrical Trust, the latter has entered into an agreement with the Berlin A.E.G. under which the German company has offered on a favourable credit basis to supply machinery and other electrical manufactures of the value of 15,000,000 roubles. Negotiations of a similar kind are said to be in progress with the Osram Gesellschaft. It is added that the Trust will shortly send a Commission to Germany, England, France, and the United States in order to negotiate concerning equipment of the value of 5,000,000 roubles. Another report, also from German sources, states that the Donetz Coal Trust, the Southern Steel Trust, and the Southern Ore Trust have commissioned the Soviet Trading Delegation in Berlin to purchase electrical and mechanical installations for the extension of the works of these trusts. In this connection it is said that an agreement has been entered into with the A.E.G., the Siemens concern, and Brown, Boveri & Co. under which a postponement of payment would be granted for a part of the deliveries for a period of three years. In the case of the supply of winding-engine equipment and transport installations, difficulty is stated to have arisen owing to the scarcity of capital in Germany; as a consequence these particular orders have not yet been allocated. Negotiations by the Soviet delegation with regard to the sinking of new pits in the Donetz basin, as well as for the construction of dwellings for the Steel Trust, are said to be still pending.

Credit Information.—The Federation of British Industries has decided to organise a credit information service with the aid and for the use of its members. The main intention of the scheme is to "curb the activities of the fraudulent debtor, the debtor who is unable to pay, and also those of the buyer who adopts sharp or immoral business practices." It is proposed to issue a weekly list to members who notify their intention of assisting the service, and in every case of the receipt of information the name of the member reporting will be confidential.

Turbine Tenders in Norway.—Particulars have now been published concerning the tenders received last year for the supply of two turbines for the State hydro-electric works at the Nore and for the delivery of two further turbines this year. Last year the Norwegian A.S. Kvaerner Brug quoted 1,077,520 kr. for one machine and 1,002,520 kr. for the second, the highest guaranteed efficiency at an average fall being 86 per cent. The Myren Verksted tendered at 1,162,000 kr. and 1,092,760 kr., respectively. On the other hand, the German firm, which secured the order for the two turbines, quoted 659,360 kr. per machine, with an efficiency of 87 per cent. This year the Kvaerner and Myren works, which obtained the order for the two turbines, submitted joint tenders at 770,000 kr. and 750,000 kr. for the two, respectively, with an efficiency of 88 per cent. The amount of the German tender was 612,880 kr. with an efficiency of 88.5 per cent.

Unjustifiable Pessimism.—Speaking at a luncheon to inaugurate a "Buy British Goods" week in Birmingham recently, the President of the Board of Trade said that a great deal of the pessimism prevalent was unjustifiable. In many directions trade was improving and British capacity, initiative, and ability would pull us through.

At the same luncheon, the Labour Lord Mayor of Birmingham protested strongly against the practice of municipalities in awarding contracts to foreign firms because their tenders were a little lower than those of British manufacturers.

For Sale.—The Superintending Engineer, Henlow Aerodrome, Beds., invites offers for surplus generating plant, &c., at Bircham Newton Aerodrome, near King's Lynn. (See our advertisement pages to-day.)

New Czecho-Slovakian Company.—A new company has been formed in Reichenberg, with a capital of 200,000 crowns and the title Kontakta Gesellschaft, to manufacture electric carbons, contacts, and allied material.

New Belgian Company.—The Société Uranus d'Appareils Brevetés is the name of a new company which has lately been formed in Brussels, with a capital of 1½ million fr.

The Ten-Penny Shilling.—At the annual meeting of the Decimal Association last week the following resolution was passed unanimously:—

That the Government be urged to divide the pound sterling into 20 shillings of 10 pence instead of 12, in order to secure many advantages simultaneously, including:—

(*a*) A lower cost of living through a general restoration of "pennyworth" and "halfpennyworth" of full pre-war value.
(*b*) A lower cost of producing goods through this lower cost of living.
(*c*) Increased efficiency in home and foreign trading operations through an extended use of cheaper office machinery.
(*d*) Increased facilities in foreign trading through the establishment of the decimal system as the universal basis of all the coinages used throughout the world.
(*e*) Improvement of the present British coinage by gradual evolution instead of by the more revolutionary proposals hitherto considered.

The ten-penny shilling proposal has been unanimously approved by the Executive Committee of the Federation of British Industries, and will come before the Council of the Federation next month.

A Chilean Transformer Contract.—The *Manchester Guardian* reports that Messrs. Ferranti, Ltd., have secured an important order from Santiago, Chile, in the face of keen competition from United States manufacturers who have a firm hold upon the market. The order comprises two 13,333-kVA, 3-phase, 110,000-V transformers and several smaller units for use in connection with the electrification of the Chilean State Railways.

The British Empire Exhibition.—The financial loss on the Exhibition has been provisionally put at £1,581,905, and guarantors will be called upon for 15s. in the £ of their guarantees. The cost to the State will be in the neighbourhood of £800,000.

Wireless Retailers.—The Wireless Retailers' Association is about to issue a Handbook of 100 pages relating to its activities and other matters of interest to retailers.

Lighting and Power Notes.

Adwick.—LIGHTING CHARGES.—At the request of the ratepayers the Council formulated an electricity scheme, on which a sum of £30,000 has been spent. Recently it was announced that the weekly charge for an unlimited supply of electricity was 1s. 6d. for five points per house and 1s. 7½d. for seven points per house. Residents intimated that unless the charge was reduced by half they would not take a supply. At a recent meeting of ratepayers it was stated that the Council was counting upon 60 per cent. of the 3,500 houses taking electricity to make the scheme self-supporting. The principal opposition was to an all-the-year-round charge, meters being preferred.

Beckenham.—LOAN.—The Town Council is applying for sanction to a loan of £10,000 for mains and services.

Birmingham.—ELECTRICITY SUPPLY RECORDS.—The output at the Corporation power station during the week ended November 27th was 6,288,000 kWh, which established a record, being nearly 20 per cent. more than in the corresponding week of last year, and considerably above the highest weekly output during the war period. On a recent foggy day the output was nearly 1,200,000 kWh, a record for one day.

Birkenhead.—ELECTRICITY IN BULK.—The Electricity Committee has received a report from the electrical engineer upon a provisional offer received from the Wallasey Corporation for an increased supply of electricity in bulk to Birkenhead. The Town Clerk of Wallasey is to be informed that the Committee is prepared to recommend the Council to accept the offer.

Blackpool.—LOAN SANCTIONED.—The Corporation has received sanction to the borrowing of £12,000 for a 2,000-kW turbo-generator.

Bolton.—LOAN SANCTIONED.—The Electricity Committee has received sanction to borrow a further sum of £103,000 for plant extension and buildings at the Back of the Bank generating station.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—According to the *Electrical News*, the Algoma Power Co.'s plant at High Falls on the Michipicoten River has been purchased by the Chicago Edison Insull interests for a sum of $300,000. This plant comprises two units, one of 600 h.p., and one of 1,000 h.p. operating under an average head of 128 feet. The new interests will expend some $4,000,000 in the development of from 20,000 to 25,000 h.p., which will be available for the Goudreau and Michipicoten gold mining areas.

Work is reported to have started on a new paper mill costing $12,000,000 and a water power development costing $5,000,000 for the Canadian International Paper Co., Ltd., Three Rivers, Que. Both of these projects are on the Gatineau river.

Cheadle and Gatley.—LOAN.—The Urban District Council has applied for sanction to a loan of £3,280 for extending the mains to supply electricity to a new housing estate at Cheadle Hulme.

Colne.—"ASSISTED WIRING" SCHEME.—The borough electrical engineer has submitted a scheme to the Town Council in connection with the wiring of premises on the hire-purchase system. The scheme has been adopted by the Council and submitted for the approval of the Electricity Commissioners.

Continental.—SWEDEN.—It is reported that the proposal has been put forward for the formation of a company to supply electricity to the Island of Oland. It is proposed that power should be taken from the hydro-electric power stations on the mainland (probably Sydsvenska Kraft-A/B, Malmo) and transmitted by a h.p. submarine cable to Oland and further distributed to the different parts of the island by l.p. overhead lines.

BELGIUM.—Recently issued reports of the Société de l'Union des Centrales Electriques, of Brussels, state that good progress is being made with the linking up of the electricity supply undertakings in Belgium. The Union has now 24 sub-stations and nearly 80 miles of cables connecting up to 29 power stations belonging to 22 metallurgical, coal mining, tramway, and electricity supply undertakings. During the past year the exchange of electric power between distribution systems amounted to over 50 million kWh.

Criccieth. — ELECTRICITY SUPPLY. — The Urban District Council has notified the Gwynedd Trust of its intention to withdraw its support from the Trust's scheme for providing an electricity supply for the district, and to prepare an electricity scheme of its own.

Croydon.—MAINS EXTENSIONS.—The Electricity Committee has decided to extend mains at an estimated cost of £2,900.

Elland (Yorks.).—PURCHASE OF DOMESTIC APPLIANCES.—The Urban District Council has approved a proposal of the Electricity Committee to seek sanction to borrow £1,000 for the purchase of electric cookers, fires, &c., to be let out on hire.

Guernsey.—INAUGURATION OF SUB-STATION.—The new sub-station erected by the Guernsey Electric Light & Power Co. was formally inaugurated by Major-General the Hon. Charles Sackville-West, Lieut.-Governor of the island, on November 26th. Electricity is transmitted to the sub-station at a pressure of 6,000 V and reduced to 420 and 210 V d.c. for distribution.

Grimsby.—SUPPLY FOR "BEAM" STATION.—Upon the recommendation of the Electricity Committee, the Town Council has passed a resolution authorising the borrowing of £9,000 for the provision of cables and switchgear for supplying electricity to the "beam" wireless station, which the G.P.O. is constructing at Tetney.

Hastings.—INQUIRY.—Colonel T. E. Ekin, Inspector of the Electricity Commission, held an inquiry on November 24th and 25th into the application of the Corporation for a Special Order to supply electricity in various districts outside the borough, including Rye, Battle, and Ninfield. Mr. R. Harker, for the Corporation, stated that the Battle Urban District Council and the Hailsham and Battle Rural District Councils had given their consent to the proposed Order, and the borough of Rye had consented, subject to terms of an agreement. The Broomsgrove power station was capable of meeting the demands in the borough and Bexhill, leaving a substantial margin to be disposed of. Mr. R. Ferguson, the borough electrical engineer, stated that the capacity of the Broomsgrove station was 9,500 kW, and if further extension was required it would be possible to extend the system to 50,000 kW in an economical manner. He estimated the total supply to districts outside the borough at 702,869 kWh. Objections were raised to the scheme by the Hastings and St. Leonards Gas Co., the Southern Counties Electric Light & Power Supply Co., Ltd., the Commissioners of Sewers for the Rapes of Pevensey and Hastings, and Mr. P. Idle, for Mr. Bannister and 150 Hastings ratepayers. The Commissioners will give their decision in due course.

Helensburgh.—ELECTRICITY SUPPLY.—At the Dean of Guild Court the Clyde Valley Electric Power Co. was granted permission to erect a sub-station in connection with the town's electricity supply.

Hornsey.—The Housing Committee has recommended the wiring of 229 Council houses for electricity at a cost of £2,153. The following are the proposed weekly charges:—Nine points per house, 1s. 1d.; 8 points, 1s.; 7 points, 11d.; 6 points, 10d.

Irish Free State.—DUBLIN.—The Dublin Electricity Supply Bill has been further considered by the Free State Parliamentary Joint Committee, and it is announced that when the Committee's report has been presented it is the intention of the promoter, Sir John P. Griffiths, to hand the scheme over to the Free State Government free of cost.

WATERFORD.—The Corporation is taking steps to obtain a loan of £30,000 in connection with its electricity scheme. Of this amount £17,000 is estimated for providing mains, street lamps, services, and associated works, whilst the balance of £13,000 is for generating plant and accessories.

Lancaster.—ELECTRICITY IN BULK.—The Corporation has been in negotiation with the Carnforth Urban District Council regarding a supply of electricity to the district. The Electricity Committee proposes that for a bulk supply the Carnforth Council should pay £6 per annum per kW of maximum demand plus 1d. per kWh, together with 3½ per cent. per annum on the cost of the transmission line if erected by the Corporation; and that for a supply in detail the charges should not exceed 25 per cent. above the charges for the time being in force in Lancaster.

Leeds.—PROPOSED NEW POWER STATION.—The Corporation Electricity Committee is contemplating the erection of a new power station on the bank of the River Aire, where a site was acquired some time ago. The estimated cost of the work is £500,000, and the Committee is to approach the Electricity Commissioners for their sanction to the scheme.

London.—LEWISHAM.—The Board of Guardians has rejected a proposal to install its own generating plant and has decided to enter into a new agreement for seven years with the South Metropolitan Electric Light & Power Co., Ltd., for a supply at 1.25d. per kWh for the first 125,000 kWh, the charge to be reduced by a sliding scale to 1d. when the consumption reaches 250,000 kWh.

LONDON AND HOME COUNTIES JOINT ELECTRICITY AUTHORITY.—The Authority has established a Finance Committee, a Technical Development and Works Committee, and a General Purposes Committee, and has taken immediate steps to deal with questions referred to it under the statutes and the London Order regarding the establishment of the sliding scale of prices to be charged for electricity by the London Companies. It is hoped that the steps taken will enable the sliding scale to come into operation in January next in accordance with the desire expressed by the Electricity Commissioners. The Authority has also taken in hand the immediate consideration of applications for orders to supply in certain parts of the area and is giving special consideration to Parliamentary applications for the ensuing session.

Liskeard.—INAUGURATION OF SUPPLY.—The new power station of the Liskeard Gas and Electricity Co., Ltd., was formally inaugurated on December 1st by the Mayoress. The plant includes two 56/60-h.p. Vickers-Petters crude-oil engines, direct-coupled to two 36½-kW Crompton generators, with a D.P. battery of 470 ampere-hours capacity of 200 V. The scheme has been carried out under the supervision of Mr. H. Hill, consulting engineer and manager of the Bodmin Electric Light Co., and the total cost was approximately £6,000.

Lytham St. Annes.—LOAN SANCTIONED.—The Town Council has received sanction to the borrowing of £3,000 for mains and other works in connection with the supplying of electricity to the Lytham Shipbuilding & Engineering Co., Ltd.

Manchester.—PROGRESS DURING OCTOBER.—During the month of Octobor the Corporation electricity undertaking showed an increase in connections of 1,926 kW, bringing the total to 271,628 kW; and the number of applications received for supply, including existing consumers for additional supplies, was 1,190, representing a total of 3,543 kW. The number of consumers connected increased by 545, and the number of hired cookers connected by 81, bringing the total actually on circuit to 1,069. Applications for the hire of cookers totalled 118.

ELECTRICITY SUPPLY RECORDS.—On November 10th, the maximum supply demanded reached 129,230 kW and on November 20th the output reached 1,544,680 kWh, both figures creating records in the history of the undertaking.

LOAN SANCTIONED.—The Electricity Committee has received sanction to a loan of £160,000 for mains.

Middlesbrough.—FIRE DAMAGE.—Referring to the fire at the North Tees power station reported in our last issue, it was at one time during its course feared that the switch house would be gutted, and early reports which we quoted stated that this had actually occurred. We understand, however, that the oil which became ignited was oil contained in one of the switch tanks; only 200 gallons of oil was involved, and the damage to the switch house was confined to the immediate vicinity of the fire. No oil was stored in any of the power station buildings. Only two out of the twenty Reyrolle metal-clad switches installed in the switch-house were damaged as a result of the fire; the whole of the switchgear (with the exception of the panels affected) was put back into commission soon after the fire was extinguished, and the power station was dealing with the normal load within eighteen hours of the commencement of the outbreak. Supply to a large number of local consumers affected was provided from the company's other sources of supply within a very short period.

Rawtenstall.—ELECTRICITY CHARGE.—At the last meeting of the Town Council it was reported that in response to an inquiry as to the price at which the Corporation would supply electricity to the type of house in which it was proposed that nothing but electricity should be used, for heating, cooking, domestic power and lighting, the Electricity Committee recommended a charge of 1d. per kWh, with a suitable minimum payment per annum. The matter is receiving further consideration.

Retford.—ELECTRICITY SCHEME.—It was reported to the Town Council on November 27th that draft specifications and form of tender for an electricity supply had been received and that it was hoped to proceed with the scheme at once. If, as is suggested, an electric drive is required at the town's sewage works at Bollam, and also for the waterworks, the lay-out of the whole scheme will be affected, including the size of the generating plant, which is to be set up at the gas works.

Reunion.—HYDRO-ELECTRIC DEVELOPMENT.—At a recent meeting of the French Institution of Civil Engineers, M. L. Guerin gave particulars of the hydro-electric plant which it is proposed to establish on the Island of Réunion in the Indian Ocean. It is estimated that by means of three plants water power to the extent of from 50,000 to 60,000 kW can be utilised, a large portion of which could be used for the production of synthetic nitrate which is largely used in Réunion and is at present imported from Chile.

Salvador. — ELECTRICITY SUPPLY. — Engineers from the United States are studying plans to harness the waters of Lakes Guija and Ilopango to provide power for an electric lighting system to supply all the towns of Salvador.—*Reuter's Trade Service* (San Salvador).

Sheffield.—ELECTRICITY EXTENSIONS.—The Electric Supply Committee has approved extensions and works at an estimated cost of £5,865, and extensions to mains for general distribution purposes at an estimated outlay of £11,584.

South Africa.—PAARL (CAPE PROVINCE).—A meeting of ratepayers of the Municipality has authorised the raising of a loan of £5,000 for the purpose of making alterations and extensions to the existing electricity supply undertaking, and the signing of a ten years' contract with the Electricity Supply Commission for the supply of electricity to Paarl, subject to the Council obtaining contracts from consumers for 980,000 kWh per annum. The supply to be given by the Commission will be taken from the new power station in course of erection near Cape Town.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Clacton Urban District Council to supply electricity in the parish of Little Holland; the Maidstone Corporation in parts of the rural districts of Maidstone, Malling, and Hollingbourn; and the Barrow-in-Furness Corporation in the urban district of Dalton-in-Furness and part of the rural district of Ulverston.

Application has been made by the Bridgend Urban District Council for a Special Order authorising it to supply electricity to certain parishes in the rural district of Penybont.

Tilmanstone.—ELECTRICITY EXTENSIONS.—The Tilmanstone (Kent) Collieries, Ltd., is to install plant with a capacity of at least 10,000 kW additional to its existing 2,000-kW station.

Torquay.—LOAN.—The Electricity Committee is applying for sanction to loans of £10,000 for mains and services, and £3,000 for renewals.

Ulverston. — INAUGURATION OF SUPPLY. — The electricity supply for the district was formally inaugurated on November 17th. Electricity is obtained in bulk from the Barrow Corporation.

Wrexham.—LOAN.—The Town Council has applied for sanction to a loan of £4,000 for an e.h.p. main, a low-pressure distributor, transformer, switchgear, and additions to buildings. The electrical engineer has been authorised to purchase electric cookers to be let out on hire.

York.—PRICE REDUCTIONS.—The Electricity Committee has recommended to the City Council that a reduction of the flat rate charge for lighting from 4¾d. to 4½d. per kWh be made, and that other charges be reduced 5 per cent., as from the September meter readings.

LOAN.—The Electricity Committee is seeking sanction to a loan of £15,000 for feeder cable extensions.

Tramway and Railway Notes.

Aberdeen.—SUBURBAN TRAMWAY PURCHASE.—According to the *Electric Railway and Tramway Journal*, a proposal to terminate the Town Council's present agreement with the Aberdeen Suburban Tramways Co. as to running powers in the city has been discussed by the Tramways Committee. A statement was submitted by the general manager, and it was agreed to recommend the Council to give six months' notice terminating the agreement. A letter was read from the Aberdeen Suburban Tramways Co. suggesting that the time might now be opportune for the Town Council to acquire the suburban tramways. The Committee decided to remit the letter to the Town Council for instructions.

Continental.—SWITZERLAND.—According to the 1926 budget of the Swiss Federal Railway Department, it is proposed during the coming year to increase the electric rolling stock by the addition of 155 locomotives and motor coaches. Contracts for 80 of the vehicles have already been placed.

Blackpool.—LOANS.—The Finance Committee has decided to apply for sanction to borrow £15,660 for the provision of 12 new tramcars, £8,268 for feeders and negative returns in connection with the Corporation Tramways Department, and £3,300 for the construction of an electric subway under the L.M. & S. Railway in the borough.

Halifax.—TRACK RENEWALS.—The Town Council has decided to apply to the Unemployment Grants Committee for assistance in connection with the proposed relaying of the tramway track from Tuel Lane Bottom in Wharf Street towards Halifax at an estimated cost of £2,295.

Heywood.—NEW ROUTE.—The Town Council has decided to co-operate with Middleton in the construction of a new tramway between Manchester Road, Heywood, and Hollins Lane, Middleton, to enable the Manchester Corporation, which will be granted a lease, to provide a through service of cars between Manchester and Heywood.

Liverpool.—PURCHASE OF UNDERTAKING.—The City Council, on December 2nd, approved of the acquisition by the Corporation of the Waterloo and Crosby tramways as from January 1st next. The proposed transfer provides that the Corporation, where practicable, shall lay forthwith and maintain a double track with a single or overlapping track where a double track is not practicable. The Corporation is to pay the district councils over a period of 21 years at the rate of £750 per annum until the land for widening is obtained, and afterwards at the rate of £1,100 a year. The fare under the Corporation management is not to exceed 2d. from Crosby to Seaforth with not fewer than three intermediate stages of 1d. each. These fares are to be maintained as long as the Liverpool fares are not increased. The number of passengers carried on the Waterloo and Crosby system in 1924 was 3,593,574 and the gross receipts amounted to £26,850, the expenditure £21,310, and the profit £5,540. It is estimated that there will be a saving in operating costs of nearly 3d. per car-mile, equal to £3,000 per annum, when the system is run by the Liverpool Corporation.

London.—NEW "UNDERGROUND" PLANT.—To meet the demand for the increased supply of energy which will be required for operating the new tube extension to Kennington and Morden, the Underground Company has taken steps to augment the existing plant of the Chelsea power station, and also at various points on the system. At Lots Road a third 15,000-kW turbo-alternator is being installed, and a fourth is on order. Two additional boilers, ten h.p. "group" switches, new circulating water strainers, oil filters, and two electrically-driven feed water pumps are also on order.

RECONSTRUCTION OF CHARING CROSS STATION.—A start is shortly to be made with the scheme for rebuilding Charing Cross underground station to enable it to deal with the increased volume of traffic which will arise when the Kennington extension opens next year. Contracts have been placed for the construction of the new subways and circulating area beneath the District Railway permanent-way and platforms. From this intermediate landing new escalators will lead down to the Hampstead platforms and also connect with the street. Contracts for this work have also been placed. The Charing Cross stations (District, Bakerloo and Hampstead) now cater for an annual traffic of 35,000,000 passengers. The new station will be capable of handling 50,000,000 passengers annually.

Salford.—THROUGH-RUNNING.—It was reported at a meeting of the Tramways Committee on December 1st that negotiations with the Bury Corporation for a service of through cars from Salford were approaching completion, and it was hoped that the service would be commenced about January 4th. The fare for the single journey will be 7d. It is intended that a reciprocal service shall be run by the Bury Tramways Committee to Salford.

South Africa.—RAILWAY ELECTRIFICATION.—A *Reuter* message from Cape Town states that it is hoped to complete the electrification of the 174 miles of railway from Glencoe to Maritzburg in Natal by March next. The electrification of the suburban lines in the Cape Peninsula, involving some 65 miles of track and comprising chiefly the Capetown-Simonstown line, is progressing, and it is hoped to have electric trains running in two years' time.

Telegraph and Telephone Notes.

Austria.—TELEGRAPH SERVICE.—The Government telegraph service recently introduced a system of "lightning messages" which are accepted for specially rapid transmission to any part of the country, also to Germany and Poland, at a charge nine times that of the ordinary rate. Another innovation is a reduced charge for telegrams containing over 60 words for transmission between stations provided with Hughes apparatus. On messages containing between 60 and 100 words a reduction of 20 per cent. on the ordinary rate is allowed; between 100 and 150 words, 30 per cent.; between 150 and 200, 40 per cent.; and over 200 words, 50 per cent.

Australia.—TELEPHONE SERVICE.—A speech by the Postmaster-General, in which Mr. Gibson reviewed the operations of his department, seems to show that normal conditions appear to have been reached with regard to telephone arrears; 5,000 new services are being added per month. In placing orders for supplies full advantage has been taken of opportunities offering to encourage Australian industries. Australian firms now are manufacturing nearly the whole of the wire and lead-covered cable used, to the value of £600,000 a year, and when to this is added the expenditure on such other commodities as insulators and conduit the annual amount expended by the department on local supplies is in excess of £1,000,000. The development of the telephone service has been marked in country districts, where the rate of increase is now higher than in the metropolitan areas.

Canada.—TELEPHONE SERVICE.—At the last census (1921) there were 11 telephones to every 100 of the population; the gross annual revenue per telephone (including all long-distance tolls and other charges) was £8 12s., compared with £9 13s. in the United States, and slightly above £10 in the United Kingdom. The actual cost for a private telephone installed in a residence is 11s. per month with unlimited calls. In the Prairie Provinces there are two rural telephones for every one urban.—*Reuter* (Ottawa).

At the beginning of the present year there were 1,083,964 telephones in Canada, as compared with 1,022,782 at the beginning of 1924. Next to the United States, Canada has the largest number of telephones in use *per capita*—one telephone to every nine inhabitants, as compared with England's one to thirty-seven.

China.—NEW RADIO STATION.—The Shansi authorities are constructing a wireless station at Hou Hsiao Ho Taiyuan, Shansi provincial capital. A number of experts and skilled mechanics have been engaged from Peking to carry out the work.

LONG-DISTANCE TELEPHONY.—A long-distance telephone service between Kalgan and Suiyuan, which had been under construction since last winter, was recently completed, and according to General Wu Te-ching, chief military engineer for the North-eastern Army and Manager of the Chinese Telegraph Administration at Shanghai, work was to commence on October 15th on the first long-distance telephone service in this part of China, connecting Shanghai and Nanking and also bringing within speaking range of Shanghai the cities of Soochow, Wusih, Shangchow, &c. It is hoped to have the line completed by January 1st, 1926. Another long-distance line stretching from Nanking to Tsinanfu, *via* Tientsin, was to be started simultaneously. The total cost of the lines from Shanghai to Nanking and from Nanking to Tsinanfu will be approximately $300,000. The rates charged for using the service will probably be $3.50 for five minutes' conversation between Shanghai and Nanking, $8 between Shanghai and Tientsin, and $4 between Tientsin and Mukden.

Marine Radio Operators.—STRIKE.—Representatives of several trade unions were present at a meeting of the Seafarers' Joint Council which was held last week in London to consider the strike of marine wireless operators. It is understood that the Wireless Operators' Union brought forward a resolution which the National Sailors' and Firemen's Union objected to and refused to discuss business until it had been withdrawn. The meeting was accordingly suspended.

The President of the Board of Trade informed the House of Commons that returns from the principal ports showed that up to December 4th (evening) 25 passenger ships and 124 cargo vessels had sailed without radio-telegraphists. Passengers had been warned of the suspension of the regulations requiring ships to carry operators.

Shetland-Iceland Cable.—CONCESSION RENEWED.—It is announced by the *Financial News* that the Great Northern Telegraph Co.'s concession for a cable from the Shetland Islands to the Faroe Islands and Iceland has been renewed, subject to the approval of the Icelandic Alting.

South Africa.—TELEGRAPH AND TELEPHONE DEVELOPMENT.—Mr. Thomas Boydell, Union Minister of Posts and Telegraphs, recently stated that since the present Government took office in June, 1924, nearly 10,000 miles have been added to the country's telegraph and telephone facilities, which fact, says the *British S.A. Export Gazette*, ought to impress upon British manufacturers the importance of the Government business likely to be on offer shortly in this connection. Official purchases of telephone and telegraph equipment in 1925 reached a higher figure than the £265,685 recorded in 1924, which was in its turn an advance on the £122,201 registered in 1923, and an effort is being made to add 3,000 miles to the farm telephone service before the end of the financial year in March. In 1924 British firms handled contracts to the value of £205,314 out of a total of £265,685, but both Swedish and German efforts to participate to a greater extent than formerly are very evident. There would appear to be little danger of Britain losing considerable ground, however, says the *Gazette*.

The Telephone Service.—DUTCH CABLE REPAIRED.—The submarine telephone cable to Holland, which broke about 10 miles from Aldeburgh (Suffolk) on November 17th, has been repaired. In spite of rough weather and heavy seas, the cable ship was able to find both ends of the broken line, and on December 3rd the eight telephone circuits contained in this cable were again available for use.

FIRE CALLS.—Statistics supplied by the London Fire Brigade show that out of 7,478 calls received in the London area, no fewer than 1,800, or over 24 per cent., were received through subscribers' or call-office telephones, which figures indicate the increasing use of the telephone for firm-alarm purposes, notwithstanding the fact that there are now 1,700 street fire alarms throughout the London Fire Brigade area.

Radio Notes.

Australia.—LICENCES.—According to the Postmaster-General, by the end of the first year of broadcasting operations, *i.e.*, August, 1925, nearly 70,000 listeners' licences had been issued, while for the year ended June 30th last the revenue amounted to £118,909.

Canada.—LICENCES.—The number of amateur wireless receiving licences issued for the nine months of the current year ended September 30th showed an increase of 7,823 over the previous year, making a total in use of 64,682. Ontario issued half the licences with a total of 32,833. The cost of each licence is one dollar per annum.—*Reuter* (Ottawa).

EDUCATIONAL.—A "University of the Air" is to be established by the Manitoba Agricultural College, in conjunction with the Manitoba telephone system broadcasting station at Winnipeg. According to Prof. Clark Hopper, a series of diploma courses will be instituted by the college, all instruction being given by wireless. Examinations will also be conducted by radio, and students who are successful will be given diplomas.

Daventry.—AERIAL MISHAPS.—The recent severe frost coated the aerial of the B.B. Co.'s high-power station (5 XX) with ice, the weight of which brought down some of the wires in the early hours of Saturday morning, December 5th. Temporary repairs were made, but during the night a further breakdown occurred; until repairs have been completed, the service will be maintained at reduced power.

European Wave-lengths.—OFFICIAL VIEW.—It is considered (by the *Radio Times*) undesirable that listeners should hold hopes of an improvement which has no possibility of being fulfilled for some time to come. Rather they should know definitely that the existing state of affairs must unfortunately continue during the present winter. No scheme satisfactory to all who must participate in it has been yet devised by which room can be found for 150 broadcasting stations in a wave-band which can only properly accommodate 100 stations. New proposals are being drafted, but they cannot be put into immediate operation. For the time being, therefore, no general alteration will be made in the wave-lengths of European broadcasting stations. Jamming between one station and another must get worse before it can become better.

BRUSSELS CONFERENCE.—The Co-ordination Committee of the Council of the International Radio-phony Union, assisted by engineers, will meet in Brussels on December 14th, when several plans for stabilising the European wave-length situation will be discussed, says the *Daily Mail*, which points out that the scheme drawn up at the last conference of experts, while excellent in theory, has proved entirely unsatisfactory in practice. At present one of the worst culprits is Toulouse, which on one occasion recently was found to have changed its wave-length six times in 24 hours.

Germany.—NEW STATION.—Frankfurt is erecting a new high-power broadcasting station which will be ready in February. This 10-kW station, says *The Times*, will be a considerable improvement on the present station, which is accommodated in the Post Office buildings. Frankfurt has at present 65,000 listeners, and arrangements were recently made to put crystal users in touch with foreign stations, which scheme has given much satisfaction.

RESTRICTION REMOVED.—The removal of restrictions on reception in occupied territory will give a new impulse to the radio industry in that district. The Post Office has not yet published an official statement, and doubt appears to exist as to the interpretation of the exemption. The ordinance of the Rhineland Commission of November 20th refers to the removal of restrictions on "wireless telegraphic receiving instruments." Listeners will be obliged to notify the police, who will have to supply a list of the names of users to the military authorities. Stations for broadcasting within the occupied zones continue to be prohibited.

India.—BROADCASTING COMPANY.—Last summer it was announced that applications for permits to establish a broadcasting company for India, together with applications for a separate company for Burma, would be received up to August 31st by the Director-General of Posts and Telegraphs, Wireless Branch. At the request of interested parties the last day for tendering was postponed to December 7th. There is reason to believe that tendering was confined to interests associated with the Indian Radio Telegraph Co., Ltd., which some time ago took over the Marconi interests in India, says *The Times*. The receiving licence is to cost not Rs.15 per annum, as at first suggested, but Rs. 10. Consequently the percentage payable to the broadcasting company has been raised to 15 per cent. Various suggestions have been made as to meeting the claim of the promoters that they should be permitted to create a second source of revenue in addition to the percentage, and it is now announced that applications will be considered which provide for the payment to the company, by importers, of a royalty on imported wireless apparatus. The duty on such apparatus was fixed some time ago at 2½ per cent., as compared with a general import rate of 15 per cent. Another question as to which negotiations have been taking place is the extent to which the broadcasting programme may be utilised for the publication of Government announcements and *communiqués*. Mr. McCarthy Jones has been selected to be the general manager of the Indian Radio Telegraph Co., Ltd., and is proceeding to India to take up his duties.

Italy.—NEW STATION.—The new broadcasting station at Milan was inaugurated on December 9th; it will work on a wave length of 320 metres for the time being.

The *Morning Post* draws attention to modifications recently introduced in the law controlling radio in Italy. Owners of receiving sets may pay the annual fee for the licence in monthly instalments of 8 lire (about 1s. 4d.), and where sets are installed in public places, or for purposes of gain, special contracts will have to be made with the broadcasting companies. Manufacturers of receiving apparatus must obtain from the Ministry of Communications a special permit, which costs 500 lire annually.

Radio material is to be taxed; for example, the tax on every valve will amount to 6 lire, on every crystal set 12 lire, on every loud-speaker 24 lire, and on every receiving set having one or more valves 36 lire, in addition to the tax on the parts already mentioned, the amounts being added to the buyer's invoice at the time of purchase. Ten per cent. of the taxation receipts go to the State, and 90 per cent. to the broadcasting company. Those who do not comply with the law are, in addition to the penalties laid down in the Penal Code, liable to fines of from 1,000 to 2,000 lire for all violations committed by manufacturers, merchants, and shopkeepers, and 200 lire where receiving sets are kept without a licence.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Aberdeen.—December 16th. National Committee for the Training of Teachers. Electrical work in connection with two hostels and subsidiary buildings at Kittybrewster, Aberdeen. Specifications from Mr. J. A. O. Allan, architect, 25, Union Terrace, Aberdeen.

Ashford.—December 14th. Electricity Department. Concrete engine foundations, concrete cooling pond, reinforced-concrete road, steam and small electric circulating water pump, fuel-oil pump, oil-purifying plant, fuel-oil storage tanks, &c. (November 27th.)

Australia.—MELBOURNE.—April 12th, 1926. State Electricity Commission of Victoria. Plant for the Sugarloaf and Rubicon hydro-electric scheme, consisting of turbo-generators, transformers, switchgear, cranes, and accessory plant. (See this issue.)

Victorian State Railways. January 20th, 1926. Automatic battery-charging equipment.* January 13th. Double recording wattmeter.*

Banff.—December 14th. Town Council. Electrical work in connection with the new Town Hall. Specifications from Town Clerk.

Belgium.—December 30th. Belgian Ministry of National Defence, 10, Rue du Méridien, Brussels. Wireless telegraph apparatus for use on military aeroplanes. Particulars (Cahier des Charges Special, No. 636) for 4 fr., from 15, Rue des Augustins, Brussels.

Brentwood.—January 1st. Guardians of Billericay Union. Electrical wiring in conduit and installation of complete electric generating plant at the Institution, Billericay. (See this issue.)

Edinburgh.—December 14th. District Board of Control. Electrical and heating work at Bangour Mental Hospital new X-ray building. Specifications from Mr. J. D. Gibson, surveyor, 60, Frederick Street, Edinburgh.

January 4th, 1926 Electricity Supply. Two 1,200-b.h.p., 6,600-V, 3-ph. induction motors. (See this issue.)

Edmonton.—Education Committee. Wiring offices at Brettenham Road, Edmonton, for electric light. (See this issue.)

Folkestone.—Electric lighting and telephone installation at the Leas Cliff Hall. (See this issue.)

Leamington Spa.—December 17th. Corporation. Installation of electric light, electric bells, and wiring of motors at the Royal Pump Rooms. (See this issue.)

London.—ISLINGTON.—December 17th. Electricity Committee. One 75-kW a.c. motor and d.c. generator, with starters, switchgear, &c., and three 5,000-kVA Scott-connected transformers, &c. (November 20th.)

H.M. OFFICE OF WORKS.—December 18th. Electric wiring in conduit of the Western Annexe, &c., at the British Museum. (December 4th.

LONDON COUNTY COUNCIL.—December 31st. Renewal of the storage battery at Bexley Mental Hospital. (See this issue.)

Manchester.—December 30th. Electricity Committee. One single unit (or, alternatively, one double unit) three-phase induction regulator. (See this issue.)

New Zealand.—WELLINGTON.—February 16th. Outdoor switchgear for the Waikato electric power scheme.*
February 16th. Outdoor switchgear for the Waikato electric power scheme.*
AUCKLAND.—February 8th. Auckland Electric Power Board. Overhead cotton-covered triple-braided cable.*
February 22nd. 15-amp. cut-outs.*

Preston.—January 15th. Electricity Department. Supply and erection of approximately 15 miles of 33,000/45,000 V double transmission lines. (See this issue.)

South Africa.—JOHANNESBURG.—January 28th, 1926. S.A. Railways and Harbours. Eleven 4-ton electrically-driven wharf jib cranes and seven electric capstans for Durban Harbour. Secretary to the Tender Board, S.A.R. Headquarters, Johannesburg.*
UNION TENDER BOARD.—January 28th. Miscellaneous telegraph and telephone materials for the Department of Posts and Telegraphs.*

Uruguay.—February 23rd, 1926. State Electricity Supply Works. Porcelain insulators and accessories.*
D.c. and a.c. meters.*

Wakefield.—Installation of electric lighting at Outwood Council School, Stanley, near Wakefield. P. Beaumont, West Riding County Council Education Offices, 8, St. John's North, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Accrington.—Electricity Committee. Accepted:—
Two years' supply of cable.—W. T. Glover & Co., Ltd.

Birkenhead.—Electricity Committee. Accepted:—
220 yd. low-pressure 4-core cable (£344).—Macintosh Cable Co., Ltd.

Bradford.—Tramways Committee. Accepted:—
Eight miles round copper trolley wire (£800).—Collier Bros. (agents for Thos. Bolton & Sons, Ltd.).
New No. 5 model 45-h.p. engine for motor tower wagon (£220).—Associated Equipment Co., Ltd.

Hornsey.—Electricity Committee. Recommended:—
Turbo-generator and condensing plant (£16,520); air filter (£213); Lea recorder (£210).—Brush Electrical Engineering Co., Ltd.

Hull.—Tramways Committee. Accepted:—
500 tons rails, 12 tons fishplates, and 7⅛ tons of sole plates (£6,037).—Bolckow, Vaughan & Co., Ltd.

Telephones Committee. Accepted:—
Bronze wire (£369); cable (£66).—W. F. Dennis & Co., Ltd.
Lead-in wire (£147).—London Electric Wire Co.
Switchboards (£190).—British L. M. Ericsson Manufacturing Co., Ltd.
Cable (£66).—W. F. Dennis & Co., Ltd.

The City Council, on Thursday last week, confirmed the recommendation of the Telephones Committee accepting tenders for German-made cable and wire. An amendment was moved that the lowest British tender should be accepted, and in the discussion a statement was made that the Hull Board of Guardians was paying £400 per week additional relief this year in consequence of unemployment. The reply was that it was ridiculous to argue that we should not trade with other countries. We must buy in the cheapest market and stimulate international trading.—*Manchester Guardian.*

Kilmarnock.—Ayrshire Education Committee. Accepted:
Installing electric light at a new special school.—William Johnstone and Son.

Leeds.—Waterworks Committee. Accepted:—
Electric motor and pump at Moortown reservoir (£208).—Mather and Platt, Ltd.

Tramways Committee. Accepted:—
150 electric equipments for new rolling stock (£85,000).—Metropolitan-Vickers Electrical Co., Ltd.

Electricity Committee. Accepted:—
Cable.—£2,748, W. T. Henley's Telegraph Works Co., Ltd.; £1,560, Macintosh Cable Co., Ltd.; and £1,095, Enfield Cable Works, Ltd.

Liverpool.—Tramways Committee. Accepted:—
New tramway works and car depôt in Edge Lane (£243,623).—W. Moss and Sons, Ltd.

London.—POPLAR.—L.C.C. Education Committee. Electric lighting at George Green school:—

A. Hawkins & Sons (Recommended)	**£559**
Malcolm & Allen, Ltd.	594
Commercial Telephone and Electrical Co., Ltd.	629
Star Electrical Co.	640
J. G. Sneath	698

UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON.—Additional plant for Lots Road power station.—According to *Modern Transport*, the third 15,000-kW turbo-alternator is being installed, whilst a fourth is on order. Main contractors for the turbines, C. A. Parsons & Co., Ltd.; sub-contractors for the alternators, Metropolitan-Vickers Electrical Co., Ltd.; condensers, W. H. Allen, Son & Co., Ltd.
HAMMERSMITH.—Electricity Committee. Accepted:—
Installation of reactors between the two- and three-phase switchboards (£465).—British Thomson-Houston Co., Ltd.
ADMIRALTY.—Accepted:—
Six Yarrow patent water-tube boilers (land type) with Yarrow superheaters for Portsmouth electric power station.—Yarrow & Co. (1922), Ltd.

Manchester.—Tramways Committee. Accepted:—
Copper trolley wire.—F. Smith & Co., incorporated in the London Electric Wire Co. & Smiths, Ltd.
Bronze trolley wire.—Elliott's Metal Co., Ltd.
Cadmium trolley wire.—Rd. Johnson & Nephew, Ltd.
Education Committee. Accepted:—
Rearrangement of electric lighting at Bangor Street school.—Ward and Booth; at Grange Street school.—Lancaster & Bowen, Ltd.
Electricity Committee. Accepted:—
Cable.—Johnson & Phillips, Ltd.

Oldham.—Electricity Committee. Accepted:—
Construction and erection of a new cable bridge across the railway at Greenhill.—Babcock & Wilcox, Ltd.

South Africa.—BULAWAYO, RHODESIA.—Municipality. Accepted:—
Three B. & W. 10,000-lb. boilers, with mechanical stokers, superheaters, and economisers, £14,000; two Belliss-Witton (G.E.C.) turbo-alternators, condensing plant and auxiliaries and engine room steel work, £13,130; one Yarway spray cooling plant, complete, £1,100; steam and auxiliary piping, including Cope's regulators for boilers, £2,000.—Reunert & Lenz, Ltd.
One Johnson & Phillips eleven-panel truck-type switchboard, complete (£1,328).—Bartle & Co.—*S.A. Mining and Engineering Journal.*

Spain.—MADRID.—Babcock & Wilcox (Spain) has obtained the order for eight electric cranes for the port works on the Guadalquivir.—*Reuter's Trade Service* (Madrid).

York.—Electricity Committee. Recommended:—
6,000-kW turbo-alternator, &c. (£18,998).—Oerlikon, Ltd.
Switchgear (£680).—Metropolitan-Vickers Electrical Co., Ltd.

According to the *Yorkshire Post*, it was stated at a meeting of the City Council that thirty tenders had been received from British, Swiss, French, Dutch, and Belgian firms. The lowest English tender was something over £24,000. Much of the material under the Oerlikon contract would be made in England; less than £7,000 would be spent in Switzerland. During a discussion the referring-back of the Electricity Committee's recommendation was proposed and defeated. A member of the Council said that the high rate of British tenders were due to the operation of "rings."

Forthcoming Events.

Institution of Mechanical Engineers.—Friday, December 11th. At the Institution, Storey's Gate, S.W. At 6 p.m. Papers on "Foundry Practice," by Mr. J. G. Pearce; and "Some Applications of Research to Modern Foundry Practice," by Mr. J. E. Fletcher.

Nottingham Society of Engineers.—Monday, December 14th. At the Victoria Station Hotel. At 7.30 p.m. Papers on "Buying of Second-hand Machinery," by Mr. M. A. Crosbie; on "Electric Vehicles," by Mr. A. O. Fawcett; on "Electricity *v.* Gas," by Mr. E. Mellon; on "Electric Welding as Applied to Boiler Repairs," by Mr. F. G. Skerritt; and on "Engineering in the Fire Service," by Chief Inspector Stokes.

Institution of Civil Engineers.—Tuesday, December 15th. At the Institution, Great George Street, S.W. At 6 p.m. Paper on a "Pressure-boosting Station for the Waterworks of the City of Montevideo," by Mr. A. Honeysett.

Society of Technical Engineers.—Wednesday, December 16th. At the Queen's Hotel, Birmingham. At 7.30 p.m. Lecture on "Some Present-day Needs of the Electrical Industry," by Mr. A. G. Ellis.

Edinburgh Electrical Society.—Wednesday, December 16th. At the Royal Scottish Society of Art, 117, George Street. At 8 p.m. Paper on "Radio-Telephony and Broadcast Receivers," by Mr. F. Boyd.

Radio Society of Great Britain.—Wednesday, December 16th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 6 p.m. Annual general meeting. Paper, "Some Facts and Notions About Short Waves," by Mr. D. Sinclair.

Paisley Association of Engineers.—Tuesday, December 15th. At 16, High Street, Paisley. At 7.30 p.m. Paper on "Motor Breakdowns: Their Causes and Rectification," by Mr. T. T. D. Geesin.

Institution of Electrical Engineers.—Thursday, December 17th. At the Institution, Victoria Embankment, W.C. At 6 p.m. Paper on "The Power Losses in Magnetic Sheet Material at High Flux Densities," by Mr. C. E. Webb.

(Mersey and North Wales (Liverpool) Centre).—Monday, December 14th. At The University, Liverpool. At 7 p.m. Paper on "Post Office Wireless Stations," by Mr. E. H. Shaughnessey.

(North-Eastern Centre).—Monday, December 14th. At the Armstrong College, Newcastle-on-Tyne. At 7 p.m. Paper on "Recent Improvements in the Insulation of Electrical Machinery," by Lt.-Col. K. G. Maxwell and Mr. A. Monkhouse.

(North-Western Centre).—Tuesday, December 15th. At the Engineers' Club, Manchester. At 7 p.m. Paper on "An All-Electric House," by Prof. S. P. Smith.

(London Students' Section).—Wesdnesday, December 16th. Second annual dance.

(Sheffield Sub-Centre).—Wednesday, December 16th. At the Royal Victoria Hotel, Sheffield. At 7.30 p.m. Informal evening discussion on "Engineering Difficulties and How They Were Surmounted."

Birmingham Electric Club.—Friday, December 18th. At the Grand Hotel, Colmore Row, Birmingham. At 7 p.m. Annual meeting.

British Electrical Development Association.—Friday, December 18th. At Australia House, Strand. Display of electrical films.

Junior Institution of Engineers.—Friday, December 18th. At E.L.M.A. Lighting Service Bureau, 15, Savoy Hill, Strand, W.C. At 7 p.m. Lecture on and demonstration of industrial and domestic electric lighting.

Manchester Electro-Harmonic Society.—Friday, December 18th. At the Albion Hotel, Piccadilly, Manchester. Smoking concert.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—
Heating moulds for bowler hat making.
A wooden lampholder adaptor, the top of which has two holes drilled to permit of flexible leads being taken out.
STAR signalling instruments.
Also we have an inquiry for the present address of Messrs. H. W. Butler & Co., late of Great Ormond Street.

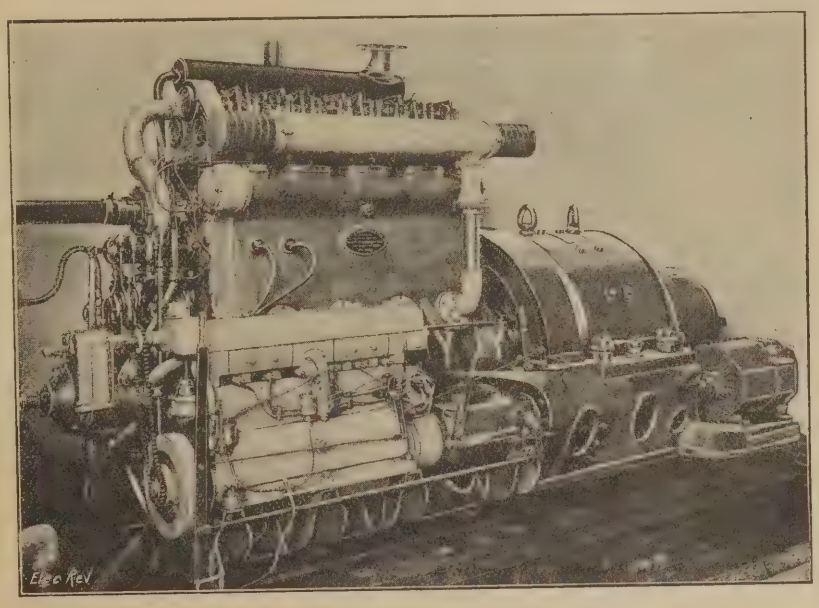
Notes.

"Unchokeable" Ash Pumps.—In connection with the ent description of the St. Marylebone electricity generating nt, we have been asked to point out that Messrs. Blackstone i Co., Ltd., are the sole manufacturers of the "unchoke-e" ash pumps used in that station, each of which is capable handling 70 tons of ash per hour.

The Whitworth Society.—The third annual commemora-n dinner in memory of Sir Joseph Whitworth will be held 6.30 for 7 p.m. on Monday, December 21st, at the Holborn staurant, Kingsway, London, Mr. Wm. Sisson, president, in chair. Further particulars can be had from the Hon. Secre-y, Whitworth Society, Institution of Mechanical Engineers, rey's Gate, Westminster, S.W.1.

Diesel-Electric Railway Traction.—The success of the new itish light Diesel engine, specially designed by Messrs. Wil-m Beardmore & Co., Ltd., and built in one of their Glasgow rks, for the oil-electric cars recently introduced on the nadian National Railways, some details of which will be ind on p. 665 of our October 23rd issue, is attracting interest ongst railway engineers. The general problem to be solved is that of reducing operating costs on lines where the low nsity of traffic does not justify steam traction, and puts elec-fication out of the question owing to the capital outlay volved. It is generally felt that by putting into commission nucleus of nine cars—two of which are eady in service — the Canadian tional Railway has taken an impor-nt step towards its solution.

At the luncheon during the trial trip the first articulated car between Mon-al and Ottawa, Mr. C. E. Brooks, ief of the Motive Power Department, N.R., outlined a trip he made to weden and Great Britain to examine e possibilities of adapting oil-burning gines of the Diesel type to railway actice in Canada. Such engines were use in Sweden, but the space they cupied and their weight in relation to eir power-producing qualities were far o great to adapt them to service in anada. He found in the light aero gine in the Beardmore plant at Glas-w the basis for the engine which had en installed in the articulated car. The nearest approach to this engine," e continued, "weighs from three to ur times as much per horse power. Its ssibilities are great, provided we can aintain it reasonably. The fuel cost is uch lower than our expectation. We lt that if we could operate the small r at between 4 and 5 cents a mile for el, we would be satisfied. We have und that we are able to operate it at nder two cents a mile for fuel and, in me cases, we have come very close to one cent. Our tests ave proved that it compares very favourably with any other rm of transportation."



Diesel-Electric Railway Traction Plant.

The special features in favour of the oil-electric type of car re low cost of fuel oil, lubricating oil, and engine maintenance, niform acceleration, elimination of the roughness of operation nd high maintenance cost of heavy mechanical transmissions, acility of control from either end of the car, and operation f the engine under its most economical conditions by main-aining a constant load throughout a large variation in car peed. The accompanying illustration shows a 160-b.h.p. ngine and generator on test in the makers' Glasgow works; is fitted in the smaller type of car, which carries 56 passen-ers and luggage.

Further particulars of the feat of the new oil-electric car, hich crossed Canada from Montreal to Vancouver in 67 ours, show that two world's "records" were achieved, one or the fastest run for such a distance (2,937 miles), and the ther for the longest non-stop run ever made. The car left Montreal 16 hours after the C.N.R. fast "Continental imited," passed it at Winnipeg, and arrived in Vancouver 2 hours ahead of it, the steepest grades of the Rockies being limbed at an average speed of 40 m.p.h. From the time he car left Montreal until it reached Vancouver the engine ever stopped running.

According to *The Times*, five of the principal trunk line ailways entering New York City have ordered oil-electric ocomotives to displace the coal-burning locomotives. In a ecent test of fuel and lubrication, the cost of the steam locomo-ive showed itself to be more than six times the cost of the il-electric locomotive, which is operated as an internal-com-ustion engine using low-grade fuel oil. It is calculated that f all trunk lines employ oil-electric locomotives the railways' annual fuel bill can be reduced by $375,000,000 per annum.

Agricultural Hall Lighting.—CORRECTION.—In our Novem-ber 27th issue, in a note headed "The Public Works and Roads Exhibition," reference was made to the re-lighting of the Agricultural Hall and in connection with the new installa-tion the title of the Engineering & Lighting Equipment Co., Ltd., of St. Albans, was given in error. We apologise for the accidental omission of the words "Engineering &."

Electrical Power Engineers' Association.—ANNUAL DINNER.—The third annual dinner of the West Yorkshire Section of the Electrical Power Engineers' Association took place at the Great Northern Hotel, Leeds, on Saturday, December 5th. The chair was taken by Mr. A. J. S. Waddell, of Bradford, who, together with Mrs. Waddell, had held a reception of the guests, numbering over 150.

After the loyal toast, Councillor J. W. LONGLEY, chairman of the Bradford Corporation Electricity Committee, in proposing "The Association," said the E.P.E.A. was a body which he believed everybody in the electrical world appreciated. Bradford valued very much the help rendered by it in the difficult times through which they had to pass in that city. Members of such an Association could either make or mar the electricity industry, or the undertakings with which they were connected, and it was a pleasure to be able to state that in every respect its members appeared to feel themselves a part of such undertakings. The Association had spent some considerable time in drawing up a scheme for the training of apprentices. Everybody was agreed that nothing was more necessary than that apprentices should be given the finest and most thorough training possible, not only in the electrical world, but also the mechanical world.

Mr. A. L. LUNN, of Manchester, responded, and said they all felt proud of their Association. It was a fact that the members were more prosperous to-day owing to the efforts of the E.P.E.A., which had given them a standard of living more commensurate with their responsibilities. With regard to the training scheme, they all knew the rather hopeless way in which men had been trained in power stations in the past and that must never be repeated.

The toast of "The National and District Joint Boards" was proposed by Mr. THOMAS ROLES, electrical engineer and manager to the City of Bradford, who said that in Bradford they were very pleased that such Boards and the E.P.E.A. were in existence. No industry could expect to progress unless it could attract the right kind of man; and if only for the fact that the Association had been instrumental in raising the standard it had surely proved its worth.

In responding, Alderman WALKER, of Manchester, chairman of the National Joint Board, said that the Joint Boards had been able to bring about a scale of salaries which had proved acceptable to all parties, and after five or six years' working had gained the confidence and respect of both the employers and employed. If an adequate salary was paid, the right man would be obtained; low salaries resulted in a low level of service. With regard to the training scheme, it was essential that the training should be an all-round one to enable the lads to pass the A.M.I.E.E. examination, or its equivalent. A ground training in the power station or on the mains was not sufficient. Training in the general work of the undertaking should be given, together with an insight into the business organisation and the system of arriving at costs.

Mr. H. P. WADSWORTH, of Huddersfield, proposed "The Guests," and coupled with the toast the Press.

A musical programme, given by a party from Huddersfield, added to the pleasure of the proceedings.

Visit to Electricity Works. — Members of the Lancaster Chamber of Trade paid a visit to the Caton Road electricity works of the Lancaster Corporation on December 2nd, and the following night heard a lecture by Major G. C. Milnes, on "Electricity, its Production, Distribution, and Costing," in the Town Hall.

Appointments Vacant.—Boiler-house assistant engineer (£349) for the Kingston-upon-Hull electricity department; mains assistant (£156), for the Southport Corporation electricity department; plumber-jointer, for Ashford (Kent) U.D.C. electricity department; telegraph foremen (£400), cable jointer (£425), for the Government of the Gold Coast. (See our advertisement pages to-day.)

Local Societies.—On December 2nd, the Edinburgh Electrical Society paid a visit to the Department of Engineering, University of Edinburgh. A brief account of the buildings and equipment, illustrated by lantern slides, was first given by Prof. Hudson Beare, M.Inst.C.E., after which a tour was made through the various laboratories, the workshops, and the drawing office. Various tests and demonstrations were witnessed by the party, including steel bar tension and cement briquette tensile tests, and other tests on water wheels and turbines, &c.

A Turbine Wrecked on the Rand.—As we go to press it is reported in the daily papers that an explosion occurred at the Vereeniging power station of the Victoria Falls & Transvaal Power Co. on December 8th. The shaft of one of the A.E.G. (German) 10,000-kW turbine-driven generators broke, and the machine was wrecked, parts flying through the roof and in other directions. The other three generating sets were damaged, but it was hoped that they would be quickly set at work again. Fortunately no one was hurt. As all the stations of the company, of 216,000 kVA aggregate capacity, were fully loaded, the supply to the Rand mines was curtailed in the central area.

Electrical Association for Women.—The new Glasgow and District Branch at its first meeting enrolled over 50 members, and the Committee has already drawn up its first programme of activities, which include a visit to the Dalmarnock Power Station and a lecture on "Home Lighting." The secretary of the branch is Miss R. F. Kennedy, 251, Sauchiehall Street, Glasgow. The Association has arranged a lecture on electricity for the nurses at the Westminster Infants' Hospital during this month, which will be given by Miss E. E. Wilson, the chair being taken by Mrs. Leslie Gamage, deputy chairman and hon. secretary of the Hospital Appeal Fund. Members of the Association were to visit on December 8th a special display of "Sun Ray" radiators at 50, Oxford Street, London, when a short talk on "The Sun Ray Radiator and Sun Ray Applications" was to be given by Mr. A. F. Berry.

Finsbury Technical College.—In the course of the Streatfield Memorial Lecture, which was given at Finsbury Technical College on December 3rd by Mr. F. H. Carr, director of British Drug Houses, Ltd., under the chairmanship of Sir William J. Pope, the lecturer said that the college could no longer be continued, and in a few months it would close, in spite of the great purpose it had served. This would produce in many a feeling of deep disappointment, though they would remember that warm thanks were due to the City and Guilds of London Institute for its great work there for over 40 years When the laboratories and buildings of the college were vacated it was not impossible that the City and Guilds would assign them for the development of a college of chemical engineering. There was need for chemical engineering training on an adequate scale, and he believed that the council of the Institute would give favourable consideration to any scheme which offered reasonable prospects of success. He would look to the council named to appoint a delegacy consisting of representatives of the Institute, the Association of British Chemical Manufacturers, the Institution of Chemical Engineers, and others who might help in the realisation of that great purpose. With buildings and equipment privided, £10,000 per annum, *plus* fees from students, would probably maintain a College of Chemical Engineering.—*The Times.*

B.E.S.A. Publications.—The British Engineering Standards Association has just published the following new and revised specifications:—No. 42, 1925, Reciprocating Steam Engines for Electrical Purposes; No. 120, 1925, Gas Engines for Electrical Purposes; No. 211, 1925, Heavy-Oil Engines for Electrical Purposes, Diesel Type, Air-Injection; No. 212, 1925, Heavy-Oil Engines for Electrical Purposes, Surface-Ignition Type; and No. 213, 1925, Heavy-Oil Engines for Electrical Purposes, Airless-Injection, Cold Starting Type. The specification for reciprocating steam engines is a new edition of the original specification No. 42 issued in 1909. All the clauses have been modified and brought up to date and a number of additions have been made. The rating of the steam engine is specified as the load in b.h.p. assigned to it by the maker to satisfy the requirements of the purchaser and to comply with the specification: a margin of capacity of 25 per cent. above the rated output is called for. The cyclic irregularity has been defined and limits given, and the question of flywheel effect is dealt with. Steam and exhaust pressures, standard speeds, speed adjustments for paralleling and governing, and the equipment which is to form part of the standard engine are also given, together with appendices setting forth the particulars which should be supplied to the engine-maker and the particulars to be supplied by him.

The four specifications for gas engines and heavy-oil engines were prepared concurrently, and the aim has been to secure consistency and uniformity regarding the salient features as far as practicable. The rating in each case is defined as the load in b.h.p. which the engine can carry continuously for a period of 12 hours at its rated speed when working under the stated conditions of pressure and temperature, and in the case of gas engines, with gas of the given calorific value. The engine must be capable of developing for one hour, 10 per cent. above this rating. Clauses are also included regarding the selection of the size of engine required to suit the capacity of a specified generator; the cyclic irregularity and the question of flywheel; the permissible variation in speed for paralleling and governing; the allowance to be made when an engine is working under non-standard atmospheric conditions; gas or fuel consumption; and tests and standard equipment.

The Association has also issued two publications, one giving standard dimensions for dynamos, distributor mountings, starting motors, and dynamotors for automobiles (No. 5,031-503 1925), and the other containing similar dimensions for small couplings for internal-combustion engines (No. 5,035, 1925). The first includes four specifications for the over-all and other important measurements, which are useful to the designer when arranging the placing of the various accessories in the chassis. When universally adopted it will be possible to replace or interchange the various makes of these fittings without costly alterations. The second publication, or fifth specification, is also dimensional, and gives all that is necessary for interchangeability. The dimensions in each are given both in inches and millimetres. The new standards contained are based upon the provisional standards Nos. 15, 16, 17, 18, and 19 of the Society of Motor Manufacturers and Traders, Ltd., published in the Data Sheets of the Institution of Automobile Engineers. They were submitted to the B.E.S.A. for consideration and approval, and have now been issued as British standards.

Copies of these publications may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d. each, post free.

STANDARDISATION RULES FOR ELECTRICAL MACHINERY.—The revision of B.E.S.A. Publication No. 72-1,917, Standardisation Rules for Electrical Machinery, is now nearing completion. Early in the deliberations of the committee which has undertaken the revision it was decided to divide this publication into eight different parts, each part to be issued as a separate specification. Two parts have already been issued, namely No. 168, "Electrical Performance of Industrial Electric Motors and Generators with Class A Insulation," published in February, 1923, and No. 173, "Electrical Performance of Traction Motors (Direct-current Series Wound)," published in December, 1923. The B.E.S.A. now announces the publication of three further parts, as follows:—

B.S.S. No. 169, "Electrical Performance of Large Electric Generators and Motors (Load with Overload Rating).

B.S.S. No. 225, "Electrical Performance of Alternators of the Steam Turbine-driven Type."

B.S.S. No. 226, "Electrical Performance of Large Electric Generators and Motors (Continuous Maximum Rating)."

The temperature rises included in these three specifications were agreed at the meeting of the International Elctrotechnical Commission, held at The Hague last April. It is hoped to complete the three remaining parts of the revised publication, *i.e.*, Transformers, Rotary Converters, and Fractional Horse-power motors, early in the New Year.

Institution Notes.

Institution of Electrical Engineers.—WESTERN CENTRE.—A lecture, illustrated with lantern slides, on "Switchgear Developments During the Last 20 Years," by Mr. J. H. Thomas, M.I.E.E., Cardiff, of the technical staff of the General Electric Co., Ltd., attracted a large attendance at the South Wales Institute of Engineers, Cardiff, on November 30th. The meeting was presided over by Mr. J. W. Burr, borough electrical engineer, Swansea, and a discussion followed. The lecturer declared that this country was far ahead of the Continent and the United States with regard to switchgear for industrial and colliery work. It was in this direction that the most radical changes had taken place in modern times. Development had been so rapid with regard to high-pressure work that the standardisation of a great many important classes of gear had been impossible, and any attempt at standardisation would have retarded progress. Regulations had been drawn up, but without a recognised testing authority they led to misinterpretations and sometimes mis-statements. Valuable work, however, had been done by Sheffield University in testing colliery switchgear designed to be explosion-proof, and also by the British Engineering Standards Association, but certain gear which had been standardised was almost obsolete. Rules and regulations, which were sometimes unnecessarily severe, increased the cost of overhead lines and switchgear. In industrial and colliery work, particularly on the surface, a good deal of expensive oil-break gear was installed which was not really necessary.

SCOTTISH CENTRE DINNER.—A representative company of 300 attended the annual dinner of the Scottish Centre of the Institution in Glasgow on December 2nd, at which Prof. Magnus MacLean, D.Sc., LL.D., presided. Lord Blythswood toasted "The Institution of Electrical Engineers." Mr. R. A. Chattock, in reply, said Glasgow had to be congratulated on being one of the first cities to establish an Electricity Service Bureau, an organisation for educating the public to use electricity properly. The Institution, he said, was now adapting itself to the needs of its 12,000 members, and he thought it was unfortunate that a proposal had been made to establish an institution independent of the Institution of Electrical Engineers for radio engineers. He felt it was quite unnecessary, and it was bad policy to divide the interests of the profession in that way, which must lead to overlapping and ultimate chaos. It was quite possible, of course, that wireless might be developed to a greater extent than it was at present, and might supplant their own distribution methods, and they must keep an eye on it and watch developments to see if it could be fitted into their new

siness. The establishment of another institution in con-ction with fuel economy had also been mooted. A more necessary suggestion he had never heard made. Here, o, they were vitally interested, and would be glad to scuss the question and explore it jointly with mechanical gineers.

Institution of Lighting Engineers.—LEEDS CONFERENCE XPENSES.—At Leeds City Council, on December 2nd, Sir harles Wilson, chairman of the Finance Committee, pro-sted vigorously against the expenditure of £327 in enter-ining delegates at the annual conference of the Institution Leeds, in September. He moved that expenses in con-ction with conferences of organisations concerning public dministration be not incurred without first obtaining the nction of the Finance Committee. The resolution was conded by Councillor Stanley Horrell, and Alderman G. itcliffe, chairman of the Leeds Gas Committee, vigorously posed the proposition. He contended that the Street Light-g Sub-Committee had full authority by resolution for the penditure incurred, and said the hospitality at Leeds was rsimonious in comparison with that at Glasgow the previous ar. After further discussion the resolution was withdrawn, the understanding that in future entertainment estimates ould be presented to the City Council beforehand.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

The Edinburgh Tramways Committee has decided to recom-end that the salary of Mr. F. A. FITZPAYNE, deputy tramway anager, be increased next May to £850 per annum and to 900 in the year following.

The Hornsey Council Electricity Committee recommends pay-g the borough electrical engineer the sum of five hundred ineas for the extra duties undertaken by him in connection ith the extension of the plant, and a sum not exceeding £500 those members of his staff, in such proportions as may be etermined, who have also carried out extra work involved by ie extension scheme.

The Bristol Corporation Salaries Committee recommends in-easing the salary of Mr. PROSSER, the sales manager of the ectricity department, from £600 to £700 per annum.

With reference to the shooting of Mr. LEONARD JOHNSON, Cor-oration traffic manager of Birmingham, by John Henry uttler, a chief inspector of the tramways, the latter was on aturday last charged at the Birmingham Assizes with at-empted murder. Evidence was given for the defence to show iat the revolver was not intentionally discharged and the jury eturned a verdict of not guilty either of intent to murder or cause bodily harm.

Mr. O. G. LEE, of the Liverpool Post Office service, has been ppointed telephone district manager at Southampton and has arted his duties there. He entered the service in the days f the National Telephone Co., and rose to the position of elephone contracts manager in Liverpool.

The Doncaster Electricity Committee recommends Mr. E. oss, of Tynemouth, for appointment as sales engineer in the orporation Electricity Department, at a commencing salary f £300 per annum, rising to £350, by annual increments of 25.

Mr. H. C. HEAD-JENNER has resigned his position as director f the Sheffield relay station of the British Broadcasting Com-any, and is succeeded by Major T. H. HOWARD. Mr. Head-enner is about to commence business in Sheffield as a wireless xpert.

Mr. R. C. HALL has resigned the position of municipal elec-rical engineer at Riversdale, South Africa. His address is Oakleigh, College Road, Rondebosch, Cape Province.

Mr. J. W. WILKINSON, A.M.I.E.E., M.A.Min.E.E., has been ppointed sales and export manager to Electrical Utilities, Ltd.

Obituary.—MR. W. H. BAUGHAN.—The death occurred on November 23rd of Mr. W. H. Baughan, one of the pioneers f the British electrical industry. He commenced business at harlbury (Oxon) in 1876, making electric bells, telephones, ndicators, lightning conductors, &c. His products were sold n large quantities to the leading London and provincial houses nd a sound export trade was done. All the components had o be made in Mr. Baughan's own factory and the coil winding vas done by hand. Later, Continental competition was felt nd the business developed on contracting lines with an inde-endent connection. Mr. Baughan retired in 1905 in favour f his son, Mr. A. H. V. Baughan, M.I.E.E., and the latter ubsequently turned the business into a limited company, etiring in 1918.

MR. H. GRIFFITHS.—Mr. Harry Griffiths, A.M.I.E.E., dis-rict engineer at Newcastle-on-Tyne to the Metropolitan-Vickers Electrical Co., Ltd., was the victim of a fatal accident on De-ember 4th, when a transformer which was being installed at he premises of the Co-operative Wholesale Society, Blandford Street, fell upon him. Previous to joining the Metropolitan-Vickers Co., Mr. Griffiths was chief electrical engineer to the Caledon Shipbuilding Co., Dundee, for several years.

MR. H. W. MORLEY.—We regret to learn that Mr. H. W. Morley, for many years managing director of Messrs. Cole, Marchent & Morley, Ltd., of Bradford, passed away last month at Northampton at the age of 59 years. Previous to his connection with the above company Mr. Morley had held appointments with Messrs. Hick, Hargreaves & Co., of Bolton, and with Mr. Wilson Hartnell at Leeds.

MR. C. GEEN.—The death occurred at Newton Abbot, on November 28th, at the age of 85 years, of Mr. Charles Geen, who had for over 26 years been managing director of the Lynton and Lynmouth Electricity Co. Mr. Geen initiated the supply of electricity for Lynton and Lynmouth, and the business was later made over to the present company.

MR. E. WILKINS.—The death occurred, on November 25th, of Mr. Edmund Wilkins, of Bilston, who had for upwards of 25 years been engaged at the Mount Pleasant depôt of the Midland Electric Corporation for Power Distribution, Ltd. He was 68 years of age.

New Companies Registered.

Sydney Hellyar, Ltd. (210,101).—Private company. Registered December 3rd. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical engineering contractors, general, mechanical, constructional, marine and civil engineers, manufacturers, importers and exporters of and dealers in electrical, magnetic or galvanic and motor engines, &c., to adopt an agreement with S. Hellyar and J. L. Shearme. The first directors are:—H. S. Marquand, Northwood, Woodcote Road, Leigh-on-Sea, electrical contractor (permanent chairman and governing director); J. L. Shearme, 29, Merton Avenue, Chiswick, W.4, electrical contractor. Qualification, 10 ordinary shares. Secretary: H. S. Marquand. Registered office: 4, South Place, E.C.2.

B.S.A. Radio, Ltd. (210,069).—Registered as a private company on December 2nd with a nominal capital of £2,000 in £1 shares. Objects: To carry on the business of manufacturers and factors of and dealers in all kinds of apparatus, articles and accessories used in connection with electrical and other transmission and reception of words, sounds, symbols, drawings, photographs and pictures, whether with or without conductors, and any other use for which wireless electricity may be applied or adapted, electrical engineers, &c. The subscribers (each with one share) are:—J. H. Rice, 81, Oxford Road, Moseley, Birmingham; and G. J. Withington, The Gables, Francis Road, Stechford, Birmingham, accountant. The first directors are Sir Hallewell Rogers, Percy Martin, and Willoughby L. B. Baylay. No qualification required. Remuneration, £50 each per annum (chairman, £250). Solicitors: Pinsent & Co., 6, Bennetts Hill, Birmingham.

H. and S. W. Thomas Co., Ltd. (210,074).—Private company. Registered December 2nd. Capital, £2,000 in £1 shares. Objects: To acquire the business of electric lighting now carried on by "H. Thomas and S. W. Thomas" at Saundersfoot, Pembrokeshire. The first directors are:—H. Thomas, 1, Bellevue, Tenby; S. W. Thomas, Delphi, South Parade, Tenby. Qualification, 100 shares. Secretary and solicitor: F. E. L. M. Thomas, Tenby House, Tenby. Registered office: 1, Bellevue, Tenby, Pembrokeshire.

Electro Acoustics, Ltd. (210,052).—Private company. Registered December 2nd. Capital, £250 in £1 shares. Objects: To carry on the business of electricians, electrical engineers and contractors, mechanical engineers, machinists, metal workers, tool makers, wood workers, suppliers of electricity for purposes of light, heat, motive power, telegraphy, telephony or otherwise, manufacturers of and dealers in amplifiers, condensers, detectors, magnetos, &c. The first directors are:—E. J. E. Bean, The Spinney, Pollards Hill North, Norbury, S.W.16; F. H. Burgess, 69, Braxted Park, Streatham Common, S.W.16; C. W. Nadal, 60, Meath Road, Ilford, Essex. Secretary: C. W. Nadal. Solicitors: Headley, Dalzell and Dickinson, 8, Stone Buildings, Lincoln's Inn, W.C.2. Registered office: 175a, Peckham Park Road, S.E.15.

Haydey, Ltd. (210,077).—Private company. Registered December 2nd. Capital, £500 in £1 shares (425 "A" and 75 "B"). Objects: To acquire the business of a manufacturer of wireless sets and accessories carried on by Maude A. Adey at 5, Great Peter Street, Westminster. The subscribers (each with one share) are:—J. G. Hay, 20, North Audley Street, W.1, retired officer; H. W. Adey, 10, Lambolle Road, Hampstead, electrical engineer. Lt.-Col. J. G. Hay is sole director, and may retain office for life. Solicitors: Williams and Poole, 106, Fulham Road, S.W.3. Registered office: 5, Great Peter Street, S.W.1.

The Gretna and District Electricity Supply Co., Ltd. (13,897).—Registered in Edinburgh as a public company on November 30th, with a nominal capital of £15,000 in £1 shares. The objects are to take over part of the business of electricity supply carried on by H.M. Factory, Gretna, in the Counties of Dumfries and Cumberland. The first directors are:—P. M. Carlyle, The Gables, Gretna, medical practitioner; J. S. Wise, 86, The Rand, Eastriggs, Dumfries, electrical engineer; T. C. Tatnall, 101, Annan Road, Gretna, merchant; J. W. Matthew, The Crescent, Eastriggs, Dumfries, mechanical engineer; J. S. Moir, Gordon House, Gretna, Dumfries, surveyor; J. Elliot Millar, 3, The Ridge, Eastriggs, Dumfries, retired; G. Ritchie, Central Avenue, Gretna, stationer. Minimum cash subscription, £4,000. Qualification, 200 shares. Secretary: J. Hutcheon. Registered office: 58, Annan Road, Gretna.

Ashley Wireless Telephone Co. (1925), Ltd. (210,014).—Private company. Registered November 30th. Capital, £2,500 in £1 shares. Objects: To carry on the business of wireless telephone and telegraph engineers, manufacturers of wireless apparatus, &c. The subscribers (each with one share) are:—H. Dewhurst, 40, Tynwald Hill, Stoneycroft, Liverpool, electrical engineer; W. A. Brooke, 45, Pilkington Road, Southport, radio engineer. The first directors are to be appointed by the subscribers. Qualification, £50. Secretary: J. V. Underwood. Solicitor: T. G. Henry, 11, Lord Street, Liverpool. Registered office: 24, North John Street, Liverpool.

Pyramid Products, Ltd. (210,042).—Private company. Registered December 1st. Capital, £1,000 in £1 shares. Objects: To acquire the business of a wireless electrical engineer carried on by Francis Addie at 4, Cornbrook Place, Stretford, Lancs. The first directors are:—F. Addie, 90, Derby Street, Moss Side, Manchester, electrical engineer; J. H. Burrows, The Bungalow, Witham Road, Woodhall Spa, Lincs., engineer (life directors). Qualification, 1 share. Secretary: F. Addie. Registered office: 4, Cornbrook Place, Chester Road, Manchester.

Selfix Electric Co., Ltd. (210,024).—Private company. Registered November 30th. Capital, £1,000 in £1 shares. Objects: To acquire the business belonging to R. E. Robson and W. F. T. Pinkney, initiated by them in connection with the electrical illumination, lighting, power, equipment, heating and other electrical agencies, and to carry on the business of electricians, electrical and mechanical engineers, &c. The directors are:—R. E. Robson, "Greenside," Linden Avenue, Gosforth; W. F. T. Pinkney, 3, Douglas Avenue, Gosforth; H. S. Bird, 58, Grey Street, Newcastle-on-Tyne. The said R. E. Robson shall be permanent so long as he holds 25 ordinary shares. Qualification of directors, 25 ordinary shares. Secretary: N. B. Ridley. Solicitors: W. C. Soden-Bird, 58, Grey Street, Newcastle-on-Tyne. Registered office: 32, Grainger Street West, Newcastle-on-Tyne.

Official Returns of Electrical Companies.

Belling & Lee, Ltd.—Particulars filed of £2,000 debentures authorised November 21st, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, if any, the amount of the present issue being £1,500.

Kirby (Wimbledon), Ltd. — Debenture dated November 23rd, 1925, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: C. H. Benmore, 16, Pembroke Square, W., and W. T. Greenland, 8, Dunmore Road, Wimbledon, S.W.

Oco Electrical Appliances, Ltd.—Debenture dated November 18th, 1925, to secure £750, constituting a specific charge on the company's land in London and all other freehold, leasehold and copyhold properties and a floating charge on the company's undertaking and other property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd. 15, Bishopsgate, E.C.

Greenwich Cable Works, Ltd. (formerly New Gutta Percha Co., Ltd.).—Satisfaction in full (*a*) on June 11th, 1925, of mortgage, registered charges, and collateral charge and registered charge, all dated July 10th, 1924, securing £2,000; and (*b*) on October 27th, 1925, of mortgage and four registered charges, all dated September 12th, 1921, securing £2,000. (Notices filed November 27th, 1925.)

Landis & Gyr, Ltd.—Deed of covenant dated November 11th, to secure all moneys to become payable to the mortgagees under a building agreement dated October 13th, 1925, charged on certain land in Victoria Road, Acton. Holders: Edwards Construction Co., Ltd., 17, Throgmorton Avenue, E.C.2.

Sterling Telephone & Electric Co., Ltd. (101,415).—Capital, £65,000 in 49,650 preference and 15,350 ordinary shares of £1 each. Return dated September 7th, 1925. 39,500 preference and 15,350 ordinary shares taken up. £24,500 paid. £30,350 considered as paid. Mortgages and charges, £125,000.

Calcutta Tramways Co., Ltd. (14,764). — Capital, £1,400,000 in 700,000 ordinary and 700,000 preference shares of £1 each. Return dated June 23rd (filed September 17th), 1925. 700,000 ordinary and 250,000 preference shares taken up. £764,900 paid. £185,100 considered as paid. Mortgages and charges, £350,000 4½ per cent. first debenture stock and £250,000 7 per cent. second (registered) debentures.

H. L. Wood & Son, Ltd.—Particulars filed of £2,500 debentures authorised November 17th, 1925, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,500.

Electric and General Investment Co., Ltd. (31,506).—Capital, £201,500 in 19,900 preference and 20,000 ordinary shares of £5 each and 40,000 deferred shares of 1s. each. Return dated July 24th, 1925. All shares taken up. £121,500 paid (being £5 per share on the preference, £1 on the ordinary, and 1s. on the deferred shares). Mortgages and charges, £8,547 10s.

Sheerness and District Electric Supply Co., Ltd. (65,749).—Capital, £75,000 in £1 shares. Return dated June 18th (filed September 15th), 1925. All shares taken up. £75,000 paid. Mortgages and charges, nil.

Electric Supply Corporation, Ltd. (52,036).—Capital, £350,000 in 200,000 ordinary and 150,000 preference shares of £1 each. Return dated April 9th (filed June 11th), 1925. 150,000 ordinary and 150,000 preference shares taken up. £279,000 paid on 129,000 ordinary and 150,000 preference shares. £21,000 considered as paid on 21,000 ordinary shares. Mortgages and charges, nil.

Chepstow Electric Lighting & Power Co., Ltd. (70,646).—Capital, £10,000 in £1 shares. Return dated April 29th, 1925. 5,510 shares taken up. £1,537 paid. £3,905 considered as paid. £68 in arrears. Mortgages and charges, £3,000.

Yorkshire Switchgear & Engineering Co., Ltd. (formerly the T. S. Switchgear & Construction Co., Ltd.) (93,698).—Capital, £10,000 in £1 shares. Return dated August 4th, 1925. 5,332 shares taken up. £5,332 paid. £3,000 considered as paid. Mortgages and charges, £4,914 1s. 3d.

General Electric Co., Ltd. (67,307).—Capital, £6,000,000 in £1 shares (1,800,000 "A" preference, 1,800,000 "B" preference, and 2,400,000 ordinary). Return dated July 22nd (filed September 9th), 1925. 1,800,000 "A" preference, 1,800,000 "B" preference, and 2,111,975 ordinary shares taken up. £4,690,149 paid on 1,575,540 "A" preference, 1,777,109 "B" preference, and 1,337,500 ordinary shares. £1,024,826 considered as paid on 224,460 "A" preference, 22,891 "B" preference, and 774,475 ordinary shares. Mortgages and charges, £3,387,500.

Sun Electrical Co., Ltd. (63,261).—Capital, £100,000 in 50,000 ordinary, 20,000 preference, and 30,000 preferred ordinary shares of £1 each. Return dated November 13th, 1925. 25,062 ordinary, 17,141 preference, and 21,076 preferred ordinary shares taken up. £63,279 paid. Mortgages and charges, £16,217.

Tramways Syndicate, Ltd. (58,292).—Capital, £2,500 in £1 shares. Return dated June 3rd, 1925. 1,507 shares taken up. £7 paid. £1,500 considered as paid. Mortgages and charges, nil.

Peter Curtis, Ltd. — S. W. Rowland, of 296-302, High Holborn, W.C.1, C.A., was appointed receiver and manager on November 25th, under powers contained in debenture dated February 18th, 1925.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

International Automatic Telephone Co., Ltd.

An extraordinary general meeting of this company is called for January 5th next at Winchester House, E.C., to consider a number of resolutions. Among these, resolution (1) provides that the capital of the company shall be increased by the creation of an additional 640,000 shares of £1 each to be issued as ordinary shares conferring the same rights as, and ranking *pari passu* with, the 360,000 ordinary shares of £1 each now issued; and resolution (2) provides that the contract of December 2nd, 1925, made between the company and Messrs. Theodore Gary & Co. for the cancellation of the option granted to Messrs. Gary to purchase the ordinary shares in the company at £1 10s. per share be ratified and confirmed. A separate meeting of the holders of ordinary shares will follow the special meeting. The reasons why the resolutions have become necessary are explained at length in a circular issued by the directors to t ordinary and deferred shareholders. The company was form in 1920 with powers to invest in companies manufacturing te phone, telegraph and other electrical apparatus; to engage the manufacture of this apparatus; and to own and oper telephone, telegraph, wireless or cable companies in any p of the world. The company acquired the control of the Au matic Telephone Mfg. Co., Ltd., and entered into an agre ment with that company for the promotion of sales of Strowg automatic telephones in colonial and foreign territories, a secure for it a substantial amount of foreign business sufficie to establish mass production and a regular output over a peri of years. This arrangement has been satisfactory to both co panies. In view of the development of the telephone and ele trical industry throughout the world and in order that the co panies shall participate freely in this development, it is thoug desirable to create additional capital. On the formation of t company an option was given to Messrs. Theodore Gary & C Kansas City, U.S.A. (who were mainly responsible for securir to the company the contracts providing for the large amount business referred to above), so long as they continued to ho 10,000 deferred shares in the company, to purchase from t shareholders all or any of the preference shares of the compan at 21s. 6d. per share plus accrued dividend, and all or any the ordinary shares at 30s. per share. This option has no become valuable and its removal would be beneficial to t shareholders and facilitate the expansion of the company capital on a favourable basis. As a result of negotiatio Messrs. Gary & Co. have agreed to accept an option to purcha from the company if, as and when issued, 360,000 of the 640,0 new ordinary shares which it is proposed to create, at 30s. p share, and to abandon their option on the existing and issue 360,000 ordinary shares. The provisional contract will only b come effective subject to the passing of the special resolutio already mentioned. Certain trade investments have alread been made and other investments are in process of negotiatio It is expected that these investments will in all necessitate th issue from time to time of approximately 140,000 new ord nary shares, leaving the balance (500,000) available to be issue as occasion may arise. Under the present capitalisation th voting power of the ordinary and deferred shares is equal; i is proposed to maintain this position under the new capitali sation and the resolutions make provision for certain of th deferred shares conferring on the holders the requisite rights

Cape Electric Tramways, Ltd.

The report for the year ended June 30t shows a profit of £85,209, and after provid ing for debenture interest and redemption and adding the balance brought forward there is £66,461 available. From this a sum of £20,000 ha been placed to reserve and £2,500 has been set aside to form the nucleus of a staff benefit fund. It is proposed to pay final dividend of 4 per cent., free of tax, making 7 per cent for the year, and to carry forward a balance of £9,576. Th number of passengers carried and the gross receipts both de creased to a small extent owing to the general depression pre vailing in South Africa. It is stated that an improvement se in during the last few months of the year. The 6 per cent first mortgage debentures have been redeemed, and arrange ments have been made to extend the period of the 5 per cent debentures, the interest being increased to 6 per cent. Neithe the Cape Town nor the Port Elizabeth municipalities has given notice to exercise its rights of expropriation of the tram way system under the terms of the concessions. The meeting is to be held on December 16th.

Burmah Electric Tramways and Lighting Co., Ltd.

Mr. C. O. Webb, chairman, presided at the annual meeting on December 2nd, and in presenting the report and accounts (which were reviewed in our last issue, p. 909), stated that, although, generally, trade had been bad in Mandalay throughout the year, it was satisfactory to note that the gross receipts had increased; the items making up the working expenses showed a decrease, with the exception of maintenance and repairs to permanent way, overhead equipment and cars. It had to be remembered that the system was 20 years old, and until considerable expenditure was incurred in renewals, the cost of maintenance would remain heavy. The lighting and power business which had been built up in Mandalay promised to outstrip the tramways in gross receipts, and it was a more profitable undertaking. It was probable that within the next few years it would be necessary to expend a considerable amount in improving the distribution system and renewing the permanent way and cars, but the company had sufficient funds in hand to meet these charges. The chairman referred to the proposed change of the company's title to the "Burma Electric Supply Co., Ltd.," which, it was considered, better described the company's business. The report and accounts were adopted, and at a subsequent extraordinary general meeting the change of the company's name was approved.

Edison Swan Electric Co., Ltd.

The report for the year ended June 30th, 1925, states that the year's trading results have been satisfactory, and the accounts show that, after making provision for the redemption of debenture stock, the profit for the year amounts to £88,344, to which has to be added a balance of £17,575 brought forward, making £105,919, which the directors recommend should be applied as follows:—7½ per cent. dividend on preference shares, £7,500; 10 per cent. dividend on ordinary shares, £19,143; transfer to reserve fund, £50,000; leaving £29,276 to be carried forward. The directors recommend a special grant of £5,000 to the chairman and managing director, Mr. C. F. Spencer, in recognition of the

exceptional services rendered by him during the past three years, to which the present satisfactory position of the company is in a large measure to be attributed. A resolution to this effect will be submitted to the meeting which is to be held on December 16th.

French Companies. The *Société pour l'Equipement Electrique des Véhicules* reports net profits of 2,705,000 fr. for 1924-25, as compared with 2,445,000 fr. in the previous year, and it is intended to increase the rate of distribution from 45 fr. per share for 1923-24 to 50 fr. for the past year.

The directors of the *Compagnie Générale d'Electricité* recommend the payment of a dividend at the rate of 70 fr. per share for 1924-25.

British Insulated & Helsby Cables, Ltd. — At an extraordinary meeting held on December 4th, under the chairmanship of Mr. J. Taylor, a resolution was approved authorising the capitalisation of a part of the company's reserves and issuing it in the form of ordinary shares to the existing shareholders in the proportion of one new share to each three held. The chairman said that shareholders who were entitled to fractions of shares would receive the benefit of this from the sale of the aggregate of such shares in the market.

Amalgamated Wireless (Australasia), Ltd.—There was a net profit of £5,036 upon the working during the year ended June 30th last, as compared with a net loss of £21,857 in the preceding year. The work in connection with two duplex "beam" stations for direct service with Great Britain and Canada is progressing, and it is hoped to have them completed early next year. The broadcasting business was satisfactory, as was the marine section, apart from the effects of the shipping dispute.

American Loan for the A.E.G.—The *Financial News* states that negotiations are proceeding in New York between representatives of the Allgemeine Elektricitäts Gesellschaft and the National City Bank for the issue of a second series of convertible bonds. It is believed that this series will be issued on a 6½ per cent. basis.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159 :—

Coventry Chain Co., Ltd.—90,000 ordinary shares of £1 each, fully paid, Nos. 310,001 to 400,000; 100,000 new ordinary shares of £1 each, fully paid, Nos. 400,001 to 500,000.

International Telephone and Telegraph Corporation.—$2,146,200 capital stock in shares of $100 each.

Kaministiquia Power Co., Ltd. (Incorporated October 1st, 1925).—£200,000 5½ per cent. first mortgage sinking fund, registered debenture stock of Series A.

Bullers, Ltd.—The report for the year ended July 31st last shows a profit of £21,984 (an increase of £3,060), and the addition of the sum brought forward makes available £26,253. After meeting the preference dividend and transferring £5,291 to the debenture sinking fund, it is proposed to pay a final dividend of 2½ per cent. on the ordinary shares (making 5 per cent., free of tax) and to carry forward £5,665.

Manaos Tramways and Lighting Co., Ltd.—The receipts for the year ended April 30th last showed a further increase, and after meeting expenses there was a net operating revenue of £7,956 (the milreis being valued at 6d.). After adding interest, &c., and deducting debenture interest and London expenses, there remains a balance of £5,686, which has been transferred to the renewals reserve.

Marconi's Wireless Telegraph Co., Ltd.—In accordance with the provisions of the trust deed, between the company and the Law Debenture Corporation, Limited, dated November 17th, 1922, for securing the 6½ per cent. convertible 10-year first debenture stock, the company has this year applied the sum of £75,000 in purchases in the market of debenture stock.

Foundation Co., Ltd.—Out of a profit of £14,165 for the year ended June 30th last, plus £4,603 brought forward, a dividend at the rate of 8 per cent. is being paid on the cumulative participating preference shares, and £11,679 is being carried forward.

Major & Co., Ltd.—Out of a profit of £23,960 (including £9,650 brought forward) the directors are paying the dividends on the 6 per cent. and 8½ per cent. preference shares and carrying forward £12,459. They regret their inability to recommend dividends on the preferred ordinary and ordinary shares.

Petters, Ltd.—The company's funding scheme has been approved by the High Court, and the certificates are being prepared.

An interim dividend has been declared on the 7½ per cent. cumulative preference shares.

Reduction of Capital.—*Mann, Egerton & Co., Ltd., and reduced.*—A petition has been presented to the High Court for the confirmation of the reduction of the capital of the company from £400,000 to £370,925, and will be heard in London on December 15th.

Anglo-Argentine Tramways Co., Ltd.—The following dividends are announced :—2s. 9d. per share on the 5½ per cent. cumulative preference shares; and 3s. per share on the 6 per cent. cumulative second preference shares.

Ruston & Hornsby, Ltd.—It is reported that the directors have decided to postpone the payment of the interim dividends on the 5 and 6 per cent. preference shares.

New Issue.—*Newcastle-upon-Tyne Electric Supply Co., Ltd.*—The recent issue of ordinary shares was over-subscribed.

Castner-Kellner Alkali Co., Ltd.—The company has declared a dividend of 14 per cent. (making 22 per cent. for the year, as in 1923-24); £70,636 has been placed to reserve, and £28,008 carried forward.

S. Smith & Sons (Motor Accessories), Ltd. — The net profit for the past year amounted to £55,652, and to this was added £23,494 brought forward, making £79,146. In view of the present financial position of the company, the whole of this has been put to reserve.

Great Northern Telegraph Co., Ltd.—An interim dividend of 5 per cent., less tax, has been declared.

Stocks and Shares.

MONDAY EVENING.

FIVE per cent., to which the Bank Rate was raised last Thursday, is deemed to be a fair working minimum, and one which seldom imposes any serious check upon Stock Exchange business at a time when the public are ready to buy and sell securities. That there would have to be a rise before Christmas, common consent had agreed, and, this being the case, a putting an end to suspense was rather welcomed than otherwise. Stock Exchange prices are no worse, and the rubber boom paid no attention to the hint that money would be more expensive at next week's settlement.

International Automatic Telephones jumped another 6s., to 42s., before the reason for the recent advance became revealed in the issue of a circular to the shareholders. We had pointed out that an American firm, Theodore Gary & Co., had an option over the ordinary shares at 30s., at which price the firm could have called them from the present proprietors. This it was which made the rise to £2 so mysterious. The company announces that the option will be cancelled by Gary & Co. in exchange for another option, also at 30s., that will give the firm the call of 360,000 new shares, at 30s., out of 640,000 shares which it is proposed to create. Meetings are to be held early in January to consider and to pass the resolutions necessary to give effect to the increase now proposed in the capital, and to modify the existing contract with Gary & Co. Upon the announcement of these particulars, the price reacted to 39s. 3d. per share.

Automatic Telephones are 9d. higher at 52s. 9d., and these are the only changes which have occurred in the telephone group.

Johnson & Phillips at 54s. 6d. are quoted ex the right to apply for the new shares at 40s. Holders of five old shares can take up one new share at £2, and the last day for sending in acceptances is Thursday in this week, December 10th. Those who have the right to do so should make a point of seeing that they secure the bonus thus offered them : too many people are apt to toss away any papers which ask for the remittance of money. The rights can be sold at about 13s. if allottees do not wish to take up their proportion of new capital.

Lancashire Electric new ordinary, issued at 22s. 6d., and the new preference, which came out at 23s. 6d., are an active and a good market on the basis of 2s. 1½d. premium. Yorkshire Electric new are being negotiated on the basis of 29s. 6d. Newcastle new ordinary, with 5s. paid, attract a good deal of business on the basis of 1s. 7½d. premium. Several other new issues are in the air, as being likely to appear between now and the fast-approaching end of the year. Clyde Valleys have risen a florin to 29s. 6d.

Chelsea Electrics put on 2s. 6d. to 2⅛, a compliment to the appointment of Mr. P. D. Tuckett to the company's board. City Lights are the main feature of strength in this market, the price being 5s. up at 52s. Several vague reports purport to provide the explanation for this big rise. Possibly a humdrum reason may be found in the wide difference which had been existing between the price of City shares and that of County ordinary. The latter maintain their strength at 58s. 3d.

Edison Swans are rather better at 8s. 9d., the report showing a satisfactory increase of £13,400 to £88,300, in the net profits for the year that ended on June 30th last. While the dividend remains at 10 per cent., the appropriations to carry forward, &c., are increased. Metropolitan-Vickers gained a few pence to 27s. 6d., on the excellent contracts which the company is acquiring. A fall of 1/16th lowered Siemens to 33s. 9d. People have been selling these in order to put the money into rubber shares. Brush shares are better at 26s. 3d.; English Electrics drooped to 19s. 9d. Iron and steel shares are dull, falls of small amount being frequent throughout the list. This served to bring about a sympathetic decline, to 2 9/16, in Babcock and Wilcox.

Cable securities are unusually quiet. Western Telegraphs recovered the 5s. dividend deducted last week from the price. Anglo-American deferred is once more ⅛ higher. Indo-Europeans have been marked down as low as 43½, although the nominal quotation is left unchanged at 45½. Marconis have failed to recover, and Canadians fluctuate narrowly around 5s. 3d. Burndept Wireless have been dull upon the coming to market of a fair line of the preferred shares.

The Home Railway list is uninteresting. Districts strengthened to 47½. Underground £10 paid shares are lower at 2⅛. The public attention paid to Home Railway stocks is lukewarm. The rubber market's attractions are blamed for this, as they are for many other falls in these days. The boom in rubber shares attained, to-day, Monday, an intensity of fury which constituted a record, up to the present, for this particular market.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom £	Dividend. 1923.	1924.	Price Dec. 7. 1925.	Rise or fall.	Yield p.c
Bournemouth and Poole	1	13	14	59/6	—	4 14 1
Brompton Ordinary	1	10	10	1⅝	—	*6 8 1
Charing Cross Ordinary	1	14½	15	2 1/16	—	6 3 1
do. do. 4½ Pref	1	4	4½	17/6	—	5 2 10
Chelsea	1	12	12	2⅜	+⅛	5 13 0
City of London	1	15	15	52/-	+½	5 15 5
do. do. 6% Pref	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	29/6	+2/-	5 8 6
County of London	1	15	15	58/3	—	5 3 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	24/-	+6d.	5 16 8
do. 7% Pref.	1	6	7	21/6	—	6 10 8
Elec. Supply Corporation	1	10	10	32/6	—	6 3 0
Kensington Ordinary	5	14	15	13	—	5 15 5
Lancs. Light and Power	1	7½	7½	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5⅝	—	5 6 8
Metropolitan	1	10	11	38/6	—	5 14 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	22/6	—	6 4 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	24/6	+6d.	5 14 3
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	15¼	+⅛	5 14 8
South London	1	15	15	2 1/16	—	5 17 1
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	18/9	—	6 8 1
Westminster Ordinary	1	15	15	45/-	—	6 13 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	31/-	+1/-	5 3 3

Home Rails.

Central London Ord. Assented Stock	4	4	67	—	5 19 5
Metropolitan	4	5	70	—	7 2 10
do. District	,,	3½	3½	47½	+½	7 7 4
Underground Electric Ordinary	10	Nil	Nil	2¼	−⅛	Nil
do. do. "A"	1/-	Nil	Nil	7/-	−6d.	Nil
do. do. Income Bonds	6	6	98	—	*6 2 5

Telegraphs and Telephones.

Anglo-Am. Tel. Pref. Stock	6	6	103	—	5 16 6
do. Def.	,,	1½	1½	24⅞	+⅛	6 0 8
Automatic Telephone	1	3	6	52/9	+9d.	2 5 5
Chill Telephone	5	6	5	6 1/16	—	*¼ 7 0
Cuba Sub. Ord.	10	5	5	6¾	—	7 8 2
Eastern Extension	10	10	10	18	−¼	*5 9 7
Eastern Tel. Ord. Stock	10	10	177½	—	*5 12 8
Globe Tel. and T. Ord.	10	10	10	18¼ xd	+¼	*5 9 7
do. do. Pref.	10	6	6	11 xd	+⅛	5 8 4
Great Northern Tel.	10	22	22	34½	—	6 8 6
Indo-European	25	7	8½	45½	—	*4 13 5
Marconi	1	10	10	1⅛	—	9 17 10
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord.	1	12	12	42/6	—	*5 12 11
United R. Plate Tel.	5	8	8	7½	—	5 6 8
Western Telegraph	10	10	10	17⅝ xd	+¼	*5 18 6

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	8½	−1/16	7 17 2
do. do. 2nd Pref.	5	6	6	8 1/16	—	8 14 6
do. do. 5% Deb. Stock	5	5	74½	—	6 14 3
British Electric Traction Ord	,,	6	6	120 xd	—	5 0 0
do. do. 6% Pref.	,,	6	6	105 xd	+1½	5 14 3
Brazil Traction	100	4	4	78	—	5 2 7
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	89½	—	5 11 9
do. do. Preferred	,,	96/-	96/-	97½	—	*4 17 11
do. do. Deferred	,,	129/5	129/5	115½	—	*5 12 7
do. do. Deb.	,,	4¼	4¼	77½	—	5 9 8
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	63½	—	7 17 6
Mexican Light Common	100	Nil	Nil	31½	—	Nil
do. Pref.	100	Nil	Nil	6½	—	Nil
do. 1st Bonds	—	5	5	72	—	6 18 11
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8

Manufacturing Companies.

Babcock & Wilcox	1	12	12	51/3	−9d.	*4 13 4
British Aluminium Ord.	1	5	10	38	—	5 5 3
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3⅝	—	4 2 9
Brush Ord.	1	10	10	26/3	+9d.	7 12 4
Callenders	1	15	15	3 1/16	—	4 10 7
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	13/9	—	... ...
Edison-Swan	4/-	10	10	8/9	+6d.	4 11 6
do. 5% Deb.	Stock	5	5	84	—	5 19 1
Electric Construction	1	10	10	33/9	—	6 6 0
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	19/9	−6d.	5 1 3
do. do. Pref.	1	6	6	21/-	—	5 14 3
Gen. Elec. Pref.	1	6¼	6¼	24/- xd	+2d.	5 8 4
do. Ord.	1	5	7½	28/6	—	5 5 3
Henley	1	15	16	3¾	—	4 11 5
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	1⅛ xd	—	*4 9 0
Johnson & Phillips	1	10	10	54/6 xr	—	3 13 7
Met-Vickers, Ord.	1	8	8	27/6	+6d.	5 16 5
do. Pref.	2	8	8	2⅝	—	6 14 9
Siemens Ord.	1	—	7½	33/9	−1/16	4 9 0
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances

CHEMICALS, &c	Price December 8th.	Fortnight's Inc. or dec
a Acid, Oxalic per lb.	5¾d.	
a Ammoniac, Sal per ton	£60	..
a Ammonia, Muriate (large crystal) ,,	£52	..
a Bisulphide of Carbon ,,		..
a Borax ,,	£25	..
a Copper Sulphate ,,	£25 10s.	...
a Potash, Chlorate per lb.	4d. to 4½d.	..
a ,, Perchlorate ,,	5½d.	...
a Shellac per cwt.	£15 15s.	..
a Sulphur, Commercial ,,	£8 10s.	..
a ,, Roll ,,	£8 10s	
a Soda, Chlorate per lb.	3¾d. to 3¾d.	...
a ,, Crystals per ton	£5 to £5 5s	...
a Sodium Bichromate, casks per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots per ton	£120 to £125	...
b ,, Wire per lb.	1/9 to 2/6*	...
b ,, Sheet ,,	1/6 to 2/	...
p Babbitt's Metal and Anti-friction Metal—		...
Grade I per ton net	£256	£3 inc.
Grade II ,, ,,	£182	£2 inc.
Grade III ,, ,,	£100	...
c Brass (rolled metal 2" to 12" basis) per lb.	9¾d.	¼d. dec.
c ,, Tubes (solid drawn) ,,	1/- to 1/0½	...
c ,, Wire, basis ,,	10½d.	¼d. dec.
c Copper Tubes (solid drawn) ,,	1/1	¼d. dec.
c ,, Bars (best selected) per ton	£92	...
c ,, Sheet ,,	£92	...
c ,, Rod ,,	£92	...
d ,, (Electrolytic) Bars ,,	£66 5s.	£3 dec.
d ,, ,, Sheets ,,	£143 10s.	...
d ,, ,, Wire Rods ,,	£76 5s.	£2 dec.
d ,, ,, H.C. Wire per lb.	9 1/16 d.	¼d. dec.
f Ebonite Rod ,,	2/3 to 2/4	...
f Sheet ,,	2 3s. 2/6	...
n German Silver Wire ,,	2/3	...
h Gutta-percha, fine ,,	3/9	...
h India-rubber, Para fine ,,	4/6	6d. inc.
l Iron Pig (Cleveland Warrants) per ton	nom.	...
l ,, Wire, galv. No. 8, P.O. qual ,,	£12	...
g Lead, English Pig ,,	£26	25/- dec.
g Mercury per bot	£15	5/- to 7/6 inc.
e Mica (in original cases) small per lb	3d. to 3/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/3	...
p ,, ,, rolled strip & sheet ,,	1/9¾	...
p ,, ,, wire ,,	1 8¾	¼d. dec.
o Platinum per oz	£2[illegible]	...
d Silicium Bronze Wire per lb	1/0½	...
r Steel Magnet. in bars ,,	7¾d	...
n Tin, Block (English) per ton	£283 to £287	£3 10/- to £4 inc.
n ,, Wire, Nos. 1 to 16 per lb.	4/5	2d. inc.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co. Ltd.
o C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Exhibition of the Physical Society of London and the Optical Society.—This exhibition, which is to be held on January 5th, 6th and 7th, 1926, at the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, London, will be open in the afternoon (from 3 to 6 p.m.), and in the evening (from 7 to 10 p.m.).

Mr. J. E. Barnard, F.R.S., will give a lecture on "The Search for Ultra-Microscopic Organisms," at 8 p.m. on January 5th; Professor A. F. C. Pollard, A.R.C.S., A.M.I.E.E., will give a lecture on "The Mechanical Design of Instruments" at 8 p.m. on January 6th; and Major W. S. Tucker, D.Sc., will give a lecture on "Electrical Listening" at 8 p.m. on January 7th. These lectures will be illustrated by lantern slides and experiments. Some 70 firms will exhibit scientific apparatus, and in addition there will be a group of non-commercial exhibits by Fellows of the Societies and others, including demonstrations of famous historical experiments in physics, recent physical research, and effective lecture experiments.

It has been decided to open the exhibition to the general public on the third day, January 7th. On January 5th and 6th tickets of admission will be required.

We understand that invitations relating to January 5th and 6th have been given to the Institution of Electrical Engineers, the Institution of Mechanical Engineers, the Chemical Society, the Radio Society of Great Britain, the Röntgen Society, the Faraday Society, and other scientific bodies. Members of such Societies should apply for tickets to the Secretary of the Society to which they belong. Others interested should apply directly to Professor A. O. Rankine, Imperial College of Science and Technology, South Kensington, London, S.W.7.

The Work of the Electricity Commissioners.

The Fifth Annual Report.*

(*Continued from page* 915).

Re-organisation of Electricity Supply.

At the end of the period covered by the report, schemes for he improvement of the organisation for the supply of elec-ricity in six electricity districts had come into force. Four f these schemes came into operation during the previous year, he two additional schemes being in respect of the East Mid-ands Electricity District and the Edinburgh and Lothians Electricity District.

A noteworthy feature of the past year was the conclusion of he proceedings before the Commissioners in connection with he re-organisation of supply in the London and Home Counties electricity district, which had occupied their atten-ion throughout a period of four years.

Since the coming into force of the North Wales and South Cheshire Electricity District Order, the North Wales Power Company has pressed forward actively with the establishment f the transmission scheme, and the marked progress already nade has not only resulted in the supersession of local gene-ation at a number of centres owing to the availability of bulk upplies, but has also stimulated a number of applications for pecial Orders for distribution powers in new areas capable f being developed by means of supplies from the transmission ystem.

On July 8th, 1924, the Commissioners made an Order con-tituting the Edinburgh and Lothians Electricity District and n December 16th, 1924, the Order came into operation. A nap is given showing the approximate boundary of the dis-rict as finally determined, and the engineering features of the listrict. The generating stations in existence or sanctioned at March 31st, 1925, have a capacity of 52,785 kW, of which Porto-ello accounts for 40,000 kW.

A new draft Order and Scheme for the London and Home Counties Electricity District was published by the Commis-sioners on March 31st, 1924. A local inquiry was held on May 5th, 1924, and following days, and on July 17th, 1924, the Commissioners made an Order constituting the Electricity District and establishing the Joint Electricity Authority.

The Minister of Transport caused a public inquiry to be held on March 9th, 1925, into the representations made to him dur-ing the confirmation proceedings, and confirmed the Order on May 20th, 1925, with certain amendments. The Order came into force on July 29th, 1925. A map is given showing the approximate boundary of the Electricity District finally deter-mined and the engineering features of the district. Particu-lars of the generating stations of authorised undertakers in the district are set out in a table, together with figures showing the capacity in kilowatts.

The total capacity of the generating plant installed and/or sanctioned at March 31st, 1925, amounted to 1,139,232 kW, divided between local authority and company undertakers in the approximate proportions of 43 per cent. and 57 per cent. respectively.

Under the Technical Scheme scheduled to the District Order, the stations denoted by a triangle on the map may be regarded as suitable for extension so as ultimately to form principal generating stations. The remaining stations in existence at March 31st, 1925, are denoted by squares on the map, the majority being classified in two main categories in the Technical Scheme.

The main transmission and interconnecting lines in existence or sanctioned at March 31st, 1925, are denoted by full lines on the map. The Technical Scheme provides that the additional mains shown in dotted lines on the map may be regarded as required during the first stage of development for the purpose of making effective use of the generating plant in the district and of supplementing the existing interconnecting and bulk supply mains.

The West Midlands Electricity District comprises a part of the district provisionally determined by the Commissioners, in 1920, as the North West Midlands Electricity District. Events led to the subdivision of the originally contemplated district and to the renaming of a portion thereof.

An interim local inquiry was held by the Commissioners at Wolverhampton on October 21st, 1924, after which the Commissioners prepared a draft Order embodying an approved scheme for the southern area, which was renamed the West Midlands Electricity District. The scheme provided for the exclusion from the area of supply of the Shropshire, Worcestershire and Staffordshire Electric Power Company of so much of the said area as was within the district, and in consideration for such exclusion conferred upon the Power Company powers to supply electricity for all purposes in certain other portions of the area of supply under the Company's Power Acts.

The Technical Scheme provided for the utilisation of certain specified generating stations; for the early erection, in sections, of a new capital station at Ironbridge; for the subsequent erection, in sections, of a further capital station at Rugeley, and for the establishment of various transmission lines.

The Local Inquiry into the approved scheme was held in December, 1924, and the Commissioners, in April, 1925, made the Order and submitted it to the Minister of Transport for confirmation.

The West Midlands District provides the only instance, among all the districts hitherto dealt with by the Commissioners, where the full support of all the local authority and company undertakers concerned has been forthcoming both to the establishment of a Joint Electricity Authority and to the transfer of the generating stations in the District to the Joint Authority. Moreover, the District provides the first instance in which there was concurrence on the part of a power company to exclusion from a District under the machinery provided by the Act of 1922 in consideration of the granting of powers to supply for all purposes in other portions of the power company's area of supply.

At the commencement of the period covered by the Report, the draft Order and Scheme for the West Riding (Aire and Calder) Electricity District was in course of settlement by the Commissioners, and the Yorkshire Electric Power Company was taking the necessary steps to secure the assent of Parliament to the introduction of a late Bill to give effect to certain heads of the settlement arrived at between the Power Company and the other principal parties in the District during the course of the local inquiry held in February, 1924. The Power Company obtained the necessary assent, and the Commissioners held a conference at the end of April with the principal parties and their Counsel.

Following the decision of a Committee of the House of Lords in July that the Power Company's Bill should not be allowed to proceed, the Commissioners reviewed the position in consultation with the principal parties, with the object of determining whether the scheme could be rendered effective without supplemental legislation.

On May 22nd, 1925, the Company notified the Commissioners that Counsel had advised that the scheme could not be carried out in the manner proposed so as to give the Company the security which would have been provided had the Bill and District Order been confirmed; and that the directors had reluctantly come to the conclusion that no useful purpose would be served by pursuing the matter further.

The Commissioners held a local inquiry at Glasgow in April, 1924, into a scheme for the West of Scotland Electricity District, but after consideration of the evidence put forward and having regard to the possible alteration in the circumstances as the outcome of the developments outlined by the Government in July, 1924, decided to defer issuing any pronouncement upon the submitted scheme.

As the outcome of the proceedings in connection with the reorganisation of supply in the North-West Midlands Electricity District, and following the decision of the Commissioners to deal separately with the southern and northern portions of the District the Commissioners issued a notice in December, 1924, provisionally determining the northern portion as a separate District under the name of the North-West Midlands Electricity District, and providing for the submission of a scheme.

The adjourned local inquiry into the draft Order and Scheme for the Mersey and West Lancashire Electricity District was not resumed, and no material progress was made with the scheme of reorganisation during the year. The Commissioners were influenced by the circumstances previously referred to and refrained from taking active steps to bring about a settlement between the parties in the District. For similar reasons, in connection with the reluctance of the Corporations of Sheffield and Rotherham to accept the establishment of a Joint Authority for the North-East Midlands Electricity District, the Commissioners decided to defer consideration of the matter pending a decision by the Government as to its policy with regard to electrical development generally.

General Observations.

In view of the investigations on the question of the further development of electricity supply in Great Britain which were in progress on behalf of the Government at the date to which the report is made, the Commissioners have felt it unnecessary to make any comments upon the general course of the proceedings before them during the past year in connection with the reorganisation of supply.

It is recorded, however, that the Commissioners have made representations to the Minister of Transport with a view to the removal by further legislation of various limitations and difficulties which have hitherto been found to preclude effective and expeditious action.

(To be continued.)

* H.M. Stationery Office; price 2s. 6d. net.

Co-operation.—In part 6 of the "Electrical Educator" (Pitman) there is a brief article by Mr. D. N. Dunlop on "Co-operation in the Electrical Industry."

A Review of the Electrical Industry.

By A. G. ELLIS.

(*Abstract of Chairman's Address*: NORTH-WESTERN CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

(*Concluded from page* 914.)

On the Chester Corporation system there are some 15 miles of 3-phase, 6,600-volt overhead line, with 13 open-air sub-stations, stepping down to 400/230 volts and supplying 20 miles of 4-wire overhead distribution lines. The area served is about 70 square miles, and already nearly 600 consumers are connected, representing a load connection of 952 kW.

On the Mid-Cheshire system, with its centre at Northwich, there are in use or under construction 21 miles of overhead 3-phase transmission line at 33,000 volts, covering an area of 120 square miles and designed to feed three towns (Knutsford, Winsford and Middlewich) and about 25 villages within a radius of about six miles.

The village and country lines in use represent a load of about 150 kW and 100,000 kWh sold per annum, but within a few months this will increase. The charges in the country areas are the same as in Northwich and the other towns.

For distribution to the small towns and larger villages adjacent to the transmission line the pressure is stepped down from 33,000 volts to 400/230 volts, 3-phase, by outdoor transforming units of the simplest possible composition, comprising oil-immersed self-cooled transformer, horn-type air-break switches, and horn-type h.p. fuses. The smaller villages are dealt with in connection with country lines, which are supplied at 3,300 volts single-phase from outdoor sub-stations on the 33,000-volt routes.

The country lines feed villages, mansions and farms, through pole-mounted single-phase transformers at 3,300/220 volts. The cost of running these country lines for 3-phase distribution would be prohibitive; and no difficulty has been experienced in the use of single-phase motors, as they rarely are required to start under load.

Even with single-phase two-wire lines the cost of extending to small consumers some distance from the main h.p. line is too high and only the larger consumers, or small ones *en route* between large ones, can profitably be taken in. To reach outlying consumers Mr. Fennell proposes, as soon as the necessary authority can be obtained, to run an experimental single-phase, 3,300-volt single line, with earth return. This system, if authorised, will go a long way towards transmitting cheap power to small consumers over widely distributed areas.

Apart from the capital cost of the transmission line the cost of tapping it for a small amount of power is an important factor, which will have a decided influence on the transmission voltage chosen. It is not economical to build a 33,000-volt transformer for a smaller rating than about 20 kVA, single-phase, or 30 kVA 3-phase; but at 3,300 volts the limits are about 2 and 3 kVA respectively.

For these smallest economic ratings the equipment (including transformer) for tapping a 33,000-volt line need not cost more than £150 for single-phase and £200 for 3-phase, or for a 3,300-volt line £35 for single-phase and £60 for 3-phase.

The small outdoor sub-station can be mounted on a single pole for sizes up to 30 kVA, at 3,300 volts; 33,000-volt gear is naturally much heavier and requires an auxiliary pole with a wooden platform, or, alternatively, a concrete raft, with switches and fuses mounted on a pole. This equipment is neither unsafe nor unsightly: as an example of safety, I recently saw near Northwich a flock of sheep warming their noses on a 33,000-volt transformer by the wayside. As to sightliness, the populace have long been used to overhead telegraph and telephone lines, and high-pressure overhead lines are at least no more detrimental to the appearance of the country; in fact, the lines appearing on the face of Cheshire are gradually giving it the beauty of Switzerland.

(2) *Standardisation.*—The second factor in the obtaining of cheap production, on which we need to concentrate, is standardisation; and to effect any influence on national economy the question must be viewed in the broadest sense.

The common materials essential to the construction of electrical machinery have to-day reached a uniform standard necessary to the production of competitive products.

Standard specifications governing the performance of electrical machinery are in a much more advanced state than those for materials.

We are in sight of the day when long and tedious individual specifications will disappear and machinery will simply be purchased on the basis of the British Standard Specification. The effect of this on the possibilities of highly standardising the product and its natural effect in reducing the cost of production cannot be too strongly insisted upon. The V.D.E. Rules in Germany have long been established in this position, and this has been one of the most important causes of the position of Germany in the world's electrical markets.

Of equal importance with the consideration of these matters nationally is their consideration internationally. Standard international specifications will do much to lighten the burden of the British manufacturer in the export market. Often he is not in as good a position as his foreign competitor, who is a nearer neighbour, to get to know intimately the mind and ideas of a prospective customer; and the British maker is often placed at a disadvantage by tendering to the accepted British Standards, which are often more liberal than the foreign standards which might be acceptable to the purchaser.

International standards would put world competition on an equitable basis and effect economy of effort and expense which could be directed into more profitable channels.

The International Electrotechnical Commission is now sitting again regularly and the post-war equilibrium has been re-established to such an extent as to permit again of the inclusion on the Commission of representatives of former enemy countries (which, I understand, will be done at the next Conference in 1926).

This is surely the right spirit in which to approach such questions, since science and engineering, in common with art and sport, should be beyond nationality; and, in addition to this, it is sound commercial common-sense.

The terrible jumble of voltages and frequencies in this country has been one of the most serious impediments to effective standardisation of electrical machinery. Although the efforts of the B.E.S.A. and the authority of the Electricity Commissioners have at last enabled us to see daylight, we are still confronted with 45 different system voltages (excluding l.p. distribution voltages below 600 volts) and 16 different frequencies. It is noteworthy that rather more than one quarter of the total alternating-current plant installed in this country is for frequencies other than 50 cycles.

These conditions, and the relatively small demand at any one time for quantity orders for any particular system, make it impossible for the manufacturer to stock wound and finished motors, transformers, &c. The advantages of mass production as regards cost, stocking and speedy delivery are out of reach.

By way of illustration of what we have to contend with, I recently analysed orders for transformers over a period covering 1,705 transformers manufactured and aggregating 750,000 kVA. For the home market the number of different h.p. voltages was 36, and of l.p. distribution voltages 44. For the export market (covering all parts of the world, except America) the numbers were:—h.p. voltages 46, and l.p. distribution voltages 38. These figures covered a range of voltages as follows:

	H.p. volts.	L.p. volts.
Home	2,000 to 66,000	100 to 670
Export	2,000 to 132,000	100 to 600

For the same batch of orders the total number of different kVA ratings was 88 for 1-phase transformers and 97 for 3-phase transformers, the range of ratings covered being:—

1-phase, 2 to 7,833 kVA.
3-phase, 1.8 to 12,000 kVA.

Had these orders been all for standard voltages, such as those recommended in B.E.S.A. Specification No. 117, and for standard ratings in reasonable well defined steps, I estimate that the total saving in cost would have amounted to approximately 15 per cent.; and this in spite of the fact that the total kVA supplied would have been appreciably higher, by reason of selecting the nearest standard rating to the one actually specified.

Standardisation of designs of the numerous manufacturers is a field which has, as yet, been little explored. Such a proposition is likely to be regarded with suspicion or outside the range of practical policy. It is, however, quite conceivable that it may become, in the not distant future, a national necessity, to enable this country to hold its place against world competition. I have already referred to the advantageous competitive position of America and Germany in certain lines of electrical machinery and apparatus. The benefits of quantity production and resulting lower material and labour costs and the large home demand enable these countries to undersell Britain.

Particular examples to which this applies are industrial motors and small and medium sizes of distribution transformers. The total annual output of the United States in industrial motors and transformers is of the order of 10 times that of Britain: and in face of this we have in this country no fewer than 80 firms manufacturing industrial motors and 15 firms manufacturing distribution transformers (both these numbers including the large firms who make all sizes).

The position we are faced with is that all these firms carry equipment and staff for handling a great variety of sizes and types, *and none of them is manufacturing in really large quantities.*

If designs could be standardised all round and the industry so organised that work was distributed to the individual firms with reference to their equipment for the most efficient handling of each particular range of sizes and types, great benefits would accrue in cheaper cost, more efficient production, shorter deliveries, reduction of spare parts, and the prolongation of life of the harassed designer.

Such a step would not be as revolutionary as might be supposed at first sight. The design and the general construction of the standard types of electrical machinery is nowadays based on certain well-defined and similar lines for all manufacturers.

he dissemination of information through the medium of this stitution has contributed largely to this). The materials ed are practically identical, being often bought from a com- on source.

The designer's art in standard electrical machinery has ached nearly the top of its saturation curve, as is shown by e fact that weights and efficiencies of machines of different akes are very near to one another. The only differences are details of construction and dimensions bound up with the ndard sizes of cores and tools which the individual manu- turer has adopted.

Unification of designs would not involve the revelation of y jealously guarded secrets. The designer's art to-day does t involve such issues, but is mainly a matter of designing fit his particular shop conditions and limitations.

By way of illustration of the gain that could be effected der such a scheme, I estimate that, given a sufficient total mand in standard sizes and voltages, distribution trans- mers up to 1,000 kVA could be produced at from 15 to 20 r cent. lower cost.

As regards industrial motors, a writer in a recent issue of e Electrical Review (who conceals his convictions on this tter under the cloak of the *nom de plume* "M.I.E.E.") imates that a particular size of motor could be turned out from 20 to 30 per cent. cheaper.

The gist of the matter is that co-operation is more conducive progress than competition. Rank heresy as this may ap- ar to some, the national aspect must be put before the rochial one. What is needed is to cut out internal national mpetition and combine the engineering brains and resources the nation to meet foreign competition. Higher efficiency production and cheaper costs are, at the moment, vital to e prosperity of the industry and of the community.

Registration of Engineers.

By the obtaining of a Royal Charter this Institution has ade a great step towards the realisation of the time when all no profess and call themselves engineers must comply with definite and high standard of qualification. One step fur- er is, however, essential, namely, the registration of engi- ers by Act of Parliament. The result of registration would that only registered persons would be permitted the use of e title "Engineer" (or "chartered electrical, civil, or me- anical engineer"), and only registered engineers would be cognised by law. The standard of entry and qualification uld be made quite definite, to the benefit of the whole ofession as regards the quality and efficiency of engineering rk, and the status of the technical engineer. It would also aid in dispelling the appalling ignorance of the public regard- ing a profession on whose efforts it is dependent in one way or another for practically all its conveniences and comforts.

This country lags behind Continental countries in this matter and in Italy the registration of engineers has been carried into effect since the end of the great war. It is also of interest to note that the Royal Institute of British Architects is sub- mitting to Parliament a Registration Bill for Architects; con- current action by the engineering profession would appear very desirable. What is required is the setting up of a Statu- tory General Engineering Council (analogous to the General Medical Council) which would determine the standard of train- ing and qualification required and would keep the register for the profession.

Technical Training.

Closely allied with this subject is that of technical training. The educational training of the technical engineer has now practically become standardised to a technical university course of three or four years, with two years of workshop training either before, after, or sandwiched.

The industry is absorbing all the students turned out, so that there is very little competition or room for selection. The in- dustry needs more than ever the best men in order to compete with foreign competitors, whose activities are gaining in strength every year. To maintain and elevate the standard in all grades of technical occupation it is necessary to attract the best type of men and in greater numbers. Registration of engineers would ultimately conduce to this end, but meanwhile we might, with advantage, concentrate more on the means of selecting and training the best brains from all sources.

Institution Activities.

It is gratifying to note an increase in the number and variety of the papers offered to the Institution, but the number ac- cepted as suitable for reading and discussion is still low. There is, I think, some degree of reticence in offering short and pithy papers on practical subjects, engendered by the feeling that the voluminous and classical type of paper has become the accepted standard. I think much would be gained by the reading and discussion of groups of short papers on specific subjects, presented simultaneously by a number of experts in the particular subject.

The time is over-ripe for an organised system of joint meet- ings between the leading engineering institutions and scien- tific societies, whereby the efficiency of the whole business may be improved. Many useful joint meetings have been held, but these efforts need to be systematic instead of spasmodic.

An All-Electric House.

Detailed Particulars of a 10-Room Glasgow Dwelling.

By Prof. S. PARKER SMITH, D.Sc., M.I.E.E.

(*Abstract of Paper read before the* Institution of Electrical Engineers.)

1923, the author, being in need of a house in Glasgow, a ting opportunity offered itself to build an all-electric house. e most noteworthy feature connected with this proposal was e adverse criticism which it elicited from the majority of ctrical engineers with whom the scheme was discussed; so ich so, that the carrying out of such an unpopular idea must largely attributed to the obstinacy of one who thought that e time had arrived when a professor of electrical engineering ght to have enough faith in his convictions and calculations put them to the test. The calculations are all based on e tariffs of the Glasgow Corporation, which also arranges the hire of electric cookers and fires. The domestic con- mer is offered the choice of two alternatives:—

(1) Energy at 4½d. per kWh for M units, and ¾d. per kWh hereafter; M is based on the annual consumption for light- ng and includes the consumer's share of capital and fixed charges.

(2) A two-part tariff consisting of a fixed charge to cover he consumer's share of capital and fixed charges, and ½d. per kWh for all energy taken; the fixed charge appears to be about one-eighth of the rent, and in the author's case works out at £12 10s. per annum. For the author's house M = 582, and the two-part tariff led to a saving of £7 6s. 5d. in the first year's working.

The house, in which no coal or gas is used, was built to be a me and not a showroom, an important point in determining e capital cost of an all-electric house, for in addition to the reased convenience of life obtainable with essential appara- s, there are many appliances which cannot be legitimately cluded under capital cost. Taking into account the fact that ny appliances can be hired, the cost of the house was 3 to 4 r cent. higher than it would have been with ordinary coal and s appliances and electric lighting. It must, however, be nembered that the architect can effect many small savings. An idea of the layout can be obtained from figs. 1, 2 and 3. . J. Austen Laird, of Glasgow, designed the house, whilst e author was responsible for the electrical layout. There are 10 rooms—three reception-rooms and kitchen on the ground floor, five bedrooms on the first floor, and a large attic nursery. Below the ground floor there is a sloping space like a shallow cellar, 3 to 4 ft. high, which is used for much of the ground- floor wiring. There is no scullery or wash-house, the only outhouse being a garage. There are three external chim- ney breasts, used for ventilation. By fitting grates and re- placing the ventilators by chimney-pots, coal fires could be used—a feature which calls forth the approval of many critics of the all-electric idea. There are no mantelpieces or over- mantels, but fireplace recesses have been retained owing to the common practice of sitting round a fire.

Distribution Board.—Separate meters were installed for heat- ing, hot water, cooking, and lighting; they are experimental and would not be needed for the ordinary consumer. The main meter is of the two-rate type and is actuated by a 40-day clock, so that the day and the night consumptions can be recorded separately. There are 31 heating circuits, and 5 cir- cuits for cooking and hot water; each has its own fuses and goes to one point only, as indicated in figs. 1, 2 and 3, by H_1 to H_{17}, H_{19} to H_{29}, C_1, C_2, W_1, W_2 and W_3 (H_{18} is in the garage; H_{30} and H_{31} are in the attic nursery). These points are 15-ampere wall sockets, with the exception of the cooker and the hot-water tank which are wired for 30 amperes. The light- ing distribution board is in the housemaid's closet on the first floor (fig. 2) and feeds four circuits. The main distribution board is between the hall and cloak-room.

Wiring.—In general, the regulations of the Institution were adhered to and rubber sheathed cable (c.t.s.) was used; nothing has yet occurred to make the author believe that it was not the cheapest and the best solution. The supply is direct current at 250 volts, the positive and neutral being brought to the house.

Switch-sockets are used throughout, of the 15-ampere, 3-pin, flush pattern with a mechanical interlock to prevent the plug being removed with the switch on, or switching on before in- serting the plug. With few exceptions, switch-sockets are in-

serted in the skirting board and the switches are arranged to be put on or off by the foot. The object in employing sockets all of the same size is to enable all fires and other appliances to be used wherever desired. The author's experience has shown that in the living rooms 4 to 5 points per room are desirable. In certain places it has been found convenient to duplicate some of the points by using a 15-ampere plug with a 5-ampere adapter.

Bells.—In order to have the bell circuits as sound as the lighting and heating circuits, c.t.s. wire was also used.

Lighting.—The charge for lighting comes to about nine shillings per quarter, consequently abundant lighting everywhere is permissible. Relatively, therefore, the cost of lamps is an important factor; indeed, this may be a case where underrunning lamps (*i.e.*, running lamps at less than the rated voltage)



Ground Floor. First Floor. Kitchen.

Figs. 1, 2 & 3.—Plans of 10-roomed All-electric House in Glasgow.

may be sound policy for the user. Wherever it is desirable to operate a light from more than one point, suitable switching is provided and the convenience of being able to control the stair lights from 7 points can scarcely be exaggerated. In the kitchen an additional strong light is placed over the cooker and all the switches are of the flush pattern; exposed or unshaded filaments are avoided throughout the house.

Clothes Washing and Drying.—In Glasgow a wash-tub is often fitted alongside the sink, and a small wringer with rubber rollers can be readily attached. Alongside the enamelled tub a wash-boiler of the percolator pattern has been placed (see fig. 3); the loadings are 2 kW, 1 kW and ½ kW. Articles, after being soaped, are placed in this boiler, no preliminary scrubbing being necessary, as the washing is done by the continuous circulation of the boiling water. Unpleasant steaming is avoided by controlling the heat, and after bringing the water to the boil the process is usually completed in half an hour with the rotary switch on "low."

Drying facilities become essential in a wet climate. For this purpose, the drying-closet shown in fig. 3 has been provided. The clothes are hung over wooden rods, while an exhaust fan draws air from the space below the floor, which passes over an air warmer of the convector type, rated at 1½ kW. After an hour the dried clothes come out as fresh as if they had been hung out in sunshine.

Cooking.—Electric cooking well merits the success it has gained and it is probable that much less will be heard of the "nasty smell of cooking throughout the house." The thermometer on the oven door and the clock enable results to b obtained which will be particularly appreciated by the growin number of refined women who have to do their own cooking Indeed, the splendid results obtainable may make cookin attractive to many intelligent people.

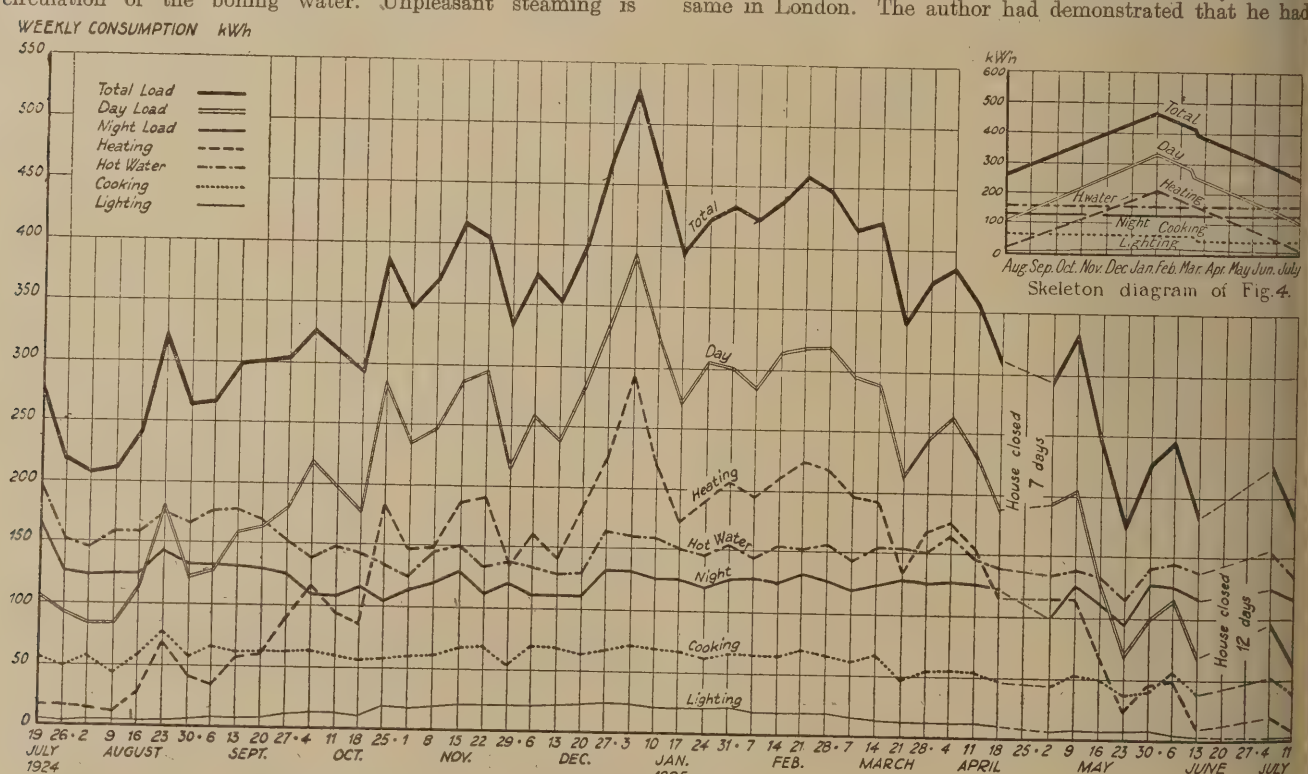
The cooker is of the table type with the oven alongside th boiling-table. This avoids stooping and the oven and grille can be given unstinted praise. The two boiling-plates are rate at 1½ kW and 2 kW respectively and are of the open type Though satisfactory when properly maintained, manufacturer must try to do better with their boiling-plates; the efficienc of the open-type boiling-plate may be 20 to 25 per cent. whe starting from cold, or little better than that of a coal fir Numerous experiments by the author have shown that sub stantial improvements are possible—see "cooking" load curve fig. 4, showing the fall in consumption—and no one will be better pleased than supply undertakings when makers can improve the efficiency and reduce the upkeep charges of boiling-plates.

Probably in some households it would be better to provide three boiling-plates on the boiling-table, while large and small ovens might be an advantage. It has been found that rustless steel makes excellent baking shelves for ovens.

(To be concluded.)

Discussion in London.

Col. R. E. CROMPTON opened the discussion by pointing out that the author had had an efficient partner in the City of Glasgow Electricity Department; he wished that they had the same in London. The author had demonstrated that he had



Skeleton diagram of Fig. 4.

Fig. 4.—Weekly Consumption of Electricity in 10-roomed House for One Year.

great knowledge of what was required to make an all-electric house a successful proposition. The paper taught much, but it should be remembered that there was a great deal of difference between the conditions that governed the supply of cheap electricity in residential cities as compared with industrial districts. The author had condemned imitation, but he had not abandoned it entirely himself, for he still retained fireplaces in which to stand his radiators. It was not only wrong, but positively wicked to use a coal fire in a bedroom; a large proportion of fog was due to bedroom fires, because bedrooms being on upper floors, the chimney draught was very bad. The use of portable electric heaters enabled the heat to be directed just where it was re-

quired; they were ideal for bedroom use, and even in London were cheaper than the coal fire. By using a small radiator under the table one could work in a cold room very much more comfortably and efficiently than if other means of heating were used. He had tried to be fair in these matters—he had conferred with the gas people, and invented a coal fire himself which cost 2s. a week to run, and heated a 16-ft. room, the coal he used being the same as that burnt in power stations. It was all very well for the author to say that the Glasgow Corporation supplied him with electricity cheaply, but if 1,000 houses instead of one were supplied at those rates, the Glasgow accounts would undoubtedly show a loss.

Dr. S. Z. DE FERRANTI considered the subject was of immense importance to the community, and the outstanding feature of the paper was the faith of the author in his scheme. The equipment of his house would enable him to live with a very much greater degree of comfort than he could possibly do otherwise, but the greatest disadvantage was the lack of means of disposing of refuse; he had installed a destructor in his own house. After pointing out the advantages of radiant heat, he expressed the opinion that in a dwelling-house, anything which heated the air should be strictly avoided. A certain amount of cool air was necessary for the maintenance of good health. There was no question of loss of money in this matter; no matter how many houses were similarly equipped to the author's, the Glasgow Corporation would still want more. Mr. Mitchell knew what he was doing. Unfortunately electricity was dear in many places, due to poor load factor and the overrating of undertakings, &c. Hot water was a cheap method of storing energy at night, and development on some such lines would do much to solve their electrical troubles. The cost of £43 per annum mentioned by the author, paid Glasgow handsomely, and a similar service could not have been rendered by other means without costing several times that figure. A public supply of electricity was not available where he lived, and he therefore installed a crude-oil engine generating plant and batteries. The total load for the 27-roomed house was about 18 kW, and for some months now he had used no coal or gas whatever. The exhaust heat from the engine and that in the water jacket was stored for use in the house. Water pipes at a temperature of about 110 deg. F. embedded in the ceiling plaster, together with electric radiators, was the means of heating the principal rooms. The only combustion was in the cylinder of the engine, and the heat efficiency of such an installation was very high.

Miss A. E. HASLETT remarked that a feature of the author's house was its labour-saving qualities. She had been privileged to visit it, and the thing that surprised her most was the fact that when she was shown into the kitchen at the busiest time of the morning, she found the maid wearing headphones and sewing. Engineers were now coming into the home, and they would have to seek the woman's point of view before they got very far. Cheap domestic labour had gone for ever, and must be replaced by mechanical means, but the prevalent public idea that electricity was too dear and difficult to manage, must be corrected. Only the other day she was talking to a University educated woman who would be normally regarded as an intelligent person, but who was not aware of the fact that electricity produced heat as well as light. The success of electricity in the home would need a very much greater maintenance service than anything yet contemplated, and also regular inspection by persons who would take a real interest in the installation. The retention of the coal fire was merely a custom. The author had said a good deal about cheap electricity in Glasgow, and she would like to mention that in her own all-electric flat in St. Marylebone, she obtained her electricity for ½d. per kWh, light being a "gift," as was the case in the author's house. London was not so far behind as they had been led to believe. She thought it was about time that an electric kettle was produced which would heat water as quickly as it could be heated by gas.

Prof. A. H. BARKER could not agree with all the views that had been expressed. He would have liked the author to give more details about the size of windows, thickness of walls, &c., these having an important bearing on his heating scheme. The heating of water by electricity could only be advocated by a man who was so keen on the subject that he lost sight of the end. Apart from Dr. Ferranti's idea, which was attractive, it was impossible to get more than 20 per cent. heat efficiency in the house when electricity was used, whereas a much higher percentage was possible by other means, and the gas people were only destroying about half as much coal as the electricians.

Major E. O. HENRICI spoke from the point of view of the cost to the consumer, comparing his own house with that described in the paper. By using coal, gas, and electric lighting, his average cost for the last three years was £50 per year, but the installation was old and inefficient. It therefore seemed to be possible for electricity at ½d. per kWh to compete with other means of heating, but it would not be possible for him to dispense with one maid, even if he had an all-electric house. In his own house the cost would have been reduced considerably if a modern heater had been introduced; an electric heater was, however, three times as efficient because the heat could be used just where it was required. If the author's house had been built in his (the speaker's) district, the annual running cost would have been about £100.

Dr. MARGARET FISHENDEN said that in her own house, using gas and coal, the annual cost was £44, which indicated that electricity at ½d. per kWh could compete in ordinary houses; but it must be remembered that such houses were old, containing inefficient equipment. The author could have saved £9 per year if he had used an independent coke-fired boiler for water heating. She appreciated the value of radiant heat, but cold walls were by no means comfortable. She was very much surprised at the author's figures of the efficiency of electric boiling rings. The great discrepancy between his figures and those of manufacturers showed something to be wrong somewhere.

Mr. W. NOBBS explained that radiant heat from the sun could not be compared with that of a fire. The size of the sun and the angle of incidence were such that a person standing in sunlight was completely surrounded by warmth, whereas a fire (very much smaller and nearer) only directed heat on one spot. He had lived for about 15 years in houses warmed by convectors, with great comfort; radiant fires should only be used to supplement the former method. The creation of a night load by hot water storage only went part of the way. The wide fluctuations of the demand for water from day to day indicated that the average demand could only be efficiently met by electric heating at night.

Mr. L. J. GOOCH said that it had always been his ambition to live in an all-electric house, but the lack of an electric fire which could compare with a coal fire prevented many would-be users of electricity adopting such a scheme.

Dr. S. PARKER SMITH replied very briefly, and the President, on account of the shortness of time, asked intending speakers to send in their contributions for publication in the I.E.E. *Journal*.

New Electrical Proposals for Parliament to Consider.

WE publish below a list of proposals that will come forward in the next session of Parliament (1926). Readers who are desirous of obtaining further information will find the notices published in full in the *London Gazette* for November 20th, 24th, and 27th.

(a) Electric Light and Power.

Oldham Corporation.—Powers to extend the area of the borough so as to include the urban district of Chadderton and to extend the Corporation's limits for the supply of electricity so as to include the added area and to alter or repeal the powers of the Lancashire Electric Power Co. to supply electricity therein; further financial powers, &c.

Ascot District Gas and Electricity Co.—Authority to raise additional capital both for gas and electricity purposes, such capital to form part of the general capital of the company, &c.

Horley District Gas Co.—Powers to supply electricity in the parishes of Horley, Newdigate, Burstow, Horne, and Nutfield, and a portion of the parish of Charlwood in the rural district of Reigate, a portion of the parish of Upper Beeding, the parishes of Rusper and Crawley, in the rural district of Horsham, and a portion of the parish of Worth, in the rural district of East Grinstead.

Authority to erect a generating station, to manufacture and supply fittings, &c., to supply electricity in bulk, to change the name of the company; further financial powers, &c.

Leicestershire and Warwickshire Electric Power Co.—Further financial powers; provision for the conversion or division of the shares in the authorised capital of the company; authority to apply for special or other Orders under the Electricity (Supply) Acts, 1882 to 1922; removal of restrictions upon the placing by the company of electric lines above and below the surface of the ground; to provide that electricity supplied by the company within its area of supply to the owners, &c., of any railway, tramway, dock, harbour, and canal undertaking may be used for all or any purposes of any part of such undertaking whether within or without such area of supply, &c.

Milford Docks Co.—Authority to supply electricity to Milford Haven Urban District Council, to lessees and occupiers of property of the company, and to owners, lessees, and occupiers of adjacent property, &c.

Halifax Corporation.—Further powers in connection with the electricity undertaking; additional powers with reference to the tramway, trolley vehicle and omnibus undertakings; further financial powers, &c.

Shropshire, Worcestershire, and Staffordshire Electric Power Co.—Powers to provide for the merger of the company and the sepearate undertaking of the company; to annul the resolution constituting the separate undertaking; to annul two agreements made between the company, the separate undertaking and the Halesowen Lighting and Traction Co., Ltd.; to vary the terms of the agreement of November 1st, 1922, made between the company and H.M. Treasury Commissioners; provision as to contracts and other instruments, &c., relating to the separate or the general undertaking; to annul

certain ordinary shares in the capital of the separate undertaking issued to the Halesowen Lighting and Traction Co., Ltd., and held by that company as nominees; to annul certain capital and borrowing powers of the separate undertaking; further financial powers, powers to relieve the company from the obligation to keep separate accounts of its undertakings, powers to invest in the shares, &c., of other companies and bodies; authority to manage the undertaking or generating stations of other undertakings; to extend the company's powers of selling or purchasing electricity in bulk and of laying electric lines for the purpose; powers to acquire by agreement the undertakings of other undertakers; to incorporate, repeal, and amend certain Acts, &c.

Metropolitan Electric Supply Supply Co., Ltd.—Powers to extend the area of supply as defined in the Metropolitan Electric Supply Co. (Various Powers) Act, 1905, as extended by the Metropolitan Electric Supply Co.'s Act, 1906, so as to include the following areas:—

In the County of Berks.—The county borough of Reading, the borough of Wokingham, the rural districts of Cookham, Easthampstead, and Wokingham, and parts of the rural district of Bradfield.

In the County of Bucks.—The rural district of Hambledon and parts of the rural district of Wycombe.

In the County of Oxford.—The borough of Henley-on-Thames, the urban district of Wheatley, the rural districts of Crowmarsh, Goring, and Henley, and parts of the rural districts of Culham, Headington, and Thame.

In the County of Southampton.—The boroughs of Aldershot and Basingstoke, the urban districts of Alton, Farnborough, and Fleet; the rural districts of Hartley Witney and Alton; and parts of the rural districts of Basingstoke and Petersfield.

In the County of Surrey.—The boroughs of Godalming, Guildford, Kingston-upon-Thames, Reigate, Richmond, and Wimbledon; the urban districts of Barnes, Caterham, Dorking, East and West Molesey, Epsom, Esher and the Dittons, Farnham, Frimley, Ham, Haslemere, Leatherhead, the Maldons and Coombe, Merton and Morden, Surbiton, Walton-upon-Thames, Weybridge, Windlesham, and Woking; the rural districts of Dorking, Farnham, Godstone, Guildford and Hambledon; and parts of the rural districts of Chertsey, Epsom, and Reigate.

Powers to supply electricity in bulk to local authorities, companies, bodies, or persons authorised to give a general supply of electricity within the area of supply comprised in the extension of districts above mentioned.

To authorise the company to supply electricity to persons requiring a supply for power within the added area and within the existing area, consisting of the district defined in the said Acts, which comprise the following:—

In the County of Berks.—The boroughs of Maidenhead and New Windsor and the rural district of Windsor.

In the County of Bucks.—The borough of Chepping Wycombe; the urban districts of Beaconsfield, Chesham, Eaton, Marlow, and Slough; the rural district of Eton and parts of the rural districts of Amersham and Wycombe.

In the County of Hertford.—The urban districts of Chorleywood and Rickmansworth and part of the rural district of Watford.

In the County of London.—The metropolitan boroughs of St. Marylebone, Hampstead, and Fulham.

In the County of Middlesex.—The boroughs of Acton and Ealing; the urban districts of Brentford, Chiswick, Feltham, Greenford, Hampton, Hampton Wick, Hanwell, Harrow-on-the-Hill, Hayes, Heston and Isleworth, Kingsbury, Ruislip-Northwood, Southall-Norwood, Staines, Sunbury-on-Thames, Teddington, Twickenham, Uxbridge, Wealdstone and Wembley, and the rural districts of Hendon, Staines, and Uxbridge.

In the County of Surrey.—The urban districts of Chertsey and Egham, and parts of the rural district of Chertsey.

Powers to make provision as to the purposes for which electricity supplied for power may be used, and for charging for electricity supplied under the intended Act. Powers to construct sub-stations; to constitute the company a power company; further powers as to the supply of electricity in bulk, &c.

London Power Co.—Power to construct a generating station on lands in the urban district of Heston and Isleworth for generating and transforming electricity, power to acquire land and erect and use electric lines, &c., within the borough of Richmond and in the urban districts of Brentford and Heston and Isleworth, to construct, place, and use electric lines and other apparatus for the transmission of electricity within the metropolitan boroughs of Fulham and Hammersmith and in the boroughs of Acton and Ealing and the urban districts of Brentford, Chiswick, Greenford, Hanwell, Heston and Isleworth and Willesden.

To make provision as to the application by the company for Orders under the Electricity (Supply) Acts, 1882-1922

Bristol Corporation.—Authority to use, for the purpose of a generating station, certain lands in the urban district of Portishead in the county of Somerset; to apply to the electricity undertaking of the Corporation the provisions of the Electric Lighting (Clauses) Act, 1899, in lieu of the provisions of the Bristol Electric Lighting Order, 1883; further powers in connection with the electricity undertaking; powers to extend the boundaries of the city and supply area so as to include part of the urban district of Portishead, in the county of Somerset, and of the parish of Henbury, in the rural district of Thornbury, in the county of Gloucester; other provisions, &c.

Hackney Borough Council.—Powers to construct in connection with the electricity undertaking an intake and screening chamber on the southern bank of the Hackney Cut navigation; to abstract water from the Hackney Cut navigation for condensing and other purposes; to apply some or all of the provisions of the Electric Lighting (Clauses) Act, 1899, to the electricity undertaking; further powers, including the construction of sub-stations under streets, the fitting-up of showrooms and offices, and the giving of demonstrations of electrical appliances; further powers, &c.

Guildford Corporation.—Further provisions with regard to the electricity undertaking, including the establishment of showrooms, &c., the allowance of discounts, &c., financial provisions, &c.

Mynyddislwyn Urban District Council.—Further provisions with reference to the electricity undertaking, &c.

(b) Electric Tramway, Motor-'bus and Trolley Vehicles.

Ramsbottom Urban District Council.—Powers to maintain and run motor omnibuses within and beyond the district; further provisions with regard to the existing tramway and trolley-car undertaking, including the increase of fares; further financial powers, &c.

Swindon Corporation.—Powers to run omnibuses within and beyond the borough; further powers with reference to the tramway undertaking; powers to extend the area of supply of electricity by the Corporation by the addition thereto of the parish of Rodbourne Cheney, in the rural district of Highworth, in the county of Wilts.; powers to provide showrooms, &c.; further financial powers.

Birkenhead Corporation.—Powers to run omnibuses within a radius of five miles from the Town Hall; further powers with reference to the tramway undertaking; additional financial provisions, &c.

Darwen Corporation.—Authority to construct new tramways, to provide and run trolley vehicles, to provide and run omnibuses within and outside the borough; further powers with reference to the tramways and electricity undertakings; additional financial powers, &c.

Doncaster Corporation.—Powers to provide and run trolley vehicles on certain routes; further powers with reference to the electricity undertaking, including the supply of electrical fittings.

Leicester Corporation.—Powers to construct and work certain new tramways; further provisions relative to existing tramways; further financial powers, &c.

Hartlepool Corporation.—Authority to equip and work trolley vehicles along certain routes; powers to abandon the tramways along these routes; authority to purchase from the West Hartlepool Corporation the overhead equipment and other works constructed in the borough by it under the provisions of the West Hartlepool Corporation (Trolley Vehicles) Order, 1925; further powers in connection with the running of trolley vehicles in substitution for tramcars; additional financial provisions.

Kidderminster and Stourport Electric Tramway Co.—Powers to construct new tramways and reconstruct certain existing tramways; powers to run omnibuses, &c.

Mexborough and Swinton Tramways.—Powers to provide and run trolley vehicles on certain additional routes; further provision with regard to the tramways and trolley vehicles, &c.

Rhondda Urban District Council.—Extension of time for the construction of tramways authorised by the Act of 1915.

East Ham Corporation.—Powers to run trolley vehicles within the borough; further provisions with regard to the tramway undertaking; additional provisions as to the supply of electricity and with regard to the electricity undertaking, including the establishment of showrooms, methods of charging, &c.

Colwyn Bay and Colwyn Urban District Council.—Powers to run omnibuses within the district; further powers with regard to the electricity undertaking.

Worcester Corporation.—Powers to acquire the existing tramways and light railways of the Worcester Electric Traction Co., Ltd., in the city, and to work the said tramways and light railways, &c.; authority to abandon and remove the said tramways and light railways, and to run trolley vehicles; powers to run trolley vehicles within and beyond the city; further provisions with regard to the tramways and light railways, &c.

Southend-on-Sea Corporation.—Powers to run trolley vehicles; further provisions with regard to the electricity undertaking, &c.

(c) Railways.

London Electric and Metropolitan District Railway Companies.—Powers to construct subways, improve, extend, and rebuild certain stations, &c.; extension of time limits for construction of certain railways authorised by the London Electric Railway Act, 1914; additional financial powers, &c.

Metropolitan Railway.—Powers to construct and work by electrical energy a railway in the urban district of Willesden and the metropolitan boroughs of Hampstead, Paddington, and St. Marylebone, &c.

Kearney High-Speed Tube Railway Co., Ltd.—Powers to construct a light railway in the county boroughs of Tynemouth and South Shields.

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A Waste-Heat Boiler.

The present-day necessity for economy, particularly in the use of fuel, creates a favourable opportunity for the practical application of Dr. Nicolson's theories with regard to waste heat and gases to the design of boilers for utilising the heat in the flue gases from metallurgical furnaces, gas retorts, or from internal combustion engines. Such a boiler, made by Messrs. Joseph Adamson & Co., Hyde, Cheshire, is shown in fig. 1. It is designed with a view to the length and speed of travel of the hot gases across the heating surface exactly suiting the temperature and volume of the hot gases available, so that they will not leave the boiler at too high a temperature. It is of the flame tube type, constructed, it is claimed, in accordance with the best marine practice; the endplates are secured in the steam space by screwed bar stays of ample section and in the water space by special stay tubes, of thicker material than the others, screwed and expanded into both endplates. The feed water is controlled by a patent marine type regulator, which, it is claimed, will maintain the water level under widely varying load conditions. The heating surfaces

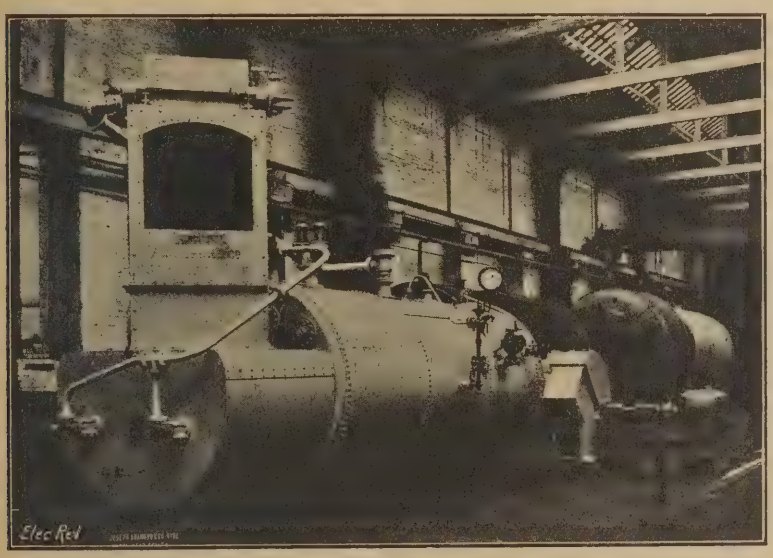


Fig. 1.—Waste-Heat Boiler.

are kept free from soot and other impurities carried in suspension by the gases, by the aid of a blower of the steam jet type, so arranged that all the tubes in the boiler are thoroughly scoured by a high-velocity jet of combined steam and flue gas. The working of the blower does not interfere with the normal

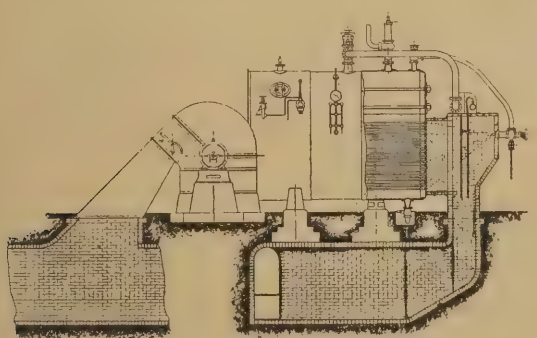


Fig. 2.—Method of Installation.

operation of the boiler, and the time occupied to clean a large boiler is only a few minutes.

It is estimated that a waste heat boiler on a soaking pit provides about 4,000 lb. of steam per hr., representing, say, 2,000 tons of coal saved per annum. The draught fan is electrically driven and for a boiler of this capacity a 20-h.p. motor is installed.

Fig. 2 shows the method of installation of the boiler with regard to the flues.

We suggest that such a boiler may meet the requirements necessary to make use of the waste heat from the small gas works in the country town, &c., for the generation of electricity. From the above estimated figures it may be assumed that a considerable plant for the generation of electricity could be adequately supplied with steam from such a source.

An Improved "Frog" for Overhead Trolleys.

A new design of overhead trolley "frog" has been recently introduced by the Westinghouse Electric & Manufacturing Co. of East Pittsburgh, U.S.A. In attempting to overcome the difficulties encountered in the use of the open-pan type of frog, many modifications of design have been introduced, some of which have operated effectively for trolleys working from the tangent to the curve, but have failed in the reverse direction, the wheel invariably leaving the frog due to the use of a 15 deg. angle. For perfect transition it was found that the correct angle was 8 deg., but such curves were found unsuitable in practice. It is claimed that the new design, which embodies a combination of the 8 deg. and the 12 deg. angles, permits of perfect transition from the tangent to the curve and *vice-versa*. One of its features is that the wheel flanges do not touch the pan, thus giving it a longer life. Flexible approaches are another feature, eliminating the hammer blow as the wheel approaches the body of the frog and doing away with the old method of holding the frog by the use of stove bolts. The bayonet approaches firmly hold the trolley wire, the sides of the approach interlocking with the prongs on the runner, and so providing a high safety factor and ease of installation.

A New Furnace Repair Gun.

The accompanying illustration, fig. 3, is of a new device in the form of a portable furnace repairing gun, which, according to *Combustion*, has been recently developed by the Quigley Furnace Specialties Co., Inc., for relining, patching, or surfacing furnace walls speedily and economically. Refractory materials of plastic consistency to conform with the best-known refractory practice of to-day in the maintenance of boiler and furnace walls are applied with the machine by means of compressed air. The pre-mixed material is placed in the gun; the nozzle is then pointed at the place to be repaired, and the mixture is forced through the hose and nozzle. A pressure of from 95 to 100 lb. is required for heavy plastic mixtures, and for thin mixtures it can be operated with a pressure of 50 lb. The gun consists of a cast-iron cylinder from which the material is forced by pressure applied to the piston. The material is placed in the gun at the charging opening A in the top. Pressure is applied at the bottom of the piston through the pipe connection F, and controlled by the valve B. As the piston rises, the mixture is forced into the Y connection C, from which point it is carried through the hose by pressure of the piston and through the valve D. The gun has a capacity of 2 cu. ft. of mixed material.

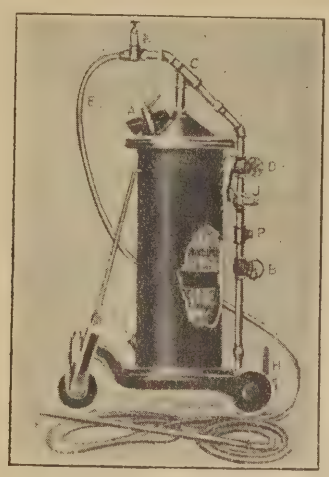


Fig. 3.—Furnace Repair Gun.

A Low-Loading Cable Trolley.

British Insulated & Helsby Cables, Ltd., has recently had constructed by Messrs. R. A. Dyson & Co., Ltd., Grafton Street, Liverpool, a trailer for the transportation of cable drums, a feature of which is that the frame level is only 5 in. from the ground, thus greatly facilitating the handling of the heavy drums. The trailer, which is of all-steel construction throughout, will be used in conjunction with a small tractor. The body which it carries is 8 ft. 2 in. long, the overall length being 10 ft. 6 in. and the width 3 ft. The axles are fitted with roller bearings and carry steel disk wheels fitted with rubber tires. Four vertical spiral springs are mounted on top of the solid axles in order effectively to damp out road shocks. The front axle is of the Ackerman steering type, and a locking arrangement is fitted in order that the trailer, which will carry loads up to 3 tons, can be reversed with ease and safety.

London's Electricity Supply in 1923-24.

The L.C.C. Annual Report.

The annual review of electricity supply in the London and Home Counties Electricity District for the year 1923-24, compiled by the London County Council,* is again replete with matter of the greatest interest and importance. In studying the report it has to be remembered that the year ends with March 31st, 1924, for local authorities and with December 31st, 1923, for companies; also that since the compilation of the report the Watford area has been excluded from the District. There is still another report to come before the record of the operation of the new Joint Electricity Authority commences.

The last census (1921) gave the population of the area as 8,168,819 in an extent of 1,797 square miles. Since the last returns the number of electricity supply authorities has been increased by one (the Chesham Electric Light & Power Co., Ltd., which commenced to supply in Amersham in September last) to 89. This gives the companies, 45 in number, a majority of one. The figures include three local authorities and one company (apparently that already mentioned) not actually giving a supply, and exclude one company (the Central Electric Supply Co., Ltd.), which is a bulk supply company only. The second part of the returns deals with bulk supply arrangements between various authorities. From this the authorities who had made agreements but had not exercised them appear to have been deleted. Apart from this the position appears to have been altered but little except that the total amount of energy interchanged increased by over 48 million kWh to about 201 million kWh. The North Metropolitan Company transferred its custom from the London Electric Railway Co. to Luton Corporation and took a larger quantity. The third section of the report merely shows the local government areas and the authorised distributors therein. The principal part of the report commences with Section 4, in which are tabulated the statistics relating to the capacity and output of all undertakings. A comparison with the previous report shows that the total capacity of generating plant installed at the end of the year rose from 675,532 kW to 758,477 kW—an increase of about 12.3 per cent. The capacity of local authorities' plant was 357,182 kW (14.7 per cent. increase), while that of the companies' plant rose by about 10 per cent. to 401,295 kW. At the same time transforming plant used in connection with bulk supplies increased by only 2 per cent. to 131,000 kW, there being a slight decrease in the amount of such plant employed by local authorities. The latter undertakers had a total of 215,510 consumers at the end of the year, as against 188,399 a year earlier, and the companies were supplying 225,757†, as compared with 219,401; so that the total number of consumers (subject to the proviso in the footnote) rose by about 8 per cent. to 441,267. The municipalities' maximum load was 236,756 kW and the average load factor 23.1 per cent., as compared with 204,432 kW and 22.5 per cent. in 1922-23. The equivalent figures for the companies were 313,512 kW and 20.3 per cent., as against 238,039 kW and 20.4 per cent. in the preceding year. The total maximum demand was thus 550,268 kW, as compared with 442,471 kW, and the overall load factor 21.6 per cent. as against 21.4 per cent. The kW equivalents of connections were as follows:—Municipalities: 1922-23, 586,790; 1923-24, 607,408. Companies: 1922-23, 691,988; 1923-24, 710,317.

Table 5 records the number of kWh generated, sold, &c., by each undertaking. The local authorities generated or purchased during the year (deducting intersales) 535,564,241 kWh, as compared with 449,684,678 kWh in 1922-23, while the companies' output rose from 479,127,973 kWh to 541,347,298 kWh; thus the total output rose from 928,812,651 kWh to 1,076,911,539 kWh. The sales closely followed the output, being 80 per cent. of the energy generated in the case of the local authorities, 79 per cent. in the case of the companies, and 79 per cent. overall; these figures remained stationary from the previous year.

Table 6 analyses the accounts of the undertakings in a very thorough manner. So far as the municipalities were concerned the total capital expenditure during the year was £1,453,659, bringing the total up to £17,936,726. The companies' capital expenditure rose by £1,906,839 to £26,253,452. It is interesting to compare the capital expended on buildings and plant with that employed for the purchase of cables and meters. In the case of the municipalities the respective amounts were £8,986,156 and £6,594,088; and with regard to the companies £14,535,404 and £10,786,253. Turning to the analysis of the trading accounts, it is seen that the municipalities recorded a total revenue from all sources of £4,202,706, as compared with £4,146,837 in 1922-23. The total of working expenses rose from £2,027,334 to £2,221,441. Thus the ratio of working expenses to receipts rose from 49 to 53 per cent. After meeting taxation and other expenses, the balance remaining to meet capital charges was £1,782,209 (as against £1,950,888). These charges amounted in the aggregate to £1,573,620 (£1,533,278), and the net profit was therefore £208,589 for the forty-four undertakings. A net contribution of £195,488 was made to rates. The companies' accounts show a total revenue of £6,127,194, an increase of £270,850, and working expenses totalling £2,433,369 (as against £2,465,868), reducing the ratio of expenses to revenue from 42 to 40 per cent. The amount remaining to meet capital charges, after deducting taxation, &c., was £3,728,939 (as compared with £3,212,113), and these charges, comprising interest, dividends, reserves, &c., aggregated £3,467,863† (£3,001,872*).

Table 7 sets out the average rates of interest and dividend paid by the sixteen companies operating in the County of London for each of the past 24 years. These figures show that the overall average rate fluctuated between the limits of 4.60 per cent. and 5.79 per cent. from 1900 to 1919; since the latter year the rates have been as follows:—1920, 6.02 per cent.; 1921, 6.22 per cent.; 1922, 7.10 per cent.; 1923, 8.07 per cent. In 1923 only three of the undertakings paid a lower rate than 6 per cent., *viz.*, the Charing Cross Co. (City Undertaking), 5.98 per cent.; the Kensington and Knightsbridge and Notting Hill Joint Station, 4 per cent. (a fixed dividend); and the Central Co., 4.91 per cent. Five undertakings distributed over 10 per cent., *viz.*, the Brompton and Kensington Co., 12.94 per cent.; the Notting Hill Co., 16.08 per cent.; the St. James' and Pall Mall Co., 10.50 per cent.; the South London Corporation, 11.26 per cent.; and the Westminster E.S. Corporation, 10.58 per cent. Statement 8 shows that the London companies had realised premiums totalling £963,022 upon the issue of new capital up to the end of 1923; the bulk of this (£674,226) was transferred to renewal, reserve, &c., funds.

Table 9 is a statement of the capital expenditure of the London undertakings (company and municipal) during each of the six years ended with the period under review, *i.e.*, from 1918-19 to 1923-24. In the case of the municipalities the expenditure for the six years totalled £11,472,164, and that of the last year £1,076,129. The companies expended £20,989,502 in the six-year period and £1,838,797 in 1923.

In statement 10 these London authorities are set out, irrespective of the class to which they belong, in order of age, to show what provision has been made for depreciation or its equivalent. The net expenditure charged to capital account is shown, and this is followed by statistics of charges met out of revenue or premiums, the writing-off of preliminary expenses, &c., the totals of various reserve funds, and the repayment or provision for repayment of loans. Among the outstanding items in this section are the following:—The County of London Co., which with a net capital expenditure of £3,072,167 has a total of the other items mentioned above of £1,702,151; the Metropolitan Co. shows a net expenditure of £3,008,188, and a total of reserves, &c., of £1,905,698; the City of London Co. has a net expenditure of £2,783,072, the other items totalling £1,615,419; the Woolwich Borough Council has been aided by the rates to the extent of £253,809; for the Hampstead Borough Council a net expenditure of £349,367 is shown, while the total before-mentioned is £551,121. The latter amount includes £236,218 applied to replacements or purposes of a capital nature, and £276,056 repayment of loans (including provision for this). The operations of refuse-destructor undertakings are dealt with in Table 11. There are six of these and details for Fulham, Hackney, Poplar, Shoreditch, and Stoke Newington are given. For the Woolwich undertaking no figures were available. Full particulars are given only in the cases of Poplar, Shoreditch, and Stoke Newington, and it is shown that these three undertakings generated 1,213,656 kWh, 319,470 kWh, and 246,698 kWh respectively, and charged 0.378d., 0.461d., and 0.240d. per kWh.

The financial results of each of the undertakings belonging to metropolitan borough councils from its inception to March 31st, 1923, are detailed in Table 12. There are 16 undertakings in the list and of these three (Bermondsey, Southwark, and Woolwich) show a deficit over the period of their existence. The remainder show aggregated profits of various dimensions and the net result of the whole 16 is a profit balance of £493,396. The net contribution to the rates has been £134,991.

(To be continued.)

* P. S. King & Son, Ltd. Price, with maps, 5s.
† Incomplete totals.

Electrical Developments in Switzerland.—In this country of "white coal" the use of electrical energy continues to increase, and a whole series of power stations have either been or are being erected or enlarged, involving the expenditure of many millions of francs. At Waggital the plant was to be extended by about 162,500 h.p., while a 10,000-h.p. plant was to be installed at Klosters and linked up with the power stations in the Grisons. In the canton of Valais, two stations at Oberems and Tourtemagne were to be established to produce 30,000 h.p. The Martigny-Orsières is constructing a station at Orsières with an output of 30,000 h.p., and the power houses at Chancy-Pougny will furnish 29,000 h.p. In German-Switzerland fresh stations are about to be built at Sufers-Andeer, the favourite summer resort Andeer-Sils, on the Upper Rhine at Niederschworstadt, Dogern and Reckingen; and at Ruperswil, Wildegg-Brougg and Bottstein, as well as other stations in the Rhone basin.

The North Wales Dam Burst.

Report of the Coroner's Inquest.

ON December 1st the inquest conducted by Mr. J. P. Williams, Coroner for North Carnarvonshire, on 11 of the 16 lives lost due to the breakdown of the dam at Lake Eigiau on November 2nd, was concluded. Mr. W. Proctor represented the Aluminium Corporation, Ltd., and Mr. E. W. Hudson the Electricity Commissioners and other Government Departments.

Mr. RALPH FREEMAN, a partner in the firm of Sir Douglas Fox and Partners, consulting engineers, gave evidence that the dam was constructed in two sections. The first section was built in 1907-8, by the executive engineers, Messrs. Harper Brothers, in conjunction with his firm as consulting engineers, the contractors being Messrs. Bott & Stennett, a firm which no longer existed. The work was suspended for two years, after which his own firm acted alone as consulting engineers for the completion of the dam. The break took place at the extreme end of the first section, built by the first Aluminium Corporation. The dam was built on hard blue clay containing granite boulders, overlaid by two or three feet of peat. The dam was a concrete wall, L-shaped in plan, and the break occurred on the long leg at a point where the greatest pressure was not met with, nor was it the weakest part of the dam; at this place the plans showed that the depth of the wall was 26 feet. Mr. Owen was resident engineer for his firm during the second stage of the work in 1910-11.

In reply to the Coroner, witness said that in his opinion a dam founded six or seven feet deep in the clay was a perfectly reliable structure. There must have been some latent defect. He had frequently visited the dam, which had not been structurally altered, nor had the water level been raised. When the burst took place a section of the clay, about 60 ft. long and 12 ft. deep, was removed from under the foundations, leaving the wall intact. Measurements that he had made since the break showed that at one end the dam was carried only 1 ft. 6 in. into the clay, and at the other end 6 ft. According to the drawings the bases should have been at the same level. This year had been the driest recorded since the dam was finished, and during the summer the lake was empty; the exposure might have dried the clay sufficiently to allow of leakage under the foundations. Leakages in the face of the dam had nothing to do with the break. The dam of the small lake Coedty above Dolgarrog, which received the escaping water, could not possibly withstand the discharge of 100 million cubic feet of water from a height of hundreds of feet.

Mr. J. ROBERTS, of Bangor, who was interested in the formation of the original company, said it was known that the dam had been leaking for some time, and the concrete used in its construction was very poor. He had seen leakages there in 1923.

Mr. A. E. JONES, watchman at the lake, said he reported a leakage near the place of the breakage early in the summer, and it was satisfactorily repaired. On the night of the disaster, November 2nd, he noticed water flowing through the wall and rang up the works at Dolgarrog; he was told to hold on the line by the person who answered the telephone, as he was speaking to someone else, and before he could deliver the message the line was broken. He then telephoned to the watchman at Lake Cowlyd and asked him to inform Dolgarrog that the dam had burst.

Mr. CROSSLEY COLLY, constructional manager to the Aluminium Corporation, gave evidence regarding work done on the dam, and said there had been leakages through it, the concrete being very porous, but no leakages under the dam had been recorded. The dam was 4,600 ft. long, of which 3,300 ft. was concrete and the rest peat bank, at the shallow end. The capacity of the reservoir above the normal level of the lake was 160 million cubic feet. It was the duty of the water supervisor to inspect the whole of the hydraulic works once a week; there was a man resident at the lake who operated the sluice-gate, and kept an eye on the works. Cracks in the dam were plastered in 1921, and grouted under pressure in 1922. During the last three years repairs were carried out on both legs of the dam, the upper face being coated with concrete. There was never any sign of water going under the dam. The two telephone lines from Eigiau and Cowlyd converged near the power station, and the former was swept away by the flood; in future it would be advisable to put the lines on higher ground.

Police-constable JONES, who was formerly a stone mason, said the part of the dam left standing over the gap had since fallen in, and he observed that the concrete was not properly mixed. During the past two years he had seen the water ankle deep across the road opposite the gap, and the place was a swamp.

Mr. A. A. HARPER, of Messrs. Harper Brothers & Co., said that his firm was responsible for the construction of part of the dam. According to the last progress sheet, issued on October 9th, 1908, the plans showed that 100 ft. of concrete had been made which had never been certified, and for it his firm was not responsible. The break took place from the point where they finished. The man in charge of the work, named Wilson, was now dead.

The witness was examined by Mr. W. PROCTOR, and admitted that a contemporary plan signed by his firm's engineer showed that the place of the fracture was within the portion constructed when Harper Brothers were alone the engineers for the reservoir. His firm never completed the contracts of 1907-1908, and was not paid for the last section of the work done, which was never certified.

Mr. L. P. D. TAYLOR, the engineer referred to by the last witness, said that his headquarters were at Dolgarrog and the work at Eigiau was under the supervision of Wilson, a reliable man who was then about 65 years of age, as clerk of works, who was responsible for the mixing of the concrete. The discrepancy between the depth of the concrete wall at the place of the fracture as shown on the plans (26 ft.) and the actual depth (20 ft. 6 in.) must have been due to negligence on the part of Wilson. Harper Brothers were the executive engineers.

Mr. J. L. OWEN said that he made the survey for the original promoters, and from the time he came into the matter for Sir Douglas Fox & Partners the foundations, to his own knowledge, were of the proper depth.

Mr. E. D. HUMPHREYS, water supervisor to the Aluminium Corporation until July last, said he reported leakages in the dam near the spot where it gave way; they all came through the concrete. A weekly report was made to the head office, and any leaks were attended to.

The CORONER, summing up to the jury, said it was clear that where the dam broke the work was not properly done; the foundations were not carried deep enough. "It was a case of accident, but undoubtedly there had been gross neglect, really criminal neglect, on the part of somebody, but unfortunately they did not know at this distance of time who was responsible."

The jury returned a verdict of "Accidental death, caused by the bursting of the Eigiau dam, and on the evidence a section of the wall lacked proper foundations." They recommended that dams should be subject to Government inspection.

For the foregoing report we are indebted to the daily Press, particularly *The Times* and the *Manchester Guardian*. Particulars and illustrations of the dam were given in the ELECTRICAL REVIEW of November 13th, p. 772.

Parliamentary News.

(By Our Special Parliamentary Reporter.)

Lighting of Parliament.—On November 30th, Mr. BARNES asked the Under-Secretary of State for the Home Department, as representing the First Commissioner of Works, whether the electric lighting installation throughout the Parliamentary buildings was the most economical and up-to-date.

Mr. LOCKER-LAMPSON said that the electric lighting installation of the Houses of Parliament was not the most up-to-date, but was generally satisfactory, and was run as economically as possible. The whole building was being re-wired gradually in order to bring it up to modern standards.

P.O. Switchboards. — On December 1st, Sir W. MITCHELL-THOMSON informed Mr. DAY that the Post Office had not ordered switchboards from Germany, nor obtained a tender for them from that or any other foreign country.

The Broadcasting Committee.—On December 1st, Sir W. MITCHELL-THOMSON informed Mr. CAMPBELL that the Broadcasting Committee would decide in due course whether it should issue any interim report and whether it should recommend the publication of evidence.

The Weir Report.—On December 2nd, Mr. BALDWIN informed Mr. T. THOMSON that it was not proposed to publish the Weir report on electrical development.

Report of Smoke Abatement League.—It is interesting to note in the 6th annual report of the Smoke Abatement League (1924-5), that satisfactory arrangements have been made to hold a "Universal Smoke Abatement Exhibition" in Bingley Hall, Birmingham, in September, 1926. The League has been engaged in adding continuously to its exhibits for use in connection with Health Weeks, &c., and many designs of exhibits, other than photographs, have been prepared. Arrangements have also been made with Messrs. Ernest Benn, Ltd., to publish a small handbook dealing with domestic smoke. This will be composed of contributions by various experts, and is intended to assist householders, builders and architects in connection with the reduction or elimination of domestic smoke. A book or series of books dealing with industrial smoke and noxious fumes is contemplated, and a pamphlet dealing with the effect of smoke on health is in course of preparation, and, it is hoped, will be published early in 1926. A forty-eight page pamphlet entitled: "Smoke Abatement in Salt Lake City, Utah," has also been published by the League with the kind permission of the Salt Lake City Engineering Department. The body has in active formation a library of books, pamphlets, &c., dealing with every aspect of smoke abatement and allied subjects, and it is hoped to develop the library for loan purposes to members. There were on September 30th thirty-nine local authorities affiliated to the League, some of which have appointed members to its Council. The League is striving its utmost to carry out its aims and ideals, but is hampered by lack of means. The statement of accounts for the year in question shows a deficiency of £289, which is the result of this year's Smoke Conference at Manchester. The subscriptions received by the League amounted to £256.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Discussions at the Institution of Electrical Engineers.

I think some protest should be made against the cutting short of the I.E.E. meetings precisely at 8 o'clock, no matter whether the discussion is complete or not, and even to the extent of instructing the author that he is not to make a verbal reply.

I was delighted to note that Dr. Smith on Thursday ignored this and gave a partial reply in acknowledging the vote of thanks. It is sincerely to be trusted that this will become the usual practice.

If it is essential that the President and Council should leave promptly at 8 o'clock, would it not be possible to appoint an acting chairman in cases where it shows signs of being worth while? Some member of standing could always be found among the audience who would be willing to take on this function.

I must say that for my part I regret the old days in which it was possible to have a really free and frank discussion.

F. Creedy.

London, *December 5th*, 1925.

As an Associate Member of the Institution of Electrical Engineers who has taken a keen interest in the progress of the Institution for a number of years, I note with great regret the very bad practice which appears to be growing, of stifling discussions at ordinary meetings, and closing the meeting, no matter what stage has been reached, so as to finish before 8 p.m.

This has been very noticeable during the last year or so. I know that several members considered this custom had reached a climax at the last meeting, when after Dr. S. P. Smith had given an excellent paper on a subject of the widest possible interest and a good discussion was developing, the meeting was curtly cut short, and the apparent discourtesy done Dr. Smith of attempting to deny him the opportunity of making even the briefest reply. To the great satisfaction of many of us he ignored this unfortunate, and, maybe, quite unintentional act and made a brief reply on general lines.

It is high time, if the Institution is to succeed in maintaining the supply of valuable papers for discussion, that members who give their time to the preparing and delivery of papers should at least be given the fullest opportunity for proper discussion of their work and for making an adequate reply.

The time at present allowed reduces the whole thing to a farce.

In conclusion, may I suggest that the Member, President or otherwise, who presides at ordinary meetings should, in all cases, be prepared to continue the meeting till 9 o'clock or even later, if it is the wish of the meeting, and that the Council dinner be held on some other evening, or that a supper at a later hour be substituted. Then perhaps the restive spirit which reveals itself as 8 o'clock approaches may be countered.

In all seriousness something should be done at once to get back to the really unfettered discussions which we used to have in the past.

May I add, I make this appeal as a listener and not as a would-be speaker.

A.M.I.E.E.

Westminster, *December 5th*, 1925.

The Metering of Three-phase Power.

In reply to "A Meter Superintendent's" letter appearing in your columns, I regret to say that I am not able to give very much *useful* information concerning the error of 15 per cent. which I mentioned as having occurred in a three-phase, four-wire meter of the two-element type. This case came to my notice in an engineering works where the load consisted of induction motors and single-phase welding plant. Condensers were also installed for the improvement of power factor. A three-phase, four-wire low-pressure supply was given to the consumer, and a two-element meter with its three current transformers connected in delta was installed to meter it. The consumer had a meter of the three-element type installed to check that of the supply undertaking, and it was noticed that this meter almost always registered apparently fast. The supply undertakers re-tested their own meter in their test department, and under the usual conditions of test to which a meter of this type is subjected, it was found to be accurate.

Doubts as to the accuracy of the customer's meter then existed, and I therefore conducted tests at his works, but only to find his meter accurate also. At my suggestion, the supply undertaking then installed three single-phase check meters, and the 15 per cent. error which I quoted was the result of the readings between these three single-phase meters and the two-element polyphase meter. Tests were afterwards made by the supply undertaking to ascertain exactly the type of load at this works, but as I was not directly concerned, I regret to say that I have no actual figures of the results obtained.

I am pleased to note that your correspondent and also Mr. Malcolm agree that three separate metering elements are desirable for the correct metering of a three-phase, four-wire supply. Whether three separate single-phase meters or one three-element polyphase meter is employed it matters not, as the results in either case will be correct for *any* condition of load.

Regarding the points which are mentioned as preventing the adoption of the three-element polyphase meter, the subject of cost is, without doubt, an important one. Whilst I admit that a five-ampere, three-element meter is slightly more costly (a matter of shillings) than one having only two elements, it should be borne in mind that usually these meters are used in conjunction with current transformers, and the extra cost for a three-element meter is then very small compared with the cost of the complete equipment.

In any case, it is my opinion that this extra cost is worth while, seeing that a meter which will register accurately under all conditions of load is obtained.

The subject of errors caused by interaction between the elements is one in which I'm afraid I am not in agreement with "A Meter Superintendent." Does he just conclude that errors of this kind occur in three-element meters, or has he any figures that he can give us on the subject? My experience is that with a properly-constructed and calibrated meter errors caused by interaction are so small that they can be neglected.

I regret to note that "A Meter Superintendent" does not think I give the meter engineer the credit due to him. That is quite contrary to my wishes. There are, without doubt, many very capable meter engineers engaged in the supply undertakings in this country, and where they are allowed to exercise their capabilities very little, if any, bad metering is to be seen. No doubt "A Meter Superintendent" is one in this fortunate position, but he should remember that the position the meter superintendent is a "minus quantity" in many of the supply undertakings, and that often when a capable man is employed he is restricted in his work and not allowed to decide on the systems of metering to be used.

I shall be interested to read the results of Mr. Malcolm's suggested experiments. The subject of maximum-demand indicators I will deal with at a later date, as I feel I have already trespassed too far on your valuable space.

H. Hugh Jaques.

London, *December 5th*, 1925.

The Salaries of Combustion Engineers.

I am afraid that the letter signed "Shift Engineer," expressing astonishment at my comments on the above subject, and, presumably, your own unqualified endorsement thereof, seems only to emphasise what I wrote. I do not for an instant belittle the rank of shift engineer, having been one myself for many years, but what I wished to emphasise was that, as in the instance given by "Shift Engineer," what constitutes a fully qualified combustion engineer does not appear to be very widely understood on this side of the Atlantic.

While the only positions open for specially trained men, of whom the specialising shift engineer is usually the best type, are of the order "Shift Engineer" has for a subordinate, there will be no encouragement for men to become specialists at all.

All engineers who keep themselves abreast of the times realise that the boiler house is nowadays the place of primary importance in view of the imperative need to keep coal costs down to a minimum, and requires infinitely more constant and careful supervision to this end than any other portion of the plant. In a case like that of your correspondent, although he is nominally responsible for the boiler-house efficiency, it is the man on the spot who actually controls this, not the one whose other duties do not permit him to do so.

It is idle to argue in these times that a man can be a first-class all-round engineer and at the same time a specialist in a particularly involved branch of engineering; whichever he gives his mind to properly, the other is bound to suffer.

Chas. F. Wade.

Sheffield, *December 4th*, 1925.

I have read with interest the correspondence on the above subject appearing in your issues of November 27th and December 4th.

In the quite early stages of my power station experience, covering as it has done the control of the combustion of, I suppose, about 3½ million tons of fuel, I was led to the inevitable conclusion that the resident engineer must, personally, give a large proportion of his time to the solution of problems pertaining to the combustion of fuel, for the very good reason that 75 per cent. to 80 per cent. of the total cost of generating electricity is due to the cost of the fuel burnt.

The efficiency of the turbine house is settled, within small limits, by the type and design of prime mover installed. It is to the boiler house with its varied problems in mind and matter that his attention must perforce be directed if he be determined to obtain true commercial efficiency. A decrease of 5 per cent. in the amount of coal consumed—quite a possibility in many stations, even in 1925—ensures a decrease of about 3¾ per cent. to 4 per cent. in the cost per kWh.

The class of grate installed, the extent to which forced and/or induced draught is available, the facilities for bunkering fuel and for disposing of ashes—in short the conditions generally—determine the classes of coal which may be burnt with hope of success. The more elastic and complete the control over the combustion chamber the wider becomes the market for fuel. A wider market tends to extract lower offers from colliery or merchant. Therefore not only must such fuel as is purchased be properly burnt, but the limitations found and the possibilities detected in the actual combustion of the many kinds of fuel purchased must be fully known or communicated to the purchaser—usually the resident engineer.

In relatively small stations I have found that the best commercial results may be obtained by each charge shift engineer undertaking the combustion work on his own shift, giving 50 per cent. to 75 per cent. of his time to it, so long as he keeps in close touch with his chief, the latter settling the thickness of fire, speed of grate, and the best draught conditions determined by trial made in closely reasoned co-operation with his three engineers on shift. Such an arrangement has the advantage of creating friendly shift rivalry provided the coal can be weighed and the *personnel* of the shift remains reasonably constant—the latter a thing of the past with the introduction of the 48 hours' week.

If, however, the station is a large one this close co-operation is not possible to the same degree in the same way. It then becomes necessary that more of the charge shift engineer's time shall be directed to the general supervision of the station as a whole, thus diverting seriously the needed constant attention to combustion details. The resident engineer in the same way finds himself drawn little by little from this important branch of his care, by wider or more immediate issues such as extension of plant, or labour troubles, threatened or actual, Hence he must engage as a right-hand man, either in the person of a chief assistant or a thoroughly sound combustion engineer, someone who can form a reliable link between himself and the boiler house. This man will, depending on the size of the plant, together with the facilities and degree of control given him, either himself direct during the day the operations of the leading stokers, setting the conditions of combustion; or, alternatively, exercise control through the medium of junior combustion engineers on shift. At the same time he will keep his chief fully informed of results, and possibilities of improvement, obtaining consent to likely improvements and carrying them out.

I am afraid no hard and fast lines can be laid down as to when in the life of a growing station the appointment of a combustion engineer becomes a paying proposition; but that a qualified combustion engineer is a very pressing need in a well-run super-power-station cannot be gainsaid. Within the limits of commercial efficiency such a man can, if he be technically proficient, patient, resourceful, of sound character and endowed with a capacity for team work, command, and will be gladly paid, a good salary.

In a power station burning 200,000 tons of coal per annum costing 10s. per ton, a saving of £1,000 a year is effected for every 1 per cent. decrease in the coal bill. But even if we assume that following the appointment of a combustion engineer such a result was obtained, the benefit derived could not be credited wholly to his endeavours. Some credit is due surely to capital for the venture made (he might turn out a "rotter") and facilities given; more is due to the customer, and more again to the loyalty and co-operation of his fellow officers and workers. A fair figure would probably be one-third or, say, £330.

Having determined roughly the salary he could offer, due regard being given to the improvement in efficiency possible, it would, in my view, be the duty of the resident engineer in the interests of true commercial efficiency—or what may be described as a fair deal by one's staff and undertaking, one's customers and one's country—to obtain the best man at the lowest figure he can. The value to be placed on the services of such a man depends, naturally, on the number of equally good men desiring the post and the number of positions vacant.

E. W. Dickinson.

London, *December 5th*, 1925.

Rural Electricity Supply.

May I contribute to your highly esteemed journal a few remarks on the above subject, which is of much interest to-day and of which I have had about 35 years' experience.

A public supply of electricity is a benefit to all, even indirectly to those who do not themselves require a supply. Therefore to charge a rental because a pole is placed upon or because wires cross over property is selfish and unneighbourly.

I have considered and treated the matter as follows:—

In asking permission to erect a pole or attach to a chimney or cross over property, it has been on the grounds that it is first a public utility, secondly an advantage to the property owner. This second reason is explained by the statement that mains will be erected in the vicinity and if the wayleave is granted a supply of electricity will be available in the future with only the small cost of the covered wire service which is part of the wiring installation, but if consent is refused the future consumer will have to pay for an extension to the property.

To avoid a "right of way" a letter was written in each case to the owner undertaking to "make good any damage and to remove the wires at any time upon receiving three months' notice to do so." This undertaking may seem a risky condition to promise, but it has been very seldom exercised, while it gives the property owner a sense of security in the event of alteration to property or change of ownership.

Many thousands of wayleaves have been granted without any payment at all, and after the district has been well covered with supply wires, generally at the backs of the houses, then in case it is necessary to remove in one case it is easy to cut out a section and feed round. If a rental is insisted on, then the rent should be debited against the supply when required—and one may rest assured that it will be required much sooner than the owner thinks.

The getting of wayleaves is a personal matter, and the district manager may leave or die or some adverse influence may create apprehension or distrust among the owners; to avoid this and for other reasons it is advisable to form what I called "District Advisory Committees."

The District Advisory Committees consisted of members nominated by the Corporation or Urban District Council and/or by the Rural District Councils, power users, domestic users, and the supply company, with the district manager; a secretary was provided by the supply company. The Committees had no executive powers, but with their local knowledge and interests were most useful in influencing troublesome wayleaves as well as in other matters.

In all cases of a continuing business, such as electricity supply is, I consider it advisable to earn only moderate profits and the paying of dividends somewhat in relation to the cost of money, especially so where the public are *giving* facilities and their interests are the interest of the business.

Before the war dividends in no case exceeded 5 per cent.; indeed, from 1905 to 1913 a steady 5 per cent. was paid, the balance between earnings and distribution being utilised for renewals and improvement of plant. Larger dividends have been paid since the war, but then the value of money has decreased.

The price to be charged for energy is another matter that requires to be in accordance with public ideas, and in this respect the District Advisory Committees were a useful medium to correlate the ideas of consumers and suppliers—a matter also relative to free wayleaves, but which I will not pursue further in this letter.

Napier Prentice.

Stowmarket, *December 4th*, 1925.

A Grumble.

May I get a small grumble off my chest suitable for the Christmas season? Like many others, I find my time so occupied that I have great difficulty in reading the technical Press. To make matters worse, the "E.R." is becoming fuller and more interesting all the time: even the advertisements clamour to be read. How is one to get the time to absorb the ever-increasing mass of knowledge?

Overtime.

December 4th, 1925.

[Our sympathies are with our correspondent; the flood of information that reaches us, both in print and in MS, in these stirring times is almost incredible, and quite beyond the power of the individual to assimilate. But though we dwell in a land overflowing with intellectual milk and honey, we are not compelled to overeat. Let us be content to select a mental diet which shall afford variety and stimulate thought, without tending either to excess or to scantiness—and leave the rest.—EDS. ELEC. REV.]

Assisted Wiring Schemes.

The full account you gave in your issue of the 27th ult. of Mr. Edgar's paper on "Assisted Wiring," which he read before the recent E.D.A. Conference, has confirmed a statement that he made which I was unable to appreciate at the time, and would anyhow have been unable to mention at the meeting, as it was contained in his reply to the discussion.

In reply to the criticism by Mr. Abbott, Mr. Edgar stated "that he did not consider that the cost per kWh should include capital charges on the generating plant, because the generating plant was already there, and there must be sufficient overload capacity, or stand-by plant, to meet all the load that would arise from these comparatively small consumers for some time to come." These capital charges, or at any rate a proportion of them, are invariably charged to the domestic consumer, but Mr. Edgar in his anxiety to attract the small domestic consumers, lets them off their share of the capital charges, and therefore presumably sells them lighting units at a cheaper rate than to other domestic consumers.

As a statutory undertaker Mr. Edgar is surely contravening the Electricity Act of 1880, which states that "no undue preference shall be given to any consumer," and his concession seems unfair to the other domestic consumers who, as Mr. Edgar indirectly admits, have financed his assisted-wiring scheme. Taking the figures given for the estimated number of consumers under this scheme by March 31st next, namely, 6,000, and allowing, say, an average maximum demand of 100 watts per consumer, we get a total maximum demand of 600 kilowatts or, say, 400 kilowatts on the station allowing for diversity. This may be insignificant in comparison with the total maximum demand of the South Shields undertaking, but it may be appreciable if the rate of connection under his scheme is maintained, and at any rate it brings nearer the time when fresh plant will have to be installed.

With the exception of this one point this scheme seems admirable, nor would it to my mind have been less successful if the proper proportion of capital charges had been added to the unit charge, though in a small undertaking, as Mr. Abbott pointed out, these capital charges are the chief item in the cost of the lighting unit.

It is to be hoped that the E.D.A. will follow up the suggestion made that it should collect and publish details of other schemes in order to help the supply industry in its ultimate aim and purpose, namely, "to sell electricity."

J. N. R. Perks.

London, *November 30th*, 1925.

Overhead Distribution.

I read with interest your article on the electric supply to Brundall, and afterwards went to have a look at the village.

While acknowledging with gratitude that the company, to avoid damage, has done what was possible by varying the lengths of the poles and by making many diversions and crossings, I cannot share your hope that compulsory powers may be obtained for the uglification of similar tree-shaded villages. My sympathies are all with the recalcitrant frontagers—and with the trees.

A money value cannot be put on æsthetic damage, but even regarding the matter from the lowest standpoint (*i.e.*, financial), I suggest that Brundall has made a mistake in allowing a pole line through the village street. The district is practically a residential suburb of Norwich, and the householders are nearly all of a good class of people who have taken some trouble to get away from the town into a pleasant country neighbourhood. Though there is no doubt of their appreciation of electricity for similar prospective owners, a system of distribution which would look ugly in the outskirts of Manchester can hardly be classed as an attraction.

The Norwich Corporation is delivering about six miles from its generating station, and the last three miles or so are through open country. It has been able to run underground all the way, so it is difficult to see how another two miles of underground distribution could have added a prohibitive percentage to the cost.

Sometimes in recent years when repassing through a village one has wondered why it looks so much nicer, and it comes rather as a shock to realise that since the last visit the Post Office trunk line which one had regarded as a permanent feature, has been put underground. It would be a great pity if, in the name of progress, supply companies should work in the opposite direction, and give us an even worse set of eye-sores to get used to.

I should not have troubled you now, if this article had not followed a long series of advertisements showing for example a charming stretch of Welsh hills or a corner of a village in Hampshire, with the only blot on the landscape "featured" as the point of the advertisement. The force of reiteration is strong, and if nobody protests we engineers will begin to imagine that a pole-line is beautiful and that those who put it up deserve well of the community.

S. E. Glendenning, M.I.E.E.

Norwich, *December 5th*, 1925.

Trade-mark Applications.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from December 2nd. In the case of foreign applications, the names and addresses of the British representatives are also given :—

Prt (lettering and design). No. 463,438. Class 5. Copper, brass, bronze, aluminium, and German silver wires. No. 463,439. Class 8. Copper, bare or tinned bronze, and aluminium electric cables.—Cie. Générale d'Electricité, Paris. (Cruikshank & Fairweather, 65-66, Chancery Lane, W.C.2.)

M.W.L., My-Lite The Sign (lettering and design). No. 460,329. Class 8. Electric cells and batteries (not for medical purposes).—Marsden's (Wholesale), Ltd., 47, Church Street, Preston.

Vortexion. No. 560,932. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Kirby (Wimbledon), Ltd., 72, Merton Road, S.W.19.

Primafa (lettering and design). No. 461,463. Class 8. Electric accumulators, batteries and parts thereof.—Accumulatoren-Fabrik Gesellschaft, Berlin, S.W.11. (E. Evans & Co., 27, Chancery Lane, W.C.2.)

Silver Knight (lettering and design). No. 462,995. Class 8. Apparatus for use in radio-telegraphy and telephony.—R. H. Eliot, 100, Victoria Street, S.W.1.

Superdyne. No. 462,682. All goods in Class 8.—C. G. Williams, trading as the British Radio Manufacturing Co., 9, South Castle Street, Liverpool.

Em-Pe-A-Adyne. No. 463,343. Class 8. Instruments and apparatus and parts thereof for use in radio-telegraphy and telephony.—The M.P.A., Ltd., 62, Conduit Street, W.1.

Omarvella. No. 463,527. Class 8. Radio-telephonic apparatus and parts, &c.—G. G. Stevens, 6, Storey Road, Walthamstow, E.17.

Xcel, All British (lettering and design). No. 459,114. Class 13. Electric kettles, cooking utensils, domestic irons, electric heating and soldering irons, and electrical fittings for use in connection therewith.—Automatic Telephone Manufacturing Co., Ltd.

Decko. No. 462,420. Class 13. Electric switches, fusible cut-outs, sparking plugs, and similar electrical fittings, but not including electric lamps and torches.—A. F. Bulgin, trading as A. F. Bulgin & Co., 9-11, Cursitor Street, Chancery Lane, W.C.2.

New Swedish-Danish Power Cable.—The Nordsjaellands Elektricitets og Sporvejsselskab (North Sealand Electricity and Tramway Co.) has, since 1914, received its electric current from the waterfalls at Lagen, near Halland, Sweden, by means of a 25,000-V line laid under the Sound. This company has recently, in co-operation with the Swedish Sydsvenska Kraftaktiebolag, of Malmo, the Frederiksberg Commune, and the Copenhagen Commune, laid a 50,000-V cable from Sweden to Denmark at a cost of approximately 2,000,000 crowns. This cable, which is said to operate at the highest pressure of any submarine cable in the world, has three conductors each of 95 sq. mm. cross section. The weight of the cable is 38 kg. per metre.—*Commerce Reports.*

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

11,543. "Means for the interpolation of cable code or other signals." Creed & Co., Ltd., and H. F. Woodman. May 9th, 1924. (242,535.)

16,720. "Illuminating appliances." W. A. Dorey. July 11th, 1924 (Patent of addition not granted.) (242,686.)

17,103. "Electrolytic rectifiers for alternate currents." R. F. Bossini. July 17th, 1924. (242,688.)

18,826. "Construction of electrical switch." A. E. Burrow and A. G. L. Prahm. August 7th, 1924. (242,693.)

18,881. "Picture transmission systems." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). August 8th, 1924. (242,694.)

19,026. "Electro-magnetic bells." A. E. Alexander (Signal Engineering and Manufacturing Co.). August 11th, 1924. (242,698.)

19,027. "Electro-magnetic bells." A. E. Alexander (Signal Engineering and Manufacturing Co.). August 11th, 1924. (242,699.)

19,028. "Electromagnetic bells." Signal Engineering and Manufacturing Co. August 22nd, 1923. (220,940.)

19,048. "Induction electricity meters." S. Z. De Ferranti and Ferranti, Ltd. August 11th, 1924. (242,702.)

19,107. "Control switches for varying the resistance of a circuit." F. B. Cox. August 12th, 1924. (242,705.)

19,279. "Electric relays." A. Reyrolle & Co., Ltd., and B. H. Leeson and R. C. Minton. August 14th, 1924. (242,710.)

19,375. "Automatic telephone systems." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd), and A. M. Searle. August 15th, 1924. (242,713.)

19,391. "Control of polyphase electromotors." Smith, Major & Stevens, Ltd., and P. H. Stevens. August 15th, 1924. (242,714.)

19,410. "Regulating or control systems for dynamo-electric machines." T. W. Ross and Metropolitan-Vickers Electrical Co., Ltd. August 15th, 1924. (242,715.)

19,665. "Thermostatic relays." Igranic Electric Co., Ltd., and C. F. Tubbs. August 19th, 1924. (242,726.)

20,246. "Crystal detectors for wireless reception." A. F. H. Morant. August 27th, 1924. (242,729.)

20,338. "Electric switches." Brookhirst Switchgear, Ltd., and J. A Hirst. August 28th, 1924. (Addition to 223,960.) (242,730.)

21,585. "Telephone receivers." J. W. Dungey. September 12th, 1924. (242,737.)

22,760. "Electrical condensers." British L. M. Ericsson Manufacturing Co., Ltd., W. D. Norbury and F. Bates. September 26th, 1924. (242,742.)

22,866. "Supporting frame for electric lines." Compagnie Electro-Mécanique. November 5th, 1923. (224,506.)

24,176. "Electric supply meters." W. H. Brown. October 11th, 1924. (242,750.)

24,548. "Apparatus for converting electric currents." W. Meacher. September 6th, 1924. (Divided application on 17,749/24.) (242,753.)

24,871. "Method for separating the set from the aerial in wireless receiving and transmitting sets." W. Rawsthorne. October 20th, 1924. (242,759.)

24,915. "Wireless receiving apparatus." H. F. Abraham. October 20th, 1924. (242,761.)

25,538. "Electron discharge devices." British Thomson-Houston Co., Ltd. November 13th, 1923. (224,877.)

25,575. "Electric condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (242,768.)

26,949. "Automatic and semi-automatic telephone systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. November 11th, 1924. (242,785.)

26,985. "Electric incandescent lamps." A. S. Cachemaille (Westinghouse Lamp Co.). November 12th, 1924. (242,787.)

30,588. "Electric rheostats." Crompton & Co., Ltd., and W. F. Jones. December 19th, 1924. (242,807.)

31,016. "Manufacture of cables." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). December 24th, 1924. (242,814.)

1925.

388. "Selecting switches for use in telephone systems." Siemens and Halske Akt.-Ges. and F. Doring. January 6th, 1925. (242,819.)

5,624. "Telephone receivers." G. Green. March 2nd, 1925. (242,847.)

5,742. "Electric luminous-discharge tubes." General Electric Co., Ltd. August 22nd, 1924. (238,845.)

7,592. "Means for influencing the power factors of alternating-current mains." Siemens-Schuckertwerke Ges. April 10th, 1924. (232,193.)

8,620. "Electric conductors." O. Sattelberg. March 31st, 1924. (231,534.)

9,179. "Emergency braking systems for electric vehicles." Maschinenfabrik Oerlikon. April 5th, 1924. (231,905.)

9,510. "Protective arrangement for alternating-current electric machines." Siemens-Schuckertwerke Ges. April 12th, 1924. (232,243.)

9,710. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. April 14th, 1924. (232,258.)

10,079. "Electric resistance elements, and methods of making same." British Thomson-Houston Co., Ltd. April 18th, 1924. (232,624.)

11,878. "Anti-dazzle devices for the headlights of mechanically-propelled vehicles." J. A. Spencer. July 30th, 1925. (242,884.)

12,495. "Means for tuning aerials and oscillatory circuits coupled with an aerial." Telefunken Ges. für Drahtlose Telegraphie. May 14th, 1924. (234,113.)

13,783. "Receivers employing the heterodyne principle." Marconi's Wireless Telegraph Co., Ltd. May 27th, 1924. (234,816.)

14,193. "Protective arrangements for alternating electric current circuits." International General Electric Co., Inc. May 31st, 1924. (Addition to 230,501.) (234,842.)

14,474. "Selective relay for the protection of electric lines." International General Electric Co., Inc. June 3rd, 1924. (235,197.)

15,016. "Process for avoiding inadmissible tension conditions in switched-off circuit portions of alternating-current electric supply systems." Siemens-Schuckertwerke Ges. June 18th, 1924. (235,869.)

15,842. "Variable electric condensers." Soc. Anon. Des Anciens Etablissements E. Picard. October 4th, 1924. (240,792.)

16,207. "Electric cables." A. H. Roberts. June 23rd, 1925. (242,911.)

16,775. "X-ray tubes comprising an incandescent cathode." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 21st, 1925. (242,915.)

17,527. "Supports for brushes of dynamo-electric and like machines." British Thomson-Houston Co., Ltd. July 11th, 1924. (236,945.)

19,454. "Protective arrangements for electric installations." International General Electric Co., Inc. October 6th, 1924. (240,798.)

23,804. "Device for indicating and determining the position and extent of sparking and other disturbances in transformers, choke coils, and other electrical apparatus operating in an insulating medium." M. Buchholz. March 24th, 1925. (Addition to 198,936. Divided application on 7,933/25.) (242,926.)

24,041. "Transmission of wave energy for high-frequency signalling." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). August 27th, 1924. (Divided application on 20,238/24.) (242,928.)

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London's Electricity Supply.

IN this issue we conclude a review of the London County Council's Return relating to electricity supply in the London and Home Counties Electricity District, for the year 1923-24, which comes opportunely when the Joint Electricity Authority has been constituted and the question of settling the standard prices to be charged by the London companies will shortly be taken in hand. Moreover, the current Return not only gives the data as usual for companies up to the end of 1923 and for local authorities up to March 31st, 1924, but for the first time includes the latest figures available for the companies—that is, up to the end of 1924. This is a convenience on which the compilers are to be commended. It is to be regretted, however, that the map showing the areas of authorised distributors in the Electricity District has not also been brought up to date; large spaces are shown uncoloured, although they have been allotted to various undertakers, and we believe it is correct to say that the whole of the District is now covered by statutory powers to supply electricity.

Undoubtedly the most interesting section of the Return at this juncture is that which deals with the methods of charging adopted and the prices charged by the various supply undertakings in the Electricity District. There are 89 authorised distributors in the District—44 local authorities and 45 companies—and they employ over 20 methods of charging; fortunately four methods predominate, namely: flat rate, sliding scale, maximum demand, and two-part tariffs. Amongst so many variables, it is not easy to institute a valid comparison, but taking the flat-rate charges only, the average decrease as compared with the previous year was in the case of lighting 3 per cent., power 18 per cent., and heating and cooking 9 per cent.

Of the metropolitan borough councils Poplar shows the lowest net revenue available for capital charges per kWh sold (0.61d.), closely followed by Stepney with 0.62d. Ten of the 16 councils received less than the average, which was 1.00d. Only one (Woolwich) drew upon the rates, to the amount of £2,844, and the net contribution in aid of the rates was £140,396.

Taking private lighting, power, and heating, with street lighting, the lowest revenue per kWh sold was at Woolwich (1.61d.), Poplar coming next with 1.65d., and Battersea and Stepney following with 1.81d. All the rest received more than 2d. The average for all was 2.26d.

Turning to the London companies, and excluding those giving only bulk supply, in 1924 the lowest net

revenue available for capital charges, 0.68d. per kWh sold, is credited to the London Electric Supply Corporation, which supplies energy to the Southern Railway; next comes the City undertaking of the Charing Cross Company with 1.06d. The average (including bulk supply companies, which received 0.35d. and 0.48d. respectively) was 1.84d.

For private lighting, power, and heating, with street lighting, no figure is given for the London Electric Supply Corporation, the revenue being lumped with that from traction; of the remainder, the lowest price per kWh sold is that of the South Metropolitan Company, 2.42d., the next in order being Westminster, 2.94d. The average is 3.14d.

The figures that we have quoted show that, roughly speaking, the London companies charge their consumers 40 per cent. more than the metropolitan borough councils do.

The Turbine Failure at Vereeniging.

THE breakdown of a turbo-generator at the Vereeniging power station of the Victoria Falls & Transvaal Power Co. on Monday last week was happily unattended by loss of life; but otherwise it appears to have been exceptionally thorough, the generator having been burst into fragments. The other three machines in this 40,000-kW station were damaged, but two of them were soon on load again, and the third will shortly be ready for service. By Thursday last week 95 per cent. of the normal peak load on the Company's system was being handled, as might be expected, seeing that the rated capacity of the several stations belonging to the Company aggregates 216,000 kVA.

The Vereeniging plant was set in operation in 1912; it is the second largest on this huge power system, which is fully loaded and works at a load factor of 70-80 per cent. A new power station at Witbank is being built by the Company on behalf of the Electricity Commission of the Union of South Africa, but will not be ready for use for some months to come. Quite recently the engineers were congratulating themselves on the fact that the boilers, many of which had been in use, heavily loaded, for 17 years, were as good as new and more efficient than when installed, but they have not been so fortunate with the turbo-generators, several of which, of German construction, gave them a good deal of trouble before the war.

The question arises whether the breakdown was due to a defect in design or material, or to age. At present we can but speculate on the matter, having no definite information regarding the origin of the fracture. When it is considered that the bending stresses in the shaft of a turbine running at 1,000 r.p.m. under the conditions obtaining on the Rand undergo some 8,000,000,000 reversals in 13 years, it will be seen that even the comparatively light stress involved may ultimately produce cumulative molecular effects of considerable importance. Up to the present we know of no other instance in which a turbine has "exploded" after many years' running, and it may be found that fatigue was not the cause of the Vereeniging breakdown.

Progress in Illuminating Engineering.

THE opening meeting of the Illuminating Engineering Society on November 26th was, as usual, marked by a good display of novelties. New arc lamps, colour projectors, motor-car headlights, and lighting fittings were amongst the exhibits. But of even greater interest, possibly, is the glimpse given in Mr. L. Gaster's report of the work on illumination that is going on simultaneously in so many different quarters—all ingeniously inter-related. The Committee working under the Department of Scientific and Industrial Research is a creation peculiar to this country. Its authoritative and impartial character lends special importance to its conclusions on industrial lighting. Evidence from this quarter with regard to the benefits of good illumination would be extremely valuable to the lighting industry, and we hope that before long it will be possible to make public some of its conclusions. Very useful work is also being done by the various B.E.S.A. committees. An informative standard specification for illumination photometers has recently appeared, and the work already done with regard to lamp standardisation is distinctly valuable. The amount of conscientious honorary work done by the members of such committees deserves more gratitude and recognition than it receives.

The second point emphasised at the meeting is the rapid growth of interest in illuminating engineering abroad. In the United States the Illuminating Engineering Society and its associated bodies have been conducting propaganda on a remarkably wide scale. We note that there are now three distinct societies interested in illumination at work in Germany, and Czecho-Slovakia is apparently to be reckoned as one of the latest recruits. There is no doubt that illumination is now entering the international phase, and it is therefore most desirable not only that there should be in this country a strong and well-supported body capable of voicing the national interests, but that this country should take a proper share in the international conferences of the future.

Swiss Industry Feels the Effect of Competition.

THE Commercial and Industrial Association of Switzerland recently issued a review of trade and manufacture in 1924, based on official statistics of imports, exports, &c., and on the detailed statements furnished by the different trade and group associations throughout the country. There was a general improvement in the activity of the machinery industry, unemployment having to a large extent disappeared and production having assumed a more stable character. The number of workpeople in 1924 exceeded the pre-war level, whilst the total exports of machinery and vehicles amounted to 53,500 tons, or a net increase of about 3,200 tons. Whilst the total value of the exports rose from 157 million fr. to 172 million fr., the average value per kg. fell from 3.35 fr. in 1923 to 3.22 fr. in 1924.

The progressive electrification of the Federal Railways was of great benefit not only to the electrotechnical industry, but to other enterprises. On the other hand, the export departments view future prospects with some anxiety. Nationalistic and fiscal tendencies, particularly in the countries directly affected by the war, have taken the form of extremely high protection for their home industries by the establishment of almost insurmountable Customs barriers. Consequently it is becoming increasingly difficult to export to certain countries which were formerly very good markets for Swiss machinery. It is felt that the loss of these markets will ultimately lead to unemployment. It is pointed out that wages in Switzerland remain on a much higher level than those in competing countries. The competition encountered in international markets has obliged Swiss firms to book contracts at unremunerative rates in order to provide employment at their works and maintain connections with their old customers. This may explain why the financial results of last year's operations were poor.

The makers of dynamo-electric machinery again complain of having to work under very unfavourable conditions of production compared with those prevailing abroad, especially in Germany. In consequence, they were frequenty obliged to accept orders at very low prices. On the whole, they experienced little difficulty in obtaining supplies of raw material, but paid increased prices for copper, brass, rubber, and, in particular, porcelain. The local electrification schemes brought considerable activity to works supplying railway material, distribution apparatus, and telephonic material, but makers of insulating material express themselves as dissatisfied with the volume of Government orders. Certain electricity works in Switzerland, it is said, do not give sufficiently favourable consideration to the local product, with the result that makers have been obliged to reduce their prices to an unreasonable level under the threat that the order would otherwise be placed in Germany.

Great Britain's Foreign Electrical Trade.

VOLUMES II and III of the annual statement of trade of the United Kingdom have just been issued. They include details of the import and export trade of the country in electrical machinery and apparatus, distinguishing the principal countries of origin or destination and the various main groups of productions. Comparative figures are given as far back as 1920. In considering these, it must be borne in mind that since April 1st, 1923, the trade of Great Britain and Northern Ireland with the Irish Free State has been included, whilst the direct foreign trade of the Irish Free State has been excluded. The effect of this alteration may be gauged from the following figures showing the total value of electrical exports from this country to the Irish Free State: 1923 (nine months), £120,560; and 1924, £378,540. In comparing last year's returns with those of preceding years, the price factor must not be lost sight of. In the returns relating to machinery, weights as well as values are recorded, thus furnishing a better guide to the real trend of trade. At the same time some allowance must be made for the alteration since the war in the design of generators and motors, less metal now entering into the construction of a machine of equivalent capacity and value. From fig. 1, showing the total imports and exports of electrical machinery in 1913 and from 1919 to 1924, certain broad tendencies are discernible. Imports, in weight, are scarcely within measurable distance of returning to their pre-war level; in value, they are slightly more than in 1923 but less than in 1922. Exports are about fifty per cent. over their 1923 level in weight and thirty per cent. in value. Compared with 1913, they are 4,200 tons more in weight and £3,000,000 more in value, surpassing the previous peak in value which was attained in 1921.

It is noteworthy that since 1919 the weights and value of imports have been strictly proportional.

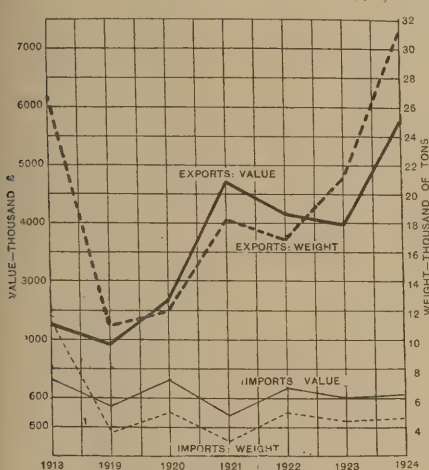


Fig. 1.—Imports and Exports of Electrical Machinery.

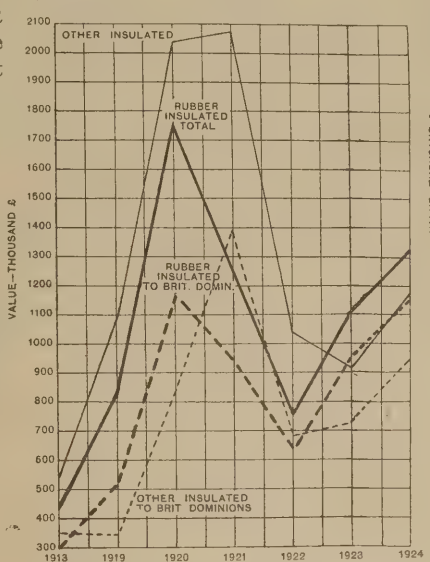


Fig. 2.—Exports of Cable (not Telegraph or Telephone).

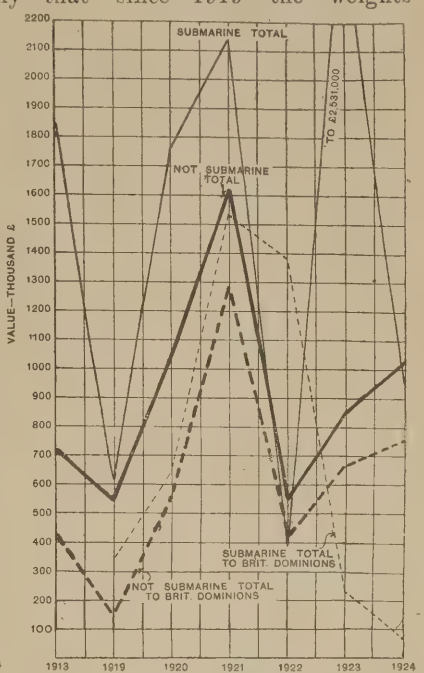


Fig. 3.—Exports of Telegraph and Telephone Cable.

Turning again to imports of electrical machinery, the largest item (as in 1923) is d.c. motors, although there has been a decline in this item. The totals last year and in 1923, with the chief supplying companies, are as follows:—

	1923. Tons.	£	1924. Tons.	£
Total ...	659	182,240	561	159,450
From Sweden ...	158	21,260	45	5,330
,, Germany...	81	12,520	184	21,090
,, Switzerland	46	10,975	21	6,260
,, U.S.A. ..	288	121,300	246	107,650

Imports of a.c. motors also are less than in 1923, *viz.*, 568 tons, value £74,400, against 681 tons, value £90,000. Of the 1924 total, £29,000 is credited to Sweden, £17,800 to the United States, and £9,800 to Germany, the share of the last-named in 1923 having been rather less. The value of the imports of "electrical machinery not elsewhere specified" is given as £611,000. This seems a large proportion of unclassified plant out of a total of nearly £1,100,000.

The steady upward course of our export trade in railway and tramway motors is strikingly shown in fig. 4. As in 1923, it accounted for about nine per cent. of the

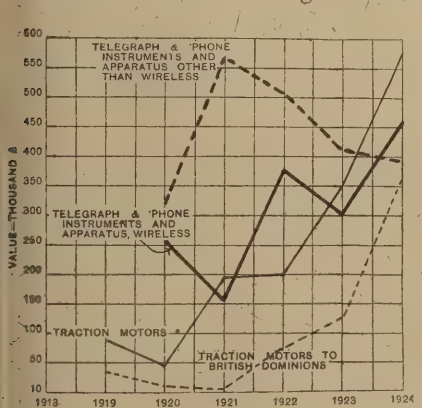


Fig. 4.—Exports of Radio, Telephone, etc., Apparatus and Traction Motors.

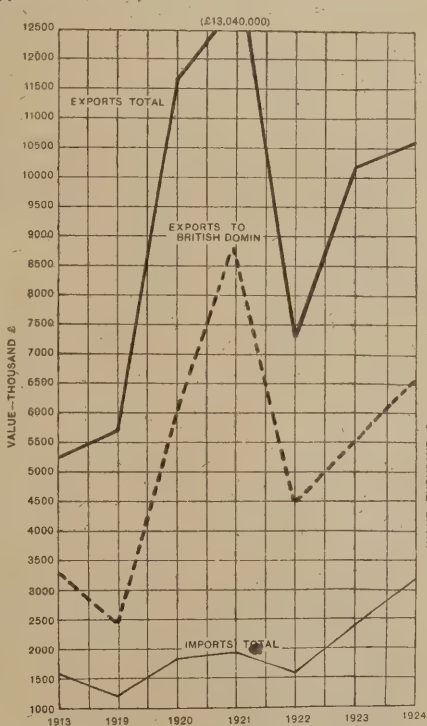


Fig. 5.—Imports and Exports of Electrical Goods and Apparatus.

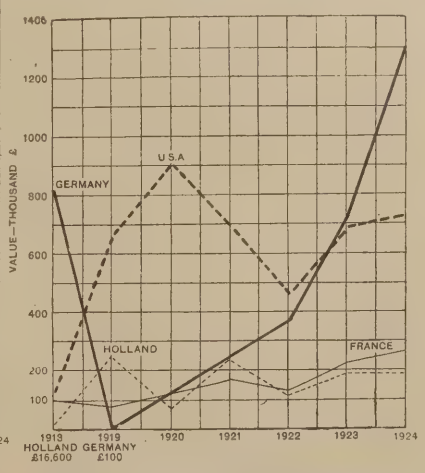


Fig. 6.—Origin of Imported Electrical Goods and Apparatus.

total value of our electrical machinery exports, whereas in 1919 the proportion was less than 5 per cent. The important place taken by Empire markets in this trade is also shown in fig. 4. It will be noted that the value of exports to those markets last year was five times that in 1922. To the Union of South Africa, shipments of railway and tramway motors rose in value from £6,500 in 1922 to £11,700 in 1923 and £208,300 in 1924.

The Empire is also our best customer for other motors, having last year taken a.c. types to the value of £446,400 out of a total of £568,900, and d.c. types to the value of £392,900 out of a total of £499,800. Of the former, exports as a whole are rather better than in 1923, but below the 1921 and 1922 levels, whilst shipments of d.c. motors are seen to be slightly higher in value but lower in weight than in 1923. India is not such a good customer as in past years, but Australia is a better one. The total exports of motors (other than railway and tramway) are shown below:—

	1921.	1922.	1923.	1924.
Motors, a.c., tons	3,928	3,185	3,293	3,640
Motors, a.c. ...	£1,051,300	755,930	555,500	568,900
Motors, d.c. ...	£668,700	404,040	493,250	499,800
Motors, d.c., tons	2,521	1,768	2,907	2,845

It is interesting to note also who are our principal customers for generating plant:—

British Exports.

	A.c. Generators.			
	1923. Tons.	1924. Tons.	1923. £	1924. £
Total	2,452	4,671	494,000	707,800
To India	340	521	60,780	79,160
,, Australia	547	804	135,900	125,390
,, New Zealand ...	161	354	23,080	52,316
,, S. Africa	143	409	37,240	75,630
,, Spain	375	18	86,990	1,266
	D.c. Generators.			
Total	1,854	3,283	380,500	544,600
To India	429	624	80,110	115,890
,, Australia	402	493	99,455	104,380
,, New Zealand ...	132	42	24,670	6,130
,, S. Africa	85	1,078	16,020	131,100

Exports of Electrical Goods and Apparatus.

Besides giving details of the trade in some of the chief classes of electrical machinery, the annual statement also divides the trade in electrical goods and apparatus into its principal groups, *e.g.*, telegraph and telephone material, cables, batteries and accumulators, and lighting accessories. An analysis of these statistics reveals the importance of our export trade in cables, the progress of which in the more important classes is shown graphically in figs. 2 and 3. The total of the submarine group calls for special comment. It shows up unfavourably in contrast with 1923, because in that year there was an exceptionally large export to the United States (value £2,131,000). America appears again as a good customer in 1924, and it will be noticed that the grand total is considerably more than in 1922, although less than in the "boom" years of 1920 and 1921. In the other groups, trade is fairly good, and to a very large extent with the Empire, as will be seen from the charts mentioned.

The general trend of the export trade in telegraph and telephone instruments is shown in fig. 4, distinguishing wireless from other types. The telegraph and telephone branch is a healthily growing trade, foreign as well as Empire sales being much larger in 1924 than in 1923.

For radio instruments and valves, our principal customers are as follows:—

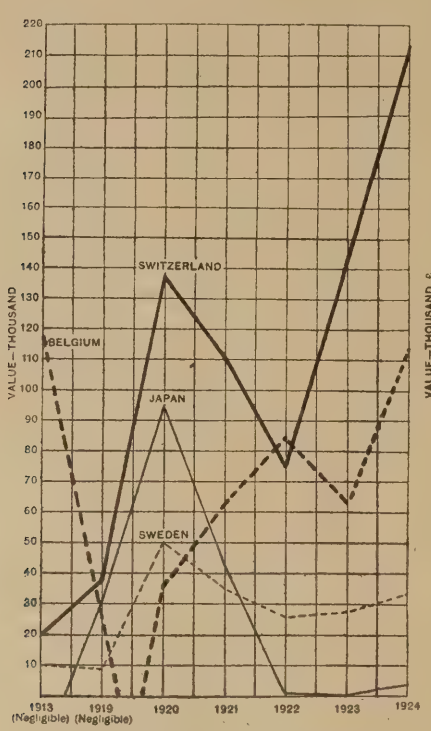


Fig. 7.—Origin of Imported Electrical Goods and Apparatus.

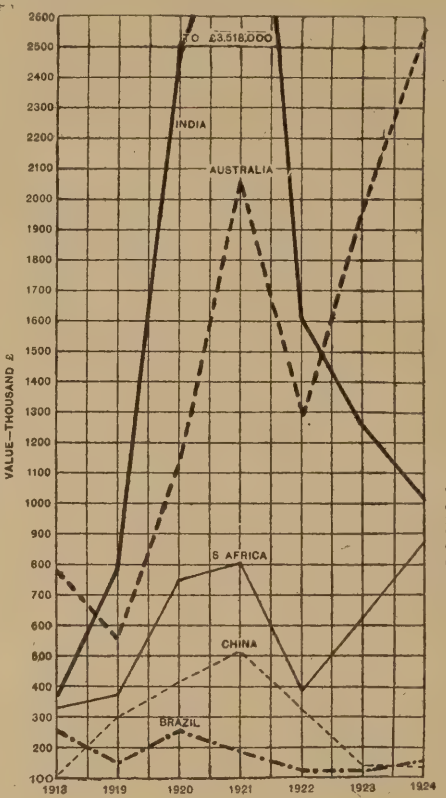


Fig. 8.—Destinations of Exported Electrical Goods and Apparatus.

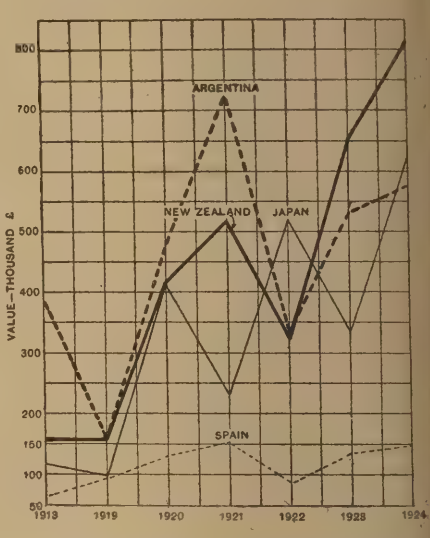


Fig. 9.—Destinations of Exported Electrical Goods and Apparatus.

	1922. £	1923. £	1924. £
Radio instruments.			
Total	377,000	309,000	465,000
To Spain	10,730	9,720	19,120
,, Greece	200	16,700	10,900
,, Japan	173,600	98,640	164,600
,, India	54,450	18,940	14,000
,, Australia	2,320	22,700	74,400
Radio valves, vacuum tubes, and X-ray tubes.			
Total	39,500	84,600	176,000
To Japan	6,000	21,000	37,600
,, India	1,200	7,000	10,360
,, Australia	2,400	12,400	30,680
,, S. Africa	3,100	2,700	24,600

Lamp exports show a slight advance and imports a slight decline, thus bringing the balance yet a little further in our favour. The supplying countries in 1924 are seen to be about the same as in the preceding year: Holland, £96,000; Austria, £51,000; and Germany, £37,000. Our best customer for lamps is Australia, which figures with gasfilled lamps to the value of £34,600, and other glow lamps to the value of £83,000 out of a total of all kinds of £341,000.

Fig. 5 shows the relative position of the total import and export trade in 1913 and since the war (omitting 1914-1918 as being abnormal years) in electrical goods and apparatus, together with the proportion of exports that have gone to the British Dominions.

This introduces the question of the countries now supplying our imports of electrical goods and apparatus and how their respective shares have varied in recent years.

Figs. 6 and 7 show the values of the imports (retained for consumption) of this group, in recent years and in 1913, from the principal countries of origin. It will be noticed that the value of Germany's imports is now above pre-war level. The increase in the grand total

from all countries is spread over nearly all the principal groups. For example, imports of wireless goods are nearly double in value compared with 1923, whilst those of other telegraph and telephone apparatus show an increase of nearly 60 per cent. The battery and accumulator group show advances in value of about 150 per cent., and the imports of lighting accessories and fittings an increase of nearly 50 per cent. In every case Germany has considerably advanced her position. There is an increase in the value of imports of rubber-insulated wires and cables (not telegraph or telephone), in which Germany, Belgium and Switzerland all share. Amongst minor importers Austria, Hungary and Denmark are becoming more noticeable.

Finally, Figures 8 and 9 show graphically the progress of our trade in electrical goods and apparatus with the principal consuming markets. Promising South American outlets other than those shown in the charts are as follows:—

Exports to:	Peru. £	Chile. £	Uruguay. £
1913	10,500	77,600	15,900
1919	108,700	57,400	8,500
1920	341,500	87,800	28,800
1921	16,700	266,000	17,600
1922	4,450	288,000	7,800
1923	64,700	101,000	50,000
1924	34,700	116,000	18,000

Choosing and Using an Electric Washing Machine.

Introducing the "Gaslectric" Washer.

By N. L. W. E.

"WASHING machines in the United States.—The American Washing Machine Manufacturers' Association reports that during the first quarter of the current year its members sold 197,764 washing machines, of which 160,353 were electrically operated. In the equivalent quarter of 1924 the total number of machines sold was 179,461, and of these 148,847 were electrical."—ELECTRICAL REVIEW, June 19th, 1925.

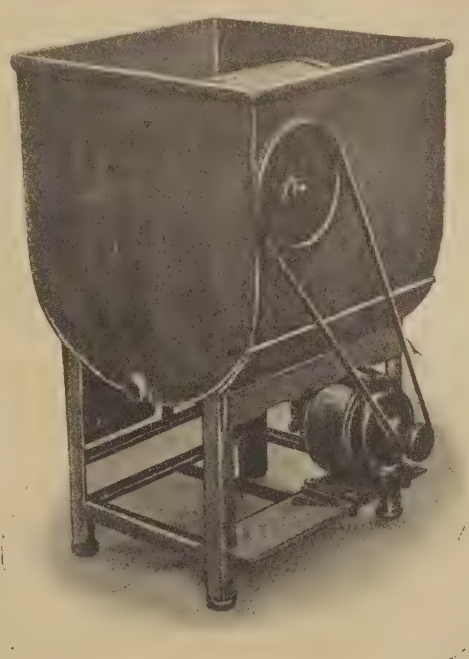
I was greatly impressed by "Wren's" article, and your editorial, on "Choosing a Washing Machine" in the ELECTRICAL REVIEW of September 4th and 11th. Like him, I was required to foot the weekly wash bill, and also the incidental losses due to damage and replacements. Realising the advantages and, incidentally, the load-building potentialities of the electric washer, I also made inquiries with a view to purchase, but was deterred by the high price—£45 to £60. Not to be denied, I constructed a machine at less than one-third the cost of the cheapest machine then on the market, to which I geared a ¼-h.p., a.c., squirrel-cage motor.

From this beginning, and after more than three years' concentration on the subject, there has been evolved an electric washer which embodies not only the desirable features enumerated by "Wren," but also several more important points which, so far, he has not mentioned. These, with the Editors' permission, I will now endeavour to amplify and explain.

Apart from their high price, many of the machines at present offered are too large, not only in size, but in washing capacity, for the average-size family and for the floor space available. Existing machines are often constructed largely of wood, which not only tends to absorb the washing liquor and to become insanitary, but, when not in use, is liable to shrink and leak. With few exceptions, existing machines have to be supplied with hot water, which, during the washing operation, gradually cools. Any steam-laundry operative knows that in order satisfactorily to wash cotton and linen articles, the initial temperature should be but moderate to prevent the fixation of stains, &c., and gradually increased until, finally, a bleaching and sterilising temperature is attained. This consideration is fundamental if the purity and "colour" of linen articles are to be maintained, and involves the provision of a heating element, which most existing machines do not possess, if the necessity for a separate boiling "copper" is to be avoided.

Moreover, existing machines with automatic reversing gears and geared wringers necessitate frequent attention if failure due to insufficient lubrication is to be avoided.

As "Wren" points out, there are many different types of washing machines of American and European manufacture, but those which are driven by electricity have, so far, failed to attract the British public. One cause of failure has undoubtedly been the unnecessarily high cost of production, and the consequent high price of the machines so far designed and offered. There are possibly other contributory causes of failure, but it is mainly the high price which has limited the market to the relatively wealthy classes, who, however, can easily afford to patronise the steam laundries, and are



The "Gaslectric" Washing Machine.

not interested in saving money or labour by having washing done at home. Moreover, the electric washers offered to the public are, in fact, combined washing and wringing machines. The wringer attachment contributes very largely to the cost of the machine, as will readily be understood, and apart from introducing a somewhat dangerous piece of power apparatus (several serious accidents have occurred), the wringer does not completely take the place of the combined wringing and mangling hand-operated machine, which, in Great Britain, is regarded as an indispensable requirement of every modern household; that is to say, such large articles as bed-sheets, table-cloths, bed-spreads, and

blankets, which do not require ironing, must be finished, if washed at home, by means of the family mangle. As the mangle invariably serves also as a wringer, the difficulty of selling an additional wringer, attached to a washing machine, at a relatively high price, will readily be perceived.

It may be assumed that in the average British home mechanical skill is practically non-existent, and complicated instructions as to oiling and adjusting and operating emergency release mechanism in case of accident tend only to frighten prospective users. It is claimed by the makers of the "Gaslectric" washer that they have constructed a machine which not only eliminates these disadvantages, but also possesses advantages from both the utility and selling points of view which have not hitherto been offered or provided, the net result being a machine of sound engineering design and construction, of proved utility, at a cost which enables the price to the public to be kept within the reach of practically every one who occupies a house supplied with electric current. This has been accomplished—

(1) By eliminating the geared wringer, but the machine is built strong enough to have a hand wringer (cost 25s.) attached if desired.

(2) By running the main machine-cut speed-reducing gear immersed in the soapy washing liquor, no other oil lubrication being required. The belt (sewing machine type) drive to the motor provides the necessary safety device to protect the motor. The gear consists of a polished shaft of stainless steel, running in ball bearings, and a cut gunmetal worm wheel mounted directly on the rotary drum.

(3) By providing gas-heating apparatus to maintain the liquor at the correct temperatures for washing woollen articles, cottons, and linens, and also for boiling and sterilising. Being a gas-using appliance, it is an attractive proposition to gas-supply as well as electricity-supply authorities—an important consideration from the sales point of view, especially where both gas and electricity are supplied by one authority.

(4) The machine is constructed mainly of galvanised steel, a material which for generations has proved its utility for this purpose in this country. The machine is therefore perfectly sanitary, non-rusting, and non-shrinking when not in use.

(5) The machine occupies the minimum of floor space (17 in. by 21 in.), and is provided with a strong flat-topped metal cover, which serves also as a useful side table when placed in a scullery or kitchen, as it would almost invariably be in this country.

(6) The machine is practically silent in operation, and functions on the well-known rotary-drum principle, the effectiveness of which cannot be gainsaid; but unlike all other rotary machines, it is so designed that the need for automatic reversal of rotation has also been eliminated. The result of these features, which form the principal claims in the British patent, is a rotary washing machine of the cheapest possible construction consistent with sound engineering design. The effectiveness and general utility of the machine have been proved by regular use for more than three years, during the past year of which neither the machine nor the motor has been oiled or attended to by any skilled person. Apart from a heavily-insulated press-button switch (Home Office pattern), the machine has no mechanical controls. Smooth-running, rustless "domes of silence" are fitted instead of iron castors, which stain the floor with iron-mould, and are very liable to cause trouble.

The Theory of Mechanical Washing.

The accepted story of the cleansing process is, in the rotary machine, repeated immersion of the articles in *hot* soapy liquid, partial draining of the articles by lifting and slight pressure, and re-immersion, in order to cause free and continuous circulation of the liquid through the fabric. In the "Gaslectric" washer the special formation of the rotating drum—which is unique in power-driven washing machines, and, therefore, unfamiliar to experts in laundry operations—enables the washing process to be completed satisfactorily by rotation in one direction only. The time required, other conditions being equal, is not materially different from that of the two-way machine, as anything in excess of the recognised maximum effective speed (16 r.p.m.) tends, by centrifugal action, to retard complete washing, whatever the type of machine.

That the "Gaslectric" washer is satisfactory and effective, in completing the washing process, is proved satisfactorily by long experience, and also by independent and hypercritical inspection of the articles washed. Further proof is the entire lack of evidence of undue wear, although many articles have been washed by the machine every week for two or three years.

The Potentialities of the Electric Washer.

Referring now to the opening paragraph of this article, indicating the enormous business done in electric washers in the United States, it should be unnecessary to point out that the domestic consumer offers at the present time the greatest possibilities for economical electrical development. This field is in this country practically untouched, so far as electric washers are concerned, and energetic development should yield a splendid return to all concerned. Casual observation during the early part of the week will show the immense extent to which the washing and drying of clothes is carried on in residential districts of all classes.

It has been stated on the highest authority that 90 per cent. of the country's weekly wash is still done, more or less laboriously, at home by hand. The true significance of these facts, from the sales development point of view, does not appear to have been fully appreciated by British manufacturers and electricity supply authorities, if one may judge by the limited number of excellently-appointed, but relatively high-priced, electric washers hitherto available.

To these and all others interested in mitigating household drudgery by promoting the use of domestic labour-saving devices, the main feature of the "Gaslectric" washer is its relatively low price, which is about half that of the next lowest-priced washer of its class now on the market.

The capacity of the No. 1 or smallest "Gaslectric" washer is one full-sized blanket, or four full-sized sheets, or the equivalent in other articles. The motor is also of British manufacture, self-oiling (ball bearings), insulated, suitably protected, and of $\frac{1}{6}$-h.p. capacity.

I can endorse all that "Wren" has said of the electric washer as a money, time, and labour saver. Bed-linen, for instance, can be, and, in my own experience, frequently is, washed, dried, finished, aired, and replaced in use during the same day.

The "Gaslectric" washer is fully protected by British patent, and the makers (Messrs. T. Balmforth and Co., Ltd., Luton) state that they are in a position to give early delivery.

Royal Institution.—The lecture arrangements at the Royal Institution before Easter next year were announced at the general meeting of the members on December 7th. The Juvenile Lectures, the 100th Course, will be delivered by Sir William Bragg on "Old Trades and New Knowledge," commencing on December 29th, at 3 o'clock. On Tuesdays, at 5.15, beginning on January 19th, there will be two lectures by Dr. J. A. Crowther on "X-rays and Living Matter," two by Dr. E. K. Rideal on "Surface Action," four by Professor Barcroft on "The Egg," and two by Dr. C. H. Desch, on the "Growth of Crystals." On Thursdays, *inter alia*, there will be three lectures by Dr. C. D. Ellis on the "Atom of Light and the Atom of Electricity." On succeeding Saturday afternoons there will be four lectures by Sir Ernest Rutherford on the "Rare Gases of the Atmosphere and their importance in Atomic Theory." The Friday evening meetings will begin on January 22nd, when Sir William Bragg will deliver a discourse on the work of the Davy Faraday Research Laboratory. Succeeding discourses will probably be given by Sir J. J. Thomson, Sir Ernest Rutherford, and other gentlemen.

Electric Washing Machines.—I.

THE electric washing machine has not made much headway in this country if judged by the United States standard, but there is little doubt that a market exists if efforts are made to meet the requirements—both constructional and financial. The first cost of a washing machine is undoubtedly heavy; this is a serious handicap which has a greater effect in this country than in the United States. Even in the latter country, however, arrangements are made to spread the cost over a year or two, and this has much to recommend it. On this basis it is much easier to compare the cost of electrical washing with older methods. Account is taken of weekly laundry charges or the cost of assistance in the home, &c., and the amount is placed side by side with the periodical payments made for the machine, when it is seen that if there is a difference in favour of the older methods, it is more than outweighed by non-pecuniary advantages.

By intensive advertising and the adoption of the instalment system of payment, a huge business has been built up in the United States. According to a recent statement which appeared in the *Electrical World*, there were 50,000 electric washing machines in use in the United States in 1914. Ten years later; in 1924, the number had grown to over 4,000,000, the value of the machines being put at $600,000,000. At the present rate of growth, it is estimated that in 1929 there will be over 7,600,000 electric washing machines, or, allowing an increase in the rate, 9,000,000. It is estimated that in 1929 the replacement rate alone will be 700,000.

So far as can be ascertained, sales of electric washing machines in Great Britain represent only an infinitesimal fraction of the American figure, Domestic drudgery is hard to eradicate in this country, but there must surely be a bigger market for these machines than the sales would indicate.

In an endeavour to stimulate interest in the subject, we illustrate below several examples of British washing machines. The term "British" has had to be extended to include machines from the other side of the Atlantic which are supplied by British firms.

Two kinds of washing machine are marketed by the General Electric Co., Ltd. The first (fig. 1) is not strictly a "machine," for there are no moving parts, the work being done by the circulation and percolation of hot water. It consists of a galvanised iron tank, with heating elements fitted in the base, and a vertical tube passing upwards through the centre of the tank. It is made in 10-gal. and 14-gal. sizes and provision is made for the fixing of a wringer. The other "Magnet" washer is illustrated in fig. 2. This is a compact machine designed on rational lines employing the reciprocating perforated cylinder operating in the tank which forms the body of the appliance. Simple controls are provided and the motor is of the enclosed pattern placed well out of the way. A swinging wringer is fitted in a convenient position.

Messrs. Whittaker Bros. (Accrington), Ltd., produce the "Electric Pioneer" washing machine illustrated in fig. 3. Wood is largely employed in the construction of this machine, the water box well being made of Louisiana cypress and the revolving drum of hardwood and tinned woven copper wire. The driving gear is placed on either side to suit the buyer's convenience and is covered in by a wire guard. The size of the wringer (24 in. by 6 in. brass-capped rollers) is somewhat uncommon, most electric washers being equipped with much smaller wringers. The machine is mounted on castor wheels to facilitate movement. A .5-h.p. motor provides the drive.

The "Laundry Queen" washing machine, shown in fig. 5, is sold by the Northern Steel & Hardware Co., Ltd. This is of very simple construction, consisting of a wooden tub mounted on a square frame fitted with castors. Through the lid of the tub passes the shaft of a rotating dolly or "Turbo-Vac." This dolly has four arms, each of which consists of two cupped wings which set up a suction as they rotate and draw the dirt from the clothes in the tub. The wringer can be easily swung and locked into any position and the drive of the rollers allows both forward and reverse motion.

Fig. 4 illustrates the "Western Electric" washing machine supplied by Standard Telephones & Cables, Ltd. This appliance is of handsome appearance, having a grey enamel body, top and cover of polished aluminium, and nickel-plated control handles. The clothes are placed in a perforated cylinder which is arranged to make six revolutions in each direction alternately. The wringer, fitted with an all-metal drain board of generous proportions, is supported at one end by means of a vertical arm above the washer. Overloading is prevented by safety friction clutches on the washer and wringer drives. All the mechanism is totally enclosed but easily accessible for cleaning.



Fig. 1.—A G.E.C. Washer.

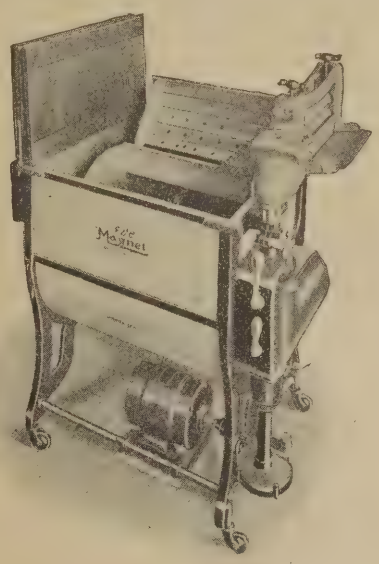


Fig. 2.—The "Magnet" Washer.

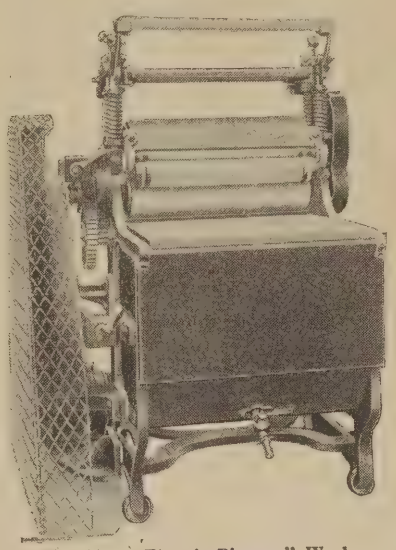


Fig. 3.—The "Electric Pioneer" Washer.

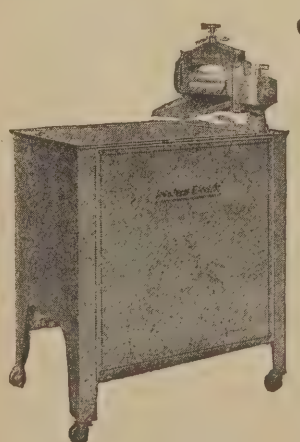


Fig. 4.—The "Western Electric" Washer.

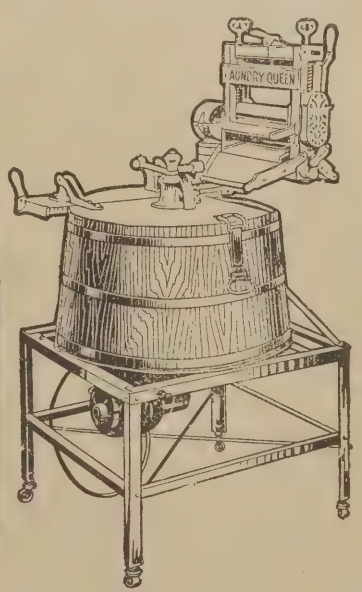


Fig. 5.—The "Laundry Queen" Washer.

Messrs. L. G. Hawkins & Co., Ltd., supply the "Universal" washer depicted in fig. 6. From the illustration the construction and operation of the machine can be clearly seen. It has a sheet steel body beautifully finished in blue enamel and the clothes are put into a reversing perforated cylinder of non-rustable metal. The drive is wholly by gears which run in an oil bath and are noiseless, the motor having a rating of 0.25 h.p. It is claimed that six full-sized sheets can be washed in this machine in 15 minutes. The wringer is fitted with a safety release device and an overload release is also provided.

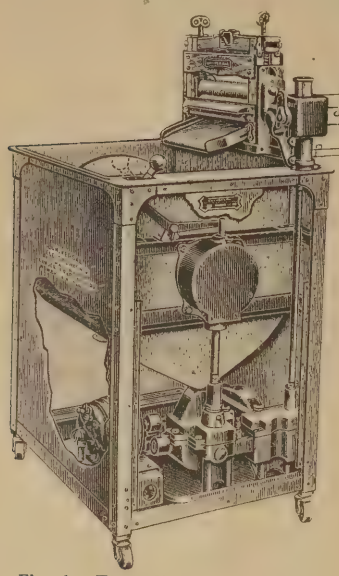


Fig. 6.—The "Universal" Washer.

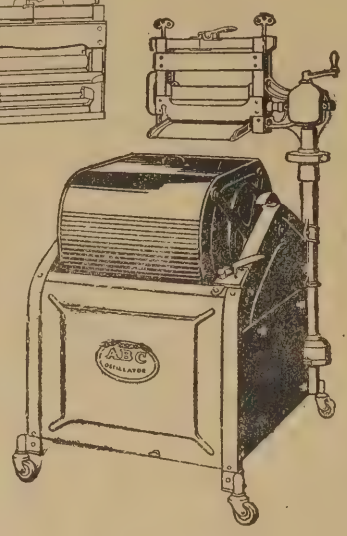


Fig. 7.—The "A.B.C." Washer.

One pattern of the "A.B.C." washer sold by the Sun Electrical Co., Ltd., is shown in fig. 7. This is a semi-enclosed machine with a rocking tub. The agitation of this tub forces the hot water through the clothes at each movement. The tub is of copper and is tinned on the inside. When not in use the tub is locked into a vertical position. A swinging wringer, with a reversing lever, is fitted, and this, as usual, is equipped with a quick-acting safety release. The body is finished in grey enamel.

Messrs. Duncan Watson & Co. are the agents in this country for the "Rotarex" machine illustrated in fig. 8. This is also of the reversing-cylinder type fitted with a wringer. The body is constructed on plain lines and is mounted on four legs fitted with castors. The driving gear is well enclosed and the motor is mounted underneath the tank.

The last example (fig. 9) is the "White Cap" washer which

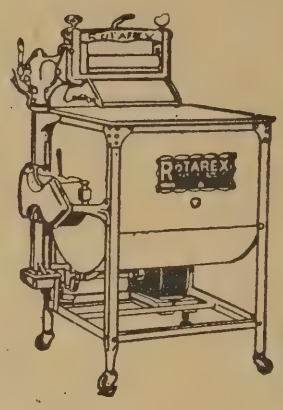


Fig. 8.—The "Rotarex" Washer.

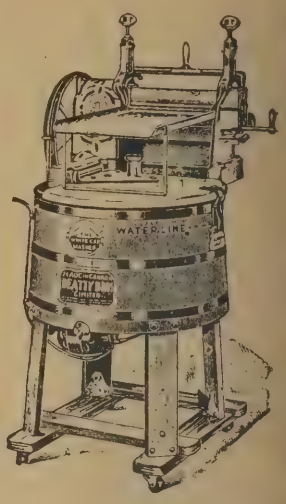


Fig. 9.—The "White Cap" Washer.

is made in Canada by Messrs. Beatty Bros., Ltd., who also market the machine in this country. The body of this consists of a wooden tub mounted on a framework of the same material. The machine operates on the dolly principle, this member being fitted in the lid of the tub. The wringer is driven by a belt which operates a rather large wheel.

Super-Station Switchgear.

The Trend of Modern Practice.

By A. MENTOR.

THE supply of switchgear to meet adequately the demands of modern large super-power stations is a subject of first-grade importance to the electrical industry in this country owing to the very large extensions and interlinkages which are now under construction or being actively contemplated.

The supreme importance of maintaining supply is fully recognised in all quarters, and there can be no question that the aggregation of large power units, bigger power stations, and the interlinking of these stations, together present to the designers and manufacturers of switchgear a number of problems of grave difficulty; upon the correct solution of these difficulties very heavy issues are at stake.

A cursory examination of switchgear equipments as installed in the most recently designed stations will at once reveal that there is no unanimity of opinion as to the design of oil circuit breakers or the physical design and lay-out of the switchgear best suited for the duty, and the standardisation of practice in even the moderate-sized station is apparently a long way from being an accomplished fact. Whilst there are undoubtedly the elements of progress inherent in the trial of various expedients to accomplish a given end, the position is only satisfactory in so far as such expedients have for their basis a proved ability to accomplish that end; and in this respect the position is unfortunately not as strong as could be desired when considering very large stations.

The actual rupturing ability of oil circuit breakers in major stations should be beyond question, and extrapolation from small designs is hazardous when tests to confirm new and larger designs cannot be made; furthermore, experience from casual happenings in operation cannot be relied upon to make good any deficiency, owing to the impossibility of securing adequate observation of the various phenomena which occur, and to the known inconsistency of performance even under tests which are controlled to the maximum degree possible.

That there is not available testing plant capable of stressing to their limit designs which are now in common use in this country, is a matter for great regret; and the degree of benefit to be derived from the experience of foreign designers who have proper test facilities at their disposal is necessarily restricted to one or two firms having access to the researches of big manufacturing companies abroad. The inability to make tests which will define the limit of safe operation will naturally reflect on the breaking ratings ascribed to oil circuit breakers, and much divergence of opinion is noticeable when breakers having the same nominal rupturing capacity are compared with each other—showing that, at best, only empirical design data, little better than guesswork, have been available.

Similarly, the arrangement of switchgear in general, and its physical design, display variations which can hardly be reconciled with an accepted and uniform degree of safety in operation. This broader aspect of switchgear safety is, of course, beyond the region of experimental test and proof and the adequacy of designed layouts to fulfill their function can only be established by satisfactory experience in service.

Fault conditions which would be capable of putting to the proof our super station switchgear have happily been of rare occurrence, and this in itself constitutes a high tribute to the care and thought which our switchgear engineers have displayed, but it should not be accepted

as a natural consequence that such a degree of immunity from trouble as has favoured us in the past will necessarily continue under the changed conditions which are impending, and furthermore, it must be remembered that the knowledge which such failures would have afforded has not been rendered available to guide practice in catering for our future requirements. It is necessary, therefore, to look very carefully into all the facts available, and to examine, particularly, such experience as has followed developments the most nearly approximating to those which we contemplate, in order to determine what our own future policy should be.

It is, of course, known that in the United States power stations of very large size, corresponding with some of those now contemplated in this country, are in active operation, and those who have watched the progress of events will be aware that during a period of a few years wherein such stations were being brought into commission, there was a considerable number of switchboard failures of a very disturbing magnitude, causing much dislocation of service and corresponding loss. As a result of knowledge brought to light by these failures, it is not too much to say that American practice on large switchboard installations underwent a complete change. This change has been exemplified in probably about twenty different stations constituting all the large installations which have been placed in commission since its inception.

The effect of a short circuit in, or close to, a power station having a quarter of a million kVA of generating plant is best left to the imagination, and whilst no effort should be spared in attempting to produce circuit breakers which can interrupt the maximum flow of energy which may be involved, the issues at stake are too vital to justify reliance on the circuit breaker alone as the only means of avoiding disaster.

It is possible, by the insertion of earthing resistances, to limit the flow of earth fault current to a value which can be interrupted readily and without disturbance to the system. Further, the application of current-limiting reactors can, in ways now well known, be made to provide some measure of limitation to the fault current which may flow between phases, and sectionalisation of bus-bars also will contribute to that end. Nevertheless, these provisions alone, because of their limitations as to application and operation, do not provide a sufficient safeguard for apparatus forming the very nerve centre of a large electrical power system, and search must be made for means of definitely preventing the occurrence of phase faults on main switchgear.

These are the considerations which led to the development in the United States of what is now known as isolated phase switchgear, the name of which serves to indicate that each phase is separated bodily from the others, as completely as can be accomplished. This is done either by vertical walls, as in the earlier installations, wherein the gear was installed in what were virtually three separate single-phase switch houses, or, as in the arrangement which has come to be regarded as standard practice, on three separate floors of one building. The latter arrangement allows that a longitudinally placed vertical dividing wall can produce six separate compartments, three for the main bus-bars and three for auxiliary bus-bars, and transverse walls can provide sectionalising barriers between various portions of each bus-bar.

Even with these precautions, trouble was not eliminated entirely until experience had demonstrated the steps which were necessary to ensure that the provisions made for simultaneous operation of the three phases of oil breakers and isolators could not be also the channel whereby trouble could spread from one phase to another.

Descriptions of the various installations carried out have been published from time to time, and it is not the purpose of this article to repeat this matter in detail. There are, however, in connection with such schemes, a number of points which are not immediately obvious from either a bare definition or a detailed description, and some of the outstanding points can be conveniently reviewed.

The main object accomplished in such gear is to ensure that within the premises of a super-station switch house there will be no point at which the phases are brought close together. The outgoing feeders, &c., may be three- or single-phase cables, or overhead lines, but the principle of separation must be carried through until the conductors pass beyond the switch house. Safety may, in many cases, demand that series reactors be placed in the run of the conductor from the switchgear to the cable sealing ends, and, in this event, the reactors for the different phases are necessarily separated in the same way as the remainder of the gear.

When duplicate bus-bars are provided and isolated from each other there must eventually be a common point at which the duplicated switchgear conductors arrive at the single out-going conductor, and it is necessary, if the maximum safety possible is to be actually achieved, that the common point be on the side of the oil circuit breakers remote from either set of bus-bars. It will at once be seen that this calls for duplicate circuit breakers as well as duplicate bus-bars. Owing to financial considerations it has not been the practice, heretofore, as a rule to use duplicate circuit breakers in this country. In view of the major developments impending in the next few years, however, it is suggested that this feature requires reconsideration, as no expense is too great to ensure immunity from breakdown at such vital points.

The question of cost is obviously one of great importance, and the first impression in regard to isolated-phase arrangements is that they must necessarily be more costly than the arrangements heretofore common in this country. This is not necessarily the case, since there are advantages inherent in the scheme which enable considerable price-saving to be realised. The matter of the space occupied is tied up very closely with the question of cost, and very careful estimates have been made to arrive at comparisons between equivalent equipments laid out according to the isolated-phase scheme and schemes of older form. The results show, in general, that the cubic space occupied is practically identical, and it is possible, therefore, to make comparisons based on engineering and technical considerations without being hampered by any material handicap from the financial point of view on either the one scheme or the other.

In summarising the advantages of isolated-phase switchgear arrangements, it may be said that:—

1.—Phase-to-phase short circuits on switchgear are impossible. The trifurcating box of a three-core cable, if such be used, is the nearest point to the bus-bars at which such an occurrence can take place, and series current-limiting reactors can, in the extreme case, be used to limit the value of current in such a fault.

2.—The large spacing which naturally results from the isolated arrangement of phases reduces to a very marked degree the electromagnetic stresses which can result from a fault external to the station switch house.

3.—High-voltage connections are simplified by their single-phase arrangement as no phase crossings are required, and in general their length can be materially reduced. The introduction of reactors were required can be more readily and conveniently effected.

4.—Flexibility of operation under emergency conditions is greater than on other arrangements as, owing to the complete physical separation, any phase can be worked on with complete safety, and the cramping effect of adjacent phases is removed.

5.—The operating solenoids or other mechanisms of the circuit breakers are removed from proximity thereto, and inspection is the more readily and conveniently carried out. Isolator mechanisms too can be arranged alongside the appropriate breaker mechanisms, and mechanically interlocked therewith by robust and visible devices.

These advantages are fundamental in character, and are peculiar to the system of arrangement, and their value cannot be questioned. In these circumstances it follows that engineers entrusted with the preparation of plans for the super-power stations of the future in this country cannot afford to ignore a switchgear scheme which had its origin in troubles experienced in stations of similar magnitude elsewhere, and which has given good service in the large equipments to which it has been applied.

Legal.

British Thomson-Houston Litigation.

THE injunctions granted *ex parte* on December 4th by Mr. Justice Tomlin in the Chancery Division to the British Thomson-Houston Co., Ltd., restraining R. H. Wood, E. A. Siderman, and Walter Thomas Smith, Ltd., from infringing its electric lamp patents by selling imported lamps, were mentioned to his Lordship on December 8th.

Mr. TREVOR WATSON, for the plaintiffs, said that Mr. Wilfred Hunt, for W. T. Smith, Ltd., wanted time to consider the matter, and he therefore asked that the motion against the company should stand over for a week on an undertaking. With regard to Siderman he asked for an interim injunction until the trial.

Mr. SIDERMAN, who appeared in person, said he was willing to submit to a perpetual injunction.

His LORDSHIP said that could not be done except by consent.

Mr. WATSON said that the third defendant, R. H. Wood, was evading service.

His LORDSHIP suggested that the *ex parte* injunctions against all three defendants should be continued for a week and that in the meantime the plaintiffs should consider whether they could put an end to it as against Mr. Siderman, as they ought not to incur any undue costs.

Mr. Watson agreed, and this course was taken.

The *ex parte* injunction obtained on December 4th by the British Thomson-Houston Co., Ltd., restraining the London Electric Lamp Co., of Sandcroft Street, Kennington, S.E., from infringing its electric lamp patents, was mentioned to Mr. Justice Tomlin in the Chancery Division on December 8th by Mr. Trevor Watson, who said that plaintiffs had not been able to effect service on the company, and he asked that the motion should stand over for a week in order, if possible, to trace the man who had to be served.

His LORDSHIP acceded to the request.

IN the Chancery Division on December 11th, Mr. Justice Astbury had before him a motion on behalf of the British Thomson-Houston Co., Ltd., for an injunction to restrain the Electric Service Company from infringing letters patent which Counsel said had been upheld by the Courts. An interim injunction had been granted over that day, and Counsel asked that it should be continued until judgment in the action or further order.

The defendants were not represented and his Lordship made the order.

British Insulated & Helsby Cables, Ltd.'s Pension Fund.

THE decision of the House of Lords on the appeal of the British Insulated & Helsby Cables, Ltd., against a judgment of the Court of Appeal in its dispute with the revenue authorities on income tax assessment for the year ended April, 1918, was given on December 11th. The company claimed to be entitled to deduct a sum of £31,874 made to a pension fund for the benefit of its clerical and technical staff in computing the profits for the purpose of assessment to income tax for the year ended April 5th, 1918, and appealed to the Special Commissioners on the point, with the result that their appeal was allowed. Mr. Justice Rowlatt upheld this decision, but the Court of Appeal reversed it. The final appeal was heard and judgment reserved on October 26th. By a majority their Lordships dismissed the appeal, the Law Lords taking this view being the Lord Chancellor and Lords Atkinson and Buckmaster, and the dissenting members being Lords Carson and Blanesburgh. The Lord Chancellor said that the object and effect of the payment of this large sum was to enable the company to establish the pension fund and to offer to all its existing and future employés a sure provision for their old age, and so to obtain for the company the substantial and lasting advantage of being in a position throughout its business life to secure and retain the services of a contented and efficient staff. He was satisfied, on full consideration, that the payment was in the nature of capital expenditure, and accordingly that the deduction of the amount from profits, although not expressly prohibited by the Act, was rightly held by the Court of Appeal not to be admissible.

Metropolitan Water Board v. North Metropolitan E.P.S. Co., Ltd.

MR. JUSTICE ROMER, in the Chancery Division on December 10th, delivered judgment on a special case stated by the Metropolitan Water Board raising the question whether the King George reservoir at Chingford came within the words "other source" contained in Section 15 (1) of the Electricity Supply Act, 1919, which states:—"The Board of Trade, on the representation of the Electricity Commissioners, may authorise any joint electricity authority, or any authorised undertaker, to abstract water from any river, stream, canal, inland navigation, or other source, to enable the undertaking to utilise and return the water, subject to such conditions as may be specified in the order."

His LORDSHIP said there was also the further question whether it was within the power of the Minister of Transport to authorise the North Metropolitan Electric Power Supply Co., Ltd., to abstract water from the reservoir. But inasmuch as the company was an authorised undertaker within the meaning of the section there could be no doubt as to the power of the Minister to make such an order if the first question was answered in the affirmative, if he was satisfied as the result of an inquiry that it was proper to make an order. With regard to the first and principal question his LORDSHIP said the words "other source" in the sub-section were not used in the sense that they were used when speaking of the source of a river or stream. The word "source" must mean some body of water from which water was capable of being abstracted and to which it could be returned. If a reservoir was not included in the words of the sub-section then it must be because the expression "other source" included a certain species only of such bodies. A reservoir was different from a river or stream in that it was exclusively appropriated for a definite purpose. But so was the water in a dock or canal. The fact of appropriation was not therefore a sufficient reason for excluding a reservoir from the scope of the words "other source." The plaintiffs had contended that having regard to the provisions of the section as a whole and to the purpose that the Legislature must have had in view, a reservoir must be taken to be excluded from its operation. He could, however, find no justification whatever for this. The plaintiffs also submitted that the sub-section only related to such water as could be abstracted without trespassing on land belonging to others; that the Minister had no power to enable anybody to pass over the property of a third party to do this; and that it was inconceivable that the Legislature intended to confer upon him the power to authorise interference with the rights of property without compensation. Of course it was true that the electricity authority or undertaker, though not the owner of land adjoining the water, might by agreement obtain the right to lay its pipes over the land for the purpose of abstracting and returning the water. But there could be no object in obtaining such a right, and he did not know that the authority or undertaker would have any power to obtain such a right, unless and until the right of abstraction was clear. In the circumstances he did not feel justified in reading into the sub-section a qualification of the power of the Minister to make an order that was not expressed. When the order was made it might be that the authority or undertaker would not be able to get to the water for abstraction purposes unless and until it obtained right of access. As to that he did not feel called upon to express an opinion. All he proposed to do at the present time was to declare that the King George reservoir was a "source" within the meaning of the sub-section.

An Electrical Trades Union Dispute.

MR. JUSTICE TOMLIN, in the Chancery Division on December 11th, had before him a motion on behalf of the officials of the London (East) branch of the Electrical Trades Union for the discharge or variation of an order made on January 30th last on an injunction obtained by the Electrical Trades Union, so as to give the branch officials liberty to make urgent payments out of funds subscribed by the branch members.

Mr. GALBRAITH, K.C., for the branch officials, said there was a dispute between them and the Union, the branch having been suspended on the ground that certain rules had been broken, which was denied. Since the order was made £700 had been contributed by members of the branch, and the question was: Who ought to pay the benefits? There were some members living in West Ham who owing to the dispute could not get the benefits they had paid for and were drawing relief on loan from the Guardians. As a way out of the difficulties he suggested submitting a list of the urgent cases to the head office with a request that they be dealt with.

Mr. NORMAN DAYNES, for the Union, said he did not wish to contend that the effect of the suspension of the branch was to deprive members of the benefits they were entitled to. He was willing to consider the suggestion Mr. Galbraith had made.

His Lordship adjourned the motion until December 15th, to see if the parties could come to some arrangement.

Claim by the Dublin United (Electric) Tramway Co.

MR. GEORGE HEWSON, official arbitrator appointed by the Free State Government, heard evidence recently in the City Hall, Dublin, in respect of a claim by the Dublin United (Electric) Tramway Company for £20,000 for property formerly occupied as offices and stores in Upper O'Connell Street, which the City Commissioners propose to acquire for street-widening purposes. The main portion of the property was destroyed in the insurrectionary fires of 1916 and has since been lying derelict, the company having acquired new premises. Evidence of value was submitted by the company and the Commissioners, the latter's valuation being £2,500. The award will be made in due course.

Bowerman v. Millett.

IN the Mayor's and City of London Court, before Judge Shewell Cooper, on December 10th, Mr. G. Bowerman, importer, Ludgate Hill, E.C., sued Mr. J. Millett, Farringdon Avenue, E.C., radio apparatus dealer, for £12 10s., the price of ten loud speakers. Plaintiff stated that in May last year a case of 24 loud speakers imported from Germany was delivered to the defendant. He had only ordered 12, but as they were packed in cases of 24 the whole case was delivered, and it was arranged that the balance of 12 should be at witness's disposal. As he could not obtain these instruments, he sent in an invoice. Mr. Millett stated that the plaintiff had received the 12 loud speakers in question. The plaintiff had called on a number of occasions and taken them away. Witness took no receipt for the instruments received by the plaintiff as they were plaintiff's own property. Judge Shewell Cooper said there was a direct conflict of evidence between the parties, and it appeared that the plaintiff had taken away the loud speakers and forgotten all about the transaction. He gave judgment for the defendant, with costs.

The Work of the Electricity Commissioners.

The Fifth Annual Report.*

(*Concluded from page* 949).

Generating Stations and Main Transmission Lines.

The aggregate capacity of the generating plant for new stations and extensions of existing stations sanctioned by the Commissioners during the year 1924-25 amounted to approximately 480,000 kW. The rate of provision for meeting the growing demands upon electricity undertakings was thus fully maintained at the figure recorded for the previous year, notwithstanding the continuance of the industrial depression.

Of the 2,244,226 kW of generating plant sanctioned during the past five years, 426,683 kW, or approximately 19 per cent., was for new stations, and 1,817,543 kW or 81 per cent., for the purpose of extending or remodelling existing generating stations. The division of the total for the five years as between the various authorities was approximately as follows:—Local Authority Undertakers, 64.7 per cent.; Company Undertakers, 27.8 per cent.; and Railway and Tramway authorities and non-statutory undertakings, 7.5 per cent.

The capacity of the generating plant sanctioned does not represent a *net* addition to the plant capacity of the country, as in a number of instances the installation of the new plant involved the displacement of other equipment of an obsolete type.

During the year the Commissioners issued 12 consents (6 to authorised undertakers and 6 to non-statutory undertakings) in respect of the establishment of new generating stations, representing an initial installation of plant having a total rated capacity of 16,681 kW.

During the year consents to the extension of existing generating stations were given by the Commissioners to 86 authorised undertakers (92 consents), and 11 further consents were given in respect of the extension of stations owned by railway and tramway authorities and non-statutory undertakings. The sanctioned extensions represent, in aggregate, a plant capacity of approximately 463,200 kW, as compared with the figure of 423,000 kW for the preceding year, the division of the total as between the various authorities being approximately as follows:—Local Authority Undertakers, 299,600 kW; Company Undertakers, 90,600 kW; Railway and Tramway Authorities, 22,700 kW; and Non-statutory undertakings, 50,300 kW.

Under the provisions of the Act of 1919, the Commissioners prescribed or approved of current, frequency and pressure to be used at new private generating stations proposed to be established by seven owners.

The Commissioners dealt with a number of important applications for consent to the establishment of main transmission lines and issued formal consents under the Act of 1919 in respect of 47 applications. A number of the consents related to 33,000-volt transmission lines, and two consents related to 66,000-volt lines, the undertakers being the County of Durham Electric Power Supply Company and the North Wales Power Company, Ltd.

Special Orders.

At the commencement of the period covered by the report, 74 applications for Special Orders relating to the establishment or extension of distribution undertakings were under consideration by the Commissioners, and during the year 88 further applications were received. The Commissioners made Special Orders in respect of 66 of the applications before them. Of the remaining applications, 10 were refused and 7 were withdrawn, leaving 79 applications still under consideration at March 31st, 1925.

As many as 35 of the applications lodged during the year competed, with current or prior applications. Eleven inquiries affecting 17 applications were held by the Commissioners.

Rates (Northumberland) Clause.

During the course of the proceedings in connection with certain applications made by Local Authorities for Special Orders to authorise the supply of electricity, the Commissioners had occasion to consider representations made by large ratepayers, for the insertion of a clause known as the Northumberland or Winchester Clause which provides that on the expiration of a certain period after the commencement of supply, and at definite intervals thereafter, the undertakers shall reconsider and if necessary revise and maintain the scale of prices charged for electricity so that so far as reasonably practicable no contributions from the local rates will be required for defraying the expenses of the undertaking during the succeeding interval. An inquiry was made of all local authority undertakers whose Electric Lighting Orders embodied a clause of the kind in question, with the view of ascertaining their practical experience of the operation of the clause. It transpired that in the majority of cases recourse to the clause had proved unnecessary as the undertakings had been consistently self-supporting. In other cases, however, the undertakers intimated that the existence of the clause in their Order had proved detrimental to development and restrictive in negotiating with consumers. After a full review of all the circumstances, the Commissioners decided normally to disallow the clause when applied for, unless a good case for its inclusion was made out.

General Observations.

The Commissioners, in the interests of future applicants for Special Orders, point out that the rules made by the Commissioners in respect of such applications provide for the submission of a statement of the capital proposed to be expended in establishing the undertaking, and of a report by an electrical engineer on the proposed scheme. The omission to furnish information of the kind in question at the outset has constituted a cause of delay which could have been avoided. Again, adequate consideration has not always been given by the promoters to the possible sources of supply available. The Commissioners require the promoters, in the event of an economic supply proving to be available, to submit a revised engineering scheme based upon such supply. Where applications have related to extensive areas of supply, the Commissioners have found it necessary to ask for a revised scheme when it has appeared to them that the compulsory works proposed to be carried out within two years after the granting of statutory powers, were not adequate or commensurate with the extent and nature of the proposed area. Lastly, there is a tendency to lodge applications, in some instances for extensive schemes, without having previously arranged for the provision of the necessary capital; in such cases the Commissioners are necessarily precluded from proceeding.

Sanction to Borrowing by Local Authorities.

At the commencement of the period covered by the Report, 101 applications from local authorities for sanction to borrowing for electricity purposes were under consideration by the Commissioners, and during the year 596 further applications were received. Sanctions were issued in 562 cases. The total amount of the loans sanctioned during the year was £13,379,060, an increase of about 37 per cent. on the figure of £9,776,593 for the previous year. Plant accounted for £5,725,196 and mains and services for £5,183,942.

Unemployment Grants Committee.

During the year there was an increase (from 60 to 75 per cent.) in the proportion of the wages bill payable by the State in the case of approved schemes financed otherwise than by loan. The number of applications referred by the Committee to the Commissioners for their observations was 153, as compared with a total of 159 in the previous year. The majority of the applications related to schemes for the laying of mains, but several important applications were made in respect of generating plant extensions and alterations of systems of supply. Four schemes submitted by company undertakers were also of an important character, involving an estimated total expenditure of £249,000, chiefly for main transmission lines and distribution works.

Mutual Assistance: Bulk Supplies.

During the past year, further progress was made in regard to bulk supply developments. In the case of the supplies (233) taken from authorised undertakers, the bulk suppliers number 58 local authorities and 32 companies. Notwithstanding the steady progress made in the giving and taking of bulk supplies during the past five years, this class of business still represents a comparatively minor branch of electricity supply in this country. The majority of undertakers prefer to extend their generating stations up to the limit of the capacity of the sites, whether well-adapted or not for modern methods of generation. Little or no regard is given in many cases to the position that will arise when the limited extension, if approved, has achieved its immediate purpose and further provision becomes necessary to meet additional demands. In a number of cases it has appeared to the Commissioners that the ultimate interests of an undertaking would have been better served by the taking of a supply in bulk. It is apparent that accelerated progress under existing conditions is dependent upon the fuller co-operation of authorised undertakers generally.

In addition to 24 other approvals, the Commissioners made Orders permitting a supply of electricity in bulk being given by the Corporation of Edinburgh to the Lothians Electric Power Company, and by the Mersey Power Company, Ltd., to the North Wales Power Company, Ltd. They also approved of the Central Electric Supply Company, Ltd., and the Metropolitan Electric Supply Company, Ltd., and of the Central Electric Supply Company, Ltd., the Kensington and Knightsbridge Electric Lighting Company, Ltd., and the Notting Hill Electric Lighting Company, Ltd., entering into and carrying into effect agreements for their mutual assistance.

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* H.M. Stationery Office; price 2s. 6d. net.

Alterations of Systems and/or Pressures.

The Commissioners issued 24 consents during the year to alterations in the declared system and/or pressure of the supply hitherto adopted by 23 different authorised undertakers. Further progress was achieved in the direction of the elimination of odd frequencies, seven of the consents being in respect of alterations to the standard frequency of 50 cycles per second from other existing frequencies. In most of the other instances the alterations were from d.c. to 50-cycle a.c. distribution.

Electric Lines and Works of the Postmaster-General.

A conference between representatives of the electricity supply industry and of the General Post Office was convened by the Commissioners in August, 1922, for the purpose of discussing various matters of joint interest. After further consultation with the General Post Office, the Commissioners, in August, 1923, received a communication from the Postmaster-General on the matters discussed at the conference, and a brief summary of the communication is given below.

On the question of the allocation of the cost of the necessary protection of Post Office lines erected subsequently to those of authorised undertakers, the Postmaster-General informed the Commissioners that although he was strictly entitled to recover from the undertakers the full cost of protection, it was the practice of the Post Office in such cases to bear (*a*) half the cost of guard wires or of an alternative such as the erection of insulated wires by the Post Office; (*b*) the whole cost of fuses and heat coils; and (*c*) the whole cost of inserting a layer of concrete between underground power plant and new Post Office plant where the separating distance was less than two inches.

The communication further stated that Parliament had recognised the danger inseparable from the presence of electricity power and supply undertakings (*sic*) on the public roads; had laid down, as a condition for the granting of statutory powers, that precautions must be taken for the safety of other users of the roads; had given specific protection against the injurious affection of telegraphs (including telephones); and had laid on the Board of Trade the duty (now exercisable by the Commissioners) of safeguarding the public; that the erection of guard wires or other protective devices in cases where telegraph or telephone plant was in proximity to the overhead lines of undertakers was essential for the safety of the public and might be regarded as a reasonable insurance by the undertakers against claims for damage to the telegraphs and telephones which might otherwise arise; and that the Postmaster-General regretted that he was unable to recommend to H.M. Treasury any further financial concessions.

With regard to the laying of Post Office mains in proximity to those of authorised undertakers, the Postmaster-General intimated that the Engineer-in-Chief of the Post Office had issued an instruction that the engineers of electricity supply undertakings should be consulted as to the position of their plant and should be informed of the probable date of laying Post Office plant.

Other questions arising in connection with the overhead line regulations of the Commissioners and of the Post Office, respectively, were also dealt with in the communication, and the technical considerations involved were left for further discussion. These matters are awaiting eventual settlement in connection with the revision by the Commissioners of their existing code of regulations for securing the safety of the public and ensuring a regular and efficient supply of electrical energy.

Supplies from Railway, &c., Generating Stations.

Under the provisions of Section 25 of the Electricity (Supply) Act, 1922, the Commissioners, during the year ending March 31st, 1925, issued consents to the undermentioned bodies in respect of the supplies indicated in each case:—

(i) *London and North-Eastern Railway Company.*—Consent was given to a supply of electricity in bulk from the generating station of the railway company to the Corporation of Harwich for the purposes of the undertaking authorised by the Harwich Corporation Electric Lighting Order, 1914.

(ii) *London County Council.*—Consent was given to a supply of electricity from the Greenwich tramway generating station of the London County Council to the London Electric Supply Corporation, Ltd.

Consents to Subscriptions to Associations.

During the year the Commissioners issued consents in respect of the payment of annual or other subscriptions to and/or expenses of attendance at meetings of the British Electrical Development Association (Inc.), the British Engineering Standards Association, the Incorporated Municipal Electrical Association, District Joint Industrial Councils and Joint Boards, electrical displays at Wembley and at the Ideal Home Exhibition, &c.

Advisory Committee on Methods of Charge, &c.

During the year the Commissioners had occasion to give further consideration to the general question of methods of charge and multi-part tariffs, and its bearing as a factor in securing a more extensive development in the use of electricity for domestic purposes. It appeared that an attempt should be made to frame a few model or standard methods of charge, with the view of its being made generally known to authorised undertakers that applications for approval of or for powers to charge by such methods would be favourably entertained in appropriate cases. By the adoption of recognised standard methods, it would only remain to fix the actual quantum (*e.g.*, the particular fixed charge and the particular unit charge in the case of a standard two-part tariff) on the merits of individual applications.

After consultation with the principal associations representative of the electricity supply industry, the Commissioners decided to appoint an Advisory Committee to consider and report upon the question.

Overhead Lines and Wayleaves.

The number of applications for consent to the erection of overhead lines was fully maintained, 162 applications being dealt with by the Commissioners during the year. At the date to which the report is made, the Minister had given his consent in respect of 155 of the applications.

The Commissioners dealt with 12 applications for consent to wayleaves. In the case of the Derbyshire and Nottinghamshire Electric Power Company, consent was given to wayleaves across certain lands in the parish of Morley, the annual rental being fixed by the Minister at 1s. for each 100 yards of cable laid underground; 10s. for each double pole which impeded ploughing operations; 5s. for each double pole which impeded the mowing of grass; and 3s. for each double pole in other cases. Similar conditions were granted to the Leicestershire and Warwickshire Electric Power Company, but in certain cases the annual rentals for double poles were fixed at 8s., 4s., and 2s., respectively, and 6d. for each stay. The North Metropolitan Electric Power Supply Company received consent to wayleaves across certain lands at the rate of 2s. 6d. per pole, and 1s. for each 100 yards of cable laid underground. The North Wales Power Company, Ltd., received consent to a wayleave across certain property at a rental of 2s. per pole.

Organisation and Staff of Electricity Commission.

The volume of work falling to be dealt with by the Commissioners showed a further increase during the year under review. On March 31st, 1925, the staff of the Electricity Commission numbered 54 in all.

At the beginning of the financial year the estimated net cost of administration for the year was £45,550; and the then outstanding liability to H.M. Exchequer in respect of interest on and repayment of advances made to meet the expenses of the Commissioners prior to April 1st, 1922, amounted to £23,450. Allowing for a reduction of £2,000 in the working balance, the total amount to be apportioned among authorised undertakers was therefore £67,000, and this estimate was approved by the Minister. The apportionments in respect of the estimate were made on authorised undertakers in June, 1924, the contributions by the electricity supply industry towards the expenses of the Commissioners for 1924-25, inclusive of repayment to H.M. Exchequer, involving a payment by each authorised undertaker concerned amounting to 3.7d. per 1,000 kWh sold.

The actual net expenditure on administration during 1924-25, including the special expenses incurred by the Commissioners in connection with the report on Standardisation of Frequency (£4,206), was £43,520, a net saving of £2,030 on the total estimate, due partly to the sustained increase in the number of applications for Special Orders. The liability of the Commissioners in respect of advances from H.M. Exchequer was finally discharged during the year.

In concluding the report, the Commissioners record, with regret, the retirement of their colleague, Mr. Harry Booth, O.B.E., from the office of Electricity Commissioner on January 24th, 1925, after five years of service in that capacity and after completing over 40 years in all in the public service.

Fifteen appendices and two maps are attached to the report.

London's Electricity Supply in 1923-24.

The L.C.C. Annual Report.

(*Concluded from page* 956.)

In our last issue we dealt with those sections of the report relating to the capacity, output and finances of municipal and company undertakings; in this part we deal mainly with charges to consumers, a subject which occupies twelve pages of the report and presents infinite variety.

No fewer than 22 methods of charging are in vogue and these methods are applied in various ways by different authorities. Generally, it may be said that there are four main methods of charging for electricity:—(i) The flat-rate system; (ii) the sliding-scale system, whereby the rate decreases as the consumption rises; (iii) the maximum demand system, by which the equivalent of so many hours' use of the maximum demand is charged for at a relatively high rate, with a smaller charge for further consumption; (iv) the "telephone" system, comprising a fixed annual or quarterly charge, based on the size and character of the installation or upon the rateable value of the premises, with a low "unit" rate for energy consumed. Other less common methods employed are:—(v) The two-rate

system, involving the use of a time switch, whereby energy consumed during certain hours is charged for at a lower rate than during the rest of the day; (vi) the prepayment-meter system; and (vii) the contract-tariff system whereby the charges are determined solely by the installation without regard to actual consumption. There are only two examples of the last system in London; these are Barnes, where the rate is based on the number and size of lamps, and Hammersmith, for power, in respect of 100 per cent. load factor devices.

It may be said at once that true comparisons between the rates charged by various undertakings are well-nigh impossible; the nearest approach to accuracy is made by comparing flat rates, and in this connection it is considered permissible to include the first steps of sliding scales, it being argued that proportionately few consumers ever reach the further steps. On this basis a table has been compiled showing the flat rate charges for lighting of 85 undertakings, or sections of undertakings where large companies make different charges in various parts of their areas. From the table it is seen that the upper and lower limits were 1s. per kWh (Leatherhead and Caterham (Urban Co.)), and 4d. per kWh (Battersea, Hampstead, Hendon, and St. Pancras). The average flat-rate of the 85 undertakings was 6.9d. per kWh. In the preceding year, although the maximum and minimum rates were the same, the average rate for 83 undertakings was 7.17d. per kWh, so that the latest figures show a decrease of 0.21d. per kWh in the average lighting charge. In the case of power charges a similar table has been prepared and 72 undertakings are set out in this. The highest rate was 7d. per kWh, representing the first step of sliding scales in force at Bromley (Kent), Chislehurst, Dorking (Edmundson's), Twickenham and Teddington, and Walton and Weybridge (Urban Co.). The lowest rate was 1d. per kWh (Hampstead and St. Pancras). The average rate for power charged by the 72 undertakings was 2.95d. per kWh. In 1922-23 the charges were bounded by the same limits, but the average was 3.6d. per kWh; thus the latest figures record a decrease of 0.65d. per kWh. In a similar statement in connection with flat-rate charges for heating and cooking, 85 undertakings are tabulated. In this case the maximum rate was 6d. per kWh (Dorking), the minimum rate 1d. per kWh (twelve undertakings), and the average rate 2.2d. per kWh (approx.). The average rate for the same number of undertakings in 1922-23 was 2.42d. per kWh. Therefore, assuming that these flat rates give some indication of the general tendency of prices, it will be seen that the average lighting rate was reduced by about 3 per cent., the power rate by 18 per cent., and the heating and cooking rate by 9 per cent.

The actual effect of the other systems dealt with cannot, of course, be gauged from the mere figures showing the basic and other charges instituted. In addition to varying their charges, many undertakings adopt special conditions, compliance with which secures to the consumer a lower rate. For instance, in Wimbledon energy for water heaters is charged for at approximately ¾d. per kWh, provided the total consumption for heating and cooking is not less than 150 kWh per quarter. Two or three undertakings allow power consumers to use a percentage of their power consumption for lighting purposes. The Brompton & Kensington Co. has instituted a lower lighting rate for private-house basements. Many authorities have special rates for institutions of various kinds, shop lighting, electric signs, &c.

Following this section is a table showing the assessments for the rating purposes of the London undertakings; this gives the rateable value of municipal undertakings as £135,409, and that of the company undertakings as £429,524, making a total of £564,863. The final part of the report proper gives the total number of kWh sold by each undertaking in 1913-14 and each year from 1917-18 to 1923-24. Complete figures for the extra-London companies are not available, but the total sales of the municipalities and the London companies are seen to have risen from 408,542,070 kWh in 1913-14 to 792,619,083 kWh in 1923-24.

A new feature of this report is an appendix which gives later figures for the company undertakings than those given in the body of the report, *i.e.*, for the year ended December 31st, 1924.

These figures may be briefly summarised as follows:—Plant capacity at the end of the year 452,480 kW generating and 98,431 kW transforming; maximum demand 344,057 kW; load factor, 21.4 per cent.; total energy generated, 659,407,609 kWh; total energy sold, 522,531,986 kWh; net capital expenditure, £28,968,474; total revenue, £6,624,761; working expenditure, £2,688,010; available for capital charges, £3,901,960; capital charges, £3,869,484. The last figure is incomplete.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The Christmas Holidays.—The ELECTRICAL REVIEW for December 25th will appear one day in advance of the usual time of publication owing to the Christmas holidays. The attention of contributors and advertisers is therefore directed to the announcements to this effect published in our last issue, as by the time this notice is in the reader's hands the preparation of the next issue must be in a forward state.

The "Electrical Review" Index.—The Index to Vol. XCVII (for the half-year ending December 31st, 1925) will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.4.

"The" Wireless Exhibition of 1926.—With reference to our several editorial comments regarding the undesirability of too many wireless trade exhibitions being organised for next year, we are pleased to be able to give publicity to an announcement received from the National Association of Radio Manufacturers and Traders.

That Association has concluded negotiations for the holding of a wireless exhibition in 1926, which will be open alike to members and non-members of N.A.R.M.A.T. Further statements regarding the matter will be issued from time to time.

The British Industries Fair.—In order that buyers may be afforded every possible facility, the Government has decided that holders of the official invitation cards may have their passports to England visaed without any charge being made. Invitations to visit the Fair are being issued to all firms abroad whose names are on the Department's index and to any other firms suggested by exhibitors. In addition, the British Government extends a general invitation to all overseas buyers to visit the Fair. Invitation cards may be obtained from the nearest British Consul or from the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

Lead.—Messrs. James Forster & Co. state that a further cut in the American price on December 8th of about 25s. per ton caused a further fall here. With a prospect of larger supplies from America in the near future, they are inclined to think that prices will go lower yet. The Board of Trade returns for November were:—Imports, 19,943; exports, 2,563; leaving for home consumption 17,380 tons.

Birmingham Electric Club.—At its annual meeting to-day the report for the 1925 session is to be presented by the committee. The total membership is now 213 as against 183 a year ago. The attendance at the club meetings varied from 41 to 136 and averaged 65 compared with 62 in the previous session.

The North-Western District Council.—The annual conference of authorised undertakers in the North-Western Area was held at the Manchester Town Hall on December 8th for the purpose of reviewing the work of the past year and electing employers' representatives for the District Joint Industrial Council (No. 3) and the District Joint Board of Employers and Staff Members. Mr. A. H. Banks, the employers' secretary, has sent us a statement showing the grouping of the undertakings and the names of re-elected representatives.

The International Glow Lamp Syndicate. — It is stated that the members of the International Glow Lamp Syndicate will meet at Berne in the near future to decide on the question of the standardisation of glow lamps throughout the world in order to simplify production and also possibly to reduce the sale prices. In this connection some further information has become available concerning the recent statements made by Dr. Meinhardt of the German Osram Company, to which reference was made in our issue of December 11th. It appears that the superstructure of the international glow-lamp agreement is formed by the Phoebus, A.G. für Industrielle Entwicklung des Beleuchtungs Wesen, which is the covering company of the whole organisation that has been established in Geneva, because Switzerland has not yet concerned itself with legislative measures restricting the activities of syndicates. In the countries represented by the syndicate, sales are independently regulated according to the turnover and the share of the country in the business. The other countries are common territories and for these allotments are arranged in a chosen year according to the sales of the interested glow lamp industries. It is, however, provided that makers who have obtained a special footing in definite markets shall not lose the advantages of their labours.

A South-Western Lighting Service Bureau.—On December 2nd a meeting was held in Cardiff to discuss the formation of a Lighting Service Bureau to serve the interests of the industry in the South-Western area. Many engineers representing supply authorities were present, in addition to representatives of the wholesalers and electrical contractors. A resolution expressing the desirability of starting a Bureau was carried unanimously, and a sub-committee of the various interests was formed in order to go fully into the details of the scheme.

Profits of German Electricity Undertakings. — The *Eletrische Betrieb*, in a recent issue, gave the results for the past financial year of 54 electricity supply undertakings in Germany, which showed an average dividend to the shareholders of 6.25 per cent., as compared with an average of only 4.3 per cent. for German industrial undertakings. Only seven of the 54 concerns failed to pay a dividend.

Trade Announcements.—MESSRS. FRANK A. SMITH, LTD., radio specialists, have opened new premises at 27, High Street, Stourbridge.

MR. F. WARREN, of the Radio Works, Dallow Road, Luton, has opened additional premises at 8, Gordon Street in that town.

MR. GARDINER, radio dealer, of Dumfries, has removed his business to 95, Friars' Vennel.

MR. C. BERNARD DAY, radio engineer, has commenced business at 10a, St. Andrew's Street, Bury St. Edmunds.

THE LIGHTING, HEATING & TRACTION SUPPLIES CO. has removed from 43 to 51, Doughty Street, W.C.1.

As some of their trade cards have been presented by unknown persons without authority, MESSRS. L. G. HAWKINS AND CO., LTD., of London and Glasgow, wish to inform the trade that they will only be responsible for goods supplied to them against their definite official order duly signed.

THE AUTO ELECTRICAL SERVICE CO. has opened a depôt at 519, Green Lane, Goodmayes, Ilford.

Book Notices. — "Electrical Engineering Problems." Part I. By John G. Pertsch. Pp. viii+213; figs. 100. London: McGraw-Hill Publishing Co., Ltd.—This volume contains problems on the fundamental relations in electrical and magnetic circuits and their application to d.c. machinery. Conversion and copper-wire tables, and also resistance computation constants are given in appendices.

"Circular of the U.S.A. Bureau of Standards No. 232," July, 1925; No. 276, August, 1925 (20 cents).

"Technologic Papers of the U.S.A. Bureau of Standards." Nos. 286 (10 cents), 288 (10 cents), and 289 (20 cents). June, 1925.

"Scientific Paper of the U.S.A. Bureau of Standards No. 508." June, 1925 (20 cents).

"Yallourn and the Associated State Electricity Schemes." Melbourne: *Australasian Electrical Times*. 6s., post free.

"Alternating-Current Circuits," by J. M. Briant, M.S., E.E., and J. A. Correll, M.S. Pp. xii+412; figs. 289. London: McGraw-Hill Publishing Co., Ltd. Price 20s. net.

Catalogues and Lists.—THE LONDON FACTORS & AGENTS, LTD., 38 and 39, Parliament Street, S.W.1.—A comprehensive catalogue of electrical material, accessories and appliances.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38 and 39, Upper Thames Street, E.C.4.—Catalogue No. 97, containing illustrated details of shades, bowls and reflectors; Leaflet No. 147, advertising "Siemens" neon lamps; and Leaflet No. 146, dealing with electric lamp outfits for decorative purposes.

THE ELECTRIC HEATING CO., George Street, Croydon.—An illustrated and priced booklet dealing with "Elect" irons and other domestic appliances.

MR. ALAN WRIGHT, Sentinel House, Southampton Road, W.C.1.—A pamphlet illustrating a number of "Inventum" appliances suitable for Christmas gifts. Priced.

MESSRS. FREDERICK BRABY & CO., LTD., Petershill Road, Glasgow.—A booklet advertising "Venteolite" galvanised sheets for ventilating purposes.

MESSRS. ERSKINE, HEAP & CO., LTD., Room 607, Australia House, Strand, W.C.2.—Pamphlet TCC.1, containing illustrated details of the company's truck type cubicle switchgear.

N-K, LTD., 111, Great Portland Street, W.1.—An illustrated pamphlet advertising "Daenite" electric signs.

THE BRITISH THOMSON-HOUSTON CO., LTD., Mazda House, Newman Street, New Oxford Street, W.1.—An adhesive coloured paper cut-out advertising "Mazda" lamps.

MESSRS. A. J. STEVENS & CO. (1914), LTD., Walsall Street, Wolverhampton.—A well-produced coloured showcard depicting one of the company's cabinet radio receivers.

MESSRS. R. JENKINS & CO., LTD., Rotherham.—A collection of illustrations of a number of welded products produced by the company.

PHILIPS LAMPS, LTD., 60, Wilson Street, Finsbury Square, E.C.2.—A folder advertising the "Savelite," an a.c. incandescent lamp of very low wattage.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—A mailing card bearing illustrations and prices of "Gecophone" receiving sets and headphones. Also the December "Osram Bulletin," containing notes and news of "Osram" lamps and valves.

FULLER'S UNITED ELECTRIC WORKS, LTD., Woodland Works, Chadwell Heath, Essex.—An illustrated publication treating of the company's train-lighting batteries.

THE LANCASHIRE DYNAMO & MOTOR CO., LTD., Trafford Park, Manchester.—Descriptive List 465, containing full, illustrated particulars of "Crypto" constant-potential battery-charging equipment—a.c. and d.c. Priced.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—Publications Nos. 364F and 438, dealing with "Marconiphone" and "Sterling" radio receivers, accessories, and components. Illustrated and priced.

THE LODGE FITTINGS CO., LTD., 57, Albert Road, Aston, Birmingham.—An illustrated and priced pamphlet dealing with "Classic" desk, &c., lighting fittings.

THE MIRRLEES WATSON CO., LTD., Scotland Street, Glasgow.—Publication No. Pu.10, containing an illustrated description of a surface condensing plant recently installed at a spinning mill at Ballymena, Ireland. Also Pamphlet No. S.515, describing the company's feed water evaporators.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—December stock list of motors and dynamos.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—Catalogue (Section M), dealing with domestic electrical appliances. The range covered is a very wide one, and full details illustrations, and prices are given. Also two smaller booklets entitled "Cosmos Home Helps" and "Home Helps for Christmas," containing details of domestic appliances.

THE RAY ENGINEERING CO., LTD., Frogmore Street, Bristol.—Publication B.S.1, containing illustrated details and prices of battery switchboards.

Bankruptcy Proceedings.—W. A. A. C. ROBINSON, 10 Carnaby Street, Golden Square, W., electrical engineer.—The application of this bankrupt for an order of discharge came before Mr. Registrar Mellor on December 8th at the London Bankruptcy Court. The Official Receiver reported that the applicant failed last July with ranking liabilities of £443 and assets which had realised £9. He was employed as a charge engineer at a salary of £350 p.a., but resigned the post owing to his financial difficulties. The discharge was suspended for two years on statutory grounds.

E. H. NEWMAN (trading as Newman & Co.), radio and electrical engineer, Shepherd's Bush Green, W.—The first meeting of creditors was held on December 10th at the London Bankruptcy Court, when the Official Receiver reported that the liabilities were roughly estimated at £700 and the assets were valued at £20. The debtor had stated in the course of his preliminary examination that he had carried on the above business in part ownership with his wife. During the war he served as a wireless operator with the Naval Forces. In September, 1923, he obtained the post of salesman to a radio company, and in June of the following year he assisted in the formation of the Radio Electrical Co., Ltd., of which he was appointed the managing director. But it was not a success and it had gone into voluntary liquidation. During the period of his directorship he was also acting as manager of a works controlled by the liquidator of another radio company, and in January last, in partnership with his wife, he began the business of Newman & Co. That business mainly consisted of employing travellers on a commission basis for the purpose of selling radio accessories to shops and dealers, and it had probably never been a success in consequence of heavy overhead expenses and lack of capital. Recently his credit had been stopped, and creditors had taken legal proceedings against him. He obtained several adjournments of the petition in bankruptcy in the hope of his being able to form a company to take over his assets and his liabilities, but nothing definite had yet matured. In the absence of any resolution the estate remained in the hands of the Official Receiver.

JOHN MUNRO and JOHN MUNRO & CO., electrical engineers and plumbers, 45, York Place, Edinburgh.—A dividend will be payable on January 21st at the office of Messrs. W. J. A. Drummond & Lessels, 10, Stafford Street, Edinburgh.

J. BRODIE, electrical engineer, 59, High Street, Dunfermline.—A meeting to elect a Trustee and Commissioner was to be held yesterday, December 17th, at the D.C.I. Rooms, Bonnar Street, Dunfermline. Agent, Mr. J. W. Sterling, 77, Queen Anne Street, Dunfermline.

T. BARTON, electrical engineer, The Electric Works, Ainsworth Street, Blackburn.—Last day for proofs for dividend, December 24th. Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester.

J. MITCHELL and F. MITCHELL (F. Mitchell & Co.), electrical engineers, 97, Stockport Road, Ardwick, and 58, Ashton Old Road, Openshaw, Manchester.—First and final dividend of 4s. 4½d. in the £, payable at the Official Receiver's offices, Byrom Street, Manchester.

J. R. PATTISON, electrical supplies factor, 15, Goldsmith Street, Nottingham.—First and final dividend of 1s. 7¾d. in the £, payable December 18th, at the Official Receiver's offices, 4, Castle Place, Nottingham.

H. L. WOOD, electrical engineer, late of Elm Grove, Southsea.—Receiving order made December 1st, on debtor's own petition.

E. O. HENSTOCK, electrical engineer, 21, Old Road, Brampton, Chesterfield.—First meeting, December 18th, at the Official Receiver's offices, 4, Castle Place, Nottingham; public examination, January 15th, at the County Court, Chesterfield.

W. R. GRIGSBY (Wenham Lighting Corporation), electrical factor, late of 184, Gray's Inn Road, W.C.—Last day for proofs for dividend, December 28th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

M. D. ROSENBLOOM (D. Rose & Co.), electrical engineer, 25, Osborn Street, E.—Last day for proofs for dividend, December 28th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

Company Liquidations.—MORGAN WESTON, LTD., 38, Great Russell Street, W.C.1, radio and electrical dealers.—A meeting of creditors was held recently, at the offices of Messrs. Oscar Berry & Co, C.A. A statement of affairs was presented which showed liabilities of £1,353, all due to unsecured trade creditors. The assets were estimated at £462, leaving a deficiency of £891. It was reported that the company was incorporated on October 14th, 1924, with a nominal capital of £500, principally to carry on business in radio, electrical, and similar goods, and for that purpose an agreement was entered into with Nancy Cope to purchase a business carried on by her at Houndsditch, and in consideration she received 498 fully paid ordinary shares in the company. The first directors were N. Cope and V. E. Cope. Mr. V. E. Cope was appointed managing director at a salary of £500. In December, 1924, the company granted a debenture for £400 to Messrs. Merchants & Agencies, Ltd., in consideration for goods supplied to the company. Further financial assistance was given by

rchants & Agencies, Ltd., in June this year, and an agreeent was entered into whereby Merchants & Agencies, Ltd., ured the right to nominate a director of the company, which ndertook to buy all high-pressure batteries from Merchants d Agencies, Ltd. In June Mr. V. E. Cope vacated his sition on the board, and Mr. W. H. Harper and Mr. V. chards were appointed directors. In July the capital was creased to £2,000, and 1,500 additional shares of £1 each ere issued to Mr. Harper as nominee of Merchants and gencies, Ltd., and the amount owing to that company was ereby reduced by £1,500. As the result of pressure from e two largest creditors the company went into voluntary quidation on November 23rd. It was stated that the books the company were in a very unsatisfactory condition, and had been difficult therefore to gauge the real financial sition. The figures placed before the company on November rd last showed a trading loss of over £400. No resolutions ere passed, and the matter remains in the hands of Mr. scar Berry as liquidator.

The creditors include :—

"Ahems" Werkstatten (Berlin) £665; Merchants & Agencies, Ltd. £549.

Engineering Industry, Ltd.—A meeting of members is lled for January 14th at Sardinia House, Sardinia Street, ingsway, W.C., to hear an account of the winding up from ne liquidator, Mr. H. N. Hare.

Private Arrangements. — W. W. Symper and D. J. vershed, trading as Symper & Evershed, 22-24, Greenhill arade, Harrow, electrical and radio contractors.—According a circular issued by the British Traders' Association, a meetng of creditors was held on November 13th, but no resolutions ere passed. Subsequently, however, it was possible, by conent of the largest creditors, for the debtors to execute a deed f assignment to Mr. W. Osborne on December 2nd. A revised tatement of affairs had been prepared, showing that the defiiency was more than explained by the writing down of the ssets. The business was commenced by Mr. Symper in 1918 n borrowed capital, and two years afterwards Mr. Evershed oined him, introducing £500. Certain accounts were prepared p to May, 1924, which disclosed a substantial profit. From une, 1924, to October 31st, 1925, there was a small profit, but fter allowing for the joint drawing of the debtors, a loss was nade. The statement of affairs attached to the circular shows iabilities of £2,647, and net assets of £1,779, leaving a defiiency of £868. By direction of the largest creditors, arrangements will be made to continue the business for a few weeks, o that either partner can make endeavours to introduce a uyer. The committee acting with the trustee comprises a epresentative of Messrs. Falk, Stadelmann & Co., Ltd., Mr. . F. Thomas (General Electric Co., Ltd.), Mr. Martin (Vulcan Electric Co., Ltd.), and Mr. Lightstone (Ever Ready Co. (Gt. Britain), Ltd.). The following are creditors :—

	£		£
Cable Accessories Co., Ltd. ...	40	Metropolitan-Vickers Electrical	
Crabtree, J. A., & Co.	72	Co., Ltd.	90
Dickison & Sons, Ltd.	24	Marconiphone Co., Ltd.	25
Ever-Ready Co., Ltd.	61	Mico Light Co., Ltd.	20
Eastick, J. J., & Son	32	Smith, J. & W. B., Ltd. ...	90
Electrical Appliances Co., Ltd....	82	Swedish General Electric, Ltd. ...	20
Falk, Stadelmann & Co., Ltd. ...	242	Vulcan Electro-Mechanical Co. ...	301
General Electric Co., Ltd. ...	385	Wandsworth Electrical Mfg. Co.	20

The Engineering Industry and Foreign Competition.—*The Times* states that arrangements have been made for the adjourned conference between the Minister of Labour and representatives of the Engineering Employers' Federation and the engineering unions, on the question of foreign competition, to be held on December 21st. The employers and the unions have joined in a request to the Government to take steps under the Peace Treaty or otherwise to secure an arrangement whereby the working hours of competitor nations on the Continent may be brought into reasonable relation with the working week in this country. The Minister of Labour at the last interview promised to consider the points raised, and it is expected that on Monday next he will give the reply of the Government.

The Newcastle Supply Co.'s New Premises.—Much interest has been aroused by the building activities lately begun on the site of the old Turkish Baths, at the corner of Pilgrim Street and New Market Street, Newcastle-upon-Tyne. The building, which is to be ready for occupation in the autumn of 1927, is destined to be the northern headquarters of the electrical industry, and has become a necessity in view of the developments in recent years in the business of the Newcastle-upon-Tyne Electric Supply Company, Ltd., and its associated companies. This group is at present housed in five different places in Newcastle, having completely outgrown its registered offices in Hood Street, into which it moved in 1904. The concentration of the staff in one building will ensure increased efficiency and economies in working, and in the administration of the large area throughout which the company now supplies electricity. In addition to the staff of the supply companies, others will also be accommodated in the building. Messrs. Merz & McLellan, the consulting engineers to the companies, have arranged to occupy a portion of the new building, and any further space in the building which may be available will, in all probability, be occupied by electrical manufacturers or others concerned in the industry. Carliol House, as the new block is to be called, may in effect, therefore, become the main headquarters of the electrical industry in the North of England. The building has been designed by Mr. L. J. Couves, Newcastle-upon-Tyne, in conjunction with Sir John Burnet & Partners, of London. Mr. Couves made a special journey to the United States for the purpose of studying the most-up-to-date methods of planning and equipping large office buildings. The site chosen—which is a commanding one in the business centre of the city—has a ground area of 28,000 sq. ft. and a frontage in New Market Street of 432 ft. The building over about one half of the site will consist of eight floors, and, on the remainder, nine floors including the basements will be erected. There will be two entrances; one in New Market Street, and the other at the corner of Pilgrim Street and New Market Street. The latter will open into a



The Newcastle Supply Co.'s New Premises.

rotunda or circular hall, which will form part of the showrooms. These showrooms, which will be a special feature, will provide ample space for consumers to see electrical appliances in actual use. The lighting arrangements will be of the most modern type. A well-arranged basement on the eastern half of the premises will provide for the central heating and vacuum cleaning plants. Central heating will be provided by means of a low-pressure hot water system, which is to be heated electrically. The vacuum cleaning plant will be wholly electrical. The New Market Street entrance will give access, through an imposing hall, to a well-lighted staircase with four high-speed elevators to the offices above. Each floor will be divided into suites of offices, which have been specially planned to make for efficient working. The contractors carrying out the erection of the building are Messrs. Stephen Easten, Ltd., Milburn House, Newcastle-upon-Tyne.

New French Company.—La Société Nerka is the name of a new company which has lately been formed in Paris (21, Rue de Peletier) with a capital of 400,000 fr., to manufacture "Nerka" sparking plugs for motor vehicles.

Clock Electrification.—The clock with four dials each 26 ft. in diameter, in the tower of the Singer Buildings at Clydebank, Glasgow, is claimed to be the largest in the British Empire, and it is interesting to note that this clock has succumbed at last to modern methods, and the mechanical movement is being replaced by an electric time-keeper. A "waiting-train" movement similar to that driving the Liver Clock at Liverpool is being fixed by the patentees—Messrs. Gent & Co., Ltd., Leicester—the order having been received through their Scottish agents, Messrs. Edward & Son, Ltd., Glasgow.

French Foreign Electrical Trade.—The appended table shows the value of the French imports and exports of electrical machinery and apparatus during the seven months ended with July last, as compared with the corresponding period of 1924 :—

	Imports.		*Exports.*	
	January to July.		January to July.	
	1925.	1924.	1925.	1924.
	1,000 fr.	1,000 fr.	1,000 fr.	1,000 fr.
Electrical porcelain parts, insulators, &c.	1,979	6,051	8,295	8,889
Incandescent lamps ...	30,518	26,660	19,806	16,120
Dynamos and motors ...	31,127	31,160	36,108	33,991
Electrical and electro-chemical apparatus ...	30,487	31,774	95,442	117,339
Dynamo and electric motor parts	85	241	28	158
Insulated wires and cables	4,027	1,761	10,630	21,714
Armatures and electrical parts	9,711	9,716	14,448	13,651
Accumulators and parts ..	3,315	1,866	5,835	3,146
Dry batteries	58	66	1,271	1,546
Totals (1,000 fr.) ...	111,307	109,295	191,863	216,554

Fire.—The fire that recently occurred at the G.E.C. conduit works (The Oriental Tube Co., Ltd., West Bromwich) will not affect the delivery service of the General Electric Co., Ltd.

Copper, Lead and Rubber Prices.—Messrs. F. Smith and Co. report, December 15th :—Copper (electrolytic), £65 10s., 15s. dec.; ditto, ditto sheets, no change; ditto, ditto wire rods, £75 10s., 15s. dec.; ditto, ditto, h.c. wire, 9½d., 1/16d. dec.

Messrs. James & Shakespeare report, December 15th :—Copper bars (best selected), sheet and rod, £90, £2 dec.; English pig lead, £35 5s., 15s. dec.

Messrs. Edward Till & Co. report, December 15th :—India-rubber, Para, fine, 4s. 5d., 1d. dec.

The Electricians' Wage Claim.—The apparently quiescent question of wages in the electricity supply industry was carried a stage further on December 9th. It will be remembered that a claim for an extra 10s. a week was put forward some months ago, and the men then resolved by ballot to take strike action if a satisfactory reply was not made to their claim. On December 9th it was decided to form a joint appeal board consisting of six representatives of each party, with an independent chairman; Mr. C. P. Sparks was unanimously elected to the position. The decision of this board is to be accepted by the parties to the claim, and it is stated that the first meeting will be held after Christmas.

E.D.A. Activities.—We are pleased to learn that the Britisn Electrical Development Association is again to arrange a display of electricity in the home at next year's Ideal Home Exhibition at Olympia (March 2nd to 27th). The Association's exhibit at Olympia last March proved one of the greatest attractions and no fewer than 17,000 people paid a visit to the "Electric House."

Chinese Notes.—*The Chinese Economic Bulletin* states that the supply of electricity in Hankow, with the exception of the foreign concessions, is in the hands of the Hankow Waterworks & Electric Light Co., Ltd. The demand for electricity has grown rapidly and last year the company extended the supply to Hanyang across the Han River.

The authorities in Nanking, Kiangsu province, are building a radio station to communicate directly with Tientsin and Mukden

The Shantung authorities are installing a long-distance telephone system "to facilitate the work of bandit suppression."

The radio station at Yunnanfu, Yunnan province, is now open for public business.

The Shansi authorities have decided to construct a radio station at Linfeng (formerly Pingyangfu).

Coloured Decorative Lamps.—THE GENERAL ELECTRIC CO., LTD., has issued a pamphlet containing illustrations in colour of the huge signs erected by Messrs. Lewis at their Birmingham, Liverpool and Manchester establishments. These show very effectively the results obtained by the use of "Osram" colour-sprayed lamps.

Dissolution of Partnership.—VLASTO, CLARK & WATSON, electrical engineers, London Road Bridge, Stockton Heath, Cheshire.—Messrs. I. Vlasto, T. Clark, and W. Watson have dissolved partnership. Messrs. Vlasto and Clark will attend to debts and continue the business.

The Hackney Showrooms.—At a meeting of the Hackney and Stoke Newington Chamber of Commerce, last week, Mr. A. C. Bostell, A.M.I.E.E., sales manager of the Hackney electricity undertaking, introduced a scheme whereby the four empty showcases in the Lecture Hall of the undertaking are to be allotted in turn to members of the Chamber of Commerce, who will dress them and maintain them for one month. The lighting will be supplied free. The shopkeepers will pay an entrance fee, and three prizes will be awarded by public ballot. A prize will also be awarded to the person who accurately guesses the total number of votes recorded. Sir Herbert Ormond, J.P., offered a challenge cup for the best dressed case of the year. The scheme was adopted and a committee formed to arrange details. Mr. L. L. Robinson, borough electrical engineer, said that the showrooms and demonstration halls had been successful beyond their expectations; each day from eighty to one hundred people visited them, and on Saturday evening the number often reached a thousand. Already the sales were up 400 per cent.

The D.O.T. Commended.—In the course of a speech which he delivered at a dinner attended by the directors and sales representatives of Agricultural & General Engineers, Ltd., the chairman of the company (Mr. G. E. Rowland) paid a tribute to the Department of Overseas Trade. He urged sales representatives to direct their attention particularly to export trade and advised them to avail themselves of the services of the D.O.T. He said that he was surprised at the organisation of the Department; it was in a position to give a great deal of information to those who approached it.

A German Osram Lamp Loan. — The German newspapers state that the Osram Co. has concluded a loan of 5,000,000 dollars, with a currency of 25 years, with the Amsterdam Bank and other Dutch institutions, the Stockholm Enskilda Bank, and Lazard Bros., of London. The rate of interest is 7 per cent., and the loan is said to be guaranteed by the Berlin A.E.G. and the Siemens & Halske Co. Apart from the recent Berlin municipal electricity loan, the new loan is the first to be raised in the European market. The proceeds are intended for further improving the works of the company and for the establishment of a new glass factory.

The Canadian Radio Industry.—In the course of a note upon trade conditions in Canada, *Reuter's Trade Service* (Ottawa) says that Canadian manufacturers of amateur radio equipment are enjoying unprecedented prosperity, and at least one large firm has been forced to decline to accept any further orders until after the New Year.

Local Exhibition.—BLACKPOOL.—The Electricity Department has organised an electrical exhibition at the Winter Gardens, where a special display has been made of electrical bread-baking devices. Each member of the trade in the district has received an invitation to inspect the new apparatus.

Calendars, Diaries, &c.—In its calendar for 1926 the NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO. retains the black and gold style which has distinguished its past calendars. Weekly date slips are provided and each of these has a calendar for the current month at its foot.

MESSRS. ARTHURS, Charing Cross Road, W.C., have placed a humorous drawing (a "doggy" cat) on their 1926 calendar, of which we have received a copy.

From Mr. CHARLES SELZ, of 83, George Street, Baker Street, London, W.1, we have received a small pocket diary for 1926 with season ticket pocket, &c.

MESSRS. MATHER BROS., of 36, Farringdon Street, London, E.C.4. have sent us a wall calendar for 1926 with monthly slips and a date indicator.

MESSRS. FRANCIS POLDEN & Co., LTD., have sent us a useful wall calendar with monthly slips and a date-marking device.

The calendar received from the HART ACCUMULATOR CO., LTD., has extra large monthly sheets with 1¾-in. figuring which makes it suitable for the wall of a large office or shop. The company has also sent us, as usual, a desk blotting pad, each sheet of which bears a calendar for the year.

MR. L. W. FOOTE, of 30, Charles Street, Cardiff, has issued a wall calendar with monthly slips fixed below a reproduction of a charming water-colour "Flowers of the Sea."

The very neat and serviceable pocket diary of MESSRS. SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham, which has been our constant companion during 1925 because of its convenient space arrangement, will shortly give place to the 1926 one just received.

MESSRS. L. MCMICHAEL, LTD., have sent us an ash-tray with a match holder (or it may be a candlestick) in glazed earthenware. The match holder is a reproduction of one of the company's h.f. plug-in transformers.

MESSRS. PRITCHETT & GOLD & E. P. S. Co., LTD., of 50, Grosvenor Gardens, S.W.1, are sending out as a Christmas souvenir a large desk ash tray moulded in "Dagenite," the special composition used in the manufacture of containers for the company's portable batteries. Trade readers who wish to receive one of these trays are invited to apply to the company.

The "Tungstone" Accumulator.—We have received particulars of a new lead storage battery, of British design and manufacture, known as the "Tungstone" accumulator, in which the grids are made and pasted wholly by machinery. The pure lead grids are die-cast in small sections, which are joined together by a small proportion of antimonial lead fed under pressure into recesses between the sections. It is claimed that, thanks to the greater volume of pure lead present in the battery, the Tungstone plate has a higher amperage capacity and lower weight, together with longer life, than any other type of plate. Various patterns are made, for car starting, lighting, and ignition, for the high-pressure batteries of wireless apparatus, &c. The distributors are the Tungstone Accumulator Co., Ltd., of 3, St. Bride's House, Salisbury Square, E.C.4.

Social Events. — The annual dinner of the staff of the Osram-G.E.C. Lamp Works and the M.O. Valve Works (General Electric Co., Ltd.), was held at the Café Royal on December 12th, under the chairmanship of Mr. Chris. Wilson. After an excellent repast and the toast of the King, the chairman offered Sir Hugo Hirst, Bart., the congratulations of those present upon the honour conferred upon him by the King; he said that they felt that it was an honour done to them all. Mr. J. J. Gracie, proposing the toast of "The G.E.C.," said that the most remarkable thing about the company had been its rapid rise from small beginnings to a position of great importance. Two reasons for its growth had been its adaptability to needs as they arose, and the way in which the production and sales sides worked together as a unit.

Sir Hugo Hirst, in reply, spoke of the efforts which had been made to secure good conditions for the staff. He also said that the directors had been through the necessary experience and knew exactly what they should do. The depreciation of foreign currencies had rendered it necessary to seek international agreements to secure the safety of the company. Sir Hugo said that the country was still in an unhappy state; a very large organisation had just found it necessary to write down its capital and close certain branches, and he feared that others might follow suit with consequent unemployment and reduced purchasing power. The G.E.C. benefited by the diversity of its products. Dealing with the question of wages, the speaker said that the high rates paid in sheltered industries had led to discontent among skilled workers. Unless conditions were brought into a sane and sound condition we should be overwhelmed by foreign competition. He hoped, however, that things would turn out well and that electricity would save the country.

Mr. G. Cheliotti, in a humorous speech, proposed the toast of "The Visitors," and referred to the joint efforts of the works and sales staffs which had resulted in record sales of the company's lamps and valves.

Mr. F. Crawford, manager of the Liverpool branch, replied —partly in verse—and Mr. J. Y. Fletcher followed. The latter, referring to the fact that he was to be the next chairman of the Electric Lamp Manufacturers' Association, said that he hoped the works would soon be better represented on that body. With regard to the company's output, he said that export trade was of vital importance; they hoped soon to reach the position when one out of each pair of lamps produced would be sent abroad. In this connection he referred to international agreements, and said that he hoped that soon the General Patent and Business Development Association—"the

Locarno of the lamp industry"—would soon be functioning. After a great deal of negotiation, British and Continental lamp makers had reached some measure of agreement and since the end of 1924 the arrangement had worked fairly satisfactorily. They were not so advanced as regarded valves, but he hoped that a similar agreement would eventually be made in this respect. The British makers would, however, first have to secure a larger share of the business, which was undoubtedly enormous.

Mr. H. Williams proposed the health of the chairman, and Mr. Wilson responded.

Music was provided during dinner by the Hamilton Orchestra, and a concert was given by Messrs. G. Piper, J. Warren, G. Ceci, G. O'Hagan, and Jock Walker and Miss Dorrie Dene.

Henley's Dramatic Club is to be heartily congratulated on the excellence of its presentation of "Nothing but the Truth" (James Montgomery's comedy) at King George's Hall, Caroline Place, W., on Saturday evening last. Mr. H. Stanley as the New York stockbroker, Mr. A. V. Burnett as Bob Bennett, who underwent the ordeal of speaking the absolute truth for twenty-four hours, and Mr. F. J. Bettley as the Rev. Dr. Doran, played important parts in such a manner as to bring credit to themselves and to the Club. Mirth and merriment were well sustained throughout.

The third annual carnival dance of the Cardiff branch of the Magnet Club (the Social Club of the General Electric Co., Ltd.), was held in the Whitehall Rooms, Park Hotel, Cardiff, on Friday, December 19th. A considerable number of the staff with friends and members of other electrical undertakings in the district attended, there being about 130 present. The special lighting and dimming effects were much appreciated.

On Friday last the staff and employés of the Airedale Electrical & Manufacturing Co., Ltd., held their annual whist drive and dance at the Parade Café, Bradford. About 80 persons took part.

Spanish Railway Electrification Contract.—The Sociedad Iberica de Electricidad, of Madrid, the Spanish branch of the A.E.G., is reported to have secured the contract for the electrification of the railway between Bilbao and Las Arenas.

Our Foreign Trade.—NOVEMBER FIGURES.—The Board of Trade returns for November show the following values of electrical imports and exports:—

	Nov., 1925. £	Inc. or dec. £	11 months, 1925. £
Exports.—			
Electrical goods and apparatus	868,865	− 51,985	+1,498,413
Machinery	3,940,718	−335,216	+3,790,577
Electrical machinery	395,344	− 95,017	+ 420,305
Imports.—			
Electrical goods and apparatus	425,648	+ 40,000	930,029
Machinery	891,910	+ 91,768	+1,231,816
Electrical machinery	78,600	+ 6,904	+ 45,788
Re-exports.—			
Electrical goods and apparatus	13,568	+ 3,509	+ 61,093
Machinery	119,811	+ 11,797	+ 250,689
Electrical machinery	7,762	− 680	− 22,759

Accrington Votes for British Cable.—At Accrington Town Council meeting last week there was another long discussion as to whether British or foreign tenders for electric cables should be accepted. The Electricity Committee recommended a contract with Messrs. W. T. Glover & Co., who were willing to offer favourable terms for two years subject to wages and lead and copper prices. Alderman Higham (chairman) said the Committee was satisfied that the Continental product was not equal in quality to the British. They would probably be paying 12½ per cent. more in price, but they would get a better article. Mr. Watson (vice-chairman) said the Committee passed the recommendation by eight votes to three, and they were assured by experts that the British cable was superior. The exact figures were:—1,000 yards of foreign cable, £504; Glover's cable, £596 12s. 6d. If they sent the order abroad they would do an injustice to the British working man, who received a higher wage than the Belgian workmen. Mr. Aspden called attention to the British firm's profits, and asked how it could appeal to the public to buy its cables in face of those facts. If electrical undertakings were firm for three or six months he thought British prices would come down. Mr. Constantine moved the minute back, and said he was not convinced that the foreign cable was inferior. If they passed the minute they would be doing an injustice to ratepayers. If the order went elsewhere it would only add to the shareholders' profits. Mr. A. Wilkinson seconded, and said it was the duty of the Council to accept the lowest tender. Eventually the Committee's recommendation was carried, there being only seven votes for the amendment.

Hydro-Electric Development in Malaya.—The Kuala Lumpur correspondent of the *Financial Times* reports that on December 12th Sir Montague Barlow, on behalf of Sir W. G. Armstrong Whitworth & Co., Ltd., signed the Perak hydro-electric agreement in the presence of the British Resident and the Sultan of Perak. The agreement has been under discussion for several months past following upon a scheme for developing the hydro-electric possibilities of the Perak River submitted by Mr. F. Bolton, who spent over a year prospecting the river on behalf of Sir W. G. Armstrong, Whitworth & Co. Mr. Bolton estimated that a capital of about £2,750,000 would be required to enable the power generated to be sold at a cheap rate. The power will be applied principally in the development of the Kinta Valley and neighbouring tinfields situated in the same State. The company has secured a guarantee under the Trade Facilities Acts to the extent of £1,250,000.

Lighting and Power Notes.

Beckenham.—LOAN.—The Urban District Council has applied to the Electricity Commissioners for sanction to a loan of £10,000 to meet excess expenditure of about £6,000, and to provide for further extensions.

Bristol.—LOAN.—The Electricity Committee has decided to apply for sanction to a loan of £140,000 for mains extensions.

Burnley.—ELECTRICITY SUPPLY.—The Town Council, on December 2nd, decided that it could not agree with the opinion expressed by the Mid-Lancs. Electricity District Board and the Electricity Commissioners to the effect that it should take a bulk supply of electricity from the Lancashire Electric Power Co. rather than proceed with its application for sanction to extend its present station, and decided that the Commissioners should be informed that the Corporation was not prepared to take a bulk supply or to withdraw its application, and that all necessary steps should be taken to extend the Burnley station.

Bury.—ELECTRICITY EXTENSIONS.—The Town Council is applying for sanction to the borrowing of £16,000 for the erection of cooling towers at the Chamber Hall station, £25,000 for mains, and £5,000 for a sub-station.

Canada. — HYDRO-ELECTRIC DEVELOPMENT. — The Toronto correspondent of *The Times* reports that a company headed by Sir Herbert Holt has acquired the right to develop one million h.p. on the St. Lawrence River near the Ontario boundary. In the case of a deficiency in Ontario Sir Herbert Holt is willing to sell 300,000 h.p. to the Ontario Hydro-Electric Commission. It is expected that the Holt development scheme will be completed in the next two years.

Cheltenham.—NEW PLANT.—The Electricity Committee is to install a new boiler, &c., at the generating station at a cost of £11,450.

Continental.—RUSSIA.—In connection with the question of protecting the city of Leningrad against sea floods, a special inter-departmental Commission was appointed some time ago to study the different proposals. The Commission has examined three different schemes, one of them planning high sea dams in the entrance from the Gulf of Finland into the Neva near the Isle of Kotlin, the second suggesting dams in the middle section of the Bay, and the third, erecting dams further up the Neva along the shore line of the Bay, and the seaside line of the isles in the estuary. The second and third schemes embody a proposal to erect a dam on the rapids of the Neva, 18 miles up from Leningrad. This dam would be utilised in connection with a hydro-electric plant working at a head of about 13 feet and yielding approximately 60,000 h.p.

The Schatur State power station, which is situated 130 versts from Moscow, was formally opened on December 6th by M. Trotsky. The station, which has a capacity of 65,000 h.p., burns turf fuel, and will supply power for part of the industrial undertakings in Moscow and the surrounding district.—*Reuter* (Moscow).

AUSTRIA. — Work has recently commenced on the establishment of a hyro-electric plant for the supply of electricity to the town of Trieste. For this purpose a dam is to be constructed on the River Reka; the water will be conveyed by a canal 11¼ miles in length to a large storage reservoir which will give a head to the power station near Trieste or nearly 1,000 ft. It is estimated that 75,000 h.p. is available and that the station will be able to produce 180 million kWh per year.

GREECE.—According to the daily Press, the negotiations conducted in Paris by M. Diomedes, the Governor of the National Bank of Greece, with English, French, and Austrian bondholders concerned in the enterprise for an electricity supply for Athens, were concluded recently. An English power and traction company is principally concerned.

Coventry.—PROPOSED NEW POWER STATION.—The City electrical engineer has submitted a report to the Electricity Committee pointing out that the bulk supply from the Leicestershire & Warwickshire Electric Power Co., will only be sufficient to meet a part of the anticipated increased demands for an electricity supply. The Committee has recommended to the City Council that the Electricity Commissioners be asked for authority to proceed with the erection of the new power station at Longford, in accordance with the understanding arrived at with the Commissioners in the early part of the year.

Dumfries. — HYDRO-ELECTRIC SCHEME. — The Corporation Electricity Committee has under consideration a report prepared by the electrical engineer upon a proposed hydro-electric scheme.

Edinburgh.—ELECTRICAL PROGRESS.—Mr. Seddon, Corporation electrical engineer and manager, in a report to the Electricity Committee, refers to a chart submitted in May showing that the anticipated load for this winter would be 37,700 kW. Up to date the maximum load has already reached 39,400 kW, an excess of 1,700 kW. At the present time the Corporation is installing a 10,000-kW turbo-alternator, which, it is hoped, will be ready in the beginning of the year. To meet future

requirements up to 1938, an additional 25,000-kW turbo-alternator will be needed in 1928 and another in 1930. The Committee has decided that foundations shall be laid suitable for the extension of the station.

Epping.—ELECTRICITY SUPPLY.—The Rural District Council has given its consent to the application of the North Metropolitan Electric Power Supply Co., for a Special Order to supply electricity to parishes in the rural area. The company does not propose to use overhead lines.

Glasgow.—ELECTRICITY SUPPLY.—A report of the meeting between representatives of Messrs. Heenan & Froude, Ltd., and the Corporation Cleansing and Electricity Departments with regard to the power station to be installed at the Corporation's new refuse disposal works has been submitted by the electrical engineer to a sub-committee, which has recommended that the report be approved, and that the Electricity Department be authorised to purchase two 50-cycle feeder panels, as and when required, and that the question of an additional frequency changer be deferred until more definite information is obtained as to the Government's intentions relative to the adoption of a standard frequency.

Godalming.—PRICE REDUCTION.—The Urban Electric Supply Co. has decided to reduce the charge for electricity from 1s. to 10d. per kWh as from January 8th next.

Hastings.—LOANS SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £6,850 for mains, and £30,925 for mains and plant in connection with the bulk supply of electricity to Bexhill Corporation.

Hove.—ELECTRICITY EXTENSIONS.—The Electricity Committee has recommended to the Town Council that further feeder mains be laid from the Davigdor Road works and the Hove Street sub-station at an estimated cost of £11,880.

Kendal.—ELECTRICITY CHARGES.—The Town Council has offered to supply electricity for power to the Barrow Ice and Cold Storage Co., Ltd., at 3d. per kWh up to 30,000 kWh per annum, and at 2½d. per kWh beyond. This scale is to apply to all power consumers in the borough.

Lincoln.—LOANS.—The Town Council has applied for sanction to the following loans:—Cables, £10,000; sub-station and equipment, £2,500.

Liverpool. — LOAN SANCTIONED. — The Corporation has received sanction to the borrowing of £136,674 for the provision of mains, transformers, and switchgear.

London.—BERMONDSEY.—At the last meeting of the Borough Council, the Electricity and Street Lighting Committee reported that it had considered the question of holding an inquiry into the electricity undertaking and recommended that Mr. W. C. P. Tapper, chief engineer to the Stepney Borough Council electricity department, be appointed to conduct the inquiry, and to report to the Council, the terms of reference to be as follows:—To investigate the financial position, technical equipment, and general administration of the electricity department, and to make recommendations as to whether any reorganisation of the department is necessary with a view to securing economies in working, and to effect a reduction in the price of current for light and power. Whether it is desirable to purchase all current in bulk from an outside source or whether it is more advantageous for the Council to continue to generate current itself. Whether the equipment of the station is efficient and economic, or whether all or any part should be replaced by more up-to-date machinery. Generally to make any recommendations necessary for the improvement of the undertaking, having regard to the new position existing in London by the creation of the Joint Electricity Authority. The recommendations of the Committee were agreed to by the Council.

Newcastle-upon-Tyne.—ELECTRICITY AGREEMENT.—The Electricity Committee has prepared an agreement between the Corporation and the Newcastle-upon-Tyne Electric Supply Co., Ltd., for the supply by the Company to the Corporation of such electrical energy as the Corporation may require at the rate of 0.55d. per kWh, subject to increase according to the rise in cost of coal. The Corporation to take a minimum quantity of 250,000 kWh. The company is to provide at its own cost the cable between the company's system and the Manors power station, together with switch panel. The agreement is to remain in force for a period of ten years from May 30th, 1925, and is determinable thereafter on six months' notice by either party.

New Zealand.—LAKE COLERIDGE.—The report of the Lake Coleridge hydro-electric undertaking for the year ended March 31st last shows a total income of £92,163, and working expenditure of £23,270, leaving a gross profit of £68,893. After meeting capital charges, &c., there was a net profit of £5,434. The electrical energy sold amounted to 51,287,033 kWh, as compared with 43,792,472 kWh in the preceding year, and the maximum supply demanded increased from 10,800 to 13,180 kW. Extensions to the generating plant are being made, and it is anticipated that additional plant with a capacity of 15,000 kW will be available by June, 1926. The area of supply is also being extended by the duplication of the present transmission line to Timaru, and the erection of a line to Oamaru.

WAIKATO (HORAHORA).—The accounts of the Horahora undertaking for the year ended March 31st last show a total revenue of £65,184, from which were deducted working expenses (£14,106), interest (£20,129), and depreciation (£9,757), leaving a net surplus of £21,192. The sales of electrical energy amounted to 41,281,159 kWh, an increase of 1,366,305 kWh, as compared with the preceding year, and the maximum supply demanded rose from 7,400 to 8,300 kW. The total system now supplied from Horahora, includes 1,396 miles of transmission lines varying from 50,000 V to 400 V. The Waikato system is being extended, and a 110,000-V line has been completed from Hamilton to Auckland. Other transmission lines of 110,000 V and 50,000 V are in course of erection.

Northern Ireland.—ARMAGH.—The Urban District Council has adopted a memorial to the Electricity Commissioners of Northern Ireland asking for sanction to the erection of a generating plant for the supply of electricity in the district.

NEWRY (CO. DOWN).—The Urban District Council has adopted a revised report submitted by Mr. P. A. Spalding of Dundalk, for the proposed electricity scheme for the town, the capital outlay upon which is estimated at £17,500.

Portsmouth.—LOANS.—The Electricity Committee has obtained sanction to the borrowing of £22,000 for mains, substations and equipment for the added area.

The Corporation is to apply for sanction to a loan of £750,000 for electricity extensions, &c.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

SLOUGH AND DATCHET.—*Slough and Datchet Electric Supply Co., Ltd.*—Lighting: 8½d. per kWh.

WINDSOR.—*The Windsor Electrical Installation Co., Ltd.*—Lighting: From 9½d. to 9d. per kWh. Heating: From 5½d. to 3d. per kWh. Power: A new rate of £5 per h.p. per annum, plus 1d. per kWh, or alternatively the lighting rate.

Ringwood.—INQUIRY.—An inquiry was held recently by Sir William F. Marwood into the application of the Ringwood Electric Supply Co., for permission to erect overhead cables and service connections in parts of the town. It was stated on behalf of the company that unless the use of overhead mains was permitted a supply of electricity could not be provided for the district in question. There was opposition on the ground of unsightliness, the narrowness of the roads, and the depreciation of property.

Sicily.—ELECTRICITY SCHEME.—A scheme is at present under consideration to supply electricity on the island of Sicily from the hydro-electric station in Calabria, the southernmost province of Italy. Three plans for conveying electricity at a pressure of 130,000 V across the Straits of Messina have been prepared. The first provides for an overhead line, supported at each end on steel towers 993 ft. high. It is estimated that there would be a sag of 770 ft. from the horizontal in the centre of the line. The second scheme provides for the construction of two 656 ft. shafts and a tunnel about 2¼ miles in length below the Straits at a depth of 378 ft. below sea level. The third scheme is that of the Pirelli Co., of Milan, which proposes a new type of submarine cable which, although laid on the bed of the sea, would, it is claimed, be capable of successfully transmitting the necessary electrical energy.

Tonbridge.—NEW ELECTRICITY CHARGE.—The Urban District Council has decided to supply electricity for ordinary power purposes at a flat rate of 2d. per kWh as from January 1st next, and to abolish the maximum demand rate.

Walsall.—ELECTRICITY EXTENSIONS.—The scheme for linking up the electricity undertakings in the West Midlands was the subject of a further report at a recent meeting of the Corporation Electric Supply Committee. From this, it would appear that the main transmission lines between Ocker Hill and West Bromwich, West Bromwich and Walsall, and Walsall and Wolverhampton, will be laid forthwith, the extension of the Walsall generating station being regarded as another immediate step necessary. This extension (10,000 kW) is estimated to cost £175,000, and the linking up £200,000.

Worcester.—ELECTRICITY EXTENSION APPROVED.—At a recent meeting of the City Council a recommendation by the Electricity Committee to spend £47,000 upon extensions of plant at the electricity works was approved.

Tramway and Railway Notes.

Bradford.—ACCIDENT.—In the fog, on December 7th, a Corporation tramcar, proceeding from the depôt to the Idle terminus, got out of hand and crashed into the Alexandra Hotel, Idle, the driver and conductor being killed and the car completely wrecked. It is thought that a skid occurred on frosty rails when the brakes were applied.

Burnley.—TRAMWAY EXTENSION.—The Tramways Committee proposes to extend the tramway past the football ground in Brunshaw Road to Stroyan Street, and has recommended that estimates be prepared.

Continental.—BELGIUM.—Good progress is being made with the electrification of the local railways between Antwerp and Santhoven and Antwerp and Schilde. All the standards have been erected, and the cables are now being fixed in position.

ITALY.—A new company has lately been formed at Stradella with a capital of 1,000,000 lire and the title La Società Tramvia-Elettrica Stradella-S. Maria della Versa, to construct an electric tramway between the two towns named.

The Italian State Railway authorities have voted a sum of 60 million lire for the electrification of the railway between Bolzano and Brennero.

(*Continued on page 983*)

A Modern Electric Motor Manufactory.

The Works of Messrs. Electromotors, Ltd., at Openshaw.

IN view of the fact, which all users will readily admit, that the construction and workmanship of electric motors do differ, which dissimilarity however may not always be assessed at its due value, it may be questioned whether the average purchaser exercises sufficient discrimination when buying an electric motor. Such a doubt adds interest to the progress that has been achieved by a manufacturing concern of which high-class construction has been the main object throughout its existence.



Fig. 1.—Shell-boring Machine Shop.

The organisation has been built up from its earliest stages by the present managing director, Sir Benjamin Longbottom, assisted by a trained staff of designers and specialists in the manufacture of electric motors and their application to industry. Launching out in 1900 with new works at Openshaw, Manchester, specially built for the purpose, the company set itself the task of producing a range of direct-current motors up to 25 h.p. of a class not hitherto attempted.* From that period onwards extension has followed extension—in 1908, 1912, 1919, 1921, 1924—and the range of sizes manufactured has been enlarged until today the works are amongst the finest plants in Great Britain for the manufacture of electrical machinery up to units of 250 h.p. in size.

Something more than pure design was required to achieve the results aimed at, and methods had to be employed which do not apply in the general engineering industry, or to those works wherein large varieties of machines are made. Some 24 sizes of d.c. machines and a similar number of a.c. machines represent the whole product of the works, and so it is evident that precision demands a perfect system of jigging, not merely designed for quantity production, but essentially for accurate production, which by their nature inherently enable production costs to be kept down. The provision of suitable jigs and gauges for every machining operation is under the direct control of the tool room, whose duty it is to keep them constantly checked for accuracy against standards. Some of the jigs are of a most elaborate nature; for instance, for every carcase size there is a jig which takes the whole carcase, and every hole in the carcase is drilled at one setting through steel-bushed holes; but even this is not final, as every piece of machinery goes through a separate examining department.



Fig. 2.—Mechanically Finished Motor Body Stock.

The accompanying illustrations give a very clear indication of the organisation, and represent generally a tour through the works, leaving out those subsidiary departments which act merely as feeders to the main productive sections. In explanation, it should be mentioned that, broadly speaking, the mechanical features of the field frames and bearings are always constant, so that it is thus possible to produce each of these standard frames in quantity to a finished mechanical stock, instead of to individual orders, and the lay-out of the works is arranged on this basis. It is this very factor, coupled with the excellent system of jigging, which enables "precision-made" machines to be produced on a competitive basis.

The first of the accompanying illustrations shows a section of the machine shop with the shell-boring machines in the foreground, while the third shows a further section of the shop with the range of boring machines at work on bearing covers, and the second shows the mechanically finished stock of motor bodies, both d.c. and a.c. This is the normal condition of this section of the works, which is



Fig. 3.—Boring Machines at Work on Bearing Covers.

*See ELEC. REV., September 25th, 1908; p. 499.

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being constantly fed by the machine shops and withdrawn from by the erecting department.

The general stores are worked on a maximum and minimum stock basis to facilitate that prompt service and delivery to customers which is so essential; fig. 4 illustrates a section devoted to the forming of armature, stator and rotor coils, and the insulating and taping thereof, while fig. 5 is a view of the general winding department. The shops illustrated above are all productive departments, and fig. 6 shows where the component parts come together for assembly prior to passing through to the three testing departments, two of which are shown in figs. 8 and 9, being the d.c. and a.c. sections respectively; the final stage of painting and packing is shown in fig. 7.



Fig. 4.—Coil-forming Department.

This description would not be complete without fuller reference to the products manufactured, which cover sizes from 1 up to about 250 h.p.

Some two years ago the machines were entirely re-designed; the type is universal in character and, by the addition or exchange of standard parts, can be adapted to meet widely differing requirements. Both the direct- and alternating-current motors are therefore available in the usual standard types, *i.e.*, enclosed ventilated, cowl or pipe ventilated, watertight, &c., for horizontal running and with vertical spindles for deep-well pumps, ships' bilge pumps, &c.

In a.c. motors, in addition to the ordinary standard squirrel-cage and wound-rotor types of machine, the firm also manufactures a high-torque squirrel-cage motor, having an efficiency and power factor comparable with those of an ordinary squirrel-cage motor, a type which is so largely filling the field hitherto held by the wound-rotor machine. Another speciality is the "Lo-thermo" motor, both d.c. and a.c., manufactured under the licence of Lo-thermo Patents, Ltd., which represents a practical solution of the difficulty of disposing of the conversion losses, which, in a watertight motor, of whatever form, have to be dissipated by radiation through the frame of the machine. The design incorporates the provision of additional radiating surface in the interior air-circulating circuit, and thus utilises material to the best advantage and maintains a highly efficient totally-enclosed motor. Other manufactures include wound-rotor machines with a flameproof slip-ring enclosure for use in fiery mines, and auto-synchronous and synchronous motors, within the limits indicated above.

To indicate the thoroughness of both design and construction, let us examine the standard three-phase squirrel-cage motor: The stators, which have semi-closed slots, are ground by a special machine to ensure the bore being central with the bearing seating to an accuracy of 0.5 of a mil; the rotors, which are built up on spiders, except the smallest sizes, are also ground to the same degree of accuracy, and it is therefore obvious that with the use of ball and roller bearings there can be no danger of the rotor not running central. Reliance is not placed on the simple forcing of the ball or roller race on to a ground shaft, but the latter is specially treated to provide for the reception of this race, and in every case a nut with a locking arrangement is provided as an

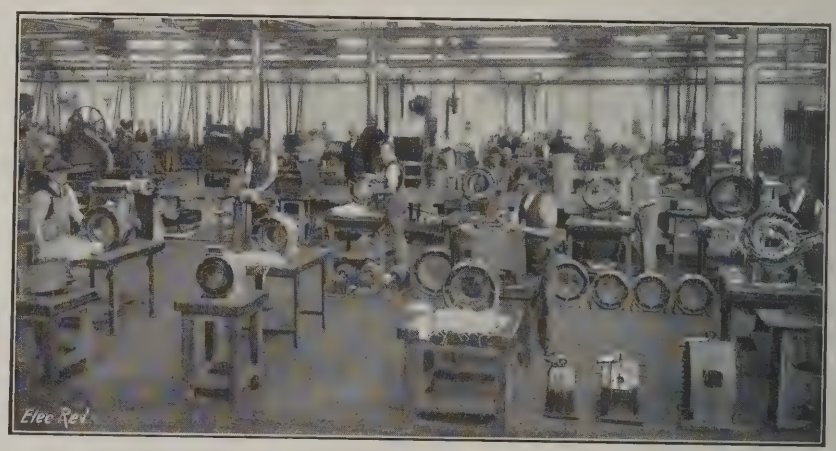


Fig. 5.—General Winding Shop.



Fig. 6.—Assembly of Component Parts.



Fig. 7.—Painting and Packing Section.

additional security. The slots are skewed and the rotor bars are brazed to the end rings. Impregnation of the windings is carried out to the extent of putting the whole stator into the impregnating tanks, and no machine is passed on to a customer until it has been thoroughly tested.



Fig. 8.—Direct-current Testing Department.

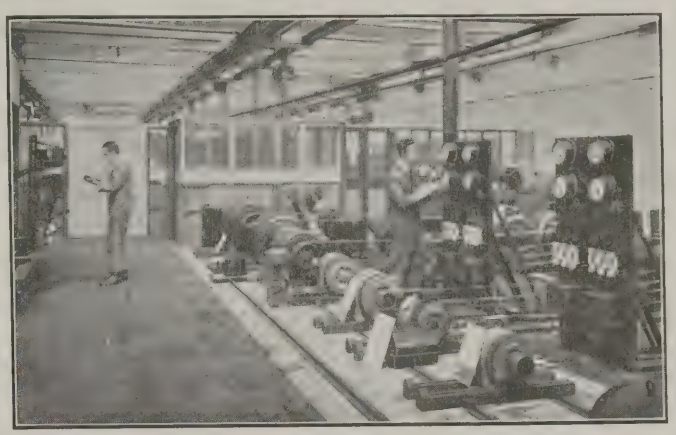


Fig. 9.—Alternating-current Testing Bay.

To a user all these features offer a safeguard of value, much more so to the user overseas, whilst as the whole energies of the Company are concentrated on this range of manufactures, it is able to give a very real and definite service in dealing with purchasers' requirements, especially with regard to prompt deliveries; and concentration on the production of high-class machines has resulted in the firm enjoying the confidence of the home and many oversea Government departments, the home, Indian State, and other oversea railways, the leading shipping lines, most of the home municipalities, and industry generally.

New Automatic Telephone Exchanges.

Leeds Satellite Exchanges, and Strowger Equipment in South Devon.

So far the largest provincial city in Great Britain to be favoured with automatic telephone service is Leeds. The original Strowger equipment was installed under considerable handicap during the war, and was made available for public service in May, 1918, at which date the total number of subscribers was 6,800, but extensions since added bring the present total to 9,600 lines.

Hitherto the outlying suburban exchanges in the Leeds area have been manually operated, but the disparity has now been remedied, for four such exchanges have been equipped with Strowger automatic switching apparatus to operate in conjunction with that at the main Leeds exchange.

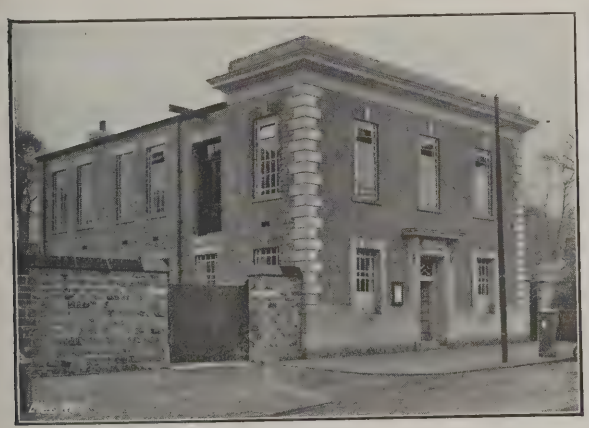


Fig. 1.—Headingley Automatic Telephone Exchange.



Fig. 2.—Chapeltown Strowger Telephone Exchange.

Four Satellite Exchanges at Leeds.

The capacities of the four new above-mentioned exchanges are shown in Table I; in addition, a 200-line extension is in hand at Stanningley, which will ultimately give this exchange a full capacity of 1,000 lines. The equipment at all four exchanges is similar, with the exception of variations in the number of Strowger units and associated selector switches, according to the relative capacities; like that at the Leeds main exchange, the system is five-digit, which involves the use of switching selector repeaters at the satellite exchanges, which perform several functions according to the nature of the call, whether local or distant. Groups of numbers have been allotted to the different exchanges, and automatic subscribers have access to all other automatic subscribers in the Leeds multi-office area by dialling in the requisite group.

In each case the equipment is housed in a new building, fig. 1, located as near as practicable to the economic "telephone centre" of the district it serves. The switchrooms accommodate standard 100-line Strowger line-switch units, fig. 3, and on one side of each unit the rotary line switches are mounted on "gates," fig. 5, each with a capacity for 50 switches, which can be swung outwards for inspection or adjustment. On the other side are fitted the final selectors.

Table I.

	Regular subscribers' lines.	P.b.x. lines.	Total lines.	Ultimate capacity.
Headingley ...	1,400	100	1,500	2,400
Chapeltown ...	1,200	100	1,300	2,100
Roundhay ...	1,100	100	1,200	2,000
Stanningley ...	600	200	800	1,000

Composite trunk boards carry the switching selector repeaters, "O" level repeaters, distributor switches, two-party line equipment, and coin-box repeaters. The selector trunk boards proper have capacities for 240

switches, or 20 per shelf. Outgoing secondary line switches are employed to select and seize a disengaged trunk for distant calls; at the main exchange these trunk connections terminate in first group selectors. The outgoing secondary line switches are located at the satellite exchanges, each rack of five shelves accommodating 25 switches.

The main batteries are in duplicate, and the charging

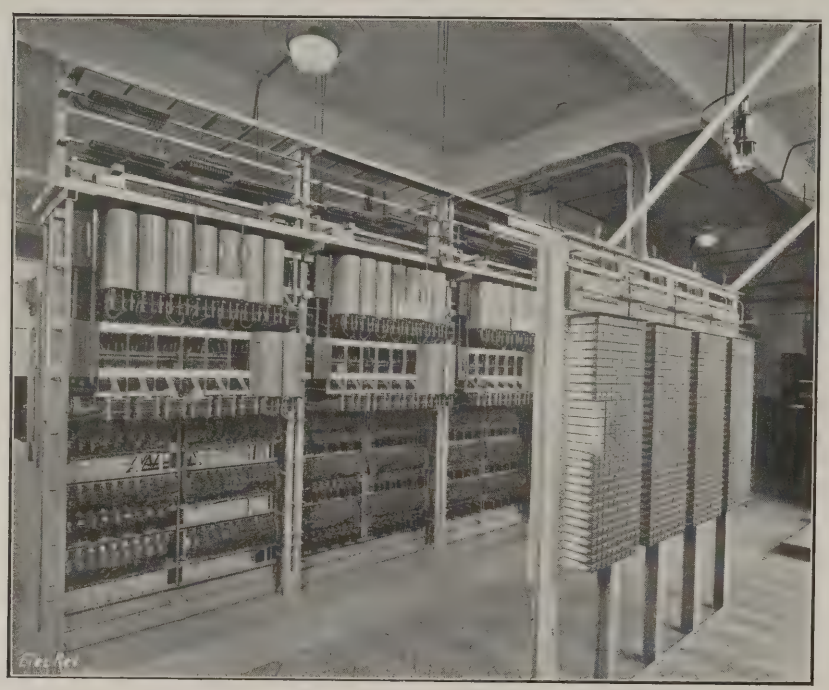


Fig. 3.—Roundhay Exchange; Back view of Line-switch Units, Meter Rack in Foreground.

motor-generators run off the a.c. supply mains. The two ringing rotary converters at each exchange work off the main battery, and also supply the various "tones" required.

Although the conversion of these four Leeds satellite exchanges eliminates manual telephonists for all local calls in the Leeds multi-office area, their services will still be required in connection with all trunk calls as well as for traffic incoming from unconverted exchanges outside the area. Automatic supervisory and fault-signalling equipment is a feature of the satellite and main exchanges, and suburban Leeds will now reap the maximum benefit from the change.

The Torquay Exchange.

Two delightful South Devon resorts will henceforth enjoy the advantages of automatic telephone service,

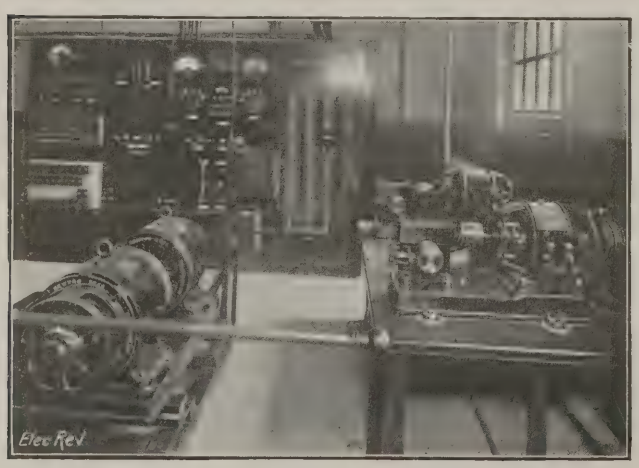


Fig. 4.—Torquay Exchange Power Plant.

both installations having been cut into service on October 31st. Torquay is a seaport and health resort with a population of over 40,000. Paignton lies only two miles south of Torquay, and has a population of over 15,000. Both installations are completed in so far as immediate requirements are concerned, although there is an extension of some 200 additional lines in hand for Torquay, which is to be ready for service early next year. The Torquay exchange is located at the Post Office, and comprises 19 Strowger units equipped with rotary line switches and final selectors. Of the 1,800 lines initially provided for, 1,600 are regular subscribers' lines, and 200 are p.b.x. lines; provision is also made for 40 coin-box lines. The system is 4-digit, so that all Torquay subscribers dial four-figure numbers for local calls, the numbers for Torquay being in the 2 and 3 thousand group. The present equipment is arranged to accommodate St. Marychurch subscribers, whose numbers lie in the 7 thousand group. Access to Brixham, a satellite to the Paignton exchange not yet converted to automatic operation, is obtained by dialling "57" when the Brixham operators complete the call.

The power board at the Torquay exchange, fig. 4, comprises four panels: On the left-hand panel is mounted the supervisory equipment, and the fourth panel is associated with the manual equipment. The main batteries are in duplicate, comprising two sets of 25-BPW, 9-element Chloride cells in lead-lined wood boxes, and the present capacity of each battery is 602 ampere-hours. The charging motor-generator, by Newton Bros., has an output of 110 amperes at 57 volts and a speed of 1,000 r.p.m. One of the ringing dynamotors (fig. 4, right) is designed for direct connection to the supply mains, and the other for working off the main battery in series with an impedance coil. The supervisory alarms are divided in order of urgency; the non-urgent alarms indicate transient or non-persistent faults, and the main alarm indicates the exact nature of a fault and its location.

The Paignton Exchange.

The automatic exchange serving Paignton comprises eight Strowger 100-line units, accommodating a total of 700 lines, 600 of which are regular subscribers' lines and 100 p.b.x. lines. Of these units one is specially equipped with 20 rotary line switches for coin-box service. The system is also four-digit, with numbers

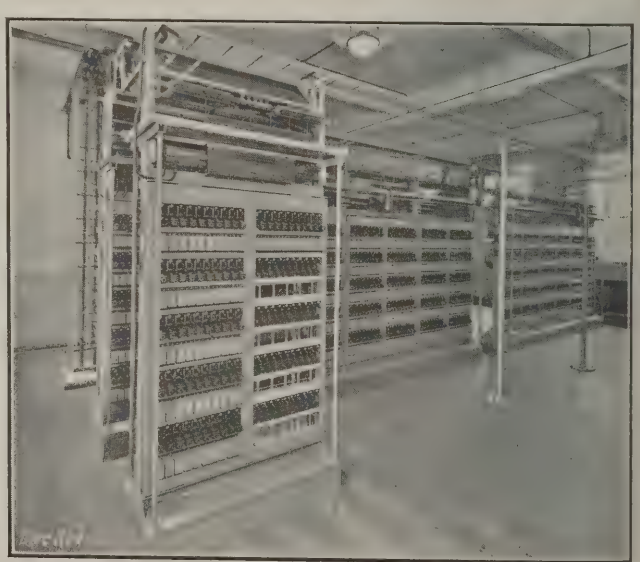


Fig. 5.—Stanningley Exchange; Rotary Line Switch Units.

in the 5 thousand group. Paignton subscribers dial direct to Torquay and St. Marychurch subscribers, and have access to the operators at Brixham.

The entire equipment of the above-mentioned exchanges was manufactured and installed for the Post Office Telephone Department by the Automatic Telephone Manufacturing Co., Ltd.

Tramway and Railway Notes.

(*Continued from page 978.*)

Irish Free State.—THE LUCAN (DUBLIN) ELECTRIC RAILWAY.—It is announced that the Dublin United (Electric) Tramway Co. is willing to purchase and work the Lucan-Dublin Electric Railway services which have been suspended in recent months, provided the Dublin City Commissioners and the townships agree to postpone for 42 years the right to purchase the tramway within their respective areas. The Dublin Commissioners and the Blackrock Urban District Council have given consent, and the consent of the other townships concerned is anticipated.

Kidderminster.—TRAMWAY IMPROVEMENTS.—The Kidderminster and Stourport Tramways Co. is contemplating the doubling of its tramway track and carrying out extensions in Vale Road.

London.—PROPOSED NEW TUBE.—According to *The Times*, the Metropolitan Railway Co. is seeking Parliamentary powers to construct a relief line which, it is expected, will materially facilitate the manipulation of traffic in North-West London. It is proposed that the new line will run parallel, on a falling gradient, with the existing Metropolitan line from a point immediately south of Willesden Green Station as far as Mapesbury Road, which is a short distance north of Kilburn and Brondesbury Station, making a triplicate "up" and "down" line over this portion of the railway. The proposed line will then change direction and run under the company's fast and local lines, entering two deep-level tunnels which will take the line under High Road, Kilburn, Maida Vale, and Edgware Road, and join with the Metropolitan "Inner Circle" lines by means of a 200-yards "cut and cover" section a few yards west of Edgware Road Station. The line will run through the administrative areas of the urban district of Willesden, the boroughs of Hampstead, Paddington, and Marylebone, and will have three stations conveniently placed along the route.

UNDERGROUND STATION RECONSTRUCTION.—The Underground Company has placed a contract with Messrs. James Carmichael, Ltd., for the entire reconstruction of the City line stations at Clapham Road and Oval. The schemes include the removal of the lifts and the installation of escalators, and it is expected that the new stations will be completed in about May of next year.

Perth.—TRAMWAY IMPROVEMENTS.—The Corporation Tramway Committee has adopted a recommendation that the whole of the tramway track be electrically welded.

Sheffield.—NEW DEPOT.—The Corporation is to spend £85,000 on the erection of a new tramway shed and garage at Trenter Street. Fifty new tramcars and 15 new motor-'buses are on order.

Telegraph and Telephone Notes.

China.—TELEGRAPH CHAOS.—As a result of the struggle between the rival war-lords in China, says the *Daily Mail*, the Great Northern Telegraph Co. gave notice on December 11th of indefinite delay to cablegrams intended for Peking, the capital, "owing to the total interruption of Chinese land-lines."

France.—TELEGRAPH RATES.—As from December 10th, French telegraph and telephone rates for international communication have been multiplied by five, as compared with 4.9 at the beginning of the month. The figure has been steadily rising for some time; at the beginning of August it stood at four.—*Reuter* (Paris).

Irish Free State.—AUTOMATIC TELEPHONY.—Some months ago Mr. J. J. Walsh announced that Dublin would within a few years be completely equipped with automatic telephones. The first automatic telephone exchange is to be opened in Ship Street next year, but it is understood that the change cannot be completed before 1932.

Rugby Radio Station.—TESTS.—The Government's radio-telegraph and telephone station at Rugby, one of the largest in the world, has been completed and will, *The Times* expects, be working on January 1st. Experimental transmission has been carried out for some time, and Morse messages on a wave-length of 17,500 metres have been heard clearly in Australia, also in America and South Africa.

Jugo-Slavia.—STOCKHOLM POSTAL CONVENTION.—Parliament ratified the Universal Postal and Telegraph Convention of Stockholm on December 11th.—*Reuter* (Belgrade).

The Telephone Service.—OPERATORS.—Post Office statistics show that of the 9,325 applicants for positions as telephonists last year, only 1,551 girls were able to qualify for service. The chief causes of failure are stated to be: Defective or slovenly speech, undesirable accent, defective hearing or eyesight, and bad spelling.

United States.—"TELEPHONE SKYSCRAPER."—The largest telephone exchange in the world will be opened in New York next March by the New York Telephone Co. It occupies an entire block, one acre in extent, and faces the waterfront. The new exchange is 32 storeys high; the first ten floors cover the full acre and the remainder taper off in accordance with the building regulations. Actually, six exchanges will be housed in the building, and they will control 120,000 telephones. While most of the exchange buildings in the city districts will still be maintained, the business for them all will be managed by 6,000 employés in the new building. The building stands 498 ft. above ground (nearly a third higher than St. Paul's), and there are also five floors extending 72 ft. underground. The total cost will be more than £3,000,000.

Radio Notes.

Daventry.—MISHAPS.—The British Broadcasting Co.'s high-power station (5XX) at Daventry ceased transmitting for a while on Saturday afternoon, December 12th; due to a technical defect it again stopped radiating for a few minutes on Monday evening last.

France.—LICENCES.—The question which has been exercising the minds of the 700,000 French listeners for three years —"Will there be a State monopoly of broadcasting?"—has been settled, the State virtually accepting the trust through its imposition of taxes on wireless receiving sets. The *Daily Mail* explains that the new taxes on receivers are: 60 fr. (about 9s. 6d. at the present exchange rate) for the first year and 50 fr. (8s.) for the succeeding years on all valve sets; and 20 fr. (3s. 2d.) for the first year and 15 fr. (2s. 4d.) for the succeeding years on crystal sets. Listeners must pay 10 times the amount due if they are found to be pirates, and there is also a tax of 2 fr. (about 4d.) on the sale of valve sets, failure to pay involving a liability of from £4 to £8.

Korea.—BROADCASTING STATION.—His Majesty's Consul-General at Seoul (Mr. Arthur Hyde Lay) reports to the Department of Overseas Trade that arrangements have been made for the foundation of a broadcasting station in Seoul. The prospectus issued by the Preparatory Committee states that the projected Broadcasting Bureau will make provision for the whole country daily, in both Japanese and Korean. The monthly charge for a receiver is estimated at 2 yen, and contributors to the capital fund of the Board will be granted a 50 per cent. or more reduction, which is to be increased as the number of subscribers increases. The Corporation maintaining the Bureau will be capitalised at 200,000 yen and the gross receipts of the first year are estimated at 102,000 yen, of which amount 12,000 yen will be net profit. Membership of the Corporation will be of two classes: ordinary membership can be obtained by subscribing for one or more shares of 100 yen each, and special membership by subscribing for five shares or more.

Radiophony Union.—BRUSSELS MEETING.—Delegates from 11 European countries met on December 14th in Brussels, under the auspices of the International Radiophony Union to consider plans for improving the wave-length interference problem. Great Britain was represented by Capt. P. P. Eckersley.

Ships' Radio Operators.—STRIKE.—Mr. J. C. A. Ward, chairman of the Engineering and Allied Employers' (London and District) Association, in a statement to a Press representative, is reported to have said that the number of ships' operators who have sailed under the reduced wages scale since the wages dispute commenced (up to December 14th) was over 300. He pointed out that since 1920 the wages of seagoing operators had fluctuated with the rise and fall in the wages of other seafarers, and in this respect the operators benefited with the other seafarers in the increase given in 1924. The present reduction was less onerous for operators than for the other seafarers, inasmuch as the reduction for the latter commenced as from August 1st, whereas that for the operators commenced on December 1st, or four months later.

Ships' Wave-lengths.—MODIFICATION.—It is reported that the radio-telegraph installations aboard the Southern Railway Co.'s 25 passenger ships, and also those of its Newhaven and Dieppe land stations, are to be converted so as to work on a wave-length of 800 metres, thus avoiding interference with the B.B.C. programmes on the South Coast.

United States.—RADIO CONFERENCE.—There is an "awful warning" of what may happen in Europe in the recommendations of the Fourth Annual Radio Conference in the U.S.A., held a week or two ago in Washington. According to the *Evening News*, drastic steps were called for by a committee, and the 600 members of the conference accepted the proposals with only occasional modifications of details. On the subject of congestion on broadcast wave-lengths, for instance: "The conference was overwhelmingly in favour of granting no more licences until the number of existing stations is materially reduced," and voted for "progressive reduction of the number of broadcasting stations." It also "opposed the granting of additional licences by dividing time with existing stations." Another recommendation is that of the abandonment of spark telegraphy by amateurs, which interferes with the reception of programmes transmitted on ultra-short wave-lengths by some of the big American stations. Most drastic of all is the recommendation for dealing with the "howler." The conference urged that a definite date should be fixed after which the manufacture of "radiating receivers" should be prohibited, and that if manufacturers disregarded this recommendation an attempt should be made to make the manufacture of radiating receivers illegal.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—April 12th, 1926. State Electricity Commission of Victoria. Plant for the Sugarloaf and Rubicon hydro-electric scheme, consisting of turbo-generators, transformers, switchgear, cranes, and accessory plant. (December 11th.)

Victorian State Railways. January 20th, 1926. Automatic battery-charging equipment.* January 13th. Double recording wattmeter.*

Ayrshire.—December 31st. Education Authority. Electrically wiring the extension to Ochiltree school. Specifications from Mr. Wm. Reid, master of works, Education Offices, Ayr.

Beckenham. — January 14th. Electricity department. ater heating and softening plant. (See this issue.)

Belgium.—December 30th. Belgian Ministry of National Defence, 10, Rue du Méridien, Brussels. Wireless telegraph apparatus for use on military aeroplanes. Particulars (Cahier des Charges Special, No. 636) for 4 fr., from 15, Rue des Augustins, Brussels.

December 29th. Portable accumulators for the telegraph section of the Belgian Army. Particulars (Cahier des Charges, No. 655) for 5 fr., from 15, Rue des Augustins, Brussels.

Brentwood.—January 1st. Guardians of Billericay Union. Electrical wiring in conduit and installation of complete electric generating plant at the Institution, Billericay. (December 11th.)

Dublin.—December 29th. Commissioners of Public Works. Installation of electric lighting at the Irish Land Commission Offices, Upper Merrion Street, Dublin. Specification (20s.) from the Secretary, Office of Public Works, Dublin.

Dundee.—January 14th. Electricity Department. Two electrically-driven centrifugal drainage pumps controlled by float gear. (See this issue.)

Edinburgh.—January 4th, 1926. Electricity Supply. Two 1,200-b.h.p., 6,600-V, 3-ph. induction motors. (December 11th.)

Edmonton.—Education Committee. Wiring offices at Brettenham Road, Edmonton, for electric light. (December 11th.)

Egypt.—CAIRO.—February 20th. Director-General, Mechanical Department, P.W.M. Power plant for Giza.—*Reuter's Trade Service* (Cairo).

January 20th. Local Commissions Section. Electric motor and accessories for Manfalout waterworks.*

Glasgow.—December 21st. Corporation. Electric lighting works at Bellefield Sanatorium. Specifications from Office of Public Works, City Chambers. Electric lighting works at Possil and Balornock housing schemes. Specifications, &c., from Mr. R. B. Mitchell, 75, Waterloo Street, Glasgow.

Kilmarnock.—Corporation. Electric lighting of tenement houses. Schedules from Mr. W. Dunbar, burgh surveyor.

London.—LONDON COUNTY COUNCIL.—December 31st. Renewal of the storage battery at Bexley Mental Hospital. (December 11th.)

CAMBERWELL.—January 11th, 1926. Borough Council. Stores, including electric lamps, for 12 months. Particulars from Borough Engineer, Town Hall, Camberwell.

METROPOLITAN ASYLUMS BOARD.—December 30th. Installation of fire-alarm system at Tooting Bec Hospital. (See this issue.)

Manchester.—December 30th. Electricity Committee. One single unit (or, alternatively, one double unit) three-phase induction regulator. (December 11th.)

Two 1,000-kW and seven 750-kW motor converters, or, alternatively, rotary converters and static transformers. (See this issue.)

Marsden (Yorkshire).—December 23rd. Installation of electric lighting at Liberal Club. Mr. G. Holroyd, 28, Peel Street, Marsden, near Huddersfield.

New Zealand.—WELLINGTON.—February 16th. Outdoor switchgear for the Waikato electric power scheme.*

AUCKLAND.—February 8th. Auckland Electric Power Board. Overhead cotton-covered triple-braided cable.*

February 22nd. 15-amp. cut-outs.*

Preston.—January 15th. Electricity Department. Supply and erection of approximately 15 miles of 33,000/45,000-V double transmission lines. (December 11th.)

South Africa.—JOHANNESBURG.—January 28th, 1926. S.A. Railways and Harbours. Eleven 4-ton electrically-driven wharf jib cranes and seven electric capstans for Durban Harbour. Secretary to the Tender Board, S.A.R. Headquarters, Johannesburg.*

UNION TENDER BOARD.—January 28th. Miscellaneous telegraph and telephone materials for the Department of Posts and Telegraphs.*

Uruguay.—February 23rd, 1926. State Electricity Supply Works. Porcelain insulators and accessories.* D.c. and a.c. meters.*

Wakefield.—The Corporation is inviting tenders for the installation of electric lighting at the Corporation baths.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Barnsley.—Electricity Committee. Recommended:—
Cables.—Scheduled prices based on electrolytic copper bars at £65 10s. per ton, and English lead at £33 per ton.—British Insulated and Helsby Cables, Ltd.

Carlisle.—Electricity Committee. Accepted:—
Cast-iron piping for condensing-water system (£4,795).—Pratchett Bros.
Large water valves (£1,199).—Blakeborough & Sons.
3-ton crane and gantry (£268).—Herbert Morris, Ltd.

Chesterfield.—Electricity Committee. Accepted:—
2,000 yd. of cable (£410 10s.).—Western Electric Co., Ltd.
1,250 yd. overhead distribution cable (£235).—Macintosh Cable Co., Ltd.

China.—SHANGHAI.—Electricity Department. Accepted:—
Four large air preheaters (total heating surface 192,800 sq. ft.), for the Riverside power station.—Howden-Ljungström Preheaters (Land), Ltd.

Dorchester.—Electricity Committee. Recommended:—
Recording ammeter.—Elliott Bros.

East Ham.—Lighting Committee. Accepted:—
Switchgear (£250).—A. Reyrolle & Co., Ltd.

Glasgow.—Baths Committee. Recommended:—
Installation of electricity at Cowcaddens Workhouse (£265).—Chas. Maguire.

Tramways Committee. Recommended:—
Rheostats for cars.—Traction Equipment Co., Ltd., and Electro-Mechanical Brake Co., Ltd.
Steel track shoes.—Acme Steel and Foundry Co., Ltd., and N. B. Steel Foundry, Ltd.
Brake chains.—Weldless Chains, Ltd.

Gravesend.—Electricity Committee. Recommended:—
Boiler-house extension (£1,800).—Hopkins & Sons.

India.—High Commissioner. Accepted:—
Two contracts for hydraulic plant for the East India Railway locomotive works at Lucknow and Jamalpur.—Hollings & Guest, Ltd.

London.—ST. PANCRAS.—Electricity and Public Lighting Committee. Recommended:—
Steam-recording apparatus for two new boilers (£547).—Industrial Combustion Engineers, Ltd.
Two 1,000-kW motor converters (£8,212).—British Thomson-Houston Co., Ltd.

LONDON COUNTY COUNCIL.—Highways Committee. Reconstruction of switchgear at Shoreditch sub-station:—

A. Reyrolle & Co., Ltd.	£3,989*
Ditto (alternative)	4,113
Bertram Thomas	3,989*
(alternative)	4,113
Metropolitan-Vickers Electrical Co., Ltd.	4,776
(alternative)	**4,080**
(further alternative)	4,527
Ferguson Pailin, Ltd.	4,729
General Electric Co., Ltd.	4,920
English Electric Co., Ltd.	5,072
Johnson & Phillips, Ltd.	5,259
Park Royal Engineering Co., Ltd.	5,424
Switchgear & Cowans, Ltd.	5,945
British Thomson-Houston Co., Ltd.	6,029
New Switchgear Construction Co., Ltd.	6,612
Whipp & Bourne, Ltd.	9,490

*Not to specification.

The tender of Metropolitan-Vickers Electrical Co., Ltd., at £4,080, less £441 in respect of a battery-charging set and panel quoted for, has been accepted by the Committee.

PADDINGTON.—Great Western Railway Co.
Gasfilled lamps.—Siemens & English Electric Lamp Co., Ltd.

Portsmouth.—Board of Guardians. Accepted:—
Electrical stores and electric lamps.—H. A. Evans.

Stafford.—Electricity Committee. Accepted:—
Boiler feed pipes.—Aiton & Co., Ltd.

Stourport.—
Wiring the Stourport lighting and power station for electric light.—B. French.

Sunderland.—Corporation. Accepted:—
De-aerating plant.—Hick, Hargreaves & Co.
500 15-amp. meters.—Robert Hornby & Co., Ltd.

Weymouth.—Electricity Committee. Accepted:—
Laying mains (£650).—Johnson & Phillips, Ltd.

Forthcoming Events.

Manchester Electro-Harmonic Society.—Friday, December 18th. At the Albion Hotel, Piccadilly, Manchester. Smoking concert.

Junior Institution of Engineers.—Friday, December 18th. At E.L.M.A. Lighting Service Bureau, 15, Savoy Hill, Strand, W.C. At 7 p.m. Lecture on and demonstration of industrial and domestic electric lighting.

British Electrical Development Association.—Friday, December 18th. At Australia House, Strand. Display of electrical films.

Birmingham Electric Club.—Friday, December 18th. At the Grand Hotel, Colmore Row, Birmingham. At 7 p.m. Annual meeting.

Salford Technical and Engineering Association.—Saturday, December 26th. At the Royal Technical College. At 5.30 p.m. Annual social.

Notes.

The Electrical Engineers' Ball, 1926.—The seventeenth annual Electrical Engineers' Ball will take place at the Hotel Cecil on Friday, February 12th, 1926. The event is one of the outstanding features of the London electrical season, and for the information of those of our readers who are interested we give below, as usual, a full list of the members of the general and executive committees :—

GENERAL COMMITTEE.

Addenbrooke, G. L.
Alabaster, H.
Andrews, Leonard
Atkinson, Ll. B.
Baldwin, O. H.
Balfour, George, M.P.
Bowden, J. H.
Byng, E. G.
Callender, Sir T. O., J.P.
Chattock, R. A.
Cramb, A. C.
Cridge, A. J.
Couzens, H. W.
Devonshire, Sir J. L., K.B.E.
Elder, T. C.
Fairman, H. W.
Ferranti, Dr. S. Z. de
Fox, E. J.
Gatehouse, E. A.
Geipel, Kenneth
Gill, Frank
Gillespie, M. M.
Gray, James
Gregory, J. P.
Gridley, Sir Arnold, K.B.E.
Hadley, A. E.
Highfield, J. S.
Hill, C. W.
Hirst, Sir Hugo, Bt.
Hunter, P. V., C.B.E.
Hughman, R. W.
Kemnal, Sir James, K.B.E.
Kerr, M. J. D.
Kingsbury, J. E.
Knight, C. M.
Leaf, H. M.
Leigh, Lt.-Col. F. A. Cortez
Lonsdale, W. Stanley
McGregor, J. J., C.B.E.
McKinstry, A. E.
McKay, H. J. S.
McClelland, Wm., C.B.
McMahon, P. V.
Matthews, W. Lee
Midgley, H. E.
Mordey, W. M.
Moss, E. W.
Nalder, F. H.
Nash, Sir P., K.C.M.G., C.B.
New, E. S.
Noble, Sir Wm.
Partridge, G. W.
Pooley, F.
Purves, Col. T. F.
Pybus, P. J., C.B.E.
Railing, M. J.
Robinson, L. L.
Rogers, F. M.
Rowell, P. F.
Sayer, C. E.
Scholey, H., C.B.E.
Shaughnessy, E. H.
Siddeley, H. C.
Sillar, A. M.
Snell, Sir John, G.B.E.
Sparks, Col. H. C., C.M.G., D.S.O.
Sutton, Sir George, Bt.
Taite, C. D.
Taylor, Capt. Godfrey
Taylor, James, J.P.
Tresize, J. M. G.
Wallis-Jones, Capt. R. J.
Walton, A. H.
Willock, David
Wilson, David
Woodhouse, W. B.
Worsdell, F. E.

EXECUTIVE COMMITTEE.

O. H. Baldwin
W. S. Lonsdale
A. M. Sillar
R. J. Wallis-Jones
H. W. Couzens.
J. E. Kingsbury
P. V. McMahon
A. H. Walton

HON. SECRETARIES: A. M. Sillar; W. S. Lonsdale.

HON. TREASURER: J. E. Kingsbury.

"All-Electric" Houses.—An interesting experiment by the City of Birmingham Electric Supply Department, in electric (artisans') houses is to be made, for a week beginning December 14th, on the Woodlands estate, Northfield, Birmingham. One house is "all electric" and a second "electric" apart from one coal fire to heat the kitchen. The electrical equipment actually included in the purchase price (£500 each) of the "all-electric" houses is as follows:—A 3-kW wash-boiler; one 30-gallon hot water storage tank, constant loading 450 watts with boost load of 2,000 watts; one 6-kW Santon hot water geyser for intermittent use in kitchen; one 3-kW fire for drawing room; one 2-kW Utility fire for living room; one 2-kW fire for bedrooms; and the usual lighting points. A 6-kW cooker will be taken on hire from the Corporation Electric Supply Department.

The Liverpool Corporation has decided to erect 250 all-electric houses on the Walton Clubmoor estate. These houses will have electrical appliances for heating, lighting, cooking, washing, and hot water supply. They will be specially designed, and as they will have neither fireplaces nor flues, there will be no chimney pots. The cost of construction will be cheapened, although special means of ventilation will be provided. Our local correspondent was shown the type of electric fire which will be installed, producing the illusion of a live coal fire. All-electric house occupiers will get their electricity supply at the low price of ½d. per kWh. The Corporation has obtained useful data from two all-electric houses which have given satisfactory results, on the Larkhill estate. The all-electric houses are of particular interest in view of the decision announced by the Minister of Health that an inquiry is being made to ascertain which local authorities are encouraging the adoption of devices in their houses to reduce the smoke nuisance. The Liverpool Housing Committee and the City Electric Supply Department are co-operating in the scheme. Pratically every house now erected in the Liverpool area is wired for electricity.

The Electrical Association for Women.—The recently inaugurated Glasgow and District Branch of the Electrical Association for Women commenced its activities on December 11th, by a visit to the Dalmarnock power station of the Glasgow Corporation electricity department. There was a good attendance of members, including Lord and Lady Belhaven and Stenton. After being shown round the power station the company had tea in the "all-electric" canteen. The branch secretary is Miss R. F. Kennedy, Electricity Showroom, 251, S uchiehall Street, Glasgow.

On Tuesday, December 8th, a party of 30 members of the E.A.W. visited the "Tricity" showrooms at the invitation of Mr. A. F. Berry. The party was first conducted round the showrooms, where there was a special display of "Sun Ray" radiators and other domestic apparatus. Tea was taken in the restaurant, after which Mr. Berry gave a talk on "Electricity and Health."

Late Legal.—SOUTHPORT CORPORATION *v.* BIRKDALE DISTRICT ELECTRIC SUPPLY CO., LTD.—Lords Birkenhead, Atkinson, Sumner, Wrenbury and Carson, on December 14th heard arguments in the House of Lords in the appeal of the Birkdale District Electric Supply Co., Ltd., *v.* The Corporation of the Borough of Southport. It was claimed by the Southport Corporation that by virtue of clauses included in indentures dated 1901 and 1904 it was entitled to prevent the appellants from charging higher prices for electrical energy within the district formerly within the jurisdiction of the old Birkdale Urban District Council, than the Corporation was charging within the original Southport area. Mr. Justice Astbury, in the Chancery Division, dismissed the Corporation's action, but the Court of Appeal, reversing his decision, granted an injunction. The company now appealed to the House of Lords, with a view to getting Mr. Justice Astbury's judgment restored. In stating the case for the company, Mr. Clauson said it was an attempt to fetter or abrogate statutory power and was *ultra vires*. whether such fetter was or was not incompatible with carrying out the general purposes of the undertaking, in relation to which the power had been conferred. Lord Birkenhead said that the appellants were asking to be allowed to repudiate part of the agreement while retaining all the advantages for which it was a consideration. Counsel said the terms of the transfer had, under statute, to be approved by the Board of Trade, and from that the conclusion was to be drawn that the only legal consideration was the consideration stated in the deed and approved by the Board. At the conclusion of the arguments for the appellants the Law Lords called upon Mr. Greene to put before them the case for the Corporation, and the learned Counsel was still speaking, when the further hearing was adjourned till December 15th. The Corporation submits that the Legislature has cast upon the appellants no obligation to make particular, or any charges for electrical energy supplied to consumers, and that there is nothing in the Birkdale Lighting Order, or the Electric Lighting Act, 1882, or otherwise in law to prohibit the appellants from entering into any reasonable business agreement to limit the charges to be made by them.

The hearing was continued on December 15th and at the request of Lord Birkenhead, the respondents' leading Counsel, Mr. Greene, proceeded to discuss the judgment of Mr. Justice Russell in the York Corporation case, in relation to power to trustees to make improvements in the navigation in the River Ouse, for which purpose they were authorised to levy tolls up to a certain rate.

The learned Counsel proceeded to indicate the differences which, he suggested, existed in the York case which distinguished it from the present one.

The House reserved judgment.

Inside Frosted Lamp Bulbs.—Lamp bulbs frosted on the inside in such a manner as to diffuse the light by refraction of the direct rays, are a feature of the new standard line of lamps recently introduced by the Westinghouse Lamp Co. The new line will consist of five sizes of lamps, and will replace a number of the forty-five lamp types of 100 watts and under now in common use. The first of the line, a 25-watt lamp, has already been placed on the market. This finish eliminates glare and makes it easy to keep the lamp clean, and so renders it more efficient throughout its life. It is claimed that the initial loss by absorption is less than 2 per cent. of the light output. In appearance the bulb is a neutral grey with a highly polished exterior and has the shape naturally taken by a falling drop of water; a coiled filament is used.

World Power Conference.—SECTIONAL MEETING.—We have received from the Secretary of the World Power Conference (36, Kingsway, London, W.C.2), the technical programme of the sectional meeting which is to be held at Basle from August 31st to September 12th, 1926. Section A deals with the "Utilisation of Water Power, and Inland Navigation"; Section B with the "Exchange of Electrical Energy between Countries"; Section C with the "Economic Relation between Electrical Energy produced Hydraulically and Electrical Energy produced Thermally: Conditions under which the two Systems can work together with Advantage"; Section D with "Electricity in Agriculture"; and Section E with "Railway Electrification."

All papers will be printed in Switzerland under the supervision of the Swiss National Committee of the World Power Conference, and will be available for the participants before the Conference opens. It is intended that the papers, together with the discussions thereon, shall be published after the Conference by the Swiss National Committee in a special volume to be entitled "Transactions of the World Power Conference Sectional Meeting, Basle, 1926." Distinction is made between: Papers contributed by authors in the different countries by request or on the initiative of the respective National Committees or of a member of the International Executive Council, World Power Conference (*National Papers*); and Papers prepared by general reporters appointed by the Swiss National Committee, containing a summary of all the national papers presented before April 1st, 1926, under the respective headings of the Technical Programme (*Reporters' Papers*). National Papers will be accepted for presentation to the Conference only when forwarded by a National Committee or by a member of the International Executive Council. Each country will present only one National Paper under each of the items A to E of the Technical Programme; these National Papers may be prepared by one or several authors. Official delegates to the World Power Conference are entitled to one copy each of papers which are of particular interest to them. Advance copies will be available for sale. All communications regarding the meeting should be addressed to the secretary as above.

Large Hydro-Electric Plant in Italy.—The De Bretto, Escher Wyss Co., of Schio, the Italian branch of the Swiss Escher Wyss Co., has just secured a contract for two vertical-shaft turbines which, it is claimed, will be the largest so far constructed in Europe. They are to develop 50,000 h.p. each under a head of 646 ft., and are intended for the new Galleto hydro-electric station on the River Velino of the Società Industria e Elettrica, of Terni, near Rome.

Bauxite in Montenegro.—According to a report from Cetinje, large deposits of bauxite have been discovered between Bar and Ulcin, and have already been investigated by the Vienna geologist, Herr Korner. The deposits are said to be similar to those in Hungary, and are estimated to represent 30,000,000 tons. The distance to the nearest port in the bay of Mrkovac is 5.5 miles. It is stated that a Splitler firm has provisionally obtained working rights, although negotiations are pending with French and German firms for the opening up of the deposits on a large scale.

Electric Furnaces in France.—Dealing with the progress of electrometallurgy in France, a Paris journal points out that most of the electric furnaces in use in that country for such purposes have a capacity of from 2 to 3 tons, although some of recent types have a capacity up to 15 tons. In 1913 there were 24 furnaces in operation for the manufacture of steel, the production in that year having amounted to 21,124 tons of ingots and castings and 11,700 tons of finished products. The number of furnaces which served for the manufacture of ferro-alloys was much greater and their output amounted to about 30,000 tons. At that time the electrometallurgical industry comprised 12 companies with a share capital of 41,600,000 fr. The annual production for French consumption was about 3,000 tons of ferro-silicon of from 25 to 90 per cent., but calculated at 50 per cent., and that of ferro-tungsten amounted to 250 tons. In the meantime development which has taken place has brought the number of companies up to 22, of which a certain number produce both ferro-alloys and carbide of calcium. Most of these undertakings are situated in the region of the Alps (Isere, Savoie, and the Dauphine), where they are grouped in those districts wherein the use of water power has been the most developed; but they are too distant from seaports for the import of raw materials as well as from the chief centres of consumption. During 1924 the manufacture of ferro-silicon alone absorbed over 100,000,000 kilowatt-hours, corresponding to a production of more than 13,000 tons of this alloy. The production of ferro-manganes in the electric furnace in 1924 ranged from 20,000 to 30,000 tons. Among other products are mentioned ferro-chrome, silico-managanese, and ferro-tungsten. In the case of carbide of calcium it is stated that the production in electric furnaces only reached 31,500 tons in 1913, but increased to over 110,000 tons in 1924. Of this total a quantity of 40,000 tons was used for autogenous soldering, 20,000 tons for fixed and portable lighting, 38,000 tons was converted into cyanamide and 10,000 tons used for chemical purposes.

Electricity in Mines.—Spanish Competition.—The Mines Department of the Spanish Government has recently issued particulars of a competition, open only to Spanish engineers and in respect of which a first prize of 8,000 pesetas is offered together with two second prizes of 2,000 pesetas each, for the best outline of a modern electrical installation for mines, embracing extraction, ventilation, traction below ground, mechanical preparation, &c. The competition will remain open until March 15th next.

High-frequency Rays.—In *Nature* of December 5th, an address delivered by Dr. R. A. Millikan, before the National Academy of Sciences, Madison, U.S.A., on "High-frequency Rays of Cosmic Origin," was reproduced. The author stated that in 1903 the British physicists Rutherford and McLennan noticed that the loss of charge of an electroscope in an air-tight chamber could be reduced by enclosing the whole in a completely encircling metal shield a centimetre thick, showing that the leakage was not due to imperfect insulation but to highly penetrating rays which could pass through the shield and ionise the gas inside the chamber. The rays were at first attributed to radioactive materials, but in 1910 it was found that the radiation did not decrease rapidly with altitude, and German physicists reported in 1912-14 that it greatly increased at a height of 9 km.

After the war Dr. Millikan and Mr. I. S. Bowen sent up balloons containing recording instruments to a height of 15.6 km. (nearly 10 miles) and proved conclusively that the "penetrating radiation" was greater there than at the earth's surface. In 1923 Dr. Russell Otis and Dr. Millikan went to the top of Pike's Peak, and made further experiments; and in the summer of this year Mr. H. Cameron and the author ascended to Muir Lake, 11,800 ft. high, at Mount Whitney, where they sank their electroscopes to various depths down to 60 feet. Their experiments left no doubt that the rays could penetrate the water to a depth of 45 feet, and as the atmosphere above the lake had an absorbing power equivalent to 23 ft. of water, the total penetration was equal to 68 feet of water, or 6 feet of lead. The most penetrating X-rays cannot go through half an inch of lead. High penetrating power means high frequency, and according to a formula valid with longer waves, the wave-length of the shortest waves the experimenters discovered was 0.0004 Angstrom, or one-fiftieth of that of the hardest gamma rays previously known; the longest was 0.00067 Angstrom. Their conclusions were accurately verified at another lake. The author suggested that the rays were due to nuclear transformations of some sort, enormously more energetic than those taking place in any known radioactive changes. They come to the earth with equal intensity from all directions by day and night.

Discussing these observations in a letter to *Nature* of December 12th, Dr. J. H. Jeans suggested that the radiation was generated by quanta of wave-length 1.3×10^{-13} cm., each quantum being produced by the simultaneous destruction of one electron and one proton. Such newly generated energy could escape from the transparent nebulæ into space, and its penetration into our atmosphere would seem to provide a natural explanation for the radiation investigated by Millikan. The high-frequency radiation from the great nebula in Andromeda alone would contain sufficient energy to produce about one-half the observed ionisation. After showing that the radiation produced on this hypothesis would have properties corresponding to those observed, Dr. Jeans concludes that "the bombardment by these rays provides an obvious explanation of the luminosity of such objects as the irregular nebulæ, as well as of the negative charge of the earth."

"Linaludo." — This is the name of a game, requiring much time and a good deal of patience, which has been produced by Mr. Archibald Sharp, B.Sc., A.M.Inst.C.E., F.C.I.P.A. It is based on the knight's move in chess, the idea being to touch upon each of a set of squares once only, and, if possible, to complete a circuit or "grand tour." The game is published by Messrs. E. Marlborough & Co., Ltd., at 4s.

Coal Commission.—Giving evidence before the Coal Commission on December 9th, Mr. Edmund Hann discussed with Mr. Evan Williams the subject of electricity supply to collieries, and is reported by the *Financial Times* to have expressed the belief that it was cheaper to transport coal than to transmit electricity over routes in excess of three miles.

Visit to Power Station.—On December 3rd members of the Taunton Traders' Association paid a visit to the borough electricity works, being conducted round the station by Mr. A. J. Howard, the borough electrical engineer, and his assistants. The invitation to view recently-installed machinery was extended by Ald. J. E. Kingsbury, the chairman of the Electricity Committee.

Appointments Vacant. — General fitter (£400), for the Government of the Gold Coast; electrical inspector (£600) for the Government of Nigeria; engineer clerk of works, for the Peterborough Corporation Electricity Department; junior shift engineer or improver for the Horsham U.D.C. Electricity Works; assistant in Mains Department for the Wolverhampton Corporation Electricity Department; electrical engineer (£480) for the Government of Nigeria Public Works Department. (See our advertisement pages to-day.)

The Electroplaters' and Depositors' Technical Society.—The first business meeting of this new Society was held at the Northampton Polytechnic Institute on December 9th, when Mr. S. Field delivered an address on the above subject as an introduction to the work of the session. Prof. F. G. Donnan, president of the Faraday Society, was in the chair. Mr. Field ascribes recent progress to the growing recognition among practical platers, of the inadequacy of rule-of-thumb methods, and to the consequent desire to found the art on sound scientific knowledge. Another factor, he says, has been the increasing applications of electrodeposition in many fields of industry, even in engineering practice. The day has passed when electrodeposition included nothing but silver and nickel plating and electrotyping, and we now have zinc, tin, lead, iron, cobalt, cadmium, and chromium, being commercially deposited. In other directions copper matrices are being deposited as moulds for gramophone records, and copper is also being deposited as wire for the prevention of carbonisation and in the manufacture of copper water-jackets. Iron and nickel are being deposited in the repair of iron parts of machinery, while cadmium is being used as a substitute for zinc in protecting against sea-water and similar corrosion. It is probable that chromium plating will become fairly general to render iron and steel non-corrodible, although the practical difficulties in the deposition of this metal call for care and knowledge.

Many problems remain to be solved. In the actual processes may be mentioned such difficulties as spotting-out, the appearance of pin-holes, and the exfoliation of deposits. Indeed, the whole subject of the relation between the mechanical properties of deposited metals and the constitution of the electrolytes used calls for systematic examination. What is it that conditions the adhesion of a deposit; what is the effect of neutral salts in solution, and why do colloidal additions in minute quantities have so extraordinary an effect on the properties of the deposit? There is obviously room for organised co-operative research in this branch of technology, and it is gratifying to learn that the Department of Scientific and Industrial Research has made a beginning in initiating such work at Woolwich and elsewhere. Finally, Mr. Field deals with the possibilities of standardisation in the electroplating industries, both as regards language and methods. May it not be possible, by means of concerted effort, to replace the multitudinous so-called formulæ now in use by a comparatively few and reliable compositions? It is evident that the new Society responds to a real need, and if by its discussions it leads to organised efforts in carrying out fundamental research, it will have performed a real service to a not unimportant branch of the electrical industry.

Roedean Schools Installation.—Since the publication of the reference to the recent electrical installations at the Roedean Schools, Brighton, in our issue of December 4th, we have been informed that "Walsall" metal-sheathed wiring fittings supplied by the Walsall Hardware Manufacturing Co., Ltd., were employed throughout the entire installation.

Road Surface Traffic Guide.—We are asked to state that the correct title of the firm responsible for the electrical installation in the "Illuminated White Line," described in our issue of December 4th, under the above heading, is British Electrical Installations Co.

Miners' Electric Lamps in France.—At a recent meeting of the Northern Section of the French Société de l'Industrie Minerale, M. Soulary read an interesting paper on the experience of the use of miners' electric lamps in the collieries of the Compagnie des Mines de Bruay, in the Pas de Calais Department. So satisfactory have they been that the company has now over 14,500 such lamps in use and is only retaining a sufficient number of oil lamps (about 2,700) to meet legal requirements.

The batteries are charged in groups of 100, a method which simplifies the electrical connections, and prevents any waste of current. No battery repairing is undertaken in the charging department, any accumulators which need repair being dealt with in a special shop. M. Soulary stated that, not only have the electric lamps proved successful, but they are also found to be more economical, their adoption by the company having resulted in an annual saving of about 800,000 francs. The increased use of electric lamps at the Bruay mines has enabled a reduction in the lamp trimming staff to be effected. Thus, whereas out of 13,110 lamps in use in June, 1922, only 6,316 (or about 48 per cent.) were electric, while 6,794 (or 52 per cent.) were oil, the total is now 17,172, of which the electric lamps' share is 14,431 (or approximately 84 per cent.) and the oil lamps' share 2,741 (16 per cent.). During the same period, notwithstanding an increase of 30.9 per cent. in the number of lamps, the number of trimmers required has fallen from 229 to 156, a drop of 31.8 per cent.; in other words, each man is now able to look after 110 lamps, as against only 58 when oil lamps preponderated.

The Electric Vehicle Committee of Great Britain.—RECONSTRUCTION OF COMMITTEE.—The Electric Vehicle Committee, formed in 1913 under the auspices of the Incorporated Municipal Electrical Association, has for some years been associated with the British Electrical Development Association. At a meeting held on June 20th, it was resolved to reorganise its constitution by forming a "Main Committee" representative of all interests concerned in the electric vehicle business, and composed of persons nominated by the various associations (or individually elected, where necessary); the Main Committee is to elect its chairman and to appoint a small Executive Committee. The former will meet quarterly, the latter monthly.

Starting from November, 1925, the following will hold office till March, 1927: Chairman, Mr. J. A. Priestley; vice-chairmen, Messrs. A. J. Makower and W. B. Worby Beaumont; hon. treasurer, Mr. J. Christie; past chairmen, Messrs. F. Ayton and R. A. Chattock.

The Main Committee includes representatives of nineteen societies or groups, of which the I.M.E.A. and the makers of electric vehicles have the largest numbers (7 and 6 respectively); the Committee when fully constituted will comprise 44 members. The Executive Committee consists of Messrs. A. C. Cramb, A. W. Blake, F. E. Gripper, F. W. Crawter, E. W. Curtis, F. Ayton, R. J. Mitchell, A. J. Makower, J. B. Osler, J. A. Priestley, and Col. R. E. Crompton.

We hope that the Electric Vehicle Committee, of which little has been heard for some years, will now enter upon a new era of well-directed activity. There is abundant scope for its labours.

Diesel-Electric Railway Traction.—With further reference to the note on the above subject on page 943 of our December 11th issue, our attention has been drawn to the fact that the electrical system adopted for the smaller of the two types of car in use on the Canadian National Railways was developed by the General Electric Co., of America, and carried out by the British Thomson-Houston Co., Ltd. It involved the design of generators having a special characteristic, with the object of eliminating control resistances and thereby saving space and obtaining higher running economy, which is of a substantial order, particularly over routes that include gradients, &c., and necessitate a large torque at a low speed for an appreciable proportion of the running time.

The main generators are designed for a speed of 700 r.p.m. and a terminal pressure of 600 volts, and are rated at 105 kW for two hours, with a temperature rise not exceeding 50 deg. C., or 85 kW continuously, with a temperature rise not exceeding 40 deg. C. On test, temperature rises were very low, and it was found that the machines were capable of an output of 105 kW continuously without dangerous heating. The exciters are shunt wound and of the overhung type, the frames being supported from the main generator end shields and the armatures carried on extensions of the main generator shafts; they are rated at 6 kW at a terminal pressure of 60 volts. A 16-cell battery of 450 ampere-hours capacity, which is charged by the exciter during the running periods, is provided for lighting, starting, and supplying power for contactor-closing coils, &c.

The main generators are provided with three windings on the main poles:—(*a*) A shunt winding separately excited from the exciter, (*b*) a winding connected in series with the battery across the exciter terminals, and (*c*) a differential series winding carrying the line current of the generator. By means of this combination, an extremely drooping volt-ampere characteristic is obtained which causes the demand for power from the engine over the working range to be substantially constant; on high gradients the torque required from the driving motors demands a heavy current from the generator, but as this is associated with a comparatively low voltage, there is no likelihood of stalling the engine. The engine is started up by means of a series-wound motor capable of exerting a torque equivalent to 45 h.p. at 200 r.p.m., and supplied from the battery, or alternatively, by means of the starting engine. The main driving motors are of the railway type, and can be connected in series or parallel by means of a controller of the usual traction type. There are no losses in starting and regulating resistances as the supply voltage, and therefore the speed, is controlled by the main engine throttle.

Science and Business.—Mr. A. P. M. Fleming, head of the Department of Education and Technical Research of the Metropolitan-Vickers Electric Company, delivered a lecture last week at the London School of Economics, under the auspices of the Commerce Society, on the subject of "Science and Business." He said, according to the *Financial Times*, that there was no industrial country in which there appeared to be such a lack of understanding between science and business as in Great Britain. Yet the scientist could not exist without the labours of the business man, and, on the other hand, no industry could make progress without continuous application of new scientific knowledge. Practically every phase of civilised life depended on the use of power. In this country we employed much less power than certain other industrial countries. This condition was changing, and it seemed likely that in the near future, with the interlinkage of electrical power systems, we might have power available under sufficiently economic conditions to extend its use very considerably. One of the problems of the future, and one on which civilisation would ultimately depend, would be the question of suitable electricity supply. It was increasingly necessary in this country to have a strong public well informed of the need for science and its underlying importance in all our business and national life.

Institution Notes.

Institution of Electrical Engineers.—INFORMAL MEETING.—On Monday, January 11th, 1926, at 7 p.m., a discussion on "The Electrical Installation at the Rockefeller Building, University College," will be opened by Mr. W. C. Clinton, B.Sc. On this occasion the meeting will take place at University College, Gower Street, London (refreshments at 7 p.m.). The X-ray and dissecting rooms and the library and museum of the Rockefeller Building will be open for inspection. The nearest stations to the College are:—Warren Street and Goodge Street (Hampstead Tube), and Euston Square (Metropolitan Railway).

At the informal meeting on Monday, December 7th, with Mr. P. Dunsheath, O.B.E., in the chair, Mr. C. L. Lipman opened a discussion on "The Design and Performance of Protective Relays." The opener showed a large number of lantern slides illustrating the operation and range of relays for all duties, and several types of the instruments described were on exhibition.

Dr. R. D. Gifford remarked that one of the great difficulties of the designer arose from the tendency of voltages to increase; with the consequent fall in current, transformers were almost at their winding limits.

Col. K. Edgcumbe said that in the United States, where until quite recently it was the practice to scoff at relays, they were now very much used and the larger supply authorities employed a "relay engineer," whose duty it was to inspect and maintain the automatic protective devices.

Mr. J. F. Shipley said that within the limits of reliability and safety there was no need for the expensive finish that was customary in English instruments. He had found in the United States that they were buying from the Continent in large numbers a robust type of relay with overload and inverse-time-limit features which cost considerably less than the highly-finished British article.

Many other members took part in the discussion.

IRISH CENTRE.—The advantages of harvesting peat by machinery was the subject of an interesting lecture on December 10th by Mr. James Lindsay in Dublin. He dealt in detail with the success of machinery driven by electricity generated from peat in the Turrann bogs in the King's County, and emphasised the importance of drainage to facilitate the setting up of plant on the bogs. Prof. Purcell paid a tribute to Sir John Griffith for the time and money that he had expended in endeavouring to make the peat industry the profitable undertaking it might easily be for all who were engaged in it.

SCOTTISH CENTRE.—At a joint meeting of the Scottish Centre of the Institution of Electrical Engineers and the Association of Mining Electrical Engineers (West of Scotland branch) in Glasgow on December 8th, a paper on "Electricity in Mines" was read by Major E. Ivor David. Dr. Magnus Maclean presided.

Junior Institution of Engineers.—On Friday last week Mr. J. S. Highfield, M.Inst.C.E., M.I.E.E., was inducted to the presidential chair by the retiring president, Dr. Alexander Russell, M.A., and delivered his inaugural address, which will be abstracted in our pages.

Institution of Mechanical Engineers.—In a paper on "Foundry Practice," read before the above Institution on December 11th, Mr. J. G. Pearce, B.Sc., said that to-day cast iron was regularly produced in foundry cupolas from a wide variety of raw materials with great consistence and economy. Certain applications which had temporarily been usurped by steel and other materials were reverting to cast iron, and in some developments, notably in internal combustion engineering, the development of the material was keeping pace with the growing demands of the designer. A paper was also presented by Mr. J. E. Fletcher on "Some Applications of Research to Modern Foundry Practice," in which he gave in detail some examples of the type of work and methods of attack used in applying the results of research in the foundry.

Institution of Production Engineers.—At a meeting held on December 16th, Mr. A. H. Mundey delivered a lecture on "Die-Casting."

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Mr. E. W. ANDREWS, who has completed 25 years as head of the Sunderland branch of Messrs. F. Reid, Ferens & Co., of Newcastle-on-Tyne and Sunderland, has been presented by the workmen and officials with a combination cabinet. The workmen and apprentices of the Sunderland branch presented Mrs. Andrews with a silver trinket basket.

Reading Town Council has decided to increase the salary of the general manager and engineer of the tramways, Mr. CALDER, from £800 to £900 per annum, without bonus.

According to the *Australasian Electrical Times*, Mr. R. H. BARTLEY, chief engineer of the Auckland Electric Power Board, has been appointed to the position of general manager at a salary of £1,100 a year, and Mr. A. O. GLASSE has been appointed chief engineer in succession to Mr. Bartley.

Mr. H. KITCHEN, M.I.E.E., was entertained by his colleagues in the Northern Engineering District of the Post Office at the Central Exchange Hotel, Newcastle-on-Tyne, on Saturday, November 28th, when he was presented with a gentleman's wardrobe, on the occasion of his promotion to the position of assistant staff engineer, London. The gathering was representative of all ranks in the district. The chairman, Mr. J. R. M. Elliott, M.I.E.E., superintending engineer, in making the presentation, said that Mr. Kitchen was captain of the rifle team before the war, and he registered the highest score when Major O'Meara's cup was won by the district. He is a member of the Institution of Electrical Engineers, and for some years lectured on technical subjects at Rutherford College, Newcastle, and at Jarrow Technical School. He had always manifested a keen interest in the work and activities of the Institution of Post Office Electrical Engineers, and for a period of three years served on the main Council of the Institution.

Capt. H. SAUNDERS-JACOBS has been appointed assistant director of the Sheffield relay station of the B.B.C. After war service he was a member of the Military Inter-Allied Commission of Control in Germany from 1920 to 1922. He took a science degree at London University.

At the annual dinner of the Merthyr Electric Traction and Lighting Co., Ltd., held at Merthyr on December 3rd, Mr. F. J. Cursons, secretary of the company, presiding, Mr. LEWIS W. DIXON, the managing engineer, was presented with a solid oak writing table. It had been subscribed for by the staff and employés as a token of appreciation. Mr. Edward Rowlands, the chief clerk and cashier, who made the presentation, proposed the toast, "Our Chief," and in doing so referred to the growth of the business from small beginnings to its present operations supplying electricity over an area of nearly 30 square miles—but with the heavy burden of £6,000 per annum in rates! Mr. Dixon, who responded, has been manager of the company for 18½ years.

Shoreditch Borough Council Law and Establishment Committee recommends that Mr. C. NEWTON RUSSELL, the borough electrical engineer, be granted a retiring allowance of £510 as from December 19th, 1925 (the six months' extension of service expires on December 19th).

The fiftieth anniversary of the day on which Dr. H. A. LORENTZ took the degree of Doctor of Physical Science at the University of Leyden, was celebrated at Leyden last week, many noted scientists being present for that purpose, besides the Queen of Holland and the Acting Prime Minister, Mr. Colyn.

Obituary. — We are sure that many of our readers will desire to associate themselves with us in an expression of deep sympathy with Mr. HOWARD FOULDS, F.C.I.S., the secretary of Callender's Cable & Construction Co., Ltd., on the death of his wife, who passed away, after a long illness, at "Littlecomb," Caterham Valley, Surrey, on December 9th.

MR. A. P. BOLGER.—The death took place on December 8th, in his 57th year, of Mr. Alfred Patrick Bolger, who was a departmental manager at the works of Crompton & Co., Ltd., of Chelmsford. He had been with the firm for 31 years, and was formerly at the London office.

New Companies Registered.

Scientific Products, Ltd. (210,205).—Private company. Registered December 7th. Capital, £500 in 5s. shares. Objects: To carry on the business of scientific instrument manufacturers, factors and merchants, manufacturers of wireless apparatus, &c. The first directors are:—E. H. Newman (permanent), 237, Uxbridge Road, W.12; A. Grigg, 237, Uxbridge Road, W.12. Remuneration as fixed by the company. Registered office: 88/90, Chancery Lane, W.C.2.

Gaston E. Marbaix, Ltd. (210,252).—Private company. Registered December 10th. Capital, £1,000 in £1 shares. Objects: To carry on the business of importers, exporters, manufacturers, assemblers, equippers and repairers of and dealers in all wireless and telephonic apparatus, valves, instruments, equipment and accessories, electrical, mechanical and general engineers, &c. The subscribers (each with one share) are:—G. E. L. J. Marbaix, 50, Leyland Road, Lee, S.E.15, merchant; W. L. Bibley, 36, Brambledown Road, Wallington, accountant. The first directors are:—G. E. L. J. Marbaix (permanent governing director), and such other persons as shall be appointed by him. Solicitors: Frank Simmonds & Carter, 98, Salisbury House, London Wall, E.C.2. Registered office: 27/28, Anning Street, E.C.

Exe Valley Electricity Co., Ltd. (210,235).—Public company. Registered December 9th. Capital, £6,000 in £1 shares (4,000 preference and 2,000 ordinary). Objects: To carry on at Bampton and elsewhere in the Counties of Devon and Somerset the business of an electric light company in all its branches; to acquire the benefit, rights, powers, authorities, obligations, and liabilities of J. A. Purves in and under two agreements (1) with the Urban District Council of Bampton and (2) with A. Scott; and a lease between George and V. J. Burrow of the one part and J. A. Purves of the other part and a special order to be made by the Electricity Commissioners and known as the "Bampton Electricity Special Order, 1925," which is being applied for by J. A. Purves. Minimum cash subscription, £1,500. The first directors are:—J. A. Purves, Thorpe Hall, Eaton Rise, Ealing, engineer; Margaret M. Partridge, 16, East Southernhay, Exeter; F. W. Wescott, 42, Brook Street, Bampton, baker; J. Seward, Newton Square, Bampton, baker; F. C. Davey, 15 and 17, Fore Street, Bampton, saddler; B. M. Read, Castle Grove, Bampton, retired colonial civil servant; D. E. Green, The Vicarage, Bampton, engineer (managing director for three years). Qualification, 50 shares. Remuneration of managing director, £150 for first year, £200 for second year, and £250 for the third year, and a percentage of the profits. Solicitors: Joyce, Risdon and Hosegood, Williton, Taunton. Registered office: 27, Brook Street, Bampton, Devon.

R. R. Goding, Ltd. (210,116).—Private company. Registered December 5th. Capital, £3,000 in £1 shares. Objects: To acquire the business carried on at 42, Gray's Inn Road, W.C., as the National Wireless and Electric Co., to adopt an agreement with R. R. Goding, and to carry on the business of manufacturers of, and dealers in wireless and electrical goods, wireless, electrical, mechanical, and general engineers and contractors, &c. The directors are:—R. R. Goding, 20, Chatsworth Gardens, Acton, W.3, wireless engineer (permanent managing director); A. N. Entwistle, West View, West Moors, Dorset, wireless engineer. Qualification, 50 shares. Remuneration as fixed by the company. Secretary: A. N. Entwistle. Registered office: 42, Gray's Inn Road, W.C.1.

Jemco, Ltd. (210,197).—Private company. Registered December 7th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of insulated and other wire, cables, and all electrical apparatus and appliances, electrical and general engineers, &c. The first directors are:—Mrs. Mary C. Smith, Stowfield House, Lydbrook, Glos.; Miss Muriel C. Smith, Stowfield House, Lydbrook, Glos. Qualification, £25 shares or stock. Remuneration (if any) as fixed by the company. Solicitors: Rooke & Sons, 45, Lincoln's Inn Fields, W.C.2. Registered office: Lydbrook, Glos.

British Hard Rubber Co., Ltd. (210,166).—Private company. Registered December 5th. Capital, £6,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in hard rubber, ebonite, vulcanite and any other plastic substances or compositions and articles made therefrom; chemical, textile, electrical, mechanical and general manufacturers and engineers, manufacturers of and dealers in radio and electrical instruments, &c. The subscribers (each with one share) are:—Joan Peachey, 9, Hetley House, Hetley Road, W.12, stenographer; V. Deighton, 97, Junction Road, Highgate, N.19, solicitor's clerk. P. E. Wells is to be one of the first directors and shall be permanent chairman. Qualification of first directors, 1 share; of other directors, 100 shares. Solicitors: A. Blackman, Hailey & Co., Gresham House, Old Broad Street, E.C.2. Registered office: Wharf Road, Ponders End, Middlesex.

Milton and Barton-on-Sea (Hants) Electrical Supply Company, Ltd. (210,162).—Public company. Registered December 5th. Capital, £15,000 in £1 shares. Objects: To carry on at Milton and Barton-on-Sea, in the Rural District Council of Lymington, Hants., the business of an electric light company in all its branches, and to adopt an agreement with A. R. Musgrave for the carrying out of an order made by the Electricity Commissioners under the Electricity (Lighting) Acts, 1882-1922 in respect of the parish of Milton, for taking a transfer of an undertaking and the said order. Minimum cash subscription, 10 per cent. of the amount offered. The directors are:—A. R. Musgrave, Grove Lodge, Isleworth, Middlesex, soap manufacturer; Mrs. Margaret A. Musgrave, same address. Qualification, 500 shares. Remuneration as fixed by the company. Secretary: Mrs. M. A. Musgrave. Solicitors: Moore, Vicary & Trestrail, 38, High Street, Lymington and New Milton. Registered office: Milton, Hants.

James & Venables, Ltd. (210,265).—Private company. Registered December 10th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of manufacturers of, and dealers in wireless products of all kinds, speedometers, clocks, brake and clutch linings, motor accessories, tobacco, cameras, and fancy goods, &c. The directors are:—E. H. Cully, 3, The Drive, Hove, Sussex; W. O. Carroll, 12, Great Queen Street, W.C.2. Qualification, 1 share.

Official Returns of Electrical Companies.

W. R. Harding & Co., Ltd.—H. J. Herbert, of 172, Bishopsgate, E.C.2, was appointed receiver and manager on November 21st, under powers contained in debenture dated June 12th, 1925.

New System Private Telephone Co., Ltd. (73,732).—Capital, £20,000 in £1 shares. Return dated May 5th, 1925. 15,000 shares taken up. £13,000 paid. £2,000 considered as paid. Mortgages and charges, nil.

Modern Electrical Supply Co., Ltd.—F. S. Wilks, of 31, Lombard Street, E.C.3, ceased to act as receiver or manager on November 30th, 1925.

Rowland Edwards & Co., Ltd.—Debenture dated November 30th, 1925, to secure £600, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. B. K. Sharman, 51, Madrid Road, Barnes.

Church Stretton Electric Supply Co., Ltd.—Satisfaction to the extent of £250 on October 20th, 1924, to the further extent of £250 on May 12th, 1925, and to the further extent of £250 on November 13th, 1925, of charge dated January 29th, 1921, securing £1,550.

Auto Welding and Engineering Co., Ltd.—A. H. P. Howard, of 46, Peartree Street, Goswell Road, E.C.1, ceased to act as receiver or manager on November 13th, 1925.

Harry Morser & Company (Wireless), Ltd.—Debenture dated November 30th, 1925, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. W. D. Gallwey, Winchester House, Kingston Hill, Surrey.

Betax Manufacturing Co., Ltd.—Debenture dated November 16th, 1925, to secure £2,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Ben Tax, 21, St. Vincents Road, Westcliff-on-Sea.

Eclat Electric Manufacturing Co., Ltd.—E. M. Carrington, F.C.A., of 2, Gresham Buildings, Basinghall Street, E.C.2, ceased to act as receiver and manager on November 30th, 1925.

R. M. P., Ltd.—Mortgage debenture bond, dated November 27th, 1925, to secure £307, charged on the company's undertaking and property, present and future. Holder: G. P. Power, Adderley Road, Saltley, Birmingham.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Foundation Co., Ltd.

The annual meeting of this company was held on December 9th, Mr. A. W. Tait, C.B.E., presiding. In presenting the report and accounts the chairman made mention of a number of important contracts which had been entrusted to the company. During the year the principal contracts obtained were:—The City and South London Railway extension to North Morden; escalators at Tooting, South Wimbledon, and Colliers Wood; transmission lines for the North Wales Power Co.; mast foundations for the Marconi Co. (Australia); and tramway construction for the Melbourne Tramways Board. Work was also in hand for the following:—The London Electric Supply Corporation, Deptford; the Yorkshire Electric Power Co., Ferrybridge power station; the Borough of Woolwich; the South Wales Power Co.; and the Mid-Cheshire Electric Supply Co. An arrangement had been made with the parent company for direct participation and incidental assistance in contracts obtained by that company and its associates in Europe, Asia and Africa, other than British territory. For the purpose of assisting in the finance of contracts in the territory referred to a new company had been formed in America with a paid-up capital of $3,000,000. The parent company had also recently increased its capital by $1,200,000. The company itself intended to raise its capital from £250,000 to £350,000 by the creation of ordinary £1 shares, ranking *pari passu* with the existing ordinary shares. The business was satisfactory and they hoped that it would continue to expand and that its connections would increase. The report and accounts were adopted and at a subsequent extraordinary meeting the proposed increase in the company's capital was approved.

The Vickers Reorganisation Scheme.

Last week the advisers appointed by Vickers, Ltd., to inquire into the company's affairs and make recommendations regarding reorganisation (Mr. Reginald McKenna, Mr. F. Dudley Docker, and Sir William Plender, Bart.) made a lengthy report, which the board has endorsed, and it is intended to carry the recommendations into effect. The investigators found that the earning capacity of the company and its allied undertakings had greatly decreased in recent years and that it appeared unlikely that the position would improve sufficiently to allow of the payment of dividends on the existing ordinary share capital. It was also found that the value of many of the assets was considerably below the figures at which they stood in the company's accounts. The company was also under heavy contingent liabilities for which no specific provision had been made and might be expected to result in actual liabilities upon the company. It is therefore recommended that the ordinary share capital be written down from £12,315,483 to £4,105,161 (*i.e.*, the £1 shares will be reduced to 6s. 8d.); that £3,600,000 be appropriated from the reserve fund; and that £632,044 be appropriated from the balance standing to the credit of the profit and loss account. This sum (£12,442,366) will be utilised in writing down the land, buildings, &c., by £4,254,994; the book value of the company's interest in subsidiary companies by £5,488,316; and the book value of the marketable securities, &c., in hand by £472,150; the balance (£2,271,906) will be used to create a reserve to meet contingent and other liabilities not provided for. The causes of the company's loss are stated to have been:—(*a*) The general depression in trade; (*b*) Depreciation in foreign exchanges; (*c*) Reduced earning capacity attributable to: (1) The world reduction in armament expenditure; (2) the home production of armaments by foreign countries; (3) the decline in shipbuilding; (4) foreign competition in world markets; and (5) financial stringency and political unrest in Europe, which has restricted the giving of credit and retarded schemes of development. Other causes of a different nature which have contributed to the position are the lack of special experience in the management, necessary to control so large and varied a body of industrial undertakings; and the entering into investments which have not only proved unremunerative but are now the subject of considerable liability. It is therefore proposed that some of the present directors should retire to provide vacancies on the board for new members. It is recommended that, in addition to the reconstituted board of directors, there should be three management boards, *viz.*, an industrial board; an armaments and shipping board; and a finance board. It is suggested that the remuneration of the directors should be limited; that superfluous officials should be discharged; that all unremunerative subsidiaries should be wound up, &c. The principal subsidiaries are the Metropolitan Carriage, Wagon and Finance Co. and the Metropolitan-Vickers Electrical Co., Ltd., both of which have been profitable. Other electrical (or partly electrical) concerns in which the company is interested are Vickers-Petters, Ltd., the British Lighting & Ignition Co., Ltd., W. T. Glover & Co., Ltd., the Ioco Rubber & Waterproofing Co., Ltd., Electric & Ordnance Accessories, Ltd., and Adam Hilger, Ltd. In accordance with the request of the board, Messrs. McKenna and Docker, and Sir Wm. Plender have agreed to continue to act in a consultative capacity until the board has been reconstructed and the three suggested boards are functioning. The directors point out that while the proposed reduction of capital is drastic, it is in effect only a book entry and each ordinary shareholder will continue to hold exactly the same *pro rata* interest in the company which he now holds.

An extraordinary general meeting was to be held yesterday (Thursday) at Sheffield to give effect to the recommendations. It was to be proposed that the capital should be reduced from £26,500,000 to £18,289,678 by cancelling paid-up capital to the extent of 13s. 4d. on each of the existing 12,315,483 ordinary shares, and that each of the 5,684,517 unissued ordinary shares should be subdivided into three shares of 6s. 8d. each.

French Companies.

The *Société d'Applications Industrielles* (*Compagnie d'Entreprises Electriques*), of Paris, earned net profits of 4,278,000 fr. in 1924-25, and has declared a dividend at the rate of 12 per cent.

The *Société des Etablissements de E. C. Grammont et de Alex. Grammont* reports gross profits amounting to 21,746,000 fr. for 1924-25 as compared with 17,713,000 fr. in the previous year. It is proposed to apply the net profits to writing off various amounts, whereas in 1923-24 a dividend at the gross rate of 6 fr. per share was distributed.

The *Compagnie des Exploitations Electriques* states that the net profits increased from 1,405,000 fr. in 1923-24 to 1,943,000 fr. in 1924-25, and the dividend is at the rate of 17.50 fr. per share on share capital of 25,000,000 fr., as compared with the same rate on 18,000,000 fr. in 1923-24.

Austrian Company.—The report of the Oester. Siemens Schuckert Werke, for 1924, which has only just made its appearance, complains of lower sales caused by the economic crisis and the high taxes and social burdens. The absence of adequate orders to permit of the mass production of motors and other electrical goods was partly compensated for by the large orders for hydro-electric plant and electric railway equipment, and these orders have again been considerable in the current year. The net profits in paper crowns in 1924 were twice the amount of those in the previous year, and the rate of dividend rises from 2,000 crowns per share in 1923 to 4,000 crowns last year.

Dutch Company.—PHILIPS' LAMP WORKS.—The *Financial Times* correspondent at Amsterdam reports that the company is issuing 3,500,000 ordinary and 1,125,000 preferred shares, at 150 and 110 per cent. respectively, to present shareholders. This raises the capital of the company to 17,500,000 guilders in ordinary shares and 5,625,000 guilders in preferred shares.

British Columbia Electric Railway Co., Ltd.—The report for the year ended June 30th last shows a profit of £360,792, after providing for debenture interest, &c. Final dividends at the rate of £2 9s. 3d. on the preferred ordinary shares (making £6 6s. 9d. per cent.) and at the rate of £4 2s. 6d. on the deferred ordinary shares (making £8 per cent.), all free of tax, are recommended. The meeting is to be held on December 23rd.

Victoria Falls & Transvaal Power Co., Ltd.—The directors have declared a dividend of 3 per cent. for the half-year ending December 31st, and a further dividend of 3 per cent. in respect of participating rights for the year ending December 31st, on the preference shares. A dividend of 3 per cent. has also been declared on the ordinary shares.

Armstrong, Whitworth Development Co., Ltd.—Out of profits of £97,152 for the year ended September 30th last the company is paying a dividend of 15 per cent., free of tax, on the ordinary shares (as in 1923-24) and carrying forward £31,291, as compared with £11,640 brought in.

Manila Electric Corporation.—The financial Press reports that there is growing opposition to the offer of the Associated Gas and Electric Co. to exchange its 6½ per cent. obligations for Manila shares.

Power-Gas Corporation, Ltd.—There was a profit of £12,315 for the year ended September 30th last. The directors propose to transfer £2,000 to reserve, to pay a dividend at the rate of 4 per cent., and to carry forward a balance of £19,598.

Eastern Telegraph Co., Ltd.—A third quarterly interim dividend of 2½ per cent. on the ordinary stock, free of tax, is announced.

Eastern Extension, Australasia & China Telegraph Co., Ltd.—A dividend of 5s. per share, free of tax, has been declared in respect of the quarter ended September 30th last.

W. & T. Avery, Ltd.—A half-yearly dividend at the rate of 5 per cent. has been declared on the ordinary shares.

Stocks and Shares.

Monday Evening.

With Christmas so closely at hand, and with timorous apprehensions expressed about the Bank Rate, the Stock Exchange markets cannot expect to attract much business outside the area covered by the rubber share section. The rubber market remains remarkably active and tolerably strong. An occasional reaction may arouse the impression that the boom is over, and that quieter conditions are about to prevail, but the strength is quickly recovered, and prices go ahead again. This week's settlement in rubber shares is one of the heaviest on record, and money to pay for its purchases has to be found, to some extent, by the sale of securities elsewhere—a factor which adds a contributory cause to the reasons that make for dulness in other markets.

The electricity supply department is firm, the feature being a rise of 2s. 6d., to 60s. 9d., in County of London ordinary. Various rumours came into circulation to account for this, but the real reason has yet to be revealed, although it may be made public before these paragraphs appear. City of London lost 1/16 of their last week's advance; otherwise, the prices are good. Buyers of the shares frankly admit that they desire to discount the day of distribution of capital reserves. The cautious observer may deem this as, possibly, premature. He would urge that it might be well to await some definite indication of the manner in which the reserves are to be valued. However, the investor evidently considers that the outlook is sufficiently assured to justify him in the present purchase of shares in this list, and prices are hard in consequence of a persistent demand.

Brazilian Tractions stand out with a gain of 7 points, on the increasing favour with which the company's prospects are regarded. Brazilian tramway issues have not changed to any material extent. An interesting issue was made in New York last week, when ten million dollars of 6½ per cent. gold debentures in the Allgemeine Elektricitäts Gesellschaft, were offered at 94. Allowing for redemption in 1940, the yield at this price is 7⅛ per cent. on the money.

Victoria Falls Power shares gave way upon news of an explosion having occurred on the property, but the decline was recovered upon declaration of an interim dividend on the preference shares at the same rate as that of last year. The price is now 33s. 9d., and the ordinary are quoted at 52s. Two of the company's machines were quickly restarted, thus ensuring a normal supply of power to the mines for 18 hours a day.

Falls are marked against some of the cable and electrical manufacturing shares, but, on the other hand, a few improvements occurred. Telegraph Constructions gained 10s.; the price has barely moved throughout the recent period of rising prices in this market. Callenders have gone back to 3¼ and Electric Constructions to 1⅝; Siemens drooped to 32s. English Electrics lost a trifle at 19s. 3d. Brush shares hold their gain at 26s. 3d., Edisons hardened to 9s. General Electrics fell 6d. to 23s. 6d. Cromptons at 15s. are 1/16 up. International Automatics keep close to £2, and Automatic Telephones at 51s. 3d. have parted with 1s. 6d. of their recent jump.

Vickers announce a drastic scheme of reorganisation, the directors proposing to write off 13s. 4d. per share from the ordinary, and so to reduce these shares to the nominal value of 6s. 8d. each. The price promptly put on 1/16, strengthening to 8s. 1½d., thanks to the hope that this plan, if carried through, may bring the shares within sight of a dividend once more. Nothing has been paid on them since May, 1923. Several other companies in this group are expected to follow suit.

United River Plate Telephones have gone up 3s. 9d., to 7 11/16, and the market is a hard one as a whole. Globe ordinary rose ¼, to 18½, Great Northerns fell back to 34. The wireless shares fail to make headway, or to attract public attention. Marconis are 22s. 6d. and Canadians 5s. As previously noted, wireless shares have been turned out by some of the holders who wanted to exchange into rubber shares. The Marconi dividend time is approaching, and some nervousness is entertained lest the previous 10 per cent. may be cut in the forthcoming distribution.

Home Railway stocks are dull and uninteresting. Metropolitan slipped back a point to 69. This is the season at which, normally, investment takes a hand in the Home Railway market, but the public nowadays declines to evince any interest. The National Wages Board decision makes little difference to the position as it has been standing already.

British Insulated, ex rights, are nominally 17s. 6d. down: the value of the new shares makes up for the deduction. On the assumption that the 15 per cent. dividend will be maintained upon the increased capital, the yield on the shares now works out to a little under 5½ per cent. The rubber share market continues to absorb lively public interest. A disposition to take profits is, however, noticeable and the boom begins to look a little tired. The which is not altogether surprising, having regard to the furious pace at which the movement has proceeded during the past three months.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Dividend. 1923.	Dividend. 1924.	Price Dec. 14. 1925.	Rise or fall.	Yield p.c.
Bournemouth and Poole	£1	13	14	59/6	—	4 14 1
Brompton Ordinary	£1	10	10	1⅝	—	*6 8 1
Charing Cross Ordinary	£1	14½	15	2⅞	—	6 3 1
do. do. 4½ Pref	£1	4	4½	17/6	—	5 2 10
Chelsea	£1	12	12	2⅜	—	5 13 0
City of London	£1	15	15	50/9	−1/16	5 18 1
do. do. 6% Pref.	£1	6	6	23/-	—	5 4 4
Clyde Valley	£1	8	8	29/6	—	5 8 6
County of London	£1	15	15	60/9	+⅛	4 18 8
do. do. 6% Pref.	£1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	£1	7	7	24/-	—	5 16 8
do. 7% Pref.	£1	6	7	21/6	—	6 10 8
Elec. Supply Corporation	£1	10	10	32/6	—	6 3 0
Kensington Ordinary	£5	14	15	13	—	5 15 5
Lancs. Light and Power	£1	7½	7½	26/-	—	5 15 5
London Electric	£1	10	10	34/-	—	5 17 8
do. do. 6% Pref	£5	6	6	5⅝	—	5 6 8
Metropolitan	£1	10	11	39/6	+1/-	5 11 0
do. 4½% Pref.	£1	4½	4½	17/6	—	5 2 10
Midland Counties	£1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	£1	6	7	22/6	—	6 4 5
do. 5% Pref.	£1	5	5	18/9	—	5 6 8
do. 7% Pref.	£1	7	7	24/6	—	5 14 3
Notting Hill 6% Pref.	£10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	£1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	£5	17½	17½	15½	—	5 14 8
South London	£1	15	15	2⅝	—	5 17 1
South Metropolitan Pref.	£1	7	7	1½	—	5 12 0
Urban Ordinary	£1	4	4	18/3	—	4 7 8
do. 6% Pref.	£1	6	6	18/9	—	6 8 1
Westminster Ordinary	£1	15	15	45/6	+6d.	6 11 10
Whitehall Elec. Invst. 7½% Pref.	£1	7½	7½	1	—	7 10 0
Yorkshire Elec.	£1	8	8	30/6	−6d.	5 5 0

Home Rails.

Central London Ord. Assented Stock	£4	4	4	67	—	5 19 5
Metropolitan	£4	5	5	69	−1	7 5 0
do. District	£8½	8½	8½	47	−½	7 9 4
Underground Electric Ordinary	10	Nil	Nil	2¼	—	Nil
do. do. "A"	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds	6	6	6	98	—	*6 2 5

Telegraphs and Telephones.

Anglo-Am. Tel. Pref. Stock	6	6	6	108	—	5 16 6
do. Def.	£1½	1½	1½	24⅞	—	6 0 8
Automatic Telephone	£1	3	6	51/3	−1/6	2 6 10
Chili Telephone	£5	6	5	6⅞	—	*4 7 0
Cuba Sub. Ord.	£10	5	5	6⅝	—	7 8 2
Eastern Extension	£10	10	10	18	—	*5 9 7
Eastern Tel. Ord. Stock	10	10	10	177½	—	*5 12 8
Globe Tel. and T. Ord.	£10	10	10	18½	+¼	*5 8 1
do. do. Pref.	£10	6	6	11	—	5 8 4
Great Northern Tel.	£10	22	22	34	−½	6 8 6
Indo-European	£25	7	8½	45½	—	*4 13 5
Marconi	£1	10	10	1⅜	—	9 17 10
Marconi Marine	£1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord.	£1	12	12	42/6	—	*5 12 11
United R. Plate Tel.	£5	8	8	7 11/16	+3/16	5 4 1
Western Telegraph	£10	10	10	17⅝ xd	+⅛	*5 12 6

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref.	£5	5½	5½	8½	—	7 17 2
do. do. 2nd Pref.	£5	6	6	8⅞	—	8 14 6
do. do. 5% Deb. Stock	£5	5	5	73½	−¼	6 16 3
British Electric Traction Ord.	£1	6	6	120	—	5 0 0
do. do. 6% Pref.	£1	6	6	105	—	5 14 3
Brazil Traction	£100	4	4	85	+7	4 14 2
Brit. Columbia Elec. Rly. Pce. Stock	£5	5	5	85½	−4½	5 17 0
do. do. Preferred	£1	96/-	96/-	96½	−1	*4 19 5
do. do. Deferred	£1	129/5	129/5	115½	—	*5 12 7
do. do. Deb.	£1	4¼	4¼	76	−1½	5 11 10
Lond. & Sub. Trac. 5% Pref.	£1	2½	Nil	4/-	−6d.	Nil
London United Tram. Deb. Stock	£4	4	4	42½	—	9 8 4
Mexico Trams. 5% Bonds	£—	£5	£5	62½	−1	8 0 0
Mexican Light Common	£100	Nil	Nil	31½	—	Nil
do. Pref.	£100	Nil	Nil	61½	—	Nil
do. 1st Bonds	£—	£5	£5	72	—	6 18 11
Yorkshire (West Riding)	£1	£5	—	18/9	—	5 6 8

Manufacturing Companies.

Babcock & Wilcox	£1	12	12	51/3	—	*4 13 4
British Aluminium Ord.	£1	£5	10	38	—	5 5 3
British Elec. Transformer Pref.	£1	Nil	7	1	—	
British Insulated Ord.	£1	15	15	2¾xr	—	5 9 1
Brush Ord.	£1	10	10	26/3	—	7 12 4
Callenders	£1	15	15	3¼	−1/16	4 12 4
do. 6½% Pref.	£1	6½	6½	23/9	—	5 9 5
Crompton Ord.	£1	Nil	Nil	15/-	+3/16	
Edison-Swan	4/-	10	10	9/-	+3d.	4 9 0
do. 5% Deb. Stock	£5	£5	£5	84	—	5 19 1
Electric Construction	£1	10	10	32/6	−1/16	6 3 0
Enfield Cable, Pref.	£1	7½	7½	1½	—	6 0 0
English Electric	£1	£5	£5	19/3	−6d.	5 4 0
do. do. Pref.	£1	£6	£6	21/-	—	5 14 3
Gen. Elec. Pref.	£1	6½	6½	23/6 xd	−6d.	5 10 8
do. Ord.	£1	£5	7½	27/6	-1/-	5 9 1
Henley	£1	15	16	3½	—	4 11 5
do. 4½% Pref.	£5	4½	4½	4½	—	5 6 0
India-Rubber	£1	£5	£5	1 3/16	−1/16	*4 14 1
Johnson & Phillips	£1	10	10	54/6	—	3 13 7
Met-Vickers, Ord.	£1	8	8	27/6	—	5 16 5
do. Pref.	£2	8	8	28	—	6 14 9
Siemens Ord.	£1	—	7½	32/-	−1/9	4 13 9
Telegraph Construction	£12	20	20	27	+½	4 9 0

*Dividends paid free of Income Tax.

Electric Vehicles in France.

Some Particulars of the Renault Sight-seeing Cars.

DURING the past few years, as a result of the activities of the Société pour le Developpement des Véhicules Electriques and as an outcome of the annual trials which are being held, there has been a marked increase both in the construction and use of industrial electric vehicles in France. A firm which has hitherto been chiefly associated with petrol vehicles, but which is, in conjunction with the Société Alsacienne de Constructions Mécaniques, of Belfort, which is responsible for the electrical equipment now turning out electric trucks, 'buses, and sight-seeing vehicles is Renault Frères, of Billancourt, Paris. A number of the last-named cars have been employed during the past few months in conveying visitors round the Decorative Arts Exhibition in the French capital in the same way as the Railodok cars were used at Wembley.

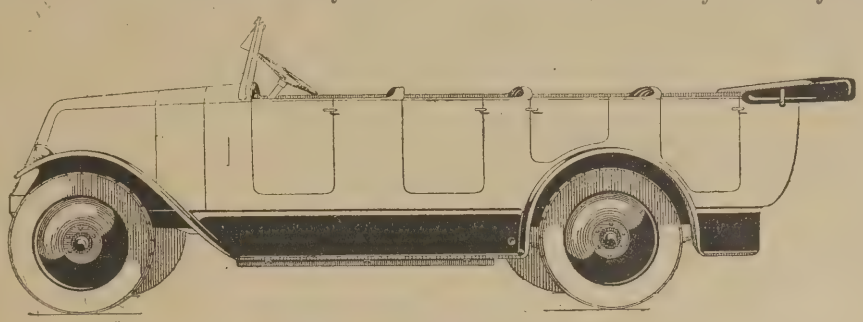


Fig. 1.—Renault Electric Car.

The vehicles are designed to carry eleven passengers, in addition to the driver, the body, which has doors only on one side, comprising four rows of seats. The chassis frame is rectangular in shape and perfectly straight both in elevation and plan, and is supported on semi-elliptical springs at both the front and rear. The electric motor, which is located just forward of the centre of the chassis below the driver's seat, is of the four-pole self-exciting type, with auxiliary commutating poles. It normally develops 5 h.p. at speeds ranging between 750 and 3,350 r.p.m., and is connected with the rear axle through a flexible coupling, enclosed propeller shaft, bevel and reduction spur gearing. The motive power is supplied by a battery of 40 lead accumulator cells arranged in two boxes containing 20 cells each and carried along the sides of the vehicle. The capacity is 210-230 amp.-hours at the 5-hour discharge rate, enabling the vehicle to cover a distance of about 56 miles on one charge. The battery boxes are secured in such a way that they can be detached and carried away on a special trolley for replacement purposes, or the cells can be charged *in situ*.

The electric control gear is readily accessible, being located under a standard Renault bonnet, and comprises an automatic cut-out which breaks the main circuit in case of overload; a lever giving neutral, forward, and reverse speed positions; a set of starting resistances; a field rheostat acting on the shunt winding, and enabling the speed of the vehicle to be varied between $3\frac{3}{4}$ and $18\frac{3}{4}$ m.p.h.; a battery-charging connection, and a lamp which warns the driver when the load on the battery exceeds a predetermined value. The vehicle is driven exactly as is a petrol car, the driver having at his command a starting pedal, a pedal accelerator, and foot- and hand-operated brakes. The foot brake acts on all four road wheels, whereas the hand lever acts only on the rear wheels. Interlocks are provided so that as the hand brake is applied, the battery-motor circuit is broken.

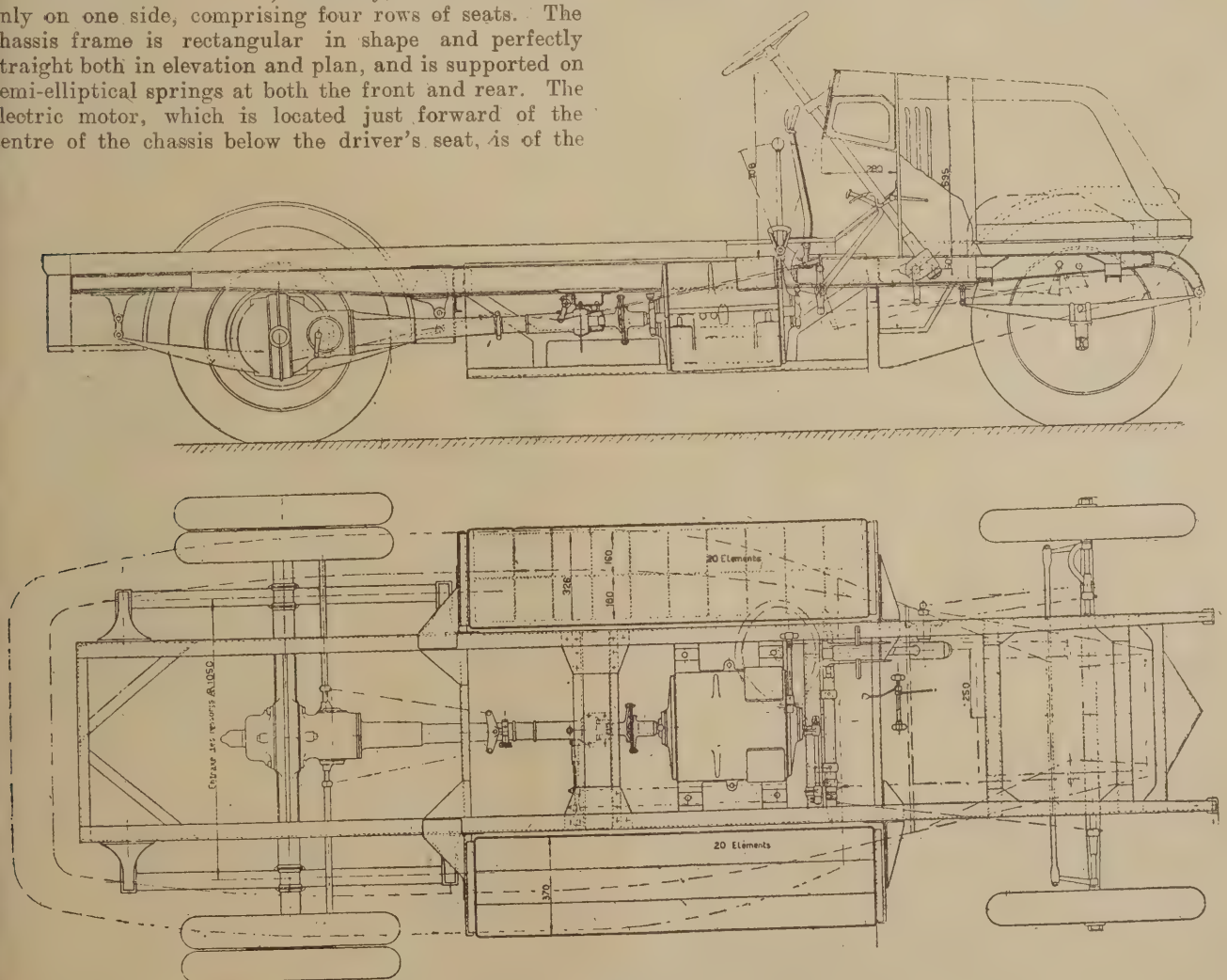
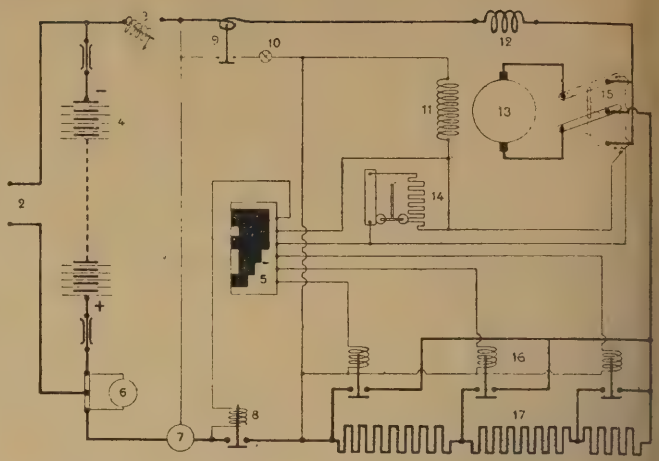


Fig. 2.—Elevation and Plan of Chassis of the Battery-propelled Charabanc.

The road wheels are of the disk type, shod with 820 by 120 mm. pneumatic tires, twins being fitted at the rear. The weight of the chassis is given as two tons, and that of the battery as between 16 and 18 cwt. Including the body, the vehicle is designed to carry a total load of about a ton. It may be added that the steering gear is mounted on the left side of the vehicle, and that the wheelbase is 10 ft. 6 in., with a track width of 4 ft. 9 in.

In view of the improvements that have been made in the manufacture and operation of storage batteries in recent years, and the experience that has been gained with public service vehicles at Wembley and at the Paris Exhibition, it is somewhat surprising that so few electric battery vehicles are employed for passenger transport. The fact that some of the pre-war experiments in this direction had unfortunate results should not prove a bar to further trials; the difficulties met with in the early days of the petrol-driven motor-car were triumphantly overcome, and the success of the commercial battery vehicle suggests that a good case might be made out for the passenger car, which for convenience, reliability, and ease of control is without a rival.



(2) Charging plug connection.
(3) Main switch.
(4) Battery.
(5) Coupling unit.
(7) Amp. and voltmeter.
(8) Main contact maker.
(9) Main relay.
(10) Indicating lamp.
(11) Shunt excitation.
(12) Series excitation.
(13) Motor.
(14) Speed-increasing rheostat.
(15) Reversing switch.
(16) Starting contact.
(17) Starting resistance.

Fig. 3.—Diagram of Connections.

The Shipping and Engineering Exhibition.

A Review of the Principal Exhibits of Electrical Interest.

(*Concluded from page 931.*)

Echo Depth Sounders.

An "earth inductor" compass was an interesting item on the stand of Henry Hughes & Son, Ltd., who also exhibited sonic echo depth-sounding apparatus, which can now be used by the merchant service under British Admiralty licence. The system (Mr. F. E. Smith, F.R.S.) depends on the indirect measurement of the time interval between the production of a sound wave under water and its reflection from the sea bed. The source of sound is a steel diaphragm fixed to the hull of the ship that is set in vibration by a spring hammer, which is withdrawn from the diaphragm by a solenoid, the circuit of the latter being broken automatically every half second. The note emitted has a frequency of 1,250 per second, and when immersed in water the diaphragm is heavily damped, so that the energy communicated to it by the hammer is quickly transferred to the water. The receiving hydrophone is a simple microphone enclosed in rubber and immersed in the water; it is comparatively aperiodic, and in the vessel a $\frac{1}{8}$-h.p. electric motor, running at 1,800 r.p.m. (fig. 12) drives two switches through 10 to 1 reduction gear. Constancy of speed within 1 per cent. is obtained in spite of large variations in the supply voltage by a special centrifugal friction governor. One of the switches, which consists of a pair of brushes in contact with a rotating disk provided with an insulated segment breaks the 100-volt d.c. supply to the transmitter every third of a second for a period of about 0.0025 second. The other switch, running on the same shaft as this disk, short circuits the telephones in the receiving circuit, except as determined by the position (relative to the corresponding pair of brushes) of a second insulating segment. When, therefore, the apparatus is running no sound will be heard in the telephones unless the insulating segment in the telephone switch happens to open the telephone circuit at the instant when the transmitter is actuated, or at the instant when the echo returns from the bottom of the sea. By a simple mechanism the position of the brushes in the telephone circuit can be displaced by hand relative to the corresponding pair of brushes in the impulse circuit, so that an interval of time, proportional to the angular displacement of the brushes, intervenes between the emission of an impulse by the transmitter, and the opening of the telephone circuit. If a sound is heard in the telephone, the angular displacement of the brushes gives a measure, in terms of the known speed of rotation of the switch, of the time taken by the sound to travel from the transmitter to the receiver—a distance which is approximately double the depth of water, depth being read directly on a dial.

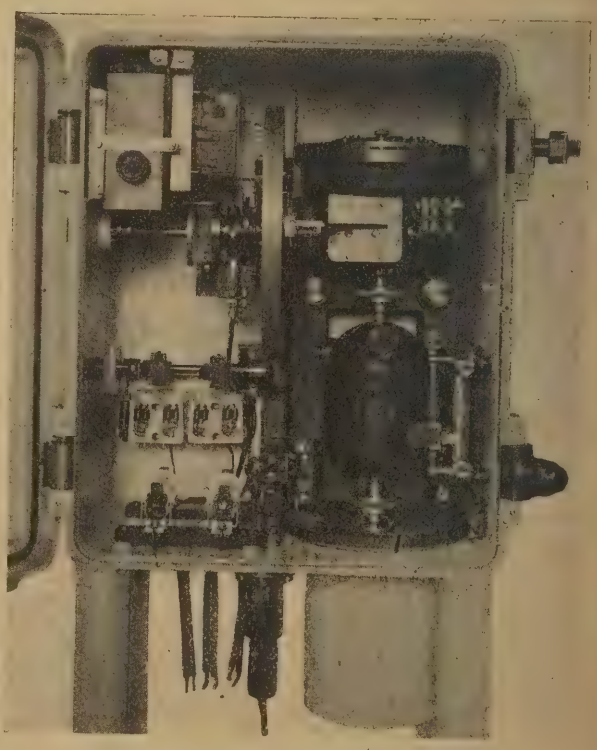


Fig. 12.—Depth Sounder Recording Mechanism.

Another depth sounder (Herr Behm, Germany) was shown by Kelvin, Bottomley & Bird, Ltd. The outfit comprises a time-interval recorder capable of measuring to a 1,000th part of a second; a small cartridge is discharged into the water, which detonates a few feet below the surface, setting up a sound-wave that jogs a "starting" microphone sufficiently to release the recorder.

The sound-wave eventually reaches a second microphone, after reflection at the sea bottom. The effect on the echo-receiving microphone is to stop the recorder, the time-interval being so short that the pointer appears to spring from the zero position on the scale to that indicating the true depth instantaneously. As a rule, the starting and the echo-receiving-microphones are on opposite sides of the ship, but when the ship's hull does not form a sufficient screen to enable the receiving microphone to be protected from the direct action of the detonating cartridge, the recorder is provided with a relay which interrupts the circuit long enough to allow the sound-wave which would have reached it by the shorter path to die away. The receivers are fixed internally hard up against the ship's plating, but without the necessity of drilling the hull. The cartridge is discharged into the sea electrically from the deck rail. Such instruments as electric engine-room telegraphs; loud-speaking telephones; helm, look-out, and navigation lights indicators were displayed by Siemens Bros. and Co., Ltd., and luminous signalling systems by the Sunderland Forge & Engineering Co., Ltd.

Engine Room Auxiliaries.

As representing engine-room and boiler accessories the collection of electrical CO_2 and CO recorders, draught and pressure gauges, thermometers and automatic temperature regulators, &c., exhibited by the Cambridge Instrument Co., Ltd., may be instanced. Water, steam, gas meters and recorders were seen on the stand of Geo. Kent Ltd., and the Electroflo Meters Co., Ltd. A double suspension furnace arch spanning two Bennis chain-grate stokers was shown by Liptak Furnace Arches, Ltd., as well as an interlocking air-cooled pulverised-fuel combustion chamber wall, while Edward Bennis and Co., Ltd., exhibited a graded forced-draught cellular chain-grate stoker complete; unlike usual practice, the electric fan furnishes air at comparatively high pressure to a Veni contractor, in which is induced a larger amount of air at a lower pressure. Steam air ejectors and condensate pumps were on the stand of John Musgrave and Sons, Ltd.; coal meters and water recorders were exhibited by the Lea Recorder Co., Ltd., economisers and accessories by E. Green & Son, Ltd., and boiler-house plant by Babcock & Wilcox, Ltd.

Boiler appliances featured by James Gordon & Co., Ltd., included an electrical water-level indicator and alarm which does not need the installation of apparatus inside the boiler drum, being operated by a thermostat such as is used with a Copes feed-water regulator.

Quantameters, Ltd., showed a form of water-level indicator that was brought out by the Aster Engineering Co. about a year ago. The device has no internal friction, depending on the choking effect of an alternating-current coil on a copper float that rests on a mercury bath which is balanced against the head of the liquid, the level of which is to be indicated. The indication is given at any distance by a voltmeter calibrated in feet, and it will be realised that the instrument measures quantity and not merely height, whilst its action being dependent on hydrostatic pressure, changes in specific gravity caused by variations in temperature do not influence its readings. The principle of this interesting gauge is applicable in a variety of ways.

Electric Trucks and Batteries.

Battery-driven trucks are, of course, much used in docks and warehouses, and they were represented on six stands, namely, those of G. D. Peters & Co., Ltd., R. E. Seal, Ransomes, Sims & Jefferies, Ltd., H. C. Slingsby, British Electric Vehicles, Ltd., and Joseph Booth and Bros., Ltd. Three stands were devoted to electric accumulators of the Chloride, Edison, and "Nife" makes.

Miscellaneous Exhibits.

Under this heading something like two dozen stands could be included; for instance, the Artofex Engineering Works, Ltd., included in its exhibits electric dough-mixing machines and cake mixers, and baking ovens of the sectional type. The Hotpoint Electric Appliance Co., Ltd., also had a range of electric heating and cooking devices, and vacuum cleaners were demonstrated by Electrolux, Ltd.

C. A. Vandervell & Co., Ltd., showed cabin lighting, engine starting, and ignition apparatus for small cabin cruisers and fast craft, starters for engines up to 250 h.p. being exhibited with suitable batteries, together with an automatic lifeboat safety lighting system, projectors, and electrical accessory fittings. Magnetos and engine starters were also shown by Simms Motor Units (1920), Ltd. W. G. Walker & Co. showed fan-brake dynamometers for testing motors, ventilating fans, and coil windings. Electric clocks and wind vanes, &c., were on the Magneta Time Co.'s stand, and photo-printing apparatus was shown by J. Holden & Co., Ltd., and also the Precision Photo Printing Plant Co. M. W. Woods exhibited fans, motors, rotary converters, and rectifiers, and Isenthal & Co., Ltd., control gear. The London Electric Wire Co. & Smiths, Ltd., needs no introduction; "Hollerith" electrical tabulating and sorting machines are products of the British Tabulating Machine Co. The display of the West Insulating Co. is indicated by its name, and electric furnaces were on view on the stands of Rustless Surf-Alloy, Ltd. (whose process consists of rustproofing iron and steel by alloying the surface with zinc), and of Automatic & Electric Furnaces, Ltd. (Wild-Barfield).

An All-Electric House.

Detailed Particulars of a 10-Room Glasgow Dwelling.

By Prof. S. PARKER SMITH, D.Sc., M.I.E.E.

(Abstract of Paper read before the INSTITUTION OF ELECTRICAL ENGINEERS.)

(Concluded from page 952.)

Hot Water.—It is possible to use small tanks or geysers in different parts of the house and so avoid all pipe losses, but an adverse critic might regard such a method as a makeshift. The arrangement in the present case is really due to Mr. R. B. Mitchell, who emphasised the desirability of developing new forms of night load. No better occasion offers itself for this purpose than heat storage in water. It was therefore decided to take energy for heating water between 11 p.m. and 7 a.m. Since the consumer's share of the capital charges is included in the two-part tariff, running charges will form practically the entire cost. The average running charges at Dalmarnock station are of the order of 0.25d. per kWh and the charge of 0.375d. per kWh proposed by Mr. Mitchell for domestic hot-water storage during night hours should therefore become popular. In order to make the experiment successful, however, it was necessary to obtain a well-lagged tank, which proved to be a difficult task. The author co-operated with Mr. Duncan Low, of Messrs. Arch. Low and Sons, of Glasgow, and tests were made with different forms of lagging until it was found that with a suitable application of cork the fall in temperature of the water was less than 1 deg. F. per hour. Further, it was found that by proper design the amount of mixing of the incoming cold water with the hot water in the tank could be made negligible. The tank, fed from the cistern, has a cubical capacity of 87 gallons, and supplies the bath and hand-basin in the bathroom, the maid's room, pantry, cloakroom, and three points in the kitchen. Near the bottom of the tank there are immersion heaters rated for 4 kW, 2 kW, and 1 kW. Near the top of the tank there is an emergency immersion heater rated at 2 kW, which auxiliary heater has proved to be very serviceable when the demand for hot water has been exceptional and the temperature has fallen too low for domestic purposes. For instance, it will heat up sufficient water for a 35- to 40-gallon warm bath in 30 to 60 minutes, according to the water temperature when switching on.

The tank thermometer is calibrated "high," "medium,"

and "low," to indicate in which position the switch has to be placed in the evening; in winter it is mostly necessary to place the switch at night in the "medium" position; in summer it is occasionally possible to switch on to "low." As a rule the tank is switched on about 10.30 p.m. and off at 7.30 a.m.—which partly accounts for the "hot-water" load curve being higher than the night load curve in fig. 4. Under the above conditions, the temperature of the water on switching off is usually in the neighbourhood of 140 deg. F., seldom as low as 120 deg. F., or higher than 160 deg. F. In addition to the house service throughout the day, there is sufficient water for two hot baths per day. The tank is placed in the bathroom, so that any heat loss is useful in warming this room; as a result it is seldom necessary to close the window or use a fire. To heat the water to, say, 180 deg. F., and install a smaller tank would be feasible and cheapen the first cost, but the losses from the tank and the pipes are much less at the lower temperature. Experience shows that it is more economical to supply water to the kitchen at the lower than at the higher temperature. Moreover, the possibility of working at the higher temperature in case of need gives the tank a good overload capacity.

Since the tank was installed no trouble whatsoever has been experienced and there has at all times been an ample supply of hot water—equal to some 12 to 15 gallons per person per day. Without asserting that the above method is the cheapest for obtaining hot water, Table 3 will show that the cost is reasonable, and by means of a thermostat it is simple to arrange automatic heat control for such a tank. The Clyde Valley Power Co. is prepared to sell energy at ½d. per kWh for domestic water-heating during night hours; it is possible that this charge may be reduced to ⅜d. per unit. The Corporation of Greenock is offering energy for the same service at ¼d. per kWh to all classes of domestic consumers. Supply authorities might also consider the desirability of hiring out storage tanks to consumers.

Ventilation.—Fresh air is drawn into the rooms through air bricks behind the fires in the recesses, and the amount of air can be regulated in a simple manner. The outlet for the vitiated air is a wooden grid let into the frieze and communicating with the flue in the external chimney breast. This arrangement has proved to be satisfactory, and the rooms do not get stuffy when the windows are closed. To supply rooms with filtered air would entail the use of a fan, filter, and ducts and the air could, if necessary, be slightly warmed by passing it through a convector before it leaves the outlet channel. Provision has been made for the possibility of forced ventilation, but the full details have not yet been worked out, as the need has not arisen.

Heating.—The author discarded the method of living in heated air as being inferior to radiant heat for the home. The human body appreciates heat rays, whether from the sun or from a glowing fire. Moreover, radiant heat is more pleasant in a cool than in a warm atmosphere. The electric fire renders it possible to obtain radiant heat in rooms with cool air, while owing to the portability of such fires the heat can be directed just where it is needed. Naturally, after a time the air becomes heated by the warmed objects in the room, &c., but the room can be kept cool by adequate ventilation. Experience shows that with ample radiant heat an air temperature of from 50 to 55 deg. F. is very comfortable, whereas with warmed air from 62 to 65 deg. F. is desirable.

To obtain the best results from electric fires, care must be used to have the heat where it is needed. In cold weather it is much better to have two, or even three, small fires suitably distributed in a room than one large fire. No difficulty or inconvenience of any kind has been experienced. The coal fire is not missed, while the ease with which the heat can be distributed and controlled is an advantage that would not be readily sacrificed when once enjoyed. The radiator load in the home, though large, reaches its maximum in the evening, and thus occurs after the afternoon peaks during the winter; consequently the domestic heating load is not troublesome to the power station.

Running Costs.—There are many features in an all-electric house, the value of which it is hard to appraise. Tables 1, 2 and 3 set forth the consumption and cost for the 10-roomed house for one complete year. The small discrepancies between Tables 1 and 3 are to be accounted for by meter inaccuracies. The analysis in Table 3 is based on a total day consumption cost of £33 19s. 2d. divided in proportion to the day meter readings in Table 2. The curves in fig. 4 represent the weekly consumptions of these items.

Conclusions.—A true and fair comparison can scarcely be made unless corresponding costs are available for similar services obtained from coal, gas, and electricity in some combination or other. Unfortunately, not many householders keep sufficient data to check their annual expenditure. In the author's case (total cost of 16,584 kWh used in one year was £43 8s.) the all-electric house in Glasgow cost practically the same as a somewhat smaller house in Wimbledon in which coal, gas, and electricity together cost £42 and £45 in two successive years. Here, however, much less hot water was obtained. In a slightly larger house in Helensburgh, using coal and gas, the cost was somewhat higher, varying from £58 to £44. Roughly speaking, the author would say that with energy at about one penny per kWh and a low tariff for water heating there would seem to be very little difference between the cost of an all-electric house and the same house using coal, gas and electricity. Consequently, on the score of running cost, even when the manifold advantages of electricity are entirely ignored, the objection to the all-electric house herein described cannot be sustained.

Table 1.

All-electric House (10 Rooms).

Energy cost for 52 weeks (4 quarters); six persons in house, excluding guests.

	£ s. d.
Main 2-rate meter:	
Fixed charge	12 10 0
Day load—10,299 kWh, at 0.5d.	21 9 2
Night load—6,043 kWh, at 0.375d.	9 8 10
Total cost for year	43 8 0
Average cost per week	16 8
Average cost per day	2 4½
Average cost per day per person	4½
Average cost per kWh—*day consumption* ...	0.791d.
Average cost per kWh—*total consumption* ...	0.637d.

Table 2.

Analysis of Consumption in kWh.

Separate meters.	Total kWh.	Weekly kWh.	Average Daily kWh.	Per day per person kWh.
Heating ...	5,954	114	16	2.74
Hot water ...	1,242 (day)	140	20	3.33
	6,043 (night)			
Cooking ...	2,777	53	7.5	1.27
Lighting ...	568	11	1.5	0.26
Total ...	16,584	318	45	7.60

Table 3.

Analysis of Cost.

Separate meters.	Total. £ s. d.	Weekly. s. d.	Average Daily. s. d.	Per day per person. d.
Heating ...	19 3 7½	7 4½	1 0½	2
Hot water	4 0 0 (day)	5 2	9	1½
	9 8 10 (night)			
Cooking	8 18 11½	3 5	6	1
Lighting	1 16 7	8½	1	¼
Total ...	£43 8 0	16 8	2 4½	4½

Regarding load factor, the hot-water and cooking loads are practically constant throughout the year and together form some 60 per cent. of the total energy consumption. Moreover, a part of the constant load, representing 36 per cent. of the total load, is taken at night-time. It is also interesting to see how unimportant lighting becomes, both as a load and as a source of revenue, when all services are worked electrically. Thus the all-electric house in question has an aggregate consumption of about 30 times the lighting consumption, practically without increase of station plant. An example of the daily load curve is shown in fig. 5 and represents the demand on a day when room-heating was practically restricted to the evening hours.

As regards reliability, the service has not once failed. Upkeep should not be a serious item when cookers and fires can be hired and are kept in order by the supply undertaking. Minor faults causing varying degrees of annoyance occur in electrical appliances, owing to faulty design or inspection in manufacture. Probably the weakest part of the installation is the flexible cord between the plug and the appliance.

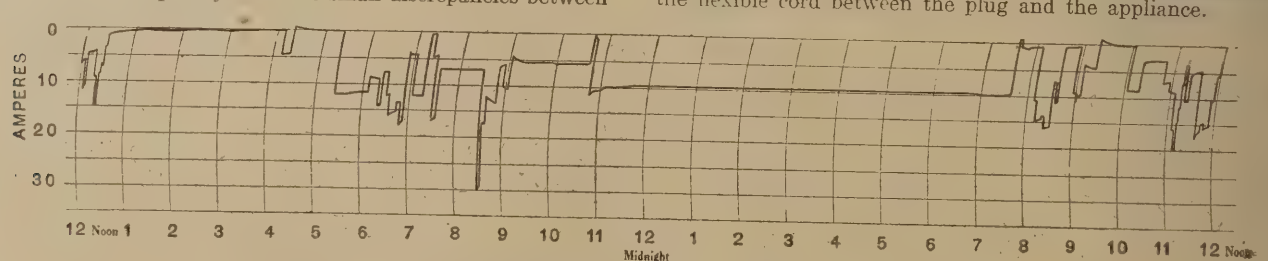


Fig. 5.—Load Curve for Monday, Aug. 25, 1925; Average Current = 6.74 Amperes.

Dalmarnock generating station uses about 1.8 lb. of coal per kWh generated. Assuming that a kWh delivered at the house needs 2.24 lb. of coal, then 1,000 kWh require one ton. Consequently, between 16 and 17 tons of coal would be needed at Dalmarnock annually to supply the services of the above all-electric house. This amount of house coal—assuming that all services could be obtained from raw coal on the premises—would cost, say, £33, while the coal used at the station would cost less than half this amount. For the coal industry it is probably better to increase the demand for station coal rather

than for house coal, while the householder will readily forgo the handling.

The drop in cooking consumption seen in fig. 4 is mainly due to the use of lighter grids. It is hoped that the present experiments will lead to further improvements in this direction. Speed and indestructibility are the ideals to aim at in the design of boiling-plates. The merits of separate utensils with built-in elements also deserve closer study. The cost of installation seems now to be receiving the sympathetic attention of supply undertakings, and the absence of coal fires in a house like the one just described may make it possible to dispense with one domestic servant and thereby not only more than repay the total cost of the electrical energy, but also lighten the domestic labour problem. Equally, the improved health of the community, by eliminating smoke, is an inestimable benefit.

Appendix.—For comparison, the following figures for a flat (three rooms and kitchen) in the west end of Glasgow are added by Mr. B. Hague, M.Sc., A.M.I.E.E. They are based on the same two-part tariff as the author's, and refer to the past year's all-electric working. The flat is at the top of the building, so that the carrying up of coal and removal of ashes presented a real problem; satisfactory ventilation can be obtained from the now unused fireplaces, combined with the judicious use of opened windows; the fires are *not* placed in the fire recesses, but are set out in the room where most required.

TABLE 4.

All-electric Flat (4 Rooms).

Energy cost for year; total consumption, 4,656 kWh.	
Cost of energy at ½d. per kWh	2,328d.
Fixed charge of £5.2	1,248d.
	3,576d.
	£ s. d.
Total cost of energy	14 18 0
Average cost per week	5 9
Average cost per day	10
Average cost per day per person	
Average cost of energy per kWh	0.768d.

The cost of hiring the cooker and two fires was £2.

The installation provided for a household of two persons (not counting guests and occasional labour), lighting, cooking of meals, hot water for domestic services and baths, heating of rooms (inclusive of occasional heating of bathroom and bedroom) and small auxiliary services. A single meter was provided, and daily readings verify the general conclusions given in the paper, *viz.*:—(1) Lighting is a small factor; (2) cooking is a fairly steady load; (3) heating is the cause of the greatest consumption and fluctuates greatly in response to seasonal variations of temperature. The energy cost is given in Table 4.

One figure, often quoted in statistics of this nature, requires comment, namely, the cost of energy per person per day. This figure, in itself, is a misleading criterion of the working of any scheme unless it is accompanied by a statement to show what services are rendered for the price. If the present household were increased to three, in none of the services would the consumption increase in proportion to the larger number of persons. Hence the cost per head per day would fall roughly to perhaps three-quarters of the preceding figure for the same domestic facilities. Thus the cost per day is a truer criterion than the cost per day per person (which is borne out by comparison between Tables 1 and 4).

As a further comparison, it may be mentioned that a Glasgow bungalow with three persons using coal, gas, and electricity, cost £15 15s. per annum, ignoring the smaller items, such as firewood, matches, &c.

Electrical Imports of British Malaya.

BELOW are given the values during 1924 of the imports of electrical and allied material into the Straits Settlements and the Federated Malay States. No strict comparison can be made with previous years owing to an alteration in the classification. It may be stated, however, that whereas in 1923 the total value of the imports of electrical machinery was given as $1,830,000, the totals of the four last items in the following table amount to only $995,000.

	Straits Settlements.	Federated Malay States.
Wire and cable, insulated.—	$	$
Total	946,000	83,000
From United Kingdom	937,000	80,000
,, Japan	1,000	—
,, United States	6,000	3,000
Telegraph and telephone instruments and apparatus.—		
Total	160,000	124,000
From United Kingdom	142,000	124,000
,, United States	9,000	—
,, Sweden	1,000	—
Electric lamps and parts.—		
Total	144,000	12,000
From United Kingdom	62,000	4,000
,, Germany	21,000	—
,, Italy	15,000	—
,, Holland	19,000	8,000
Electric glow lamps.—	$	$
Total	13,000	600
From Holland	8,000	—
,, France	—	600
Electric arc lamps.—		
Total (mainly from U.K.) ...	6,000	—
Batteries and accumulators.—		
Total	95,000	9,000
From United Kingdom	41,000	4,000
,, Japan	9,000	—
,, United States	42,000	4,000
Electric lighting accessories and fittings.—		
Total	109,000	21,000
From United Kingdom	73,000	18,000
,, Germany	6,000	100
,, Holland	4,000	3,000
,, Japan	11,000	—
,, United States	11,000	50
Electrical goods and apparatus (not machinery) not elsewhere mentioned.—		
Total	510,000	48,000
From United Kingdom	397,000	45,000
,, Italy	32,000	1,000
,, Sweden	12,000	—
,, Japan	13,000	—
,, United States	32,000	2,000
Electric generators.—		
Total	79,000	23,000
From United Kingdom	63,000	23,000
,, France	4,000	—
,, United States	7,000	—
Motors.—		
Total	533,000	33,000
From United Kingdom	246,000	29,000
,, France	17,000	—
,, Germany	22,000	—
,, Holland	9,000	—
,, United States	234,000	4,000
Ignition magnetos.—		
Total	36,000	4,000
From United Kingdom	6,000	500
,, France	5,000	—
,, Germany	17,000	—
,, Italy	4,000	—
,, United States	3,000	3,000
Other electrical machinery.—		
Total	249,000	38,000
From United Kingdom	224,000	37,000
,, Belgium	3,000	—
,, France	4,000	1,000
,, Italy	3,000	—
,, Holland	4,000	—
,, United States	2,000	—

Indian Electrical Imports.

(From Our Indian Correspondent.)

THE total imports into India of electrical machinery, instruments and apparatus during the six months from April to September of 1925 amounted in value to Rs. 209 lakhs as against Rs. 188 lakhs in the corresponding period of last year. Out of this, machinery was responsible for Rs. 96 lakhs as against Rs. 98 lakhs in 1924, and instruments and apparatus were valued at Rs. 113 lakhs as against 89 lakhs. There would therefore appears to have been a slight decline in the case of machinery and a satisfactory increase in the case of instruments and apparatus. Quantitatively there does not appear to have been any decline in machinery imports as prices were rather lower during the period. The imports of the various classes of electrical machinery were as follows:—

	1924. April-Sept. Rs. lakhs.	1925. April-Sept. Rs. lakhs.
Control or switchgear	16½	18½
Generators, dynamos, &c.	17	16
Motors	20	17
Transformers	5½	6¾
Turbo-generating sets	2	3¾
Other machinery	37	34

Out of the Rs. 96 lakhs worth of machinery, the United Kingdom's share was Rs. 76 lakhs. This was a considerable decline from the corresponding period of 1924, when the imports from the United Kingdom amounted to Rs. 85 lakhs. Imports from Germany increased from Rs. 2 lakhs to Rs. 5½ lakhs and those from the United States of America from 6 lakhs to 7½ lakhs. The latter country is now making considerable effort to regain the position which she lost during the previous year. Imports from the United States during April to September, 1923, amounted to Rs. 18½ lakhs.

As regards the imports of electrical instruments and apparatus, as already mentioned, there was a satisfactory increase.

The imports of electric fans increased from 12 lakhs to 14 lakhs, wires and cables from 34 to 37½ lakhs, electric lamps from 8½ lakhs to 14 lakhs, accumulators from 4½ lakhs to 5½ lakhs, electric lighting accessories from 8 lakhs to 8½ lakhs, meters from 3 to 3½ lakhs, and batteries from 4 to 5 lakhs. On the other hand, there were slight decreases in switchboards, carbons and unenumerated goods.

In this trade, the United Kingdom increased her share during the period, to 73½ lakhs as against 60½ lakhs in April-September, 1924. Though this appears to be a satisfactory increase it has to be remembered that in the corresponding period of 1923 the imports amounted to 92 lakhs. Other countries also increased their shares, Germany from 11 to 12 lakhs, the Netherlands from 3½ to 5½ lakhs, Italy from 2½ to 3½ lakhs, and the United States from 9 to 12 lakhs.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

There are now on the market several types of apparatus which, it is claimed, enables any make of radio-telephone receiving apparatus to be operated from the domestic electricity supply mains, the set being switched on and off very much like a lamp or radiator. The idea is to provide a device that will enable the user to dispense with batteries and accumulators and, at the same time, minimise the generator hum which is frequently heard when operating off the town's supply mains.

The "Chargeless Supplier."

An outfit of the above-mentioned kind is marketed by MESSRS. ATTAIX, LTD.; for a.c. service it consists of a perforated-metal box on top of which is a tumbler switch and three pairs of leads: two of them are used to furnish the h.p. and l.p. currents to the receiver, whilst the third is plugged into a lampholder or wall plug; the special cover of the combined plug-adaptor protects the user against shock and short-circuit. Two rectifying valves are locked in the box, so that access to them cannot be gained unnecessarily, but no rheostat is needed as the box also contains a special resistance lamp that automatically takes any excess load, and also any increase in the voltage of the mains

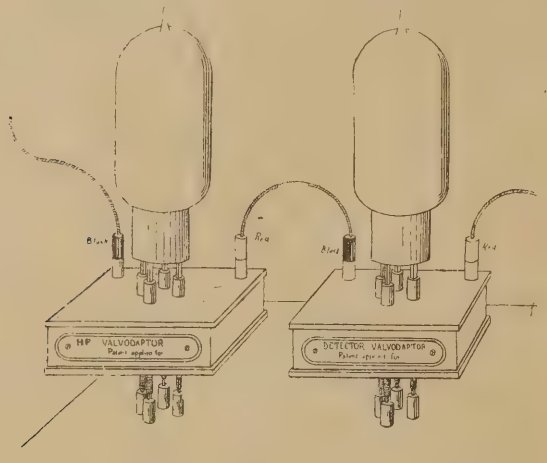


Fig. 1.—"Valvodaptors."

up to 30 per cent., so that the rectifier is operated simply by the above-mentioned tumbler switch, and suffices for from one to six valves. It should, however, be noted that only dull-emitter 0.60-A valves should be used. The h.p. current is delivered at from 70 to 90 volts and the l.p. is between 3.5 and 4 V. When operating off a.c. supply mains "valvodaptors," illustrated in fig. 1, are essential in most cases; they are made to fit the valve holders of any make of receiver set and in three patterns according to position, namely, h.f., detector, and l.f., their function being to connect all the valves in series. The d.c. "chargeless" outfit is similar, but of course no rectifiers or valvodaptors are necessary and a rheostat is used instead of the regulating lamp; the negatives of the h.p. and l.p. should not be coupled. The makers guarantee freedom from generator noises on both a.c. and d.c. circuits at all frequencies between 25 and 100 cycles per second.

"Clix" Twin Plug and Ringtags.

The latest additions to the varied range of accessories produced by MESSRS. AUTOVEYORS, LTD., are twin plugs which can be effectively employed for battery connections, multiphone applications, and wherever the possibility of a short circuit being made by the contact of two independent plugs necessitates dual connections. Ringtags are useful terminators for stranded wire, and particularly so for employment with "Clix." The difficulty experienced by some people in manipulating hollow radio conduit with ordinary pliers has precluded their full use of it for interconnecting components of receiving apparatus, but it should be noted that trouble of this nature can be overcome by the use of round-nosed pliers, which assist the conduit to bend into most shapes.

Another Pendant Loud-speaker.

An improvement on the hanging loud-speaker recently illustrated in these columns is the "Mellovox Pendant" shown in

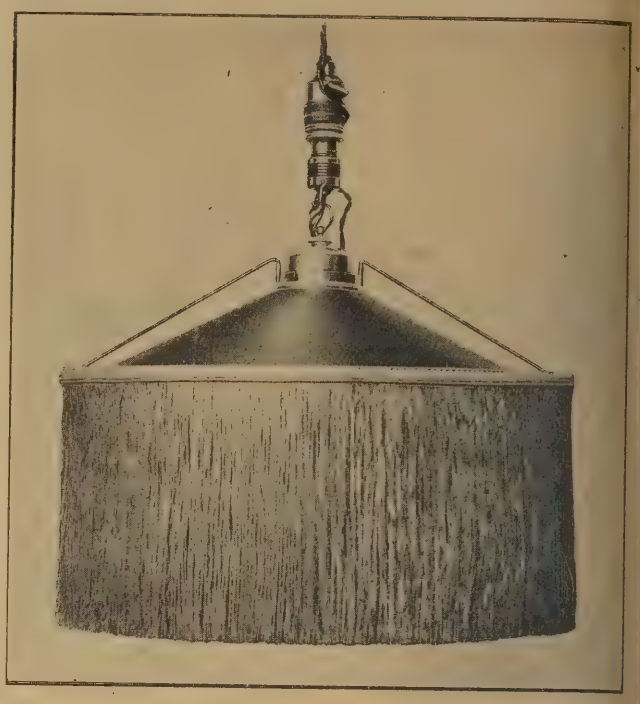


Fig. 2.—New "Mellovox" Pendant Loud-Speaker.

fig. 2, a product of the MARCONIPHONE CO., LTD. This accessory fulfils the functions, not only of a loud speaker, but also of an electric lampholder and shade, and is equipped with a plug which enables one to plug direct into the existing lampholder which is usually suspended from the ceiling. In this method of suspension trailing wires about the floor and tables are eliminated and the artistic shade adds to the decorative effect of the drawing-room.

New "Claritone" Loud-speakers.

Broadcasting having reached that stage at which receiving apparatus is commonplace in most homes, there has arisen a demand for modified forms of construction and styles of finish which will harmonise with the appointments of the rooms in



Figs. 3 and 4.—Plaque and Statuette "Claritone" Loud Speakers.

which receiving sets are commonly used, but the improvision of an attractive and unobtrusive loud speaker is not easy, for by virtue of the fundamental laws of acoustics it is essential that some of the dimensions of sound amplifiers must be fairly large. Enclosing the conventional model in a cabinet and concealing the presence of the horn by a fretted sound-aperture panel in the front is common practice; it, however, entails a larger and more costly cabinet than would otherwise be necessary. Accordingly, two new designs of speaker have been introduced by the Automatic Telephone

Manufacturing Co., Ltd., which differ considerably in external appearance from the two familiar "Claritone" models with the conventional "swan-neck" horn. In one of the new models, fig. 3, the horn has been eliminated and replaced by two bowls, between which there are amplifying passages which function in a similar fashion to an ordinary trumpet. This form of construction lends itself to a much more compact and flattened exterior, resembling an ornamental plaque, which can be hung from a picture rail or strong hook against any convenient wall. Suitably strengthened conductors serve as cords for this purpose and lead to terminals mounted on a moulded insulating medallion which also carries a suspension eyelet; by running the connecting leads in the groove of the picture rail, all trace of wires can be concealed. The statuette model, fig. 4, provides graceful supports for the receiver, sound passages being arranged within the central portion, which provides the length necessary for correct reproduction. In both these new "Claritone" models the original receiver mechanism is retained, together with the lever adjustment for varying the air gap between the diaphragm and magnet poles. The wholesale distributing firm is the Ashley Wireless Telephone Co.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The Salaries of Combustion Engineers.

Your "Shift Engineer" correspondent can rest assured that in the majority of cases there is no belittlement of his status, by raising that of the combustion engineer, for the simple reason that in a considerable number of instances the wireman-cum-switchboard attendant-cum-shift engineer procedure holds good. This being so, it is not surprising that we are confronted with the pertinent query: whence cometh that practical knowledge of boiler-house thermal efficiency in detail, so essential to fuel economy, to justify senior rank being given to the shift charge of the type referred to? The fact remains that the creation of the position of combustion engineer was due to the inefficiency of the majority of shift engineers in matters concerning the efficiency of heat liberation and transfer and not to their inability to devote the necessary time to the efficiency of steam production, as suggested.

The logical deduction is that the man whose training enables him to get an easy grasp of the fundamentals coupled with the study of the main essentials to economical power production should, to say the least, have a higher rating and remuneration than the man who, by virtue of his training and consummate lethargy, tends to become nothing more or less than a rule-of-thumb operator.

W. D. W.

December 10th, 1925.

Regarding "Shift Engineer's" letter on the above subject, I am afraid he has a great deal to learn. It makes one smile when he says that in his opinion every shift engineer worthy of the name is a combustion engineer. Far from it! as is shown by the wretched thermal efficiencies of the power stations of England for the last 12 years, averaging not more than 12 per cent.; boiler-house efficiency about 65 per cent. Combustion is a science, and it needs a specialist to deal with it, not a shift engineer who knows, in most cases, a lot about everything but is master of nothing. Who is "Shift Engineer," by the way, who goes beyond his superior officer who engages the combustion engineer, when he says a combustion engineer is only necessary because he himself has not time to attend to the boiler house? Yet he signs the coal sheet, when he acknowledges he hasn't time to devote himself to the boiler house.

The combustion engineer is not paid as much as the shift engineer for the very reason that England at present is behind the times. The boiler house is still to a large extent looked upon as a necessary evil which one must have but which it is best to ignore, and that is only because we have not yet looked upon combustion as a highly technical science. We are only just beginning to learn that a great saving can be made by burning our coal efficiently. An enormous saving can be and will be made in the production of steam in the future, provided that a specialist is obtained to control the burning of our coal, a specialist on each shift, who will have sole command in the boiler house and be responsible for it during his shift, as in America. I can see that in the future a shift engineer will be in control of the turbine room and control room and his responsibility will cease at the turbine stop valve; from there the combustion engineer will be in command, and the latter will be paid a higher salary for the very reason that it is in his hands to effect an enormous saving due to his being a specialist in efficient combustion. The position of combustion engineers is a fairly new one and so naturally we are placed under the shift engineer; it is because of this that the efficiency of a boiler house has not yet attained the high degree it ought to have done. When the chief engineers place more confidence in us and allow us to run the boiler house under our orders, the efficiency will go up.

A Combustion Engineer.

December 8th, 1925.

Rural Electricity Supply.

I think your readers will agree that, prior to Mr. F. W. Purse's intervention, Mr. S. C. Bartholomew and I were proceeding with our discussion—giving and taking hard blows with mutual good temper—and I understand we were followed by many readers with interest and enjoyment. In the process much useful information was divulged on both sides, and we are all now waiting for the figures which Mr. Bartholomew really ought to produce to justify the refusal to put the Northwich-Middlewich and Winsford local line underground, which caused the Middlewich monstrosity. I submit that, in default of clear proof that no cheaper method was possible, I am entitled to a verdict to the effect that the Post Office proceeds by rule rather than by reason, whereas there is an urgent necessity in the public interest that reason must come before rules. As a subsidy is under official consideration for rural supplies, the public has not only an ultimate interest in seeing that a State monopoly does not hinder other equally important services, but also, as taxpayers, in seeing that the habit of making a fetish of rules does not cause unnecessary expense.

Those undertaking rural distribution will frequently meet with Post Office lines in the areas between towns and in every village street. An attitude like that taken up by the Post Office in the discussions set out in the report of the Electricity Commissioners is a confirmation of the correctness of the remarks I have made as to the self-centred attitude hitherto characteristic of the Post Office. I believe the Government which controls the Post Office, and which also wants rural electricity supply, will help us to secure the active co-operation of the Post Office in giving our service to the rural dweller, even if it involves the sacrilege of recasting some of its rules. We must not omit to let the Government know the real position.

With Post Office reform, coupled with some slight modifications in the regulations and permission to use earth as a return on conditions similar to those for tramways and railways—surely a very modest request—overhead lines can be constructed at sufficiently low cost to avoid any rural development subsidy, except in special cases. We also have to get rid of the delay of from three to six months in obtaining permission to use overhead instead of underground mains, even in areas where nothing but overhead mains would be encouraged by the Commissioners. We shall then be ready to deal with rural areas on a practical basis.

I gather from Mr Purse's questions in his last letter, which answer themselves, that he had not intended to advocate the compulsory application of the 1924 edition of the I.E.E. Rules; that he does not approve of the policy of subsidy, and that he intended his reference to Ontario giving a 50 per cent. subsidy to be a warning and not an example. He now offers to assist me in forwarding rural development, if I will refrain from abuse. I can gladly accept his offer because I have never abused an opponent. I have exposed official inertia, but have stated that Post Office engineers are helpless in the face of the rules and the Post Office system; I have criticised rules, not rulers. Looking back over the correspondence, I find that my opponents have not been so careful to spare the man. I have been called a Don Quixote—that lunatic embodiment of the spirit of chivalry. I have been called the reciprocal of a big man, and worst abuse of all, have been classed by Mr. Purse with *astute* lawyers. This last insult could not be borne by an engineer, so I "lashed out." As Mr. Purse's complaint was based upon a misunderstanding of this apparently small, but really important, difference between man and matter, I am sure he will withdraw his original slighting remarks as I gladly withdraw my replies, which were intended to be caustic but not "sneering."

The ELECTRICAL REVIEW'S decisive part in this movement deserves widespread recognition. The Editors also have been most generous in the allocation of valuable space.

W. Fennell.

Northwich, *December 10th*, 1925.

I have been particularly interested in the correspondence passing through your columns on this undoubtedly important subject.

There is no doubt that we in this country are seriously handicapped by regulations, and your issue of November 20th, containing Mr. R. Borlase Matthews's letter, gives us something to think about.

Apart, however, from the technical side involving factors of "ignorance," I feel that the question of wayleaves is not stressed sufficiently. Figures have appeared in your columns and scant references have been made by the writers therein to this subject, but unfortunately we are not getting at the right people by writing to the technical Press.

I have spent the past sixteen months doing that thankless work—the negotiation of wayleaves—in the Midlands and I can only describe it as heartbreaking. It is undoubtedly a task for those fortunate people blessed with an unlimited amount of tact, and perhaps I have only recently found it. At any rate I have spent about nine months negotiating wayleaves for about ten miles of single-pole 11,000-volt line where some twenty-four landowners are involved. Surely there is one answer to Mr. Matthews's question as to how to reduce the cost per mile of overhead line!

Some may say that their answer would be to dismiss the writer as incompetent! Sometimes I feel so discouraged that I would make the same answer. But my point is this: that in spite of the 1919 Act and Section 22, we are still up against the farmer, but more still, that person I dread—the estate

agent. I have spent hours arguing about "poles in hedges" and "poles in fields" and "eyesores," and so on *ad inf.*, but one might as well talk to a deaf mute (with all due respect).

I will admit that our great difficulty is the matter of rental. Heavy rentals have in the past been agreed, because the supply authority had no option, I presume, and one always hears that so-and-so is getting as much as £5 a pole from the Post Office, so why shouldn't he? To talk about a "cheap and abundant" supply of electricity usually involves some retort about dividends and no amount of persuasion will impress upon the landowner that in the long run he will have to lose on the bargain by insisting on a high rental.

I would suggest that the only way of easing this point is to standardise rentals by Act of Parliament (for different kinds of land, of course). It would make my job easier, anyway, and apart from that it would reduce the ultimate cost of the proposed line. Section 22 is very useful, but the delay caused by having to use it loses revenue from a line which might have been earning money months ago, but for one or two owners sticking out for a higher rental.

I should be delighted to hear of some of the experiences and suggestions of any other "wayleave makers" who read your columns, because I feel that as yet I must have lots to learn!

There are only two remedies in my mind at present. The first one (which I will confess is not original) is to serve every farmer in the country with a copy of Section 22! The second is to advertise the trouble in the daily Press. (Incidentally, a protest of mine on these lines was returned "with the editor's regrets.") I notice that admirable body, the E.D.A., is giving us a hint about electricity in the home most days and wonder if this question could be taken up by it?

W. W. Clarke, B.Sc. (Eng.).

Ilkeston, *December 8th*, 1925.

Chemical and Combustion Engineering.

I sincerely hope that the scheme for making Finsbury Technical College a centre for teaching chemical engineering will succeed, and I suggest that the systematic teaching of *combustion engineering* be located there also.

Chemical and combustion engineering are very much akin, because combustion engineers and fuel technologists must necessarily have considerable knowledge of organic and inorganic chemistry. Objection may be raised that the Finsbury building is unsuitable for boiler testing, &c., but no doubt arrangements could be made at a near-by power station to run occasional boiler trials.

If the above suggestion were to be carried out, Finsbury College might also become the headquarters of the Institute of Chemical Engineers, and also of a new Society of Fuel Technologists or Combustion Engineers, which is badly wanted, because of the greater advances now being made.

It is becoming the fashion to locate scientific and engineering societies in colleges, *e.g.*, the present address of the American Electro-Chemical Society is at the Columbia University, New York City, and at one time it was at Lehigh University.

Another suggestion I make is that a scholarship for combustion engineering be founded to perpetuate the name of Bettington, a principal pioneer of pulverised fuel firing, who lost his life as an aviator in the war.

E. Kilburn Scott, A.M.Inst.C.E., M.I.E.E.

London, *December 11th*, 1925.

The Metering of Three-Phase Power.

Mr. Jaques will no doubt agree that if the sum of the three voltages between each phase and star point is zero, a two-element 3-phase, 4-wire meter will register a 4-wire load, however unbalanced, quite as accurately as a two-element meter will register a 3-phase, 3-wire load, however unbalanced it may be provided always that the sum of the three line currents is zero.

The above condition could not have been complied with in the steel works referred to, and if the supply was given along a length of low-pressure cable, having a fair voltage drop, the unbalanced nature of the load would prevent the condition $e1 + e2 + e3 = 0$ being complied with. What I wish to emphasise is that the error was due to the delivered voltage and not due to the nature of the load. I give some figures below for a steelworks load consisting of induction motors and single-phase welders connected across phases. The supply is given direct from a delta-star step-down transformer installed in the works, and is metered on the l.p. side by means of a two-element 3-phase, 4-wire meter in series with three single-phase meters. The voltage $e1 + e2 + e3 = 0$, provided the sum of the voltages between each of the three pairs of h.p. lines is zero (which must be so as the supply is three-wire) and provided that the power transformer has the same ratio on each of the three limbs at all the conditions of load metered. My experience leads me to consider the latter to be the case within reasonably small limits.

The following are the figures, which show the two-element meter to be accurate:—

Three-phase meter	100%	of units consumed	
Single-phase meter on phase A ...	32.4%	,,	,,
,, ,, ,, B ...	14.3%	,,	,,
,, ,, ,, C ...	53.0%	,,	,,
Total of single-phase meters ...	99.7%	,,	,,

In the third paragraph of his letter, Mr. Jaques misquotes me when he says I agree that three separate metering elements are desirable for the correct metering of a three-phase, four-wire supply. I said three separate meters, and I do not agree that it matters not whether they are in the same case or not. Although I have in the past made tests which show that there is more interaction in a three-element than in a two-element meter of the same make (and I have yet to discover the meter without interaction) I have not the figures at hand, but I shall have the results of some tests available shortly and will communicate them.

The statement of Mr. Jaques that I was anxious to see supported by facts and figures if possible was his statement that he had often seen inaccurate metering systems operating against the consumer. What proportion of power consumers does he estimate are being overcharged?

A Meter Superintendent.

December 14th, 1925.

The Salaries of Assistant Engineers.

It would appear to me that some of your advertisers who invite applications for appointments as "Assistant Engineers" feel very optimistic towards filling their vacancies satisfactorily.

It seems hardly credible that an efficient and responsible man possessing all the qualifications stipulated (namely, good technical education, workshop training, sound central-station experience, together with knowledge of internal-combustion engines and, perhaps, steam engines and boiler-house experience) could be found for the wages offered, unless the applicant had a private income (which, of course, is not usual amongst young electrical engineers).

However small a power station is, provided it is worthy of that name, the engineer, who is responsible for all matters affecting the efficient running and maintenance of the plant, is worth more than a bare living wage!

I feel sure that some of your readers will agree with me that I am justified in stating that the present-day assistant engineer, that is, the man who does the hard work and gets told off whether he is at fault or not, is greatly underrated in sterling worth.

F. C. Zula-Crosse, B.Sc.

Hollinwood, *December 10th*, 1925.

Cutting Girders Under Water.

We should be much obliged if any of your readers could give us information regarding the sub-aqueous cutting of girders, &c., by the electric arc, and if possible tell us the names of any manufacturers of the necessary plant.

Arc.

December 9th, 1925.

The All-Electric House.

I have been much interested in reading the first instalment, which you have published, of Dr. Parker Smith's interesting paper, and your comments thereon.

In view of your regret at the curtailment of the debate, I trust you will be able to spare space in your columns for a discussion by correspondence.

Dr. Parker Smith is to be congratulated on his pluck in building such a house, in face of discouragement, which I daresay was not confined to one sex. I would wager that he had to overcome intuition as well as reason.

The results must be considered very satisfactory. If any man or woman doubts the advantages of the all-electric house, I would recommend him or her to undertake, personally, the cleaning, relaying, and lighting of, say, three open fires one morning; and not to neglect to sift and save all cinders above one-eighth of an inch in size. Afterwards he, or she, should take a damp duster and go carefully over the whole exterior surface of every article in the three rooms to remove the resultant soot and ash.

When labour and dirt are reckoned, the all-electric house wins easily.

Next to the all-electric, I would rank a combination of gas and electricity far above a combination of electricity and coal fires.

The heating of water has hitherto been regarded as the great stumbling block; but Dr. Parker Smith has got over this by his immersion heaters. It would be interesting to know whether his tanks and pipes are thoroughly lagged.

Dr. de Ferranti's point that refuse disposal must be provided for is important. In Glasgow they are now building the biggest combined destructor and electric generating plant yet undertaken, and everyone's refuse will be collected, transported (a long way) to this station, and there turned into electricity, for power and light, and clinker for clinker-bitumen road surfaces.

In places where refuse collection is not carried out, small incinerators for home and garden refuse and rubbish can be easily obtained for each house, or group of houses, and they convert the refuse into a valuable fertilising ash.

It is a reproach to successive Governments that electricity is still in a vicious circle. Until it is cheap it will not be generally used, and until it is generally used it will not be cheap. Glasgow has broken the circle for herself, and made possible Dr. Parker Smith's ideal home.

G. Watson.

London, *December 12th*, 1925.

The Contractor and Assisted Wiring.

The discussion excited by the almost sensational success of the first experiments in this direction has elicited various contributions from the wiring contractor's side. These range from a frank recognition of the facts (which does him credit) by Mr. L. G. Tate, through the political misgivings of Mr. R. E. Robson, to the engaging candour of Mr. Howard Smith, who "sees nothing in these assisted wiring schemes"—for the contractor.

It is perhaps only human nature that the contractor should be painfully struck by the "nothingness" of a development which renders it apparent that he is no essential link in the electrical chain. The hard fact is, however, that the producing and consuming sides of the industry care nothing for the weal or woe of the electrical contractor as such, and will certainly not see their long overdue *rapprochement* impeded by any consideration of providing him with an easy living, if he cannot make it to their advantage to do so. Thus if, to quote Mr. Howard Smith, the contractor does not fancy touting for orders for three-light installations and other small beer, he will be politely ignored while these contemptible little installations, *in their millions*, are put in by someone else. After all, where is the installation contractor in the great gas industry? It exists, in a very lively state of health, without him.

Then consider the wickedness of the supply authority which purchases material direct from the manufacturer, instead of allowing the honest factor to draw a percentage on the price for passing orders through his books. He does not even need to touch the material, which, owing to the quantity, the manufacturer will doubtless deliver direct to the supply authority. He is not giving extended credit; he is not here assuming any risk of bad debts. What then is the service he can render? The plain fact is that if any middleman *can* be dispensed with he *should* be dispensed with.

With regard to the Socialistic developments which Mr. Robson fears, if the contractor is an efficient, enterprising, and useful member of the industry he can doubtless show the supply authority that it will be a saving to entrust the work to him. If it still persists in doing the job itself at greater cost, it has the ratepayers to reckon with. Mr. Robson says: "It is admitted that private enterprise is responsible for the advancement of any industry, and that wherever the State has undertaken a commercial venture it has been unsuccessful." But Mr. Robson would surely not contend that all municipal commercial ventures have been unsuccessful? Mr. Edgar, whose enterprise he commends, is himself a municipal official. Public control of public utilities, although a form of Socialism, is not nowadays considered to need any defence.

It is quite certain that without assisted wiring in some form or other the penetration of electricity into the great mass of small homes will never take place. Will the wiring contractor clutch at the broom of Mrs. Partington, or endeavour to adjust himself to the inevitable?

A Manufacturer's Salesman.

December 11th, 1925.

Overhead Distribution.

As the engineer responsible to the B.D.S. Co., Ltd., for the distribution scheme in Brundall, I am interested in Mr. Glendenning's remarks. Having "had a look at the village," he is of course quite entitled to express his keen disapproval of the system adopted.

The financial point of view can always be ignored by those who have no financial interest in a scheme of the kind, but I am afraid that the financial question is of the most important consideration if rural distribution is to be encouraged, and to be of real service to the country.

Taking the Brundall proposition as an example, the company is actually supplying current to about 75 per cent. of the inhabited houses in the village, and as I trust (living in Brundall) that most of the occupiers are of a "good class of people," it would seem that Mr. Glendenning's sympathy is misplaced, as obviously anyone who entirely disapproved of the company's scheme would refuse to become a consumer.

Another point: A number of residents faced with the domestic servant problem, find their worries very considerably reduced by the aid of a very cheap supply of electricity for cooking, heating, cleaning, &c.

I am quite sure, if purely for æsthetic reasons underground mains with their relatively expensive services to consumers' houses had been laid, the company's charges for electricity would have been at least double the present rate, and in this event a large number of the existing consumers would have been prohibited from obtaining the benefits now available.

Any frontage owner could have had the mains laid underground past his property by paying the difference; up to the present, only one such owner has decided to adopt this arrangement, with, in my opinion, every good reason for so doing.

It should also be noticed that where a compulsory crossing of the road has occurred, through the company's inability to obtain wayleave, heavy guarding has been at once involved, and this is probably the principal cause of Mr. Glendenning's complaint.

If rural distribution is to be a commercial proposition, the capital cost must be kept within certain limits, and while telephone and telegraph poles are tolerated, often on both sides of the road, I fail to see why the same concession should not be granted, from a utility point of view, for electric power poles.

I think the whole question can be summed up in the statement that overhead lines properly run are no more unsightly than existing poles for telephones, wireless, &c., and that rural districts prohibiting such a system will have to wait a very considerable period before any commercial company will undertake the very great risk of giving a supply with an abnormal first cost for cables and services.

It is, I believe, a matter of cheap electricity or none at all in many rural areas, and I am quite sure the Brundall consumers would vote solidly for a supply of electricity with the poles, in preference to no supply at all.

G. Redgment.

Norwich, *December 12th*, 1925.

Discussions at the Institution of Electrical Engineers.

I am glad to know that some attention is being given to the question of the hour at which I.E.E. meetings end, and I hope that this attention will be extended to the question of the hour at which they begin.

During the war, when restrictions were many, and travelling was difficult, to say nothing of the dangers from the air that attended upon being out too late, the custom grew up of holding the meetings at 6 o'clock; but nowadays there is no reason why, if members wish, they should not be held later. I am aware that a vote was taken on the subject some time ago, and presumably a majority was obtained for continuing the present practice, but I suggest that this is not a matter which should be decided by the greater convenience of the greatest number, but by the average convenience of all. No doubt gentlemen whose business operations are carried on within reasonable reach of the Embankment like to get to the Institution by about 5.45, have a cup of tea, attend the meeting and get home by about 8.30, but I do not know whether it is realised that some of us whose business operations are carried on a little way out of London can never by any chance get to a meeting at 6 o'clock without making special arrangements, which are often very inconvenient and difficult to make. If the informal meetings can be held at 7 o'clock, why cannot the ordinary general meetings? Personally, I should prefer them at 8 as in the old days, but I would be willing to compromise on 7, and it would at least enable me to put in an appearance at meetings, which I can never do now.

A. J. Cridge.

London, *December 12th*, 1925.

Parliamentary News.

(By Our Special Parliamentary Reporter.)

Wireless Telegraphists' Wages.—On December 7th, Sir A. STEEL-MAITLAND, the Minister of Labour, informed Mr. Lansbury that the rates of salary of wireless telegraphists as agreed upon between the London and District Association of Engineering Employers (on behalf of the Marconi International Marine Communication Co., Ltd., and Siemens Bros. and Co., Ltd.) and the Association of Wireless and Cable Telegraphists, before December 1st were £8 17s. 6d. per month in the first year of service, rising by annual increments to £20 in the ninth year. The reduction as from December 1st, of which notice was given, was 22s. 6d. per month. The agreement contained no reference to the actual hours of duty, but provided that the telegraphist should give his whole time and attention to the discharge of his duties.

Ships Without Wireless Operators.—On December 7th, Sir P. CUNLIFFE-LISTER, President of the Board of Trade, informed Mr. Lansbury that returns from the principal ports showed that up to Friday evening, December 4th, 25 passenger ships and 124 cargo ships had sailed without wireless operators.

On December 9th Sir B. CHADWICK informed Mr. Kennedy that according to the returns from the principal ports, the number of ships coming under the provisions of the Merchant Shipping (Wireless Telegraphy) Act, 1919, which had proceeded to sea with operators holding only restricted certificates up to the end of the previous week was 9; the number which had at least one operator, but not the number required by the rules, was 13; while 178 ships had no operators at all.

Census of Production.—On December 7th, Sir P. CUNLIFFE-LISTER, President of the Board of Trade, informed Mr. R. Wilson that the forms on which the returns for the Census of Production in 1924 were to be made were issued some months ago to those from whom returns were required. About 60 per cent. of those forms had been received back, with more or less complete particulars shown on them. Reminders were being sent to firms who had not returned the forms, asking that the particulars might be furnished immediately. Until a large part of the outstanding returns had been secured, he would not be in a position to state when the summarised results for the principal industries were likely to be available for publication, and regretted very much that so much delay should occur in securing this very valuable information, and he appealed to all firms in default to respond at once to these requests for information.

Lead Poisoning.—On December 10th, Mr. ROBINSON asked the Home Secretary how many cases of lead poisoning occurred among pasters engaged in the manufacture or repair of electric accumulators in the years 1921, 1922, 1923, and 1924.

respectively; and whether any cases had been reported since the new code of regulations came into force on March 1st, 1925.

Sir W. JOYNSON-HICKS said that there were five such cases reported in 1921, 11 in 1922, 44 in 1923, and 42 in 1924. Since March 1st last there had only been 15 cases among pasters. The new regulations could not be expected to have their full effect for a considerable time, but they appeared to have already caused a substantial reduction in the number of cases.

Engineering Exports.—On December 10th, in reply to Captain A. Evans, who asked what was the average value of engineering exports in 1925, Sir B. CHADWICK, Parliamentary Secretary to the Board of Trade, said that the average values per ton of exports, from the countries named, of all descriptions of machinery, including electrical machinery and locomotives and tractors, during the first nine or ten months of 1925, were as follow:—United Kingdom (10 months), £95 per ton; Belgium, including Luxemburg (9 months), £41; Germany (9 months), £82; France (10 months), £53.

Bedfordshire, Cambridgeshire and Huntingdonshire Electric Power Bill.—This Bill came before an Unopposed Committee of the House of Commons on December 10th. Mr. SEAGAR BERRY, for the promoters, said that the Bill had been an early one, and in the ordinary course of events would have passed through Parliament by about July last, as it was unopposed throughout. When the Bill was before the House of Lords it contained a proposal to erect a power station near St. Neots, but at that time Lord Weir's Committee was appointed by the Government to deal with the whole position of the electricity supply industry, and the Ministry of Transport told the promoters that it would be inconvenient for the Bill to be proceeded with at that stage. Consequently, the Bill was taken out of the group into which it had been placed for consideration by the House of Commons and put back. Subsequently the Ministry of Transport informed the promoters that there would be no objection to the Bill's proceeding on the understanding that the proposal to build a power station was taken out and that there was inserted in the Bill a clause providing for the purchase of the undertaking in 50 years' time by a Joint Electricity Authority, if such an authority should be set up. The mains of the North Metropolitan Electric Power Supply Co. practically touched the boundary of the area scheduled in the present Bill, and that company was prepared to give the promoters of the scheme a sufficient supply of electricity to carry them on for some years, at any rate, until it was known what would be the effect of the Weir report. In addition, the promoters of the scheme were in negotiation with the Peterborough Corporation, and there might be a possibility also of obtaining supplies from Cambridge.

Sir JAMES DEVONSHIRE, who is one of the promoters of the present scheme, as well as managing director of the North Metropolitan Co., formally proved the preamble of the Bill, and the Committee ordered it to be reported for third reading.

Trade-mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 9th. In the case of foreign applications, the names and addresses of the British representatives are also given.

(ZF4. No. 455,757. Class 6. Magnetos.—Robert Bosch Gesellschaft, Militarstrasse, Stuttgart. (W. P. Thompson & Co., 12, Church Street, Liverpool.)

Strowger. No. 455,491. Class 8. Apparatus for use in automatic and semi-automatic telephony.—The Automatic Telephone Manufacturing Co., Ltd.

Neutrola. No. 461,183; Neutrola-Grand. No. 461,184; and Neutrolette. No. 461,185. Class 8. Instruments and apparatus and parts thereof for use in radio-telephony and telegraphy.—The Fada Radio Co., Ltd. Alexandra House, Kingsway, W.C.

Tensilite. No. 462,776. Class 8. Electric cables.—Callender's Cable and Construction Co., Ltd.

BB Ring Battery (lettering and design). No. 462,557. Class 8. Electric batteries.—G. Bowerman, 10-12, Ludgate Hill, E.C.4.

Goodwinex. No. 463,039. Class 8. Electrical instruments and apparatus.—J. Dyson, 5-7, Godwin Street, Bradford.

Gallaphos. No. 463,487. Class 8. Electric batteries and accumulators.—Batterien und Elemente Fabrik, System Zeiler Gesellschaft, 20, Rungerstrasse, Berlin. (Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.)

Apex (lettering and design). No. 449,549. Class 13. Electric switch- and fuse-gear.—Foster Engineering Co., Ltd.

Insuloid. No. 459,079. Class 50. Electric switch covers, switch plates, electric insulators, and insulating preparations and materials.—J. A. Crabtree & Co., Ltd.

Water Power Resources.—In a paper on "The Development of Water Power Resources" read before the Liverpool Engineering Society, Mr. A. E. Malpas analysed the findings of the Water Power Resources Committee, which were published by the Board of Trade in 1921. He reviewed separately the water available and developed in each country of the British Isles, and also Norway. In dealing with Ireland he gave considerable attention to the Shannon Scheme. With regard to Scotland he said steps had been taken under the Lochaber Power Act to extend the activities of the British Aluminium Co., Ltd. The new extension would bring the installed capacity of the plant up to 107,000 e.h.p. The aggregate amounts of undeveloped water power in the countries of Great Britain in 1921, said the author, were: Scotland, 194,965 kW; Wales, 35,900 kW; and England, 20,440 kW.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

12,799. "Amplifying apparatus, particularly for wireless reception." J. Scott-Taggart. May 24th, 1924. (243,038.)

14,722. "Wireless receiving apparatus and the like." J. Scott-Taggart. June 18th, 1924. (243,039.)

19,226. "Production of solutions containing oxides of chromium, and the electrolytic separation of chromium from such solutions." E. Liebreich. August 13th, 1924. (243,046.)

19,415. "System of facsimile telegraphy by wireless signals." E. Belin. August 15th, 1924. (243,049.)

19,591. "Mechanically-connected fluid tap and electrical switch." H. W. Cox. August 19th, 1924. (243,054.)

19,623. "Thermionic valves or vacuum tubes for wireless telegraphy and telephony." C. Seymour, G. Shearing, and H. G. Hughes. August 19th, 1924. (243,056.)

19,638. "Electric alarm devices." R. H. H. Geffcken and R. H. Richter. August 23rd, 1923. (220,945.)

19,754. "Electromagnetic instruments for converting oscillating currents into sound, and *vice versa*." British Thomson Houston Co., Ltd., A. P. Young, and J. H. Butcher. August 20th, 1924. (Cognate application 1,630/25.) (243,063.)

19,771. "Crystal and like detectors for wireless reception." W. Smith. August 20th, 1924. (Cognate application 11,885/25, a divided application on 19,771/25.) (243,065.)

19,819. "Electric current collectors for the ignition distributors of internal-combustion engines." L. V. Petersen. August 21st, 1924. (243,067.)

19,822. "Toothed-gearing, particularly suitable for the driving of magneto-electric machines." R. B. North and A. Massey-Allen. August 21st, 1924. (243,068.)

19,823. "Magneto-electric machines." R. B. North and A. Massey-Allen. August 21st, 1924. (243,069.)

19,830. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd., and W. Aitken. August 21st, 1924. (243,070.)

19,998. "Coin-collecting means for telephone services." Hall Telephone Accessories, Ltd. (F. W. Hall). August 23rd, 1924. (243,080.)

20,238. "Transmission of wave energy for high-frequency signalling." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). August 27th, 1924. (243,088.)

20,425. "Heat-exchangers specially applicable for cooling the circulating air of dynamo-electric machines and the like." Lancashire Dynamo & Motor Co., Ltd., and R. S. McLeod. August 29th, 1924. (243,093.)

21,674. "Telephonic apparatus." V. A. Foot. September 6th, 1924. (243,162.)

22,825. "Glass panels for use in and upon wireless cabinets." H. Rhodes. September 27th, 1924. (243,124.)

23,083. "Electric switchgear." British Thomson-Houston Co., Ltd., H. Trencham, H. C. Heath, and C. W. Newton. September 30th, 1924. (243,125.)

24,514. "Application of two-grid valves." Compagnie Générale de Télégraphie Sans Fil. October 15th, 1923. (223,580.)

25,185. "Electrical switches, circuit breakers, or like appliances." A. Cormond. October 22nd, 1924. (243,136.)

25,412. "Electric lamps, thermionic valves, and the like." Radions, Ltd., and H. J. Osborn. October 25th, 1924. (243,137.)

25,563. "Conductive element for use in the manufacture of, and improvements in, inductance coils or magnetic cores for transformers, electromagnets, or other electrical apparatus." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (H. R. Van Deventer). October 27th, 1924. (243,139.)

25,657. "Automatic telephone systems." Relay Automatic Telephone Co., Ltd., B. B. Johnson, and G. A. Hollings. October 28th, 1924. (243,140.)

25,904. "Electric resistances." D. G. E. Barrie and Enterprise Manufacturing Co., Ltd. October 30th, 1924. (243,143.)

26,117. "Electric condensers." H. Stevens and A. J. Stevens & Co. (1914), Ltd. November 3rd, 1924. (243,146.)

26,192. "Electron discharge devices." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) and E. M. Deloraine. November 3rd, 1924. (243,147.)

26,982. "Crystal detectors for wireless receiving systems." G. Edmonds, Ltd., and H. Edmonds. November 12th, 1924. (243,153.)

27,395. "Electrically-operated valves." W. E. Ashley, J. B. Broadhead, H. Tart, and J. Lindsay. November 17th, 1924. (243,155.)

28,581. "Electrical switchgear." D. R. Davies and Metropolitan-Vickers Electrical Co., Ltd. November 28th, 1924. (243,165.)

29,583. "Headlamps for motor and other vehicles." H. Drabble. December 9th, 1924. (Cognate applications 756/25 and 22,448/25.) (243,178.)

29,681. "Dynamo-electric machinery." British Thomson-Houston Co., Ltd., and F. P. Whitaker. December 10th, 1924. (243,179.)

30,238. "Crossings for overhead electric conductors." A. Wiseman, J. W. Harris, and H. M. Dudgeon. December 16th, 1924. (243,181.)

1925.

277. "Telephone systems." Coventry Automatic Telephones, Ltd., and J. E. Collyer. January 5th, 1925. (243,188.)

961. "Resistance material electrically conductive in a cold state, usable at high temperatures, and method for its manufacture. T. A. F. Holmgren. January 22nd, 1924. (228,142.)

1,641. "End connections and joints for extra-high-tension cables." S. Silbermann. January 31st, 1924. (228,525.)

2,799. "Electron discharge devices." Standard Telephones & Cables, Ltd. (formerly Western Electric Co.) (Western Electric Co., Inc.). January 31st, 1924. (243,200.)

3,326. "Crystal detector for wireless receiving apparatus." C. R. Marshall. February 6th, 1925. (243,201.)

3,991. "Crystal detectors." P. Winocour and H. E. Thompson. February 12th, 1925. (243,206.)

6,090. "Devices for regulating the voltage of dynamos of variable speed and load. A. J. Jullin. June 30th, 1924. (236,163.)

6,092. "Setting device for the elements to regulate the speed of the disk of electricity meters." Landis & Gyr Soc. Anon. March 8th, 1924. (230,475.)

7,802. "Reduction gears for use in adjusting radio tuning instruments." Burndept, Ltd., C. F. Phillips, and S. F. Woodell. March 23rd, 1925. (243,218.)

11,762. "Electric storage batteries or accumulators." H. M. Genese, G. R. N. Minchin, and Pritchett & Gold & E.P.S. Co., Ltd. May 6th, 1925. (243,239.)

12,721. "Pole for carrying cables, telegraph and telephone wires and for other purposes." J. C. Stobie and F. W. H. Wheadon. July 15th, 1924. (237,221.)

13,179. "Electric fuses." J. H. Hickey and G. E. Beattie. May 20th, 1925. (242,243.)

14,048. "Reception apparatus for wireless." N. Lawton. May 28th, 1925. (243,252.)

14,406. "Electric connection and switch-boxes." P. S. Glover. June 2nd, 1925. (243,254.)

15,113. "Telegraph typewriters." Kleinschmidt Electric Co., Inc. July 5th, 1923. (Divided application on 218,643.) (235,572.)

15,115. "Telegraph typewriters." Kleinschmidt Electric Co., Inc. July 5th, 1923. (Divided application on 218,643.) (235,574.)

15,118. "Telegraph typewriters." Kleinschmidt Electric Co., Inc. August 11th, 1923. (Divided application on 220,280.) (235,577.)

15,786. "Induction motors." British Thomson-Houston Co., Ltd. June 20th, 1924. (235,897.)

The

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On Efficiency.

MUCH is written nowadays about efficiency. As a slogan it is hackneyed; it is a phrase which has been worn almost threadbare. At the same time, however, there was probably never greater need for real efficiency than there is to-day.

Unfortunately, many of those to whom the idea should mean most, seem in effect to regard it mainly as a debating point. They pay lip service to a doctrine, but fail to realise that it involves definite and serious practical application. Almost all concerned affect a belief in efficiency, but here, as often elsewhere, creed and deed may be sundered far. Too many who recognise the need for efficiency, in point of fact consider it as a matter affecting the other fellow.

The management is all too prone to consider that it is only the executive which is to blame for any clogging of the wheels. The executive, oftener than not, alleges outworn methods, and obsolescent, if not obsolete, machinery as the cause. Each is probably right—in part—and as wrong as right. Certainly the management which fails to realise its own responsibility in this matter is heading straight for the rapids. Rebuffs await such a policy—these, and a relegation to the category "has been." The management should realise that it has its own end of the burden to lift. That end, too, is the big end. There must be thorough and periodical overhauling of tools, processes, methods, and programmes. This is no fancy, luxury stunt: it is bed-rock, bone-deep necessity. There is the most urgent need for a far view, a near view, and a keen view. It is imperative to keep in the van of progress so as to compete unimpeded by gratuitous handicap. All this involves constant all-there-ness, most assiduous study, and wisely conceived, well-organised application. Where pains are taken in these particulars, there is of necessity careful planning beforehand as to ways and means. Programmes, however, devised on such lines are never haphazard. They are calculated, well-balanced enterprises, and, given a fair trial, have in them the seeds of success.

Now it is up to the management most of all to devise suitable programmes, to provide the machinery, to discover the ways and supply the means. This involves serious thought, a thorough grasp of the needs of the case, an adequate understanding of the various methods available to satisfy those needs, and the ability to appraise relative values, and to adjudge wisely among alternatives. It demands all this, and a great deal more. In fact, this is but the framework, the scaffolding. Not only must there be the system to work, that system must be worked to the very best advantage. A wise management will not only consider the system as

a thing apart, as a system pure and simple; it will consider that system in relation to the work to be done thereby, and also as related to those who are to use it. These considerations are often of great importance, and frequently of far more consequence than is commonly imagined.

As systems, two or three proposals may be of almost equal excellence, and yet one be greatly preferable to either of the others for one particular class of work, or for one particular body of workmen. The management which does not appreciate such facts has much to learn. A wide-awake alert control will carefully weigh pros and cons, making sure first of all that the data are sufficiently complete whereby pros may be juxtaposed to cons.

Perhaps the one factor which those responsible for the inception and execution of a programme have most of all to keep well in mind is just the human side of the business. The inherently sound and efficient scheme must be worked soundly and efficiently by ordinary workmen. This provides indeed the acid test. If a scheme fails here, be it otherwise never so perfect in conception and design, it fails everywhere. It is a beautiful corpse. The ideal is to provide a programme at once adequate for present requirements and sufficiently elastic to meet future contingencies, to do these things as economically as careful planning and forethought can devise, *and to inspire the hearty co-operation of those who are to work the programme.* It is only when the last provision is met that efficiency becomes an assured fact. More than anything else, success or failure depends upon how the men themselves respond. A moderately effective scheme *per se* can reveal a very considerable measure of success when the human factor functions in the neighbourhood of unity, while a perfect machine may give low output because the human material introduces a very high friction co-efficient. Now the management, where the latter happens to be the case, has need, often enough, of the wholesome corrective of introspection. It is seldom that failure is all due to the other fellow. Friction never arises where only one surface is involved. They who work a scheme, and also they who provide it, are equally concerned—the latter quite as much, if, indeed, not more, than the former. Thus on all counts it is certainly up to the management to do all things possible to facilitate smooth and easy running of a well-designed machine. Fair play, a square deal, scrupulous impartiality; legitimate inducement to real co-operation; an appeal to the loyalties—one loyalty seeking the other: and a genuine stressing of the essential community of interests—these things are not only inherently good things, they are sound payable propositions.

But there must be mutual giving and taking. There cannot be efficiency without reciprocity. So it is up to the operatives to do their bit. On their side of the bargain they do well to insist that their efforts shall not be exploited. Naturally if they produce better, and substantial benefits accrue to the company thereby, they expect some proportionate return. Where, however, such a principle be accepted, and an honest attempt be made on each side to deal fairly, in effect there is at least an embryo co-partnership. If success, however, is to be really assured, the workers themselves must do their part loyally, even enthusiastically. Once they realise that their efforts count, that the work they do is appreciated, that they themselves really participate in the progress they help to make, those worth their salt will work both hard and well and with added interest in what they do.

In the nature of things there is no inherent reason why management and executive should not work together in willing, even cordial, co-operation. They are team horses between one pair of shafts; they are partners in one concern. They are fellow mortals, or immortals. Their main interests in home, wife, and family in general run on all fours. Outside the company's premises they have, many of them, in many things, kindred tastes and like pursuits. Why should they not come to respect each the other, to understand that mutual helpfulness *within the works gates* is a good thing and, on the whole, a paying proposition? It is—if there is mutual confidence and mutual respect, and a concerted effort. So-called class distinction, or class-consciousness, breeds suspicion and all the evil brood which saps the nation's strength and hinders the nation's prosperity. It is suicidal; it is fractricidal.

Efficiency is ever the outcome of harmonious and effective effort. It needs that those organising and those executing the work carry it through with skill and in accord. Management and executive each contribute their quota; and success rewards the organisation where these things are the rule and not the exception. But, above all else, the human element must be studied, and the human effort stimulated.

Electricity Supply in Germany.

It is stated that at the present time development is proceeding at such a pace in the electricity supply industry in Germany as to cause managers some concern as to the possibility of fully meeting the demand; this has been particularly the case since the stabilisation of the currency. It has been pointed out in a German newspaper by Dr. Hamm, of Charlottenburg, that, although the increase in the demand of from 10 to 25 per cent. in 1924 was comparatively inconsiderable, the current year has brought about an advance amounting to 50 per cent. on the average. Tnis growth, however, has not been accompanied by a corresponding increase in the receipts, as sale prices have been largely and repeatedly reduced, and the additional income often bears little relation to the greater production. On the other hand, the expanding demand necessitates extensions of plant and networks, for which it is difficult to find the funds. In the circumstance, many of the undertakings look forward with apprehension to the winter, with its inevitable maximum loads, as very few undertakings have been able to extend their plant and networks sufficiently. As most works were only able to enter into contracts for the supply of additional plant in the spring or summer of this year, it will be impossible for the new machinery to be brought into service until the winter of 1926-27, and it is therefore not impossible that "rationing" may have to take place in some districts this winter. In interested circles it is calculated that the consumption will be doubled or trebled in the next few years.

Although the general production of electricity throughout Germany has greatly increased, the number of stations has diminished, as the smaller areas have found it advantageous to obtain supplies from the large and more efficient works rather than to generate on their own account. On the other hand, says Dr. Hamm, the extension of hydro-electric works has not always been very prudent; in the case of the East Prussian works, it has been necessary to duplicate the whole of the machinery, as the water power can only be used during a part of the year.

With reference to the increasing use of crude lignite as fuel, it is stated that, while about 70 per cent. of the total production of energy in 1913 was based upon the combustion of pit coal, the percentage fell to 40 in 1924. Actually, however, the quantities have naturally increased; thus the 70 per cent. of the year 1913 corresponds to 2,800,000 000 kWh, while the 40 per cent. of 1924 represents 4,600,000,000 kWh. But the author considers that this movement will probably again take a downward course, as the lignite resources of Germany, particularly those of Central Germany, will only suffice for a certain time. The technical improvements which are being developed will cause pit coal again to come to the forefront as fuel.

The charges for energy are far below those prevailing in 1913. On the other hand the costs of production in favourable cases are at the former peace time level, but they are frequently much higher so that the financial results of the works do not correspond with the largely increased output. Large consumers in particular are charged prices which, it is said, scarcely cover the cost of production.

In conclusion, Dr. Hamm states that the plant capacity installed in German electricity works in 1924 was 5,350,000 kW, of which 725,000 kW represented water power, 1,830,000 kW lignite stations, and 2,530,000 kW using pit coal. The stations in operation at the end of 1924 comprised 2,068 in private ownership and 1,094 in State or municipal hands. As to the size of the generating stations, in 1913 there were only 13 of a capacity of 20,000 kW and over; at the present time the number is 80, and the capital invested in the power stations, excluding the distribution systems, is put at 1,100,000,000 marks.

London's Electricity Supply.

CONTINUING our comments on the London County Council's Return, to which we referred in our last issue, we note that the aggregate output (sold) of the municipal undertakings within the County was 257 million kWh, and the total revenue was £2,436,713; the output of the companies was 413 million kWh, and the revenue £5,194,477.

From the foregoing figures it will be seen that the municipalities supplied 0.38 of the electricity used in London for 0.31 of the revenue, and the companies supplied 0.62 for 0.68 of the revenue; the average price charged by the latter, therefore, as previously mentioned, was 40 per cent. higher than that charged by the former. The incidence of the figures varies very widely in both cases, as an inspection of the results will indicate. Allowance should be made for the nature of the consuming public in each individual instance; for example, in Kensington the load is mainly lighting, whilst Stepney has a large power load. The average load factors, however, differ but little, being 22.5 per cent. for the Councils and 20.5 for the companies.

For some time correspondence has been proceeding in *The Times* regarding the high prices charged in the City of London, as compared with those offered by municipal undertakings in adjoining boroughs. In the City the conditions are not similar to those obtaining in Stepney and Poplar, where there is an industrial demand, and the lighting hours are longer; the load factor of the City undertaking of the Charing Cross Company last year was 21.5 per cent. and that of the City of London Company only 14.4, whilst that of Stepney was 28.8 per cent. The average rate of interest and dividends paid by the Charing Cross company was 6 per cent. for the year; adding to these payments the amount put to reserve, the total was 11½ per cent. on the capital—a good return, but hardly exorbitant. In the case of the City Company the average rate was nearly 9 per cent., and the total, including reserve, 16 per cent., which is certainly an unreasonably high rate of profit, representing 1.6d. per kWh sold. Now that the fear of 1931 has been removed, the companies will have no excuse for paying large sums to reserve, and as they will come under the sliding scale of prices and dividends, these matters will be settled automatically in future.

The case of the County of London Company is less excusable. With a capital called up of £4,055,000, the average rate of interest and dividends was 8.71 per cent.; the revenue was £1,023,493, and the total expenditure only £370,450. The amount available for distribution was £803,192, or no less than 2.45d. per unit sold, and after paying £355,772 in interest and dividends, the large sum of £491,316 was transferred to reserve, bringing that fund up to £1,705,247. The profit surplus thus amounted to no less than 21 per cent. on the capital.

The Operation of Inter-connected Undertakings.

WHILST there are limits to the advantages to be derived from the inter-connection of generating stations, depending upon the distance between them and the cost of the transmission line, there is no doubt that when the distances are short, very substantial economies can be effected by linking up. These benefits, however, cannot be fully realised unless the load is divided between the respective undertakings to the best advantage. In the case of such a system as that of the North-East Coast Companies, this end is attained by placing the whole of the stations and mains under the direction of a load controller, who is kept fully informed regarding the conditions obtaining in each area.

Where the undertakings are not owned by a single authority, the problem is not so simple. Apart from emergency requirements, such as the breakdown of a generating set at a fully loaded station, which would at once be met without regard to economic considerations, the question is how to regulate the output of the respective stations so as to secure the maximum commercial efficiency. In the *Electrical World* recently Mr. S. Ferguson, president of the Hartford (Conn.) Electric Light Company, explained the method of co-ordination adopted by three interconnected companies of which his own was one. An "Exchange Board" was set up comprising one representative from each company, and a manager was appointed by the Board of co-ordinate daily and hourly the load dispatchers of the three companies. The manager's function was to buy energy for the Board from any company at the lowest possible price at which it could be given at any hour without actual monetary loss—*i.e.*, at its then increment of fuel costs, depending, of course, on the state of the load at the time; at the same time, he sold it to one or both of the other companies, the sale price being again the increment cost. In this way neither the seller nor the buyer benefited financially by the transaction, but all ultimately shared in the economy through the medium of the Board at a monthly settlement.

Electric Washing Machines.

IN this issue, as in our last, we publish some notes and pictures of washing machines to give our readers some idea of the numerous models which are available both here and in the United States. As we have said already, the existence of such a large market for these machines in America seems a sufficient reason for supposing that there are great opportunities in this country. In fact, we may go so far as to say that there is already a fairly good sale for these machines. It may surprise readers to learn that one firm in this country has sold over 6,000 of its electric washers and is still disposing of them at the rate of from 20 to 30 a week. Another company informs us that last year it sold 540 washing machines. It is evident, therefore, that a demand exists; it only remains to be seen how best it can be cultivated. Most people to whom the question of washing machines is mentioned immediately point out the disadvantages of these appliances. It is a common thing for articles beyond the reach of our pockets to be considered in this light. A motor-car, for instance, requires garage space, tires are an expensive item, the engine is always needing taking down, and so forth. Similarly, we think that a great deal of the antipathy (and apathy) displayed towards washing machines is traceable to their cost. In the United States this has been met to a great extent by the adoption of hire-purchase systems, but there is no doubt that something more than this is necessary in Great Britain. It is useless to point to the saving of labour or laundry charges effected by the machines, if their price is too high. The clothes are not finished with when they leave the washer; several operations still remain to be done. Labour saving is a great point—in fact, *the* point—of the electric washing machine, but perhaps labour can be saved at too great a cost. It is surely not beyond the powers of our people to devise a machine which will cost the public about a half or even a quarter of the price at which most electric washers are now sold. The "Gaslectric" machine described in our last issue seems to be a step in the right direction as regards both cost and convenience.

Electric Washing Machines.—II.

In our last issue we illustrated and described a number of washing machines which are upon the British market, but we omitted one machine which has gained a certain measure of popularity in this country—the "Thor," which is illustrated in fig. 10, and is supplied by the Hurley Machine Co. This has a reversing-revolving



Fig. 10.—The "Thor" Washer.

cylinder driven by a 0.25-h.p. B.T.-H. motor. All the driving mechanism is totally enclosed, and thus all danger is eliminated. A friction drive is provided, so that any overload which may occur immediately stops the machine. The means of control are simple—a single switch and two levers, one for the cylinder and the other for the wringer. The latter consists of a pair of 11-in. cushioned rollers. The machines are made in a number of sizes ranging from that suitable for a small flat to a machine designed for institutions.

The Hotpoint-Aerobell washing machine (fig. 11), made by the Hotpoint Electric Appliance Co., Ltd., was also omitted from our last issue. This washer has a reciprocating-revolving shaft bearing vacuum cups. The motor and driving gear are entirely enclosed and an efficient lubrication system is embodied in the machine. The cylinder is made of copper, and the container is also of copper, tinned inside and highly polished outside. The washer is capable of dealing with eight full-sized sheets.

In this part of the article we propose to introduce our readers to a number of American patterns, which, it will be seen, vary greatly in construction and operation.

The "White Lily Ace" washer, illustrated in fig. 12, is of simple design, consisting of a wood or copper tub mounted on a movable framework. This has a capacity of eight full-sized sheets and the "agitator" and wringer are of aluminium.

Fig. 13 illustrates an entirely different pattern. This machine—the "Klymax"—operates on the vacuum cup principle. There are three cups mounted on a central arm; these are given a reciprocating motion, up and down, and are claimed to suck the dirt from the clothes. The cups operate in a perforated cage, which is arranged to run at high speed, so that when the clothes are washed they can be placed in this cage and dried on the centrifugal principle. The machine is usually provided with a gas heating arrangement for the water. There is a direct flexible shaft drive, and the moving parts work on ball bearings. The motor is only of 0.25 h.p.

The "Haag Vortex" machine, fig. 14, is also of a novel pattern, consisting of a metal tank, below which is mounted the motor and enclosed driving gear, the latter operating a dolly fixed in the centre of the tank. This dolly has four wings which have a beating action upon the clothes. An auxiliary shaft passes from the driving gear into a small gear box mounted on the top of the tank from which the wringer is driven.

The fourth example (the "Whirldry," fig. 15) is another machine on the centrifugal system. From the illustration it will be seen that in the upper part of the tank is a rotating cage containing a four-winged dolly. When the washing operation is completed the level of the water is allowed to fall or the tank is drained, and the cage is run at a high speed to extract the moisture from the clothes.

The "Gainaday" washer, depicted in fig. 16, is of the rotary container type with the motor and driving gear entirely enclosed, including the auxiliary gear at the top of the tank which drives the wringer. This machine is of a very compact nature and handsome in appearance.

The "agitator" principle is employed in the "Horton" machine, illustrated in fig. 17, the agitator being a central dolly with three vanes made of cast aluminium, which is claimed to produce a speedy washing action. It is mounted in the top of the tub. The motor and gear, as shown, are well enclosed. It will be noticed that in most of these machines the wringer gear is of the same type, *i.e.*, an auxiliary shaft operating a right angle drive in a small gear box mounted at the top of the tank. The interior of the tub in this machine is nickel plated, and the outside highly polished.

Another vacuum-cup machine is the "Trojan," fig. 18. In this the cups not only reciprocate, but they also slowly revolve, the motion being provided by an eccentric gear operating the central shaft. A tripod stand on castors is provided; the tank is of metal, and the usual form of wringer drive is incorporated.

In the "G.R.S." electric washer (fig. 19) is a revolving aluminium cylinder which reverses its direction at each few revolutions. The cylinder is contained in a

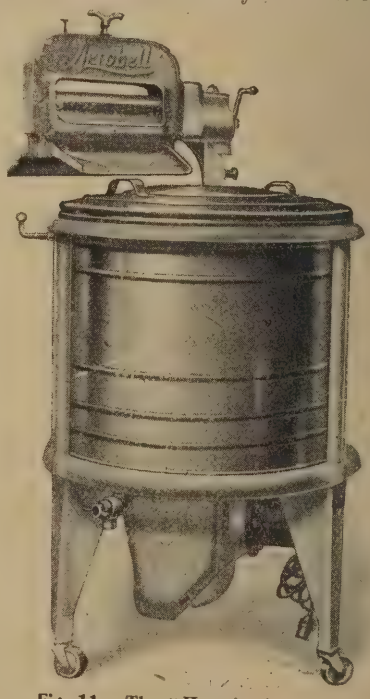


Fig. 11.—The "Hotpoint-Aerobell."

square tank; the gear is heavily protected and the wringer can be swung in any direction.

Fig. 20 depicts a very ornate machine, produced by the Coffield Washer Co. In this a reciprocating cylinder is mounted in an outer container built mainly of aluminum, which is highly finished. This machine is not only of great utility; it is also a handsome piece of furniture.

Of a somewhat different nature is the machine illus-



Fig. 12.—The "White Lily Ace" Washer.



Fig. 13.—The "Klymax."

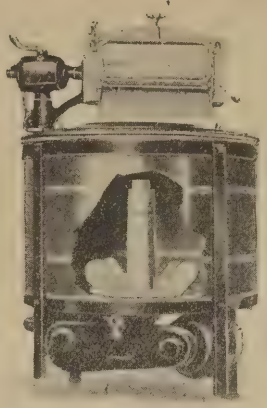


Fig. 14.—The "Haag Vortex."

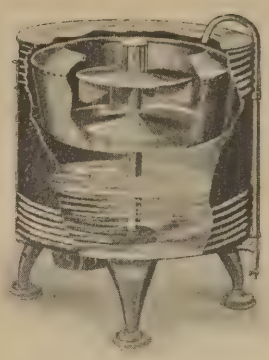


Fig. 15.—The "Whirldry."



Fig. 16.—The "Gainaday."

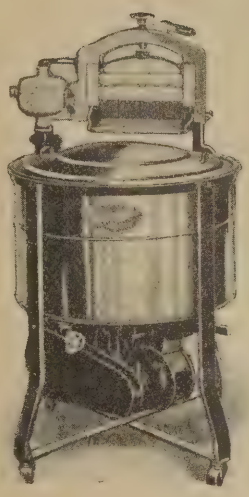


Fig. 17.—The "Horton."

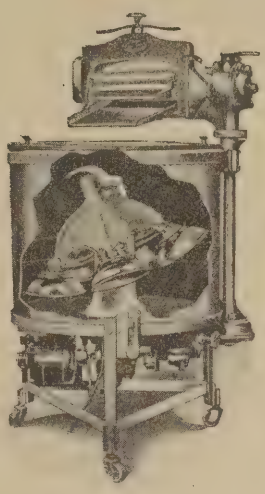


Fig. 18.—The "Trojan."

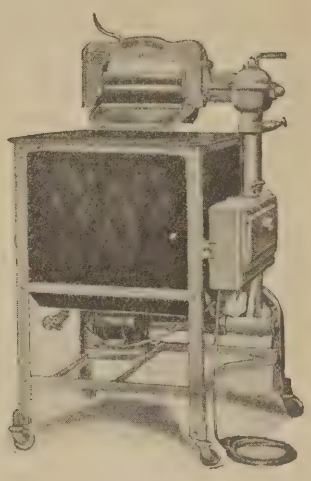


Fig. 19.—The "G.R.S."

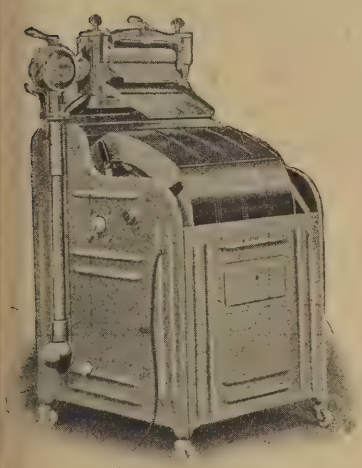


Fig. 20.—The Coffield Washer.

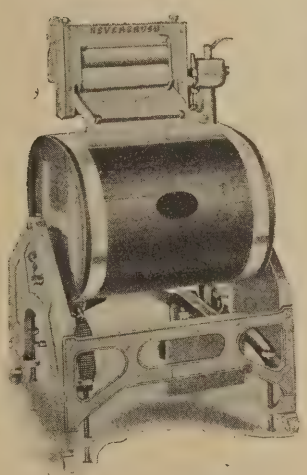


Fig. 21.—The "Prima."

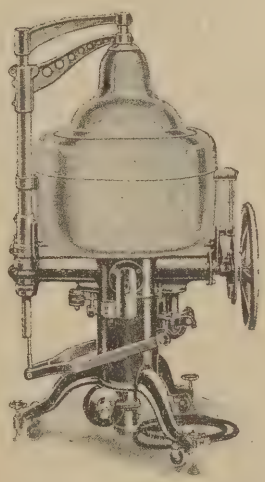


Fig. 22.—The "Bock."

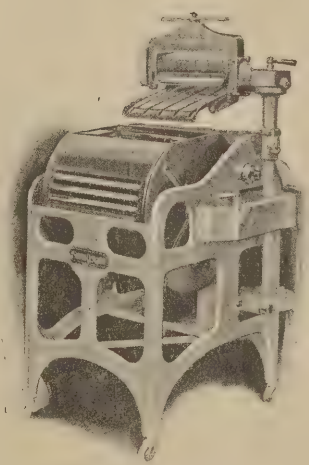


Fig. 23.—The "Sunnysuds."

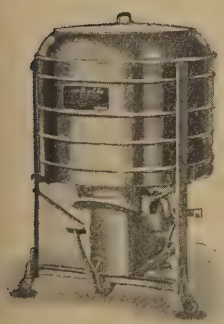


Fig. 24.—The "Laundryette."

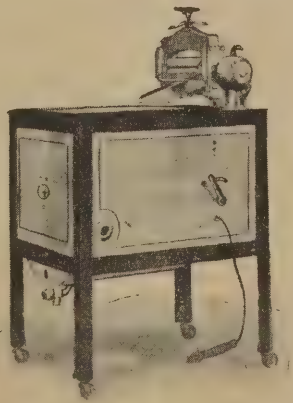


Fig. 25.—The "Double A."



Fig. 26.—The "Federal."



Fig. 27.—The "Fem" Washer.

Some Examples of American Washing Machines.

trated in fig. 21—the "Prima" washer. This consists of a plain tub mounted on gimbals which has a spring-loaded reciprocating motion. The wringer is mounted on a separate rigid post, through which the auxiliary driving shaft is taken.

The "Bock" machine, shown in fig. 22, is built on rather novel lines. It operates upon the principle of dynamic balance, which permits a speed of 1,750 r.p.m., for the proper extraction of moisture, without vibration. The actual washing is done by a reciprocating dolly actuated by the gear seen clearly in the illustration. The wheel at the right-hand side performs the necessary switching operations.

Another washer of the cup type is the "Sunnysuds," depicted in fig. 23. The cabinet is cut out to procure lightness and the tub is given a reciprocating motion, and, moreover, a "washing board" effect is obtained by a series of long horizontal indentations in the sides of the container. The usual swinging wringer is fitted, and the motor is mounted on a shelf immediately below the reciprocating tub.

Fig. 24 shows the "Laundryette" machine, in which the totally-enclosed motor is hung from the top frame, facilitating replacement. As will be seen, all the moving parts are effectively enclosed, and the machine is said to work absolutely without noise owing to the type of drive fitted—a silent pinion on the friction wheel hub and a specially-designed bronze slide on the backshaft. The drive from the motor to the central spindle is by belt.

A cut-away view of the "Double A" washer appears in fig. 25. This machine has an inverted dolly which operates at the bottom of the container. The usual form of wringer drive is fitted, and the motor is started and stopped by the lever seen in the left of the illustration. An automatic oiling arrangement is one improvement incorporated in this machine.

The "Federal" washing machine depicted in fig. 26 is characterised by a serviceable appearance. It is an oscillating-cylinder model, and the driving motor and wringer shaft are enclosed in the casing of the body, making the machine one of the safest to operate among all the types here illustrated.

The "Fem" machine, illustrated in fig. 27, employs a perhaps unique arrangement. The clothes are held motionless between two screens while the water is forced up and down by a piston which is operated by the motor mounted on the top of the copper tank. The machine has only one small gear wheel, which is enclosed in a housing.

In concluding this article we desire to express our acknowledgment to *Electrical Merchandising*, from whose advertisement pages some of the illustrations have been reproduced.

Electricity Supply in Great Britain.—VIII.*

Gloucestershire and Wiltshire.

Nearly all of Gloucestershire and more than half of Wiltshire are included in the Lower Severn Electricity District as provisionally determined by the Electricity Commissioners, and, with the exception of the Salisbury Electric Light and Supply Co., Ltd., all the other authorised undertakers in the list below are concerned with this District.

In this connection it is interesting to note that the Electricity Commissioners' Fifth Annual Report mentions that the stage is approaching when the question of the reorganisation of supply in this District will need to be reopened.

We also wish to draw attention to the remarkable similarity between the increase in output of this District (Area No. 1) and that of the counties of Dorset, Hampshire, Sussex, &c. (Area No. 19), which we have recently dealt with in this series. The figures are taken from Table 8 of the Electricity Commissioners' annual pamphlets, "Generation of Electricity in Great Britain."

Year ended March 31st.	kWh generated. Area No. 1.	Area No. 19.
1922 ...	77,943,016	76,313,651
1923 ...	89,456,059	88,869,613
1924 ...	105,394,934	104,884,274
1925 ...	119,257,004	120,094,019

The northern part of this District is a typical example of the chaotic conditions at present confronting the Commissioners. The Rural District of Tewkesbury (Glos.), for instance, has been applied for by three different undertakers. The frequencies of their systems are 25 cycles, 50 cycles, and 100 cycles respectively.

The undertaker with the 25-cycle system has just been granted statutory powers, under Section 17 of the Schedule to the West Midlands Electricity District Order, 1925, to supply electricity for all purposes in the part of Worcestershire included in the Lower Severn Electricity District, and in the detached parts of Worcestershire (Nos. 3 to 7 inclusive), as well as in certain parts of the Counties of Salop and Stafford.

The following table gives particulars of the above and other areas for which competing applications have been lodged:—

Name of authorised undertaker.	System of supply.	Areas for which competing applications have been lodged. Tewkesbury R.D. (Glos.)	Winchcombe R.D.	Gloucester R.D.	Cheltenham R.D. (part.)
—	—				
Shropshire, Worc. & Staffs. E.P. Co.	A.C. 25 ~	×	×	—	—
West Glos. Power Co., Ltd.	A.C. 50 ~	×	—	×	×
Cheltenham Corporation	A.C 100 ~	×	×	—	×
Gloucester Corporation	D.C.	—	—	×	—

× = Application lodged.

No applications have yet been lodged in respect of the areas on the map on the opposite page which are not hatched, nor do they belong to any authorised undertaker.

The following is a list of the authorised undertakers whose areas of supply are wholly or partly included in the map:—

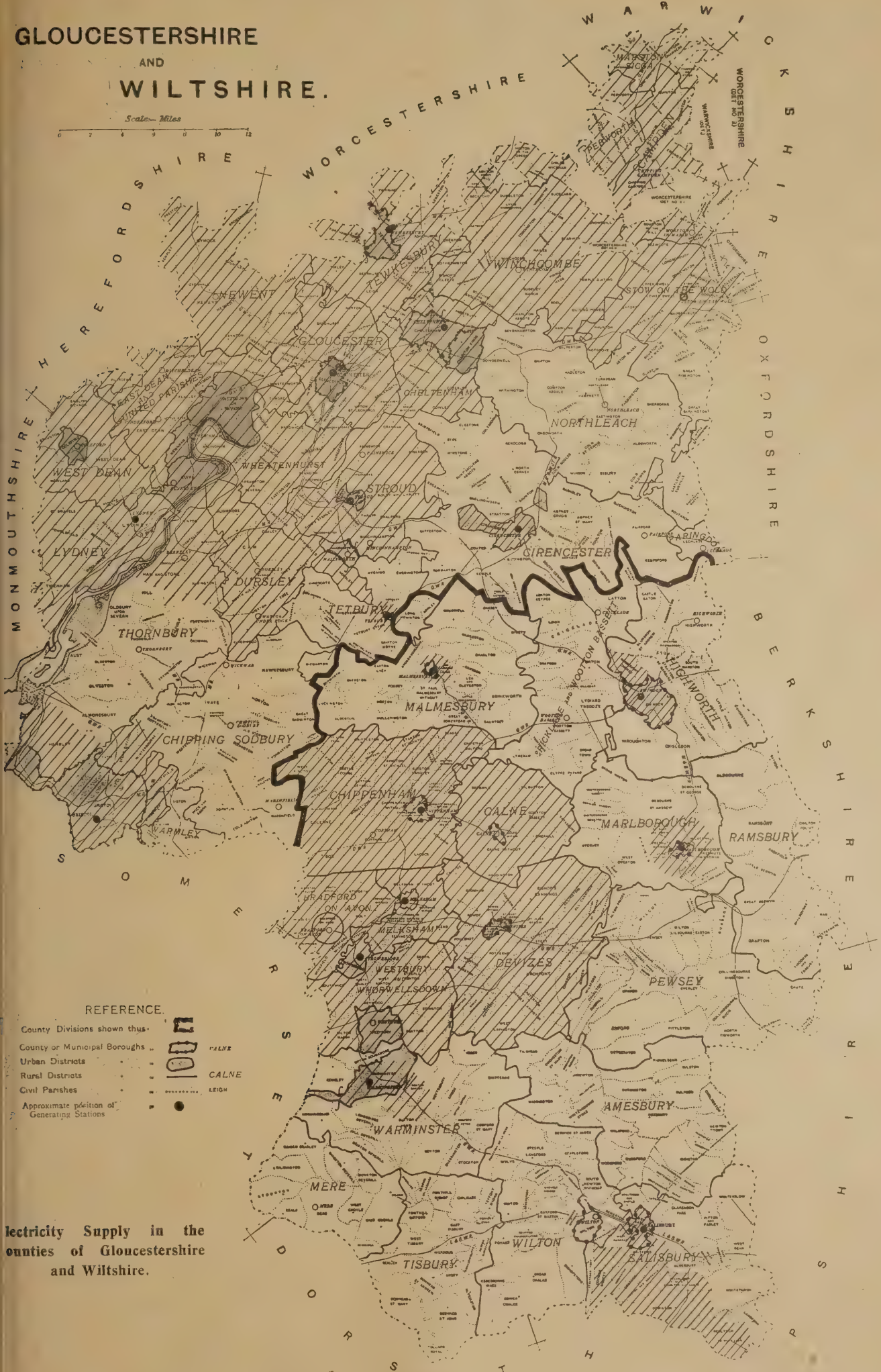
Local Authorities.

Bristol Corporation.
Calne Corporation.
Cheltenham Corporation.
Gloucester Corporation.
Marlborough Corporation.
Swindon Corporation.

Companies.

Chepstow Electric Lighting & Power Co., Ltd.
Cirencester Electric Supply Co., Ltd.
Malmesbury Electric Supply Co., Ltd.
Salisbury Electric Light and Supply Co., Ltd.
Stroud Electric Supply Co., Ltd.
Tetbury Electric Supply Co., Ltd.
Tewkesbury Electric Light Co., Ltd.
Warminster Electric Supply Co., Ltd.
West Gloucestershire Power Co., Ltd.
West Wilts Electric Light & Power Co., Ltd.

* Parts I-VII of this series appeared in the Electrical Review of October 9th, 16th, 23rd, and 30th, November 13th and 20th, and December 11th, 1925.



Electricity Supply in the Counties of Gloucestershire and Wiltshire.

The 1921 Census gives the following particulars for the Administrative Counties of Gloucestershire and Wiltshire and the associated County Boroughs:—

Acres.	Persons	Resident families.	Buildings not containing dwellings.
1,669,943	1,049,859	252,355	16,130

The map is reproduced from those prepared for the 1917 Boundary Commission, by permission of the Controller of H.M. Stationery Office.

In order to bring the map topographically up to date, a list of alterations made since 1917 is given below:—

(1) The County Borough and Parish of Bristol has been enlarged by the inclusion of parts of the Parishes of Thornbury and Easton-in-Gordano.

(2) The Parish of Downton has been divided into two new parishes, called the Parish of Downton and the Parish of Morgan's Vale and Woodfalls.

(3) Parts of the Parishes of Upper Swell and Maugersbury have been added to the Urban District and Parish of Stow-on-the-Wold.

(4) Part of the Parish of Tetbury Upton has been added to the Urban District and Parish of Tetbury.

(5) The Parishes of Marlborough Saint Mary, Marlborough Saint Peter and Saint Paul and Preshute Within have been united to form the new Parish of Marlborough, co-extensive with the Borough of Marlborough. The Parish of Preshute Without has been re-named the Parish of Preshute.

Note.—With reference to alteration (2) it will be seen that the whole of the Parish of Downton as shown on the map has been hatched, although the Parish of Morgan's Vale and Woodfalls is not mentioned in the description of the area applied for as set out in the London *Gazette* of May 22nd, 1925, page 3,463.

A Unique Electric Sign.

Some Particulars of the Huge Colgate Sign.

What is claimed to be the largest electric sign in England, the new one recently erected on the south bank of the Thames, between Charing Cross and Westminster Bridge, to advertise Colgate's toilet productions, presents some particularly interesting electrical and mechanical features. It covers a vertical area of 5,000 sq. ft., and is carried on a steel frame quite independent of the building in front of which it is erected. The frame, which weighs over 60 tons and is of a very elaborate design, to sustain the various stresses of wind pressure, &c., is carried on four 9-in. × 11-in. steel stanchions; these stand on concrete bases, each having a volume of approximately 300 cu. ft. The words

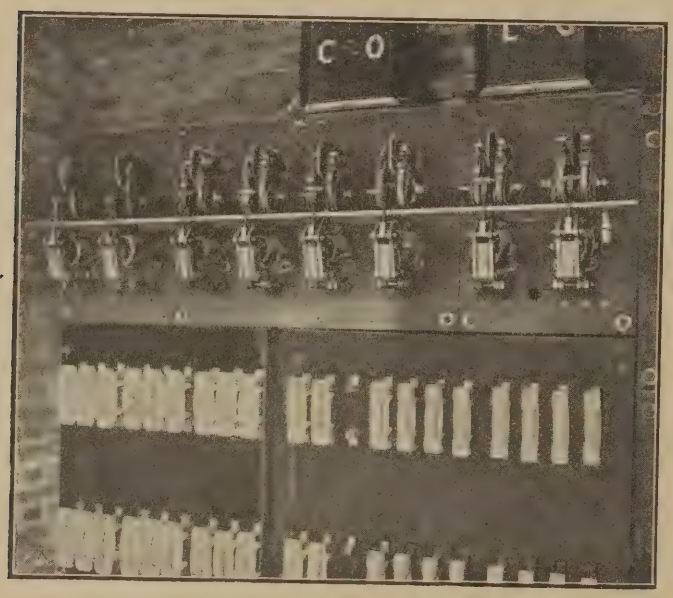


Fig. 1.— Large-Letter Control Gear.

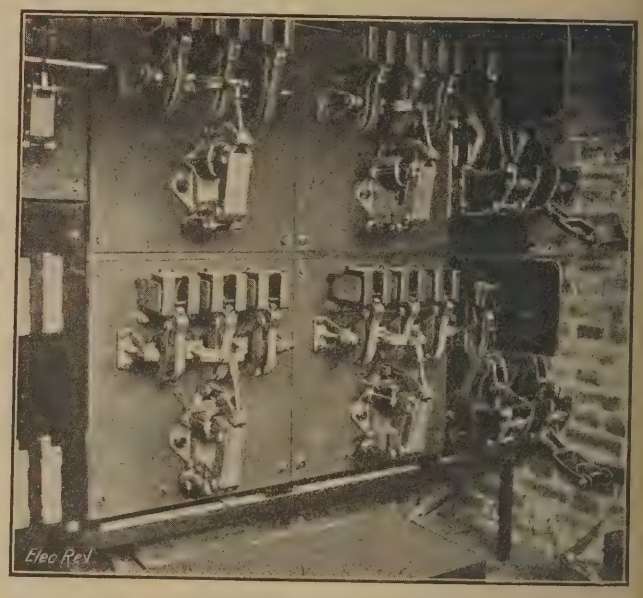


Fig. 2.—Main Breakers and Contactor Switches.

"You'll Come To Colgate's By Degrees," and a thermometer, 60 ft. high by 12 ft. wide, which records the correct temperature at all times, are portrayed by night and day. The large letters (Colgate) are 12 ft. 6 in. high, and average each a weight of a quarter of a ton; the smaller letters are 5 ft. high. All of them are constructed of white vitreous enamelled steel, giving a good visibility during the daytime and an excellent distinction when illuminated at night. The loading of the sign is approximately 100 kVA. The supply is received from the London Electric Supply Corp. at a pressure of 2,500 V, and is reduced to a working pressure of 105 V by two 50-kVA transformers on the site. The general installation is made up in two sections, which are protected by two 2,000-A d.p. breakers, fig. 2, right. Each section is controlled by a pair of 1,000-A contactor switches, fig. 2, which are governed by a Venner time switch. Each of the larger letters is operated by a small d.p. contactor switch, fig. 1. The lighting of the smaller letters and the mercury column is arranged to be intermittent and these with the small contactor switches are operated direct by a rotary flasher, fig. 3. This is built up in five sections, each section being controlled by a separate brush switch. The flasher is operated through spur gearing by a small a.c. motor, and is contained in a sheet-metal case at the foot of the control board, figs. 1 & 2. The flasher is so adjusted that at no period is the sign completely out.

The main feature of the sign is the visible thermometer, which is shaped to represent a huge "tube" of dental cream. It is constructed of sheet steel, with raised opalite figures and degree spacers illuminated from the back. The mercury medium is represented by a central white column. From the top of the "thermometer" is suspended a black "apron" covering the upper portion so that the height of the remaining part indicates the temperature as measured by an electrical resistance thermometer mounted close at hand. The "apron" is raised or lowered as the temperature varies, by means of a small d.c. motor housed in the top of the "thermometer." The control apparatus for this motor consists of an ingenious system of electrical relays governed by a regulating device in the form of a Wheatstone-bridge circuit, in which the coil of the electrical resistance thermometer forms a part of the "unknown-resistance" arm. The other three arms are made of a material the resistance of which is not affected by

changes in temperature. A slide-wire resistance is placed between the "unknown" and the "variable" arms, and the final balance is obtained by means of a moving contact. The "bridge" circuit is energised by a 1.5-V battery, and a moving coil galvanometer is connected across the "bridge" in the usual manner, the moving contact on the slide wire resistance making one terminal. The galvanometer coil is suspended between the upper poles of two vertical bar magnets. An aluminium pointer is attached to the galvanometer coil, and carries at its extremity two small thermo-couples T_1 and T_2, fig. 4, which are connected electrically to a moving-coil relay. The latter is placed between the bottom poles of the vertical bar magnets. An electrically-heated spiral H, fig. 4, almost embedded within a metal block, so that the heat is

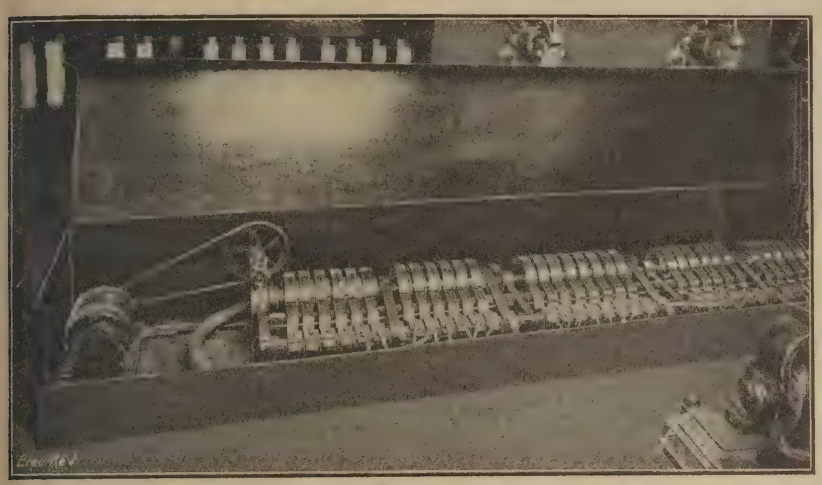


Fig. 3.—Rotary Flasher.

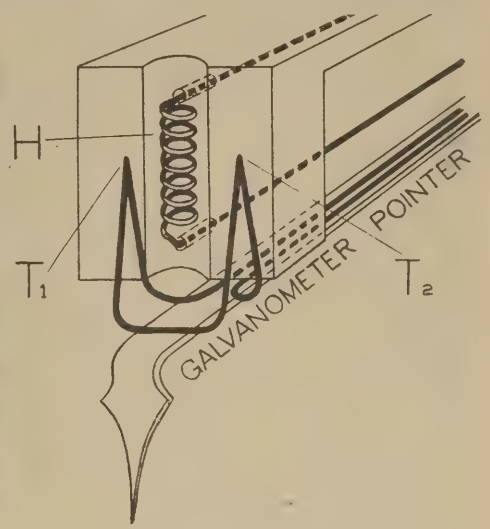


Fig. 4.—Thermo-Couples and Heater.

localised at one point, is placed immediately behind the thermo-couples. The heater is energised by a 14-V supply from a small transformer fed from the 105-V mains direct. At "bridge-balance" the pointer is in its neutral position, in which the heater is midway between the two thermo-couples. A change in the resistance coil of the electrical thermometer, brought about by a temperature change, throws the "bridge" out of balance, and hence deflects the pointer of the galvanometer. This brings one of the thermo-couples nearer to the heater; an e.m.f. is thus generated in the couple, which operates the moving-coil relay. The galvanometer complete with the thermo-couples and the heater, and the moving-coil relay, are mounted as one unit in a metal case. In a separate case are mounted two secondary or power relays. One of these is energised when the moving-coil relay is deflected. The vertical spindle of the latter forms a common terminal of the two secondary relays, and on either side of the spindle are two contacts which form the other terminals, one for each relay. When the spindle is turned by the deflection of its coil, connection is made with one of the side contacts, and the corresponding secondary relay is energised. These relays are connected so as to control the ½-h.p. operating motor in opposite directions, so that the "apron" will rise or fall. Energy for the secondary relays is supplied from the same transformer as the heater. The operating motor is supplied from a small motor generator, and the field is permanently "on," the secondary relays being arranged in the armature circuit. It is also connected through a reduction gear to the slide-wire contact of the variable arm of the Wheatstone bridge so that, as it raises or lowers the "apron," it also adjusts the contact until the bridge is re-balanced. The galvanometer is thus brought back to zero and the relays cease to operate and the motor is brought to a standstill. An efficient brake fitted to the motor ensures an almost instant stoppage of the "apron" movement. During periods when the temperature is rising or falling sharply, the relays are actuated about once in every three minutes, and during times of steady temperature, about once every half-hour. A second time switch governs the "thermometer," which is in operation from 6 a.m. to 12 m.n. The sign was designed and erected by Boro' Electric Signs, to whom the Cambridge Instrument Co., Ltd., was responsible for the design and installation of the temperature control apparatus.

Notes on Trolley-'Bus Traction.

An Interesting Undertaking in France.

By THEODORE RICH.

SINCE the war the trolley-'bus as a factor in passenger road transport has greatly increased in importance in a number of English cities. It has recently been taken up seriously in France. It may be remembered that at the Paris Exhibition in 1900, in the Vincennes Annexe, one of the features was a trolley-'bus on the Lombard-Gerin system; the 'bus was connected by cables with a motor-driven over-running trolley, the speed of the trolley motor being in synchronism with the driving motor of the 'bus, as the former was driven from slip-rings on the latter.

In some towns and districts in England the development of the trolley-'bus has been encouraged by legislation dating from the horse-tram days, requiring such undertakings to keep in repair the roadway between the rails. It is not realised that this regulation was in itself originally made to comply with the demands of local authorities for tribute from the capitalistic concerns that initiated tramway enterprise; nowadays when tramway problems are discussed, it is amusing to hear the complaints of the L.C.C. and other local authorities on this score, as what was sauce for the private-enterprise goose has turned out to be sauce for the "people's own" gander. Some authorities have put down railless trolley sections to avoid expenditure on overdue track repairs, and to avoid road maintenance expenses being charged to the tramway account; this is "robbing Peter to pay Paul," as the charge for road

upkeep comes on the ratepayers whichever way it is done.

In all questions as to road traffic whether it is a matter of tramways, trolley-'buses or motor-'buses, the vehicles, unlike an aeroplane which travels on air or a steamship that travels on the ocean, have to run on some form of track that is liable to wear out, and somebody has to pay for the upkeep; the passenger assists through his fare and the public through local rates directly

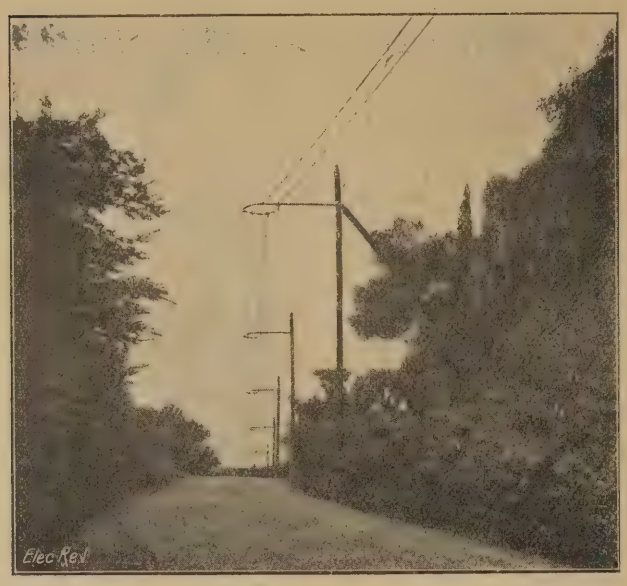


Fig. 1.—Trolley Line carried by Wood Poles.

or through purchases from local tradesmen—the money comes from somewhere. The trolley-'bus has undoubtedly a sphere of usefulness, but the system will be more injured than benefited if it is adopted to aid figure juggling by local authorities.

On the Continent.

In France as in England, due largely to the incessant demands of labour in so-called sheltered undertakings, the cost of construction and the expenses of maintenance of tramways and light railways have gone up enormously since 1914. Some undertakings in France, even where supported by local authorities, have had practically to treble their fares, and in some cases traffic has been reduced to about three trains per day each way.

In Italy during the war, owing to the high cost and difficulty of obtaining petrol, the trolley-road traction system underwent rapid development, and at the time of the Armistice several hundred kilometres of temporary and other trolley line had been erected for military purposes. In the South of Germany over twenty years ago a trolley-lorry system was started to haul stone from some quarries. There are in the United States a certain number of systems at work, although in early days the abominable state of American roads had a great deal to do with the rapid development of street and interurban electric traction, the more recent improvement in roadways bringing into competition in some places what are termed the " jitney " 'buses. In modern times the production of aluminium and magnesium on a commercial scale, great improvements in springing, the invention of solid and pneumatic rubber tires, the use of pressed steel sections to reduce the number of rivets and fastenings, and the improvements in steel and its alloys which enable much higher stresses than before to be taken by shafts and toothed wheels, have all tended to encourage road-borne as compared with rail-borne traffic.

It was largely the excessive wear and tear of the old steam coaches started about one hundred years ago that stopped mechanical road transport for such a length of time.

Trolley-'bus v. Petrol-'bus.

Not long ago M. Lévéque, chief engineer of the French Government Département de Ponts et Chaussées with a M. Gex, made a study of the trolley-'bus and motor-'bus question, and came to the conclusion, at the prices of commodities and services then ruling, that while a motor-'bus cost 1.25 fr. for petrol, 0.24 fr. for lubricating oil, and 0.04 fr. for grease per 'bus-kilometre, an equivalent trolley-'bus cost 0.07 fr. for energy at 0.10 fr. a kW-hour, and lubricants 0.04 fr., the ratio for these items combined being about 13 to 1. After allowing for interest on first cost, depreciation, wages and repairs, the petrol-'bus cost 3.73 fr.; as against 2.55 fr. per 'bus-kilometre. The cost of wages and commodities has gone up since those figures were calculated, but the ratio has not varied very greatly.

The question of the trolley-'bus was also dealt with in some detail in a paper read before the Société Française des Electriciens on July 5th, 1922, by M. M. Igléses, one of the engineers of the Constructions Electriques de France. He points out in his paper that from the point of view of comfort, the trolley-'bus is superior to the petrol-'bus because it is more silent, vibration is practically eliminated, and the unpleasant sensations of gear changing are avoided. It should be noted, however, that in the petrol-electric system of 'buses these difficulties are also largely avoided. From the point of view of French as well as English interests, so long as war risks remain conceivable, current derived from water power or native coal must be preferable to imported petrol which is subject to the operations of chamelionic international financiers.

As compared with the normal type of tramcar with rail return, the two-conductor trolley system practically eliminates all danger from electrolysis of pipes, &c., and such expensive expedients as negative boosters to comply with the seven-volts Board of Trade rule can be avoided. There is no doubt that there is scope for all three kinds of traction—tramways where cars run very frequently, and long double-deck bodies can be used; trolley-'buses where traffic is lighter; and motor-'buses where traffic is either very light or where the conditions in the streets in large towns make self-contained power vehicles a necessity.

When considering such questions, among the main factors are to be found cost of power in bulk, and average cost delivered to the trolley line, equivalent cost of petrol, wages, lubrication, repairs and depreciation, and interest charges on sub-stations, trolley lines, vehicles and equipment, tires, and car-sheds. Monsieur Iglésis, in the paper referred to above, gives some interesting formulæ and diagrams by which the relative spheres of usefulness of the different types of traction can be estimated. The existence of a power supply at



Fig. 2.—Interior of Trolley 'Bus.

convenient points along the route under consideration naturally favours the adoption of electric traction, as the cost of construction of a special power house is thus avoided.

A French Trolley-'bus System.

In France in recent years the motor-'bus has to a large extent taken the place of the old " diligence," and

to a certain extent that of the carrier's cart. In towns in the South, for instance, one finds 'buses with some seats inside which can be folded up, and part of the space used for all kinds of merchandise, from a sack of potatoes to a Paris hat in a hat-box; such 'buses radiate from market towns or connect neighbouring towns. It is this sort of traffic which, when sufficiently large, can under favourable conditions be adapted for trolley-'bus and trailer operation.

An interesting installation of trolley-'buses on the "railless" system is now at work between Nimes and Pont-du-Gard, in the wine-producing district to the west of the mouth of the Rhone. These two towns are joined by two trolley routes, one direct 25 km. (15½ miles) long, and the other forming two sides of a triangle 35 km.

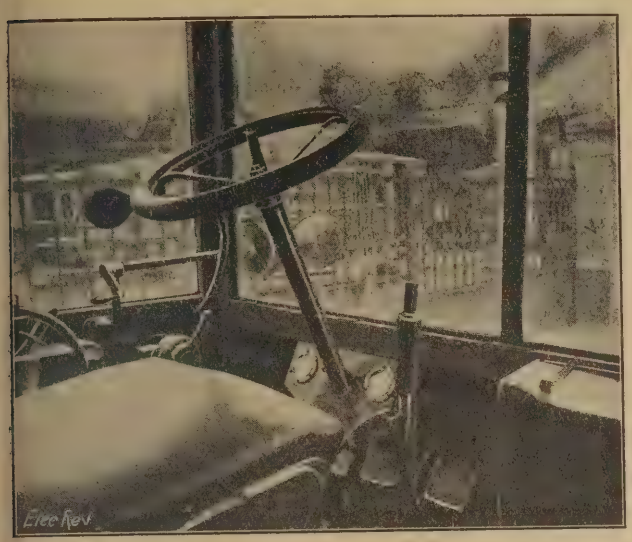


Fig. 3.—Driver's Compartment.

(21¾ miles) long, a number of small places being passed on each line. The equipment has been carried out by the Constructions Electriques de France, of Paris and Tarbes, a company that has a technical alliance with the English Electric Co. The roads followed are not of a uniform character; in places they are only 6 metres wide (19 ft. 6 in.). The gradients are not heavy, the maximum being 1 in 16.6.

Sub-Stations.

The power is supplied by the "Sud-Electrique," a company which distributes power over a large area in the South of France; it is delivered at 13,500 volts to two sub-stations, one at Lafoux, near Pont-du-Gard, and the other at Comps at the point of the angular loop. The equipment of both sub-stations is identical, comprising one 13,500 to 500-volt transformer, a slip-ring induction motor 150 h.p. 500 volts at 970 revs., direct coupled to a 100-kW d.c. shunt generator 550 to 750 volts. There is a high-tension and low-tension switchboard on the three-phase side, a d.c. generator panel, and two feeder panels.

There is also an accumulator sub-station placed between the two branches near the Nimes end of the triangle, near the centre of gravity of the system. The battery discharges automatically in the case of failure of the supply current; it is of 750 ampere-hours capacity, with 270 cells, plus 10 regulating cells. It is large enough to take care of the whole load of a normal day's traffic; for that reason there is not the usual necessity for spare gear in the motor-generator sub-stations. The sub-stations, generally speaking, look after themselves, although there is one man in charge of each. The accumulator sub-station runs without anybody being in charge, although it is regularly inspected.

Trolley Line.

The trolley line, see fig. 1, consists of two copper conductors, 87 sq. mm. section (.135 sq. in.), suspended from brackets attached to wood posts, the posts being kept off the ground by means of Pousolle type concrete bases. The posts average 7 m. 50 (24 ft. 7 in.) long, 14 cm. (5½ in.) at the tip, and 22 cm. (8⅝ in.) at the butt. The average distance of the posts apart is 25 metres (27.3 yd.). There are ten lightning dischargers on the trolley lines averaging 5 km. apart.

Coaching Stock.

The stock of vehicles consist of 10 trolley-'buses and 15 trailers of various types. The 'buses have an overall length of 7 m. 985 (31 ft. 5 in.), a width overall of 8 ft. 2½ in., a wheel base of 4 m. 40 (14 ft. 5 in.), and a wheel track of 2 m. 10 (6 ft. 10½ in.). The 'buses weigh 8 tons in working order, unloaded; one of them is shown in fig. 5, p. 1012. The forward (steering) wheels are fitted with 1,030 by 180 solid rubber tires, and the back (driving) wheels have twin tires 1,030 by 160.

There is seating accommodation for 34 persons, with standing room for four more (see fig. 2). Luggage racks are fitted, a matter of convenience where the length of a journey runs into several miles; on many 'bus and tram routes in the British Isles racks would also be a convenience. The seats are crosswise, as with the more recent London 'buses; a cross seat tends to more rapid discharge of passengers than longways seats, as people spot quickly where they are, and where the route is picturesque one can see out of the windows much better.

The 'buses are fitted with extraction ventilators; the seats are covered with rattan, and the electric lighting is arranged for by means of glass bowls in the ceiling. There is a baggage compartment at the rear which will take half a ton of passengers' luggage or merchandise; four tip-up seats are arranged in it for emergency use. Fig. 2 shows the interior of a 'bus looking towards the baggage compartment.

The passengers enter the 'bus at the front end on the right-hand side next to the curb, as traffic in France is to the right hand and not to the left as with us. A glass screen separates the driver (who also acts as the conductor) from the main compartment; passengers as they enter pay their fares and take their tickets through a window in the glass screen. Fig. 3 shows the driver's compartment; as will be seen, the seat is on the left.

Electrical Equipment.

Each trolley-'bus is fitted with two motors; each motor is of the DK 26 B type, fitted with four main poles and commutating poles. They are of the general type developed by the English Electric Co., hence the nomenclature DK. Each motor develops 20 h.p. at the car axle when the armature is running at 1,000 revs. per minute; the drive is by means of a worm and helicoidal wheel, so that the use of a differential is avoided.

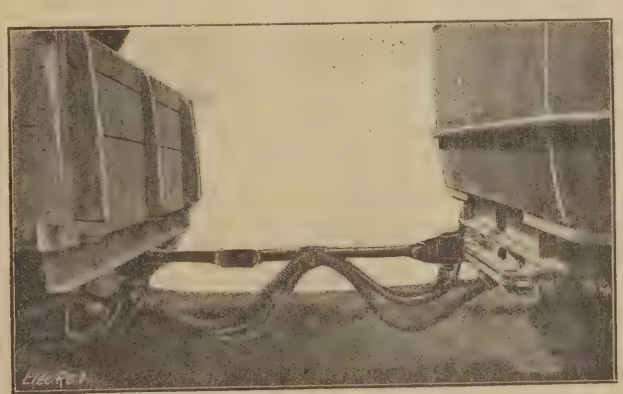


Fig. 4.—Draw-Bar, Brake Pipe and Cables.

The driver operates the controller by means of a pedal, which is notched up by successive pressings, the cylinder being returned to the off position by means of a coiled spring when the pressure of the foot is released. The reversing cylinder is operated by hand. The controller has nine running contacts, five for series and four for parallel operation; the last two positions are for shunting the fields at top speeds. The controller is fitted with solenoid blow-outs of the type with which the English Electric Co., as successors to Messrs. Dick, Kerr

and Co., has been identified since the days of the late Mr. Short.

The trolley poles are of the standard "Railless" pattern, which allows the 'bus as much variation on the roadway as is reasonably necessary for traffic conditions.

In addition to the usual resistances and resistance connections required for the starting of the main motors, for shunting the fields, and for operating the rheostatic brakes, there is a group of resistance frames which can be adjusted to suit the number of motor-propelled trailers forming a train when operating on a "mixed" service.



Fig. 5.—Trolley 'Bus and Self-propelled Trailers.

There are three systems of brakes—

(1) A hand brake acting on drums on the motor shafts.

(2) Rheostatic brakes controlled by a foot controller.

(3) A compressed-air brake acting on drums on the rear wheels, actuating also the brakes on the trailer cars.

There are two air-compressors, one driven by means of a chain off the shaft of each motor. As a rule, the hand and rheostatic brakes are used when the 'bus is run alone, the air brakes being usually used when there are trailers.

Trailers.

The trailers are 4.735 metres (15 ft. 6 in.) long, 3.19 metres wide, and have a 3-metre wheel base; they can carry a useful load up to four tons each. Each trailer is equipped with a 20-h.p. motor of the same type as the main 'bus motors; the rear axle is driven by means of wormgear. Electric couplers and cables connect the trailer motor or motors to the driver's cabin on the 'bus, and after suitable adjustment of the resistances, the trailer motors can be operated by means of the main controller pedal. Tests have been made with five trailers, but under normal traffic conditions the "mixed" service is operated with two trailers. Van bodies suitable for the transport of fruit and vegetables are fitted on some of the trailer chassis, and others are fitted with box bodies for the conveyance of sand, &c. Fig. 5 shows some of the trailers. Fig. 4 shows the draw bar, the air brake pipe which operates brakes on the trailers, and two cables and couplers for connecting up the trailer motors to the resistances and controller.

Traffic Operation.

On the direct Nimes to Pont-du-Gard route of 15½ miles, there are five passenger services a day in each direction, taking 1 hour 15 minutes on the journey, and one mixed service for passengers and heavy goods on trailers, taking 2½ hours. On the triangular route there are four through passenger services daily in each direction, taking 2 hours 10 minutes for the 21¾ miles, and 3½ hours for the mixed service. Of the villages served, five have a population of between 1,200 and 2,000, and two villages have 2,000 and 2,500 inhabitants. Agricultural produce is carried to Nimes; some goods depôts are arranged along the two routes.

The speed attained exceeds 30 km. an hour (18.6 miles) in the case of passenger traffic, and 20 km. (12.5 miles) an hour in the case of the mixed service. Those 'buses which have been in service since June, 1924, have averaged 30,000 km. (18,600 miles) per vehicle, while those set to work in November last year and February this year have averaged 20,000 km. (12,400 miles) and 10,000 km. (6,200 miles) respectively.

This system, with its simple overhead equipment supported on wood poles, its simple automatically-operated sub-stations, the absence of expensive feeders, and its service of parcels and heavy goods, is an example of what can be done at a reasonable capital cost when an effort is made to provide an installation which the revenue limits of a local, mainly agricultural, traffic, can allow for.

The design of the electrical apparatus was studied in France to suit operating conditions, the 'bus motors and controllers being constructed at Vénissieux, near Lyons; the chassis and the mechanical parts were designed and constructed at Tarbes in collaboration with the Railless Co.

The writer is indebted to the Constructions Electriques de France, of Paris, the contractors, for the technical details and photos of this interesting French installation.

The Electrical Measurement of Altitude.—A new instrument which measures altitude electrically, and about eight times as accurately as the ordinary barometer, to a height of at least one mile, has been constructed by the French physicists, Drs. Huguenard, Magnan and Planiol, and was recently shown before the French Academy of Sciences. The apparatus is based on the fact that a heated object cools off much more quickly in dense air than in very thin air or "near-vacuum," because in a near-vacuum there is very little matter to conduct or convey the heat away. The density of air depends on the altitude, so that an instrument that will measure air density will also give a measure of the altitude.

The device consists of a wire of great resistance, so that when an electric current is passed through it, a high temperature can be attained. Heat is immediately lost by radiation, convection currents in the air, and to a certain extent by conduction. After each of these leaks has done what it can, the temperature of the wire has reached equilibrium; and when once this balance is attained, changes in the temperature of the wire will be due to changes in the density of the surrounding air.

The electrical resistance of the wire changes with the temperature; a variation in the density of the air will therefore cause a variation in the intensity of the electric current, and this fluctuation can be used to measure the altitude, since the density varies according to the distance above sea level.—*Science Service.*

German Goods with an English Trade Mark.—During the hearing of an action in the Shoreditch County Court, on December 9th, before Judge Cluer, it was mentioned by Mr. Armstrong, counsel appearing in the action, which was to recover the price of a number of vulcanite syringes supplied, that the goods were ordered in February, but were not actually delivered until October, this being because they had to come from the Continent, and when they arrived on the first occasion there was a good deal of trouble with the Customs, as it was found that the goods were stamped with the defendant firm's English trade mark, and in consequence they had to be returned for the trade mark to be erased. Judge Cluer said that he was pleased to hear that the Customs Authorities were wide awake, and he hoped they always would be to prevent such a thing happening. Counsel had euphemistically called these "Continental" goods, but they were German goods and certainly should not bear an English trade mark.

Electricity Supply at Bexley Heath.

The New Sub-station of the Bexley Council Electricity and Tramways Department.

A good example of some of the installations which are being put down to deal with bulk supplies is found in the new sub-station of the Bexley Council Electricity and Tramways Department and the Dartford Light Railways. A decision to scrap the old Bexley generating station and to take a bulk supply from the Woolwich Borough Council generating station culminated in the change-over of the Bexley Heath supply to the new sub-station in July last.



Fig. 1.—2,000-V Board.

The supply from Woolwich is received at 10,000 V, 3-phase, 50 cycles, by two 0.15 sq. in. 3-core, 33,000-V cables, provision being made for a possible increase in the transmission pressure by the Woolwich Council in the future. An eight-panel switchboard deals with the e.h.p. supply, two central panels being provided for the incoming cables. Two panels each feed a 700-kVA transformer bank for a.c. distribution, and two others feed two 380-kVA transformers supplying two rotary converters for the d.c. traction supply. A spare panel is intended for a 1,500-kVA transformer bank to be installed later, while the remaining panel provides cubicle accommodation for the potential transformers of the switchboard instruments. The transformer banks are Scott-connected with their secondaries supplying two-phase, 2,000-V (phase and neutral) to a 2,000-V distribution board, fig. 1. Each phase is dealt with separately by this board, and is fed into the single-phase, 2,000-V system of the undertaking, the network being split to accommodate the two phases. Seven panels are provided, two for the incoming feeds from the transformer banks, four feeder panels, and one spare for the future bank. Each panel is equipped with two s.p. breakers, one on each phase, and accommodates two circuits, separate phases, feeding to or from independent busbars. Both the 10,000-V and the 2,000-V boards are of steel construction, with steel-plate panels and cubicles. The 380-kVA transformers at the back of fig. 2, each reduce the supply to the converters from 10,000 V to 375 V. The rotaries, fig. 2, which were installed by the British Electric Plant Co., Ltd., are each of 300-kW capacity and provided with a direct-coupled pony motor for starting. A two-panel starting board, fig. 2, centre, equipped with the necessary main switches, field reversing switches, and lamp synchronising gear, is provided for these machines. The traction board, fig. 2, right-front, is of the open type with polished slate panels, two for the converters, three feeder panels, and one B.O.T. panel equipped with the usual rail leakage apparatus, &c.

A 150-kVA local transformer fed from the 2,000-V board supplies a l.p., 4-panel board of a similar type to that of the d.c. board, during periods of heavy load. The l.p. network is permanently looped through two panels of this switchboard, the other two panels providing for the feed from the transformer and the station lighting. The l.p. system is three-wire, 400 and 200 V, and is served by 14 transforming kiosks.

A booster transformer made by the Hackbridge Cable Co. is the only piece of apparatus brought from the original generating station. It is used as a negative booster on the bulk supply at 2,000 V to the Foot's Cray Electric Supply Co., situated about four miles away.

The building, 60 ft. by 35 ft., is of brick and steel construction, glazed brick inside, with a reinforced glass and wood roof. A 5-ton "Morris" hand crane serves the machine room. A small room is set apart as a workshop and testing house, and another, equipped with electric cooking apparatus, accommodates the staff. The premises were built by Messrs. J. W. Ellingham, Dartford, under Mr. J. Cowper, architect. The e.h.p. transmission cables from Woolwich were supplied and laid by The Pirelli-General Cable Works, Ltd. The switchboards were installed by Messrs. Johnson and Phillips, Ltd., who were entrusted with all the cabling inside the station. The switchboard instruments were supplied by Messrs. Johnson & Phillips, Everett Edgcumbe & Co., and Ferranti, and the transformers, other than the booster, are of the Swedish General Electric Co.'s make. The lay-out and specifications for the station were prepared by Mr. A. J. Abraham, the engineer and general manager, to whom we are indebted for assistance in the preparation of this article.

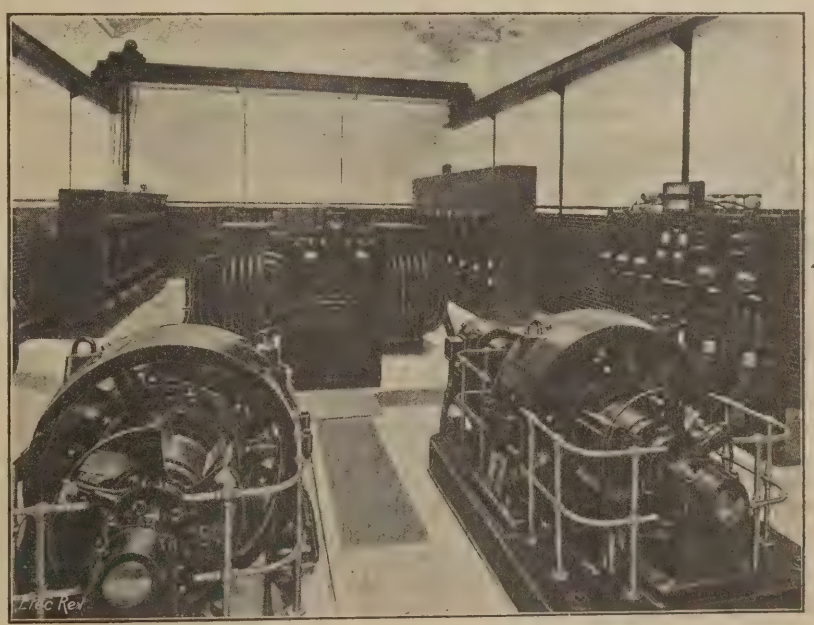


Fig. 2.—Machine Room.

D

The Combustion Engineer.

His Training and Duties in Electrical Power Stations.

By CHAS. F. WADE, A.M.I.Mech.E., A.M.I.E.E.

The fact that the highest thermal efficiency in steam raising units is to be found among the boiler plant supplying steam for electricity supply undertakings seems to be responsible for a curious fact that has been commented upon by various outside persons in conversation with the writer, who has observed the same thing personally. What is referred to is a very prevalent impression in a man's mind that because he is either in superior authority, or is on the generating staff of an electricity undertaking, he is, as a natural sequence, an expert on matters pertaining to fuel economy.

As a case in point may be cited the engineer who, after his new boiler house had been held at half working pressure for a week or so after lighting up, suggested quite seriously that the pairs of boilers were now ready to be coupled in series in readiness to work at full pressure! Another instance of appreciation of boiler-house problems is the objection a certain engineer has to turbine pumps owing to their constant speed. Again, take the case of a new battery of water-tube boilers whose exit flues are connected to an existing natural-draught stack; the stokers are fitted with balanced-draught fans, but these are not used, as the engineer considers the natural draught is sufficient and he does not for an instant realise the inefficiency and cost of chimney draught. Perhaps one other instance will suffice, and that is of an engineer who, in his own words, "will not give anyone best on boiler work," and who holds that scale in boiler tubes does not interfere with heat transmission, as, when at work, the scale is permeated with water and thus allows direct contact between the hot tube surface and the water. A very eminent power supply engineer some little while ago expressed an opinion to the effect that boiler-house control instruments were of little use, as an accurate return of water evaporated per pound of coal was all that it was necessary to know.

It is true that the highest efficiencies at the present day are to be found in modern power stations and, where not due to new plant embodying the latest advances in efficient heat transfer which has not had sufficient time to deteriorate appreciably, this high efficiency is almost entirely due to the unremitting control and careful supervision of a specially qualified expert.

The separate branch of the engineering profession known as "combustion engineering" is of comparatively recent origin, and in view of this some vagueness as to its definite scope and requirements of training and knowledge is perhaps, to a certain extent, pardonable; this lack of appreciation is frequently reflected in the scale of emoluments offered in connection with vacancies for such positions. In some stations a highly trained fuel chemist is given the duty of supervising the efficient operation of the boiler plant, but the knowledge and training needed call for more than a good training in chemistry, and the writer would be inclined to favour an enginer with an aptitude for chemistry in preference to a chemist with engineering leanings. Although a thorough appreciation and understanding of chemical principles is needed for the successful combustion engineer, a very wide knowledge of this subject is not called for; probably a more extensive knowledge of heat-physics is needed than of chemistry, together with the physical properties of materials under the influence of high temperature.

That the boiler-house superintendent should be an engineer to begin with is essential in view of the fact that practical limitations are met with in many directions, and such are almost always of an engineering nature, where they do not consist of questions of financial expediency. The latter again show the necessity for some financial or business capacity so that the feasibility or otherwise of any proposition can be reduced to reliable values in £ s. d.

The control and handling of a boiler-house staff require some knowledge of psychology in order to impart knowledge to, and to get the desired results from, men of widely varying temperament.

It is but rarely that a specialist starts his training as such, but he develops his special aptitude during the course of duties and work of which the subject in which he specialises eventually is but a section. A young generally-trained shift engineer will find some portion or other of his duties in the station appeal to him more strongly than others, and will thus tend to devote most of his attention to that branch of his work which tends to attract him most; this is the usual beginning of a combustion engineer as a specialist, and chiefs would be well advised to look out for such tendencies and to encourage them so far as is possible, in their own interest.

As to the special scientific training required to qualify him for a responsible combustion-engineering post, a shift engineer is somewhat under a disadvantage owing to the interruption to continued spare-time attendance at technical classes involved in the change round of his duties. As already mentioned, the chief would do well to encourage the keen combustion man and therefore to single him out for day-time work only on duties connected with the boiler house, fuel analysis, &c. This does not apply, of course, to places where there is no technical instruction locally available, and in these instances the aspirant will have to do the best he can with books and perhaps correspondence tuition. The latter, particularly if taken as an adjunct to everyday work, should be especially valuable. Actual combustion engineering courses are not, as yet, very widely available in the technical colleges, though they may be obtained at the Northampton Engineering College (Clerkenwell), Leeds University, and Swansea University College, among others.

If the preliminary training has been of the usual practical and technical order, including the customary heat-engine courses, the principal additional instruction needed will consist of a certain amount of chemistry and physics, while the necessary mathematical knowledge is not at all formidable as it does not extend beyond the limits of simple arithmetic, and practically all calculations are readily worked out with an ordinary 10-in. slide rule.

The chemical knowledge called for in a combustion engineer, as distinct from a fuel technologist, will be amply provided by a course of elementary inorganic chemistry, to give the proper understanding of chemical principles and laws, together with some instruction in the earlier portions of organic chemistry, especially as it affects the simpler hydrocarbons and carbohydrates. As the duties of the combustion engineer usually include the examination and treatment of feed water, some extra attention must be given to the properties of water and its impurities, solid and otherwise. In the chemistry course the student should acquire some knowledge of the methods of qualitative analysis in order to be in a position to appreciate questions of ultimate analysis of fuel and the analysis of feed water, but such work should not form a part of the regular duties of the post under consideration, being the province of the specially trained analytical chemist; as such it would occupy too large a proportion of the working day, to the exclusion of the practical application of such investigations.

The training in heat physics should be as complete as possible, especial emphasis being laid upon the all-important principles and laws of the transmission of heat by various means, such as radiation, conduction, and convection; influence of surfaces on the absorption and

dissipation of heat; influence of gas velocities on heat transfer; laws of gases, and so on.

As regards psychology, with some individuals this appears to be a gift, but in the majority of cases this rather abstract quality is developed in a person by careful attention to and study of the mental idiosyncrasies of the various persons under his supervision. Coupled with psychology may be mentioned tact, and it is difficult to draw a clear line of demarcation between the two qualities. If reliance is placed merely upon the autocratic attitude of "do as you are told or get out" it is a foregone conclusion that the whole of the employés will get into a habit of working like unthinking machines, merely carrying out the letter of their instructions and no more. With a raw staff who have not previously been accustomed to working for high efficiency, this will no doubt be effective up to a point in improving matters, and also up to the same point the "company sergeant major" attitude will probably prove of value in forcibly demonstrating to the men that their boss knows what he is talking about by the improvement in results obtained. To obtain the highest practical efficiency of which a boiler plant is capable will call for intelligent appreciation by the working staff of the reasons why certain methods of operation lead to improved results, and it is up to the combustion engineer to foster this state of mind. To be successful, therefore, calls for careful study of the men concerned, and imparting the required knowledge and interest in the manner most suitable for the individual.

We now come to the business or financial side of the question. A fully qualified combustion engineer must not only be able to get the highest possible efficiency from the plant for which he is responsible, but must also be able readily to calculate the ultimate financial result of improved methods, in view of the well-known fact that over a given point thermal efficiency and commercial economy cease to be the same, and that further improvements cost more to obtain than the value of the saving to be effected. Similarly, he must be able to weigh carefully and accurately the possibilities of new plant and accessories brought down to the ultimate question of net money saving. This calls for full consideration of money-earning value of space occupied, standing charges for depreciation, maintenance, and interest on capital, labour and power charges, and so on, all to be set against the gross economies to be effected by the changes contemplated.

Above all, the successful combustion engineer must keep an open mind with regard to modern advances, and not be prone to condemn or to approve of any plant or apparatus without due thought and consideration. He must also keep abreast of the times, and as it is a physical impossibility for any one man to have practical working acquaintance with each and every type of plant and accessory in existence, he must give full study to the permanent and periodical literature relating to his particular sphere of activity. As regards periodical literature specialising in combustion work, about 50s. per annum would cover subscriptions for the whole of it, including one very valuable publication produced in America.

Coming now to the scope of the combustion engineer's duties, this will be governed to a large extent by the size of the plant under his control. In the smaller stations he will obviously have to carry out a large portion of the practical detail work personally, while in the large stations he will be at the head of a staff of assistants, the most important of these being the boiler-house shift engineers and the chemist. His position must be such that he is responsible directly to the chief engineer without the intervention of any intermediaries whatever. This often makes a new man's position somewhat uncomfortable for a time, as it is perhaps a matter of human nature that men of comparatively long service with an undertaking will feel some resentment at a newcomer being appointed to a post carrying a higher salary than their own. The obvious remedy for these longer-service men is not to waste their time grumbling, but to do their best to qualify themselves for a similar job. Incidentally, one wonders whether the somewhat inadequate salaries usually offered for combustion engineers are due to the chief's disinclination to upset his existing staff.

Coming back to the question of scope of duties, this cannot be better described than everything connected with the fuel from its initial selection and purchase, the economical and efficient extraction of the utmost percentage of its potential heat, to the final rejection of the ashes and waste gases. The main line and ramifications of the subject are enormous, and are extending daily.

The best of workmen cannot work without tools, and if a man is offered the position of combustion engineer, before definitely taking up the post, he must insist that he shall have a free hand in the selection and installation of the necessary instruments and other indispensable apparatus. It is true that in many stations to-day the application of what the writer terms "scientific rule of thumb," or improvements in operation based upon scientific knowledge without the aid of instruments, will go a very long way in reducing fuel costs, but even the improvement thus obtained will not satisfactorily approximate to the degree of efficiency consistent with present-day possibilities.

It is impossible to ignore the fact that in all considerations of professional career and position the question of remuneration is a very important one. The writer is aware that the supply of really qualified combustion engineers in this country is very limited, many applications for such posts being from shift engineers who are employed in highly efficient modern stations, but who are unable to produce any evidence that they themselves are in any way responsible for the good results. There are, no doubt, many such engineers who propose to get the job first and then to qualify themselves for it as time goes on; while inadequate salaries are the rule, this is the only type of man the advertiser has a right to expect, and he will merely make his boiler house a sort of training ground for men who wish for an opportunity to devote the whole of their time to the study of combustion, so as to qualify themselves eventually for a better post elsewhere.

The grading of a chief combustion engineer should never be below Grade 3 on the N.J.B. Schedule, while qualified shift engineers or assistants should in every case be graded about Grade 5 when engaged solely on boiler house and fuel economy work. The writer considers that while Grade 1 applies to deputy chief officials, Grade 2 should be allocated to the superintendent combustion engineer. This certainly appears to be the correct state of affairs in view of the predominating importance of the combustion department in modern power generation.

International Agreements.—In the course of his speech at the annual meeting of Dorman, Long & Co., Ltd., the chairman, Sir Arthur Dorman, said that there was a probability that the iron and steel trades' application for protection would be rejected and that they would have to go on fighting unaided. He attributed the bulk of the evils under which we were labouring to lack of demand and the disparity between conditions in this country and on the Continent. The real remedy for these evils was an understanding with Continental producers which would be of advantage to both parties, and much more effective than any purely internal agreements. Sir Arthur concluded in an optimistic vein. He said that we were not far from turning the corner; we were nearing the end of the post-war depression.

The Shannon Scheme Dispute.—Mr. McGilligan, the Irish Free State Minister for Industry and Commerce, stated in Dail Eireann last week that work upon the Shannon scheme was proceeding. Over 900 men were working, including about 140 Germans. He contended that the men were satisfied with their conditions, in spite of the statements of trade-union leaders.

Australian Production and Imports.—In last week's *Board of Trade Journal* was published a comparative statement of the imports of various classes of goods into Australia, and the production of such goods in the Commonwealth, in the year 1923-24, the latest period for which figures are available. The table shows that imports of electrical apparatus were valued at £4,865,975, while the value of the home production was £1,233,317.

The Electrification of Textile Mills.

Some Important Contracts.

Several important and interesting contracts for electric driving and direct-geared turbine driving of textile mills, both at home and abroad, are being executed by the Metropolitan-Vickers Electrical Co., Ltd.

Work in hand for Messrs. J. & J. Hayes, of Leigh, Lancashire, covers the complete electrification of the greater part of the Victoria Mills, the installation having been laid out by Mr. A. B. Mallinson, consulting engineer. The equipment includes a 2,000-kW, 3-phase, 2,200-volt, 3,000-r.p.m. steam turbine generating set, motors totalling about 3,000 h.p. with control gear, sheet-steel cubicle-type switchgear, and a step-down transformer for lighting purposes. Interesting features of this installation are the closed-circuit ventilation system

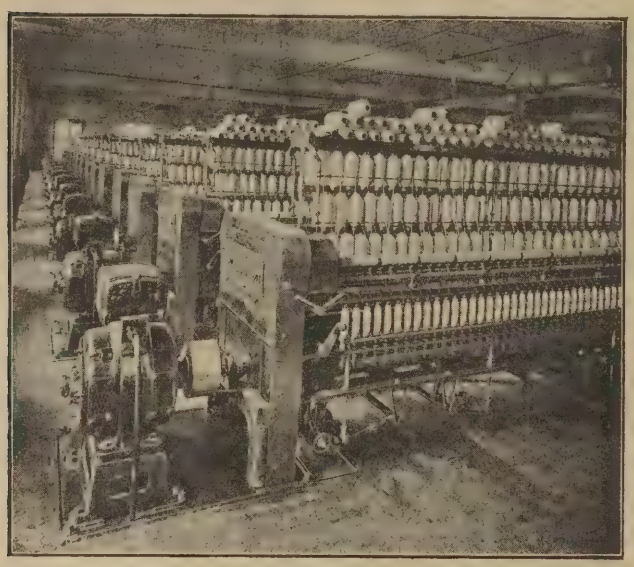


Fig. 1.—Ring Spinning Mill driven by M.-V. Motors.

to be used for the alternator, the use of a voltage regulator, and the employment of squirrel-cage motors arranged normally to start and run up to speed with the generating plant.

Electrical equipment is in hand for three mills at Preston of Messrs. John Hawkins & Sons, including motors totalling over 3,500 h.p., with liquid controllers and ironclad control pillars, and a separate main switchboard for each of the three mills.



Fig. 2.—Motors for Ring Frame Drives in a Brazilian Mill.

For the Rishton mill of Messrs. O. & J. Folds, Ltd., of Burnley, motors totalling about 500 h.p. are being supplied, together with liquid controllers and ironclad control pillars.

Equipment is now being installed at the important bleach and dye works of Messrs. John Welch & Sons at Chinley, which includes two generators of 250 kW and 50 kW, respectively, motors totalling about 400 h.p. with the necessary control gear, and also a complete main switchboard.

The illustration, fig. 1, shows a ring spinning electrical drive at the Empire Spinning Company's mills in Oldham. Twenty such equipments were supplied in 1922, 16 duplicate sets in 1924, and 20 additional sets are being completed now, all the equipments being ordered through Mr. Robert Blackmore as consulting engineer.

The Metropolitan-Vickers export textile equipment contracts are mostly for Brazil and India. In fig. 2 are shown motors for ring frame drives, forming part of an order for a new mill at Sao Paulo; this contract includes motors totalling 730 h.p., and transformers totalling 2,100 kVA capacity. Other contracts for Brazil include motors totalling over 1,200 h.p., for use in eight different mills. A number of these motors are for the Cia Fiacao Mill at Pirassununga, where already M.V. Co. motors totalling over 1,500 h.p. have been installed.

For India interesting contracts now in hand include three geared turbine sets, with condensers, for the direct mechanical drive of the mills. These contracts include turbines of 1,000 h.p. in two instances, and one of 4,500 h.p.; the latter, we are informed, represents about the largest output by the direct drive for which so far a steam turbine has been installed.

Extensions at Maidstone.—On Saturday last recent extensions to the plant and buildings of the Corporation Electricity Works, Maidstone, were officially inaugurated by Mr. J. Hillier French, past chairman of the Electricity Committee. The main extensions consist of a 3,000-kW Brush-Ljungström turbo-alternator and two Vickers-Spearing boilers each of 30,000 lb. per hour capacity, with the necessary switchgear and auxiliary plant, contained in an entirely new ferro-concrete building, turbine and switch room and boiler house. The station now has a total capacity of 8,575 kW. At an inaugural luncheon which followed the opening ceremony, Mr. S. P. Sanders, vice-chairman of the Electricity Committee, presided in the absence of the chairman, Mr. W. H. Martin, who was indisposed. After the loyal toast, Mr. French, in proposing "The Maidstone Electricity Supply Undertaking," paid a tribute to the borough electrical engineer, Mr. E. E. Hoadley, M.I.E.E., referring to the designing of the new extensions and to the management of the undertaking in general. In Mr. Hoadley, he said, the Corporation had an engineer who was a keen business man. The combination of the two qualifications was essential in the management of modern undertakings. Mr. Sanders in reply read a letter from the chairman reviewing the progress of the undertaking from its commencement 24 years ago. Mr. Hoadley also replied and referred to the happy position of the concern which he controlled with regard to its industrial load. The load factor of the station would this year exceed 43 per cent. In reply to "The Visitors" by Councillor F. R. Connor, Mr. J. Andrew Lee, technical adviser to the Electricity Commissioners, conveyed the congratulations of Sir John Snell to the Corporation and its electrical engineer on the broad-mindedness shown in extending the distributing mains to the areas surrounding Maidstone. Mr. Lee said that the Electricity Commissioners would like to see other supply engineers following the example of Mr. Hoadley in paying unofficial visits to them when any important question could be discussed with advantage. The Commissioners could not make progress without the co-operation of the supply undertakers, and too many of the latter took a too parochial view with regard to their undertakings. The industry as a whole was making headway, costs were coming down, and the thermal efficiencies and the loadings were improving. Mr. J. W. Beauchamp, director of the Electrical Development Association, also replied. He congratulated the Electricity Department on having the high consumption figure of 400 kWh per head of population. Engineers generally did not plan plant extensions with sufficient generosity. He thought there would be inconvenience in many places by Christmas, 1927, when the plant available would be inadequate for the ever-increasing demands. Maidstone was an important industrial centre as well as a town of agricultural importance situated in a beautiful country district. This curious mixture, he thought, might prove the solution of a modern problem in electricity supply in the "better world to come."

New Berlin Generating Station.—According to *Power* a new municipal generating station is being built in Berlin on the bank of the Spree River at Rummelsburg, which is to have an ultimate capacity of between 500,000 and 600,000 kW. The first section will be equipped with 16 boilers, each with a heating surface of about 19,000 sq. ft., and fired by pulverised fuel, three 70,000-kW twin-tandem compound turbines, and three 10,000-kW bleeder turbines for stage feed-water heating.

The Electrical Trade Section at the Birmingham Fair.

Progress of the Movement.

WE are pleased to learn that electrical firms are making a very gratifying response to the invitation to make small exhibits in the Electrical Trade Section of the British Industries Fair at Birmingham from February 15th to 26th.

Our anticipations that the importance of making an effective representation of British electrical products would be appreciated by manufacturers when the matter was properly brought before them, have already been fulfilled. The attention that we devoted to the subject in our issues of November 20th and December 4th, and the emphatic way in which we stressed the need for action, have been fully justified.

Shortly after the meeting held at the Birmingham Chamber of Commerce, the provisional electrical committee met, some leading electrical representatives who had been unable to attend at the first meeting being present. As a result of deliberations on this occasion it was decided to ask Mr. W. A. Gillott (who did such excellent work for the industry in the E.D.A. corner at Wembley) to proceed to secure exhibitors to fill the space that was known to be available in one of the large buildings at Castle Bromwich. In the course of a few days many spaces had been allotted and many more may be booked before this issue of our journal reaches the readers' hands.

Down to the end of last week a considerable number of firms producing various kinds of electrical goods had definitely taken space. We would impress upon others the necessity for making up their minds promptly so that the management and committee may get forward with the final organising arrangements. It is possible to have a sample counter display for an inclusive cost of £10, or a small stand (made with hired material) for an inclusive cost of £16 or £17. Forms showing such stands and giving all details can be obtained from the General Manager, British Industries Fair, 95, New Street, Birmingham.

In the Hall containing the Electrical Trade exhibits it is proposed to erect a booth of considerable size where visiting Association delegates can meet, confer, and dine together.

As should be well known by this time, a very large number of postal invitations have been issued by the Board of Trade to potential buyers in the Colonies and in foreign countries. By means of advertisement announcements in newspapers and trade papers published overseas, other invitations have been issued to an even larger body. To all of these who read the ELECTRICAL REVIEW, and to any of our special audience who have not received or seen such invitations, we are able to give a definite assurance that at Birmingham there will be a large group of representative British electrical exhibits, which together with the other features of the great British Industries Fair both in Birmingham and in London, will make a visit during the twelve days well worth while. We understand that British wireless trade products will be displayed at the London end of the Fair—at the White City.

We trust that immediately after the Christmas vacation, steps will be taken to secure the presence at Birmingham at some time or other during the run of the Fair of merchants interested in export trade, of architects, hardware men, ironmongers, and departmental managers of the great stores in different parts of the country.

Electrical retailers and factors from all points of the compass should make an endeavour to spend a day there, as a trade event of this character should possess particular value for them.

It is mainly upon the presence of the right class of visitors from at home and abroad that the success of the 1926 exhibition depends; and upon the 1926 result depend the continuance and development of the Electrical Section of the Fair in subsequent years.

The following are included in the list of electrical exhibitors:—

Sturge & Baker, Ltd.
Falkirk Iron Co., Ltd.
Tucker, J. H., & Co., Ltd.
Relay Automatic Telephone Co., Ltd.
Electricars, Ltd.
Mouldensite, Ltd.
Manda Motors, Ltd.
London Elec. Wire Co. and Smiths, Ltd.
Reeves & Co.
Magnetic Separators, Ltd.
McGeoch, Wm., & Co., Ltd.
British Elec. Repairs, Ltd.
Commutator Grinding Block Co., Ltd.
Sheringham Daylight Co.
Rapid Magnetting Machine Co.
Tok Switches, Ltd.
Waygood-Otis, Ltd.
Chloride Electrical Storage Co., Ltd.
Higgs Motors.
Siluminite Insulator Co., Ltd.
Canning, W., & Co., Ltd.
Premier Elec. Heaters, Ltd.
Nobbs, Geo., Ltd.
Imperial Engineering Co.
Coley & Swinnerton, Ltd.
Jackson Elec. Stove Co., Ltd.
General Electric Co., Ltd.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The "Electrical Review" Index.—The Index to Vol. XCVII (for the half-year ending December 31st, 1925) will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.4.

The Timber Trade. — Our timber trade correspondent reports that the market for general construction woods, imported from the north of Europe, has now got over its difficulties of late summer, when prices for forward delivery from shipping ports were low, with keen selling competition and poor values also in this country. The imports in both October and November showed a decline compared with the corresponding periods of 1924, and with an early closing of navigation there is not much more timber to come forward from northern Europe this season. Although stocks are large the consumption continues very good, and prices have become much firmer. In the hardwood section of the trade teak and mahogany are firm, as are also oak, ash, walnut, &c. The supplies from America are improving in value as shippers in that country are very firm in their ideas of the market. This has a great influence on spot prices, but it also has the effect of making wood consumers look more towards British hardwoods, the better qualities of which are second to none in the world.

Correction.—We regret that in a Catalogue Notice in our issue of December 18th we made mention of the "Ray Engineering Co., Ltd." The concern is owned solely by Mr. R. C. Carter and "limited" should not have appeared.

Lead. — In their report dated December 19th, Messrs. James Forster & Co. stated:—"There was a better tone about the market this week, and although consumers have not been active, a certain amount of buying has been seen. This, and sympathy with other metal markets, was sufficient to lift the prompt price of lead nearly 20s. per ton from the lowest prices touched. There is still no lack of prompt lead, which is generally the case about this time of the year. The future course of prices depends largely on whether consumption revives in this country and in Germany over the turn of the New Year. Consumers have shown very little interest during the past month or six weeks and, it may be, will have to enter the market after the holidays for supplies, with a consequent further recovery in values. On the other hand, if present conditions continue into next year, prices will probably fall away to a still lower level."

New French Company.—La Société d'Electrification de la Region de Bourbon-Lancy is the name of a new company which has lately been organised at Moulins with a capital of 1,600,000 fr. to establish an electricity distribution system in that district.

The British Industries Fair.—In order to relieve apprehensions which have arisen, the Birmingham Chamber of Commerce has issued a circular definitely stating that no retail selling will be permitted at the Birmingham section of the Fair. At the London Fair retail sales will be confined to "tasting samples" in the food and Empire sections.

Hackney Electricity Staff Club.—There has been established in connection with the Hackney Electricity Department the "Hackney Electricity Staff Club." Its objects are to provide catering facilities, social functions and recreative and educational opportunities for the staff of the undertaking. For five days a week members of the staff are served with an excellent lunch, cooked electrically, at an extremely moderate figure, the meal being prepared in an electric kitchen adjoining the club dining room. We had an opportunity last week of inspecting the club arrangements at the magnificent Demonstration Hall and Showrooms at 18-24, Lower Clapton Road, and found them to be all that one could desire. By the way, we would parenthetically recommend borough and other supply engineers and commercial managers to take an early opportunity of visiting the Hackney Hall, as all the notes and illustrations published in the Press have failed to do it full justice because the true idea of space and coloured illumination effects cannot be conveyed by prosaic newspaper printing. Mr. L. L. Robinson is president of the club, with Mr. J. R. Bowden as vice-president, and Mr. D. C. Clark as hon. secretary. Members pay a subscription of 1s. per month or 10s. per year, and they are entitled to bring visitors. The affairs of the club are in the hands of a management committee.

Trade Announcements.—The address of OERLIKON, LTD., is now Oerlikon House, 28-31, Essex Street, Strand, W.C.2. Telephone: City 3421 and 3422; telegraphic address: "Oerlik, Estrand, London."

MESSRS. JESSOP BROS., electrical engineers, have opened premises at the Reliance Works, 17, Beast Market, Huddersfield.

MR. LAWRENCE CHARLTON has taken over the business of Messrs. Sleigh & Wood (Pilgrim Street, Newcastle-on-Tyne), recently carried on by the late Mr. Lionel Wood. Mr. Charlton has been manager for a number of years. All debts prior to his taking over (September 12th, 1925) will be attended to by the administrator of the estate, Mr. Adamson Rhagg, 18, Clayton Street, Newcastle-on-Tyne.

THE ENFIELD CABLE WORKS, LTD., has just opened a depôt at 14, Marble Street, Manchester, for the sale of its rubber-insulated wires, cables, flexibles, &c., of which large stocks are held there.

The London address of MESSRS. SANDERSON, MURRAY AND ELDER, LTD. (buyers for Messrs. Turnbull & Jones, Ltd., of New Zealand, and for Messrs. W. G. Watson & Co., Ltd., of Australia), is now 47, Gresham Street, E.C.2, where they will be pleased to see representatives of electrical firms.

The LONDON MAGNETO REPAIRING & WINDING CO., LTD., of 78, Hampstead Road, London, N.W., has been appointed a service depôt for horns and other products of the E.A. Laboratories Inc., Brooklyn.

Catalogues and Lists.—MESSRS. GEORGE COHEN, SONS AND CO., LTD., 600, Commercial Road, E.14.—A comprehensive descriptive list of machinery and plant (new and second-hand) for sale. Also pamphlets dealing with inspection trolleys, gas, steam and water fittings, &c.

MESSRS. J. HOPKINSON & CO., LTD., Britannia Works, Huddersfield.—List No. 1860, advertising the company's draught gauges. Illustrated.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—Two showcards in colours advertising the company's "Velvact" potentiometers and variable resistances.

THE BRITISH B.A.G., LTD., Orme Buildings, Parsonage, Manchester.—A showcard advertising the "Lomax" lampholder, from which screws are absent.

THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—"The Benjamin Reflector" for Christmas, suggesting a number of seasonable gifts.

"MANDA" MOTORS, LTD., 53-54, Royal Mint Street, E.1.—A price list of electric fans and small power motors.

THE CONTRACTORS' SUPPLIES CO., 5, Finsbury Square, E.C.2—A price list of electrical materials and accessories.

HIGGS MOTORS, Witton, Birmingham.—A priced stock list of a.c. motors and d.c. dynamos and motors.

CARRON COMPANY, Carron, Stirlingshire.—A well-illustrated catalogue of the company's heavy cooking apparatus for employment in restaurants and institutions, and on board ship. The list includes electric baking ovens.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—A mailing card advertising the "Magnet" pedestal heater, toaster, iron and kettle. Priced.

MESSRS. GEORGE NOBBS, LTD., 87-89, Cleveland Street, Fitzroy Square, W.1.—Catalogue Sections Nos. 215 and 216, dealing respectively with "Genii" safety electric geysers, and electric urns and water boilers. Illustrated and priced. Also a print of a completely fitted bathroom in miniature.

MESSRS. EVERSHED & VIGNOLES, LTD., Acton Lane Works, Chiswick, W.4.—An illustrated brochure describing the "Meg" insulation tester; and a descriptive list of the company's recorders for various applications.

THE RANSOMES & MARLES BEARING CO., LTD., Newark-on-Trent.—A booklet containing illustrations, prices, &c., of ball and roller bearings.

MESSRS. E. BENNIS & CO., LTD., 28, Victoria Street, S.W.1.—An illustrated brochure dealing with the company's stoker and self-cleaning furnace.

MESSRS. T. BEADLE & CO., LTD., 3, Castle Street, Hull.—A comprehensive illustrated and priced catalogue of radio apparatus of all kinds.

MESSRS. PHILLIPS & TURNER, Cambridge Street, Birmingham.—Illustrated leaflets advertising lanterns, lamp canopies, ceiling plates, brackets and other lighting fittings.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—Publications Nos. 396a, the "Primax" loud speaker; 439, the "Mellovox" loud speaker; and 440, the "Miniloss" square-law condenser. Illustrated and priced.

Bankruptcy Proceedings.—F. A. FRASER, electrical engineer, 33, Tothill Street, Westminster.—An application for an order of discharge was made recently to Mr. Registrar Francke at the London Bankruptcy Court on behalf of this debtor, who failed last June with ranking liabilities of £3,020 and no realisable assets. The Official Receiver reported that since 1909 the bankrupt had acted as director of a number of limited companies, including the Electrical Contracts & Maintenance Co., Ltd., which went into liquidation in 1924, and was succeeded by the Electrical Contracts & Maintenance Co. (1925), Ltd. He attributed his failure to the insolvency of the old company and his liability as guarantor on its behalf. The application was opposed on the grounds (1) insufficiency of assets to equal 10s. in the £ on the amount of the liabilities, and (2) contracting debts provable in bankruptcy without having reasonable or probable ground of expectation of being able to pay them. His Honour suspended the discharge for two years.

JAMES WILSON, electrical engineer, 70, Ebrington Street, Plymouth.—This debtor appeared for his public examination at Plymouth on December 18th. Examined by the Official Receiver, he stated that after working as a journeyman in different parts of the country he fell out of work, so he started in business on his own account, without capital, and, later, commenced a partnership with another man, who provided £200 capital. After three months the partnership was dissolved, debtor paying £50 in settlement and taking over the liabilities of the business. He moved to his present address but found the rental a heavy burden. Pressed by various firms he executed a deed of assignment in October, 1923. At that time his liabilities were stated as £448, but the list was incomplete. The assets amounted to £388. He started again in business after paying a dividend of 6s. 8d. in the pound. He made a good living until the beginning of 1925, when he fell ill and was unable to give proper attention to the business. The examination was closed.

E. O. HENSTOCK, 21, Old Road, Brampton, Chesterfield, Derbyshire, electrical engineer and wireless dealer.—The first meeting of creditors was held on December 18th at the Official Receiver's offices, Nottingham. According to the statement of affairs, there was a deficiency of £259. Debtor attributed his failure to competition in the radio trade and the illness of his family. He commenced business on his own account in October, 1922. Subsequently he entered into partnership with another, but this was dissolved. In September, 1924, he started dealing in radio goods, but the business was a failure, and he became aware of his position in the following March. There was not a quorum of creditors present at the meeting, and the matter was left with the Official Receiver as trustee of the estate.

G. J. C. THORNE and A. H. THORNE (Lawrence Electrical Trading Co.), electrical engineer, late of 159, High Street, Notting Hill Gate, W.—Last day for proofs for dividend, December 31st. Trustee, Mr. D. Williams, Official Receiver, Carey Street, W.C.

W. G. BAYMAN, electrical engineer, late of 13, Russell Street, Plymouth.—Application for discharge to be heard January 11th, at the Court House, Wandsworth, S.W.

Company Liquidations.—MORCH BROS., LTD., radio instrument manufacturers, 35, Tresham Avenue, Clapton, E.—The accounts filed under this compulsory liquidation show liabilities of £1,327, assets valued at £453, and a total deficiency of £1,874 as regards contributories. Mr. E. T. A. Phillips, Official Receiver, reports that the company was formed in December, 1924, by Jacob Johannus Morch, for the purpose of carrying on the business of motor engineers and manufacturers of radio instruments and appliances. Morch stated that the motor business carried on by him and his brother was not a marked success; in the autumn of 1923 they commenced to manufacture radio sets and accessories, and installed plant for that purpose, but were handicapped by lack of capital, and they therefore borrowed £250 from his wife and a further £100 from a Mr. O. E. Nielson, on the understanding that a company should be formed and debentures created and issued in respect of such advances. By an agreement, dated January 30th, 1925, made between Jacob Johannus Morch and the company, the latter purchased the assets of the business for a consideration of £2,526, to be satisfied by the allotment to himself and his wife of all the share capital of the company, £1,000, as fully paid up, a cash payment of £156, and by the company discharging all the debts and liabilities of the vendor in relation to the business, he being indemnified

against all claims in respect thereof. The company also carried on a retail shop at Lower Clapton Road, London. In March, 1925, the directors issued five 6 per cent. debentures of £50 each to Mrs. Gladys Morch and two like bonds to Nielson as security for loans which they had advanced to the business prior to the formation of the company. Those bonds, having been issued for a past consideration within three months of the commencement of the liquidation, were invalid. According to Morch a contract was obtained for the supply of about £800 worth of radio goods, but after about £300 worth had been supplied the buyers refused to take delivery of the remainder which were in stock in various stages of manufacture, with a consequent loss to the company. On May 21st, 1925, the debenture holders appointed Mr. C. T. Payne as receiver on their behalf. The failure of the company is attributed to trade depression and illness of the managing director, which prevented his giving the necessary attention to the company's business. In the opinion of the Official Receiver the failure is due to entire lack of working capital. The Official Receiver had disposed of the assets by public auction; the gross proceeds amounted to £245, which has been credited to a suspense account pending a decision of the debenture holders as to whether they will take action to establish the validity of their charge. Mr. Charles Latham, 78, New Oxford Street, W.C., has been appointed liquidator.

ANGEL SUPER SIGNS, LTD., Lichfield Grove Works, Finchley, N.—The creditors met recently and a statement of affairs was submitted which disclosed liabilities of £2,203 and net assets of £900, leaving a deficiency of £1,213. The company was incorporated in January, 1924, taking over the business previously carried on by Mr. Angel, Senr., and Mr. Jarvis. A balance sheet of the company for the year to January 31st, 1925, showed a turnover of £6,821, and a gross profit of £1,735, but after allowing for overhead charges, there was a net loss of £144. For the period to October 31st last the turnover was £5,446, on which a gross profit of £1,313 was made, but there was a net loss of £931. It was eventually decided to confirm the voluntary liquidation of the company with Mr. W. R. Clemens, C.A., as liquidator. A committee of inspection was also nominated.

NORTH BRITISH DIESEL ENGINE WORKS, LTD.—Winding up voluntarily. Liquidator, Mr. N. M. Lindsay, Clydeholm, Whiteinch, Glasgow.

BELGRAVIA ELECTRICAL CO., LTD.—A meeting of creditors is called for December 29th at the offices of Messrs. Annan, Dexter & Co., 21, Ironmonger Lane, E.C. Liquidator, Mr. W. H. Lovatt.

Dissolutions of Partnership.—ELECTRIC PUBLICITY CO., electric sign manufacturers, 7, Chichester Rents, Chancery Lane, W.C.—Messrs. S. Dallaway, H. Mundy, and G. F. S. Goodwin have dissolved partnership.

DYER & CO., electricians, decorators and dealers in wireless supplies, Park Road, Bingley.—Mr. W. P. Dyer and Mr. C. G. Snelgar have dissolved partnership. Mr. Dyer will attend to debts and continue the business under the same style.

A French Fair.—A Commercial and International Fair is to be held at Lille from April 2nd to 18th, 1926. Full details may be obtained from the Comité de la Foire de Lille, 73, Rue Faidherbe, Lille.

Change of Address.—The address of the Portsmouth Corporation Electricity Supply Department head office is now: High Street, Portsmouth.

Irish Free State Electrical Imports.—The official returns show that the imports of electrical goods into the Irish Free State during September last amounted to a value of £39,594, as compared with £22,853 in September, 1924. The total for the first nine months of the year amounted to £249,032, as against £290,774 in the corresponding period of last year. It should be noted that dynamos and other electrical machinery are not included in the foregoing figures.

New Belgian Companies.—A new company has just been formed at Molenbeek-St. Jean, Brussels (2, Chaussée de Ninove) with a capital of one million francs and the title La Société de l'Union Electro-technique to manufacture electric fans, bells, and measuring instruments.

La Société Générale des Forces Hydro-Electriques du Katanga has been formed in Brussels, with a capital of 75 million francs, to establish hydro-electric power stations in the Belgian Congo.

Unemployment.—The Employment Exchange returns for the week ended December 7th showed a total of 1,161,000 unemployed persons, as compared with 1,165,275 a week earlier, and 1,182,188 at the equivalent date of last year.

Calendars, Diaries, &c.—MESSRS. MEASUREMENT, LTD., of 118, City Road, London, E.C.1, have prepared a very neat gilt-edged pocket diary for 1926, with adequate daily space, a thumb index to months, and an alphabetical index to names and addresses.

We have again received from MESSRS. F. C. POLDEN & CO., LTD., one of their pocket books. This is handsomely bound in dark red leatherette and contains a diary having a double page for each week and ample memoranda space; a really serviceable article.

BRITISH INSULATED & HELSBY CABLES, LTD., has sent us a set of 1926 refill cards for its calendar.

From the POWER EQUIPMENT CO., LTD., we have had a wall calendar with bold-figured monthly sheets.

The calendar issued by MESSRS. JOHN ARMSTRONG & CO. (MANCHESTER), LTD., is graced by an unbobbed beauty in riding kit. The calendar is a block of daily slips.

MESSRS. J. SHAW, SON & GREENHALGH, LTD., have sent us a "Utility" calendar with a block of large-fiured daily slips.

MESSRS. COLLINS ELECTRICAL, LTD., have adopted the humorous style for their 1926 calendar. This consists of two-monthly date sheets, each bearing a coloured drawing.

From the KEY ENGINEERING CO., LTD., we have received a little celluloid slip combining the functions of a calendar and a rule, with English and metric measurements.

MESSRS. LINDSAY & WILLIAMS, LTD., have sent us a "Utility" calendar mounted in an omega—recalling the company's "Megohmoid" insulation.

The WALKER ELECTRICAL SERVICE (Edinburgh) is issuing a wall calendar with monthly slips and illustrations of repair work.

From MESSRS. POYNTER, GRIFFITHS & CO., LTD., of Maxim Lamp Works, Canonbury Road, London, N.1, we have received a wall calendar with small monthly slips placed beneath a picture demonstrating the illuminating qualities of the Maxim lamp and the charms of the damsel who holds it.

Mr. ERIC THOMPSON, of The Electric Shop, Thirsk, has sent us a wall calendar with monthly slips below a coloured study inducing pleasant recollections.

The calendar received from MESSRS. GEORGE NOBBS, LTD., has monthly slips and an illustration of an electrically-equipped bathroom.

RADIO INSTRUMENTS, LTD., has again sent us a copy of its diary. This contains a great deal of useful information on radio matters, including a list of British amateur transmitters.

MESSRS. T. J. GRAINGER & CO., LTD., of 20, Eldon Square, Newcastle-on-Tyne, have issued a large wall calendar with boldly figured daily slips.

Book Notices.—"Case-Hardening Practice" (32 pp., illustrated). Huddersfield: David Brown & Sons (Huddersfield), Ltd.—This brochure contains a very detailed report of researches carried out in the case-hardening of steel by the company's research staff. It is profusely illustrated with photo-micrographs.

"*Journal* of the Institution of Electrical Engineers." Vol. LXIV. No. 348. December, 1925. London: The Institution. Price 10s. 6d.

"Insulated Electric Cables, I. Materials and Design," by C. J. Beaver. Pp. 264; figs. 71. London: Ernest Benn, Ltd. Price 36s. net.

"The 'Bennis' Standard Evaporation Tables" (14 pp.). Compiled and calculated by G. A. Rossetti. Bolton: Messrs. E. Bennis & Co., Ltd. Price 2s. 6d. net.—These tables, based on Prof. Callendar's data, are designed to assist in the rapid and accurate determination of boiler outputs, efficiencies, fuel consumption, &c.

Electrical Prospecting.—In their report for the past year the directors of the Rhodesian Congo Border Concession, Ltd., state:—"Assisted by electric prospecting, which has proved most effective, making possible the accurate mapping of ore deposits which do not come to the surface, three additional ore bodies were discovered. These have been tested by drill holes with most satisfactory results."

Lighting and Power Notes.

Australia.—MELBOURNE.—According to the *Electrical Engineer of Australia and New Zealand*, the City Council has adopted a recommendation of the Electric Supply Committee for a reduction of the electric lighting tariff throughout the Council's supply area by ½d. per kWh during the summer months—October to March. The new rates are: First 1,000 kWh per month, 3d. per kWh; next 1,000 kWh, 2½d., all further consumption 1½d. per kWh. The reduction is made with a view to assisting shopkeepers and others who use large amounts of energy for lighting.

WESTERN AUSTRALIA.—It is reported that the Western Australian Government will introduce, at an early date, a Bill for the constitution of an Electricity Commission to take charge of electricity supply matters in the State.

Barnes.—ELECTRICITY SUPPLY.—With reference to the Urban District Council's proposal to extend the plant at its electricity works, a communication has been received from the Electricity Commissioners intimating that they are of opinion that the interests of consumers would best be served by the Council's acceptance of the terms offered by the County of London Electric Supply Co., Ltd., and not proceeding with extensions to its generating plant. The Council has considered the Commissioners' report and has voted against the proposal to take a bulk supply. Application is to be made for authority to extend the generating plant.

Bedford.—LOANS.—The Electricity Committee has decided to apply for sanction to loans of £20,000 for mains and £5,000 for transformers and switchgear.

Sanction has been given to the following loans:—New offices for the electricity undertaking, £2,300; adaptation of boiler house, £430; domestic apparatus, £3,000; meters, £5,000; evaporating plant, £1,000.

EXTENSION OF SUPPLY.—The Committee has recommended a scheme to supply electricity to Bromham village, at an estimated cost of £5,736.

Bexhill.—NEW PLANT.—The Town Council has received an intimation from the Unemployment Grants Committee of its approval of the installation of a 1,259-kW converter, with switchgear, &c., at the electricity works for the purpose of a grant. Application has been made to the Electricity Commissioners for sanction to the scheme and to the borrowing of the necessary loan to cover the cost.

Blean.—OPPOSITION TO SCHEME WITHDRAWN.—The Rural District Council has withdrawn its objections to the application of Messrs. Hunt for an Order to supply electricity in the Council's district.

Brighton.—ELECTRICITY IN BULK.—The borough electrical engineer is making arrangements to provide a bulk supply of electricity to the Shoreham and District Electric Lighting Co., Ltd.

LOANS SANCTIONED.—The Electricity Committee has obtained sanction to the following loans:—£2,225 for structural alterations to the North Road sub-station; £45,000 for mains and services; and £4,050 for mains and services in connection with the supply in the urban district of Portslade-by-Sea.

Continental.—CZECHO-SLOVAKIA.—The municipal authorities of Kaaden have recently established a hydro-electric power station to utilise the water power of the River Eger in Northern Bohemia. The plant, which works under a head of about 90 feet, comprises two Voith turbines coupled to generators, of 1,745 and 3,270 h.p. respectively. A third set of 4,080 h.p. is to be installed later. The distribution system is being connected up with the power station at the collieries of the Poldihutte at Komotau so that a reserve supply will be available in case of excessively dry periods reducing the water supply.

Darley Dale.—INQUIRY DECISION.—In connection with the inquiry held by the Ministry of Transport recently into the objections raised by local authorities and the residents of Darley Dale to the proposal of the Derbyshire and Nottinghamshire Electric Power Co., to erect overhead cables from Matlock to Darley Dale, the Ministry has given its decision in favour of the company's proposal.

East Ham.—MAINS EXTENSIONS.—The Electricity Committee is to carry out mains extensions at an estimated cost of £1,876.

Faversham.—ELECTRICITY SUPPLY.—The Town Council is to provide an additional cable to the works of Mexco, Ltd., for a further supply of electricity on condition that the firm guarantees a consumption of not less than 60,000 kWh per annum for five years. The Council is considering a new scale of charges for power consumers of more than 50,000 kWh per annum.

Hamilton.—ELECTRICITY SUPPLY.—From January 1st next the burgh's electricity supply will be taken over by the Town Council from Messrs. Edmundsons Electricity Corporation, Ltd., and the Electricity Committee has recommended reduced rates for lighting, heating, and power, which, however, have been postponed until the results of the past year's working have been ascertained. It is reported that two companies are prepared to submit schemes for a hydro-electric installation on the River Clyde.

Ilford.—ELECTRICITY IN BULK.—The Electricity Committee has considered the report of the chairman and the electrical engineer with reference to their interview with representatives of the County of London Electric Supply Co., Ltd., regarding the question of a bulk supply of electricity from the company, and has reported to the Council that, having regard to the increased maximum demand for a bulk supply of electricity from the West Ham Corporation and to the estimated requirements of the Council's electricity undertaking for the period 1926-1927, arrangements be made with the company for a bulk supply of electricity (required in excess of the increased maximum demand, *viz.*, 2,000 kW, from the West Ham Corporation) upon detailed terms to be agreed upon, and subject to contract and to the approval of the Electricity Commissioners.

Loughborough.—EXTENSION OF SUPPLY.—The extension of the cable to Nanpantan, at a cost of £2,420, has been approved by the Town Council.

Lowestoft.—LOAN.—The Town Council is applying for sanction to a loan of £2,000 for meters.

Ludlow.—PURCHASE OF UNDERTAKING.—The Town Council has come to an agreement for the acquisition of the undertaking of the Ludlow Electric Light Co., Ltd., for £7,000, and has applied for an Order authorising it to take over the undertaking.

New Zealand.—CHRISTCHURCH.—The report on the working of the municipal electricity undertaking (engineer: Mr. J. C. Forsyth) for the year ended March 31st last shows a total revenue of £146,546, as compared with £123,432 in 1923-24. Working expenses amounted to £33,561, as against £26,181, and the purchase of a bulk supply from the Lake Coleridge station of the Public Works Department £29,599 (£26,109). After deducting interest and other charges, there was a net profit of £14,320, as compared with £22,790 in the preceding year. The electrical energy sold increased from 18,979,956 to 22,511,181 kWh, and the maximum supply demanded from 5,640 to 6,460 kW. During the year five new sub-stations were put into operation, and 88½ miles of l.p. overhead mains were erected, bringing the total to 218 miles. A loan of £375,000 has been arranged to cover anticipated extensions of the system during the next five to seven years.

Northern Ireland.—DONAGHADEE (CO. DOWN).—At a recent meeting of the Urban District Council a recommendation of the Finance Committee that tenders be invited for lighting the town by electricity or gas was adopted.

Peebles.—OPPOSITION TO ORDER WITHDRAWN.—The Town Council has withdrawn opposition to the application of the Galashiels and District Electric Supply Co., for an Order to supply electricity in the town.

Fort William.—BREAKDOWN.—The bursting of a cell at the accumulator house damaged dynamos and other plant at the generating station recently, and for a time the town was in darkness.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

PONTYPRIDD.—Ordinary lighting: From 6½d. to 6d. per kWh. Slot meters: From 7½d. to 7d. per kWh. Heating: Winter quarters—first 100 kWh, 2d. per kWh, all energy in excess, 1½d. per kWh; summer quarters—first 100 kWh, 1½d. per kWh, above this amount, 1d. per kWh. Large consumers who are prepared to take 500 kWh per quarter per kW demanded: Flat rate of 1½d. per kWh in the winter and 1d. per kWh in the summer.

BRIGHTON.—Lighting: First 10,000 kWh, from 5d. to 4½d. per kWh, the remaining sliding scale charges to be as at present. Power, heating, and cooking: Flat rate from 1½d. to 1d. per kWh. Street lighting: From 2d. to 1¾d. per kWh. Tramway supplies: From 1.3d. to 1.2d.

LOWESTOFT.—Power: Varying from 2¾d. to 1½d. per kWh, according to the quantity consumed.

BRADFORD.—Heating and cooking (except to consumers taking a supply on the rateable value system: From 1½d. to 1d. per kWh.

WOLVERHAMPTON.—The charges to be reduced from 33⅓ per cent. to 25 per cent., above the pre-war rates.

Skegness.—ELECTRICITY SCHEME.—The Finance Committee has recommended to the Town Council that the subject of a public supply of electricity be deferred for one year. The Council had decided to install its own generating plant.

South Devon.—INQUIRY DECISION.—In connection with the inquiry held in July last into two applications for authority to supply electricity in a large rural area of South Devon, the Electricity Commissioners have intimated that an Order has been granted to the Teignmouth Electric Lighting Co., Ltd., authorising it to supply electricity in certain villages.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Gwynedd Trust, Ltd., to supply electricity in parts of the rural districts of Gwyrfai and Ogwen, in the rural districts of Forden, St. Asaph, Holywell, and Congleton, the boroughs of Welshpool, Montgomery, Denbigh, and Flint, and the urban districts of Sandbach, Alsagar, and Holywell.

The Electrical Distribution of Yorkshire, Ltd., has applied for an Order authorising it to supply electricity in the urban district of Clayton.

Stoke.—EXTENSION OF SUPPLY.—The Electricity Committee has decided to supply electricity to the Abbey Hulton housing estate and is applying for sanction to a loan of £4,000 to cover the cost.

Sunderland.—ELECTRICITY EXTENSIONS.—The Corporation is to construct an underground switch chamber at the corner of High Street West and Bridge Street, at an estimated cost of £4,550. Extensions of mains are to be carried out at an estimated cost of £2,297, and application is to be made for an Order for the acquisition of land and buildings for the purpose of electricity works extensions.

STREET LIGHTING.—The Corporation has installed "Wembley" lanterns of 3,000 c.p. for the lighting of three main streets.

Swansea.—OPPOSITION TO ORDER.—It was reported at a recent meeting of the Town Council that the Llanelly and District Electric Supply Company, Ltd., had applied to the Electricity Commissioners for an Order authorising it to supply electricity to the Gorseinon Electric Light Company, Ltd., and that the Town Clerk had lodged objections to the application on the ground that the Gorseinon Company had an agreement with the Corporation by which "the Corporation shall supply such electrical energy as the company may from time to time require."

Turkey.—ELECTRICAL DEVELOPMENT.—According to the report of the Société Turque d'Electricité the power stations of the company in Constantinople produced during the last financial year 40,010,486 kWh, an increase of 5,603,806 kWh as compared with 1923-24, while the sales advanced from 27,626,175 to 33,408,983 kWh. The number of consumers increased from 30,228 to 32,752. Since June last the company has been supplying electricity to the suburbs of San Stefano and Sar Yar on the Upper Bosphorus and has entered into an agreement to give a supply to the Kadikeny Gas Co. on the Asiatic bank of the Bosphorus.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—The New York correspondent of *The Times* reports that plans have been prepared for the development of water power on a large scale, along the Tennessee River. By building 100 dams on the river and its tributaries, it is calculated that it would be possible to develop at least 4,000,000 h.p. The machinery on the Wilson Dam at Muscle Shoals is now ready. The completion of

other dams higher up river will, it is believed, permit Muscle Shoals alone to develop 612,000 h.p., maintained steadily at all seasons. Four companies have already applied to the Federal Power Commission for permits to build 24 of the projected dams with an estimated development of a further 1,441,000 h.p.

Worthing.—SPECIAL ORDER.—The Electricity Commissioners have notified the Town Council that they propose to grant its application for a Special Order authorising it to extend the present area of electricity supply to Sompting, Findon, Angmering, and Rustington.

West Riding (Aire and Calder) Electricity District.—A deputation from the conference of local authorities in connection with the West Riding (Aire and Calder) Electricity District waited upon Sir John Snell in London recently in connection with the breakdown of the proposed scheme for a joint supply of electricity to the West Riding by the local authorities and the Yorkshire Electric Power Co., consequent on the withdrawal of the latter from the scheme. The proceedings were private, and no statement was issued.

Weymouth.—NEW PLANT.—The Electricity Committee has decided that the following plant and mains be installed, subject to the approval and consent of the Electricity Commissioners to obtaining the plant and extending the area of supply:—Two 20,000-lb. water-tube boilers; two 1,500-kW turbo-alternators; two 500-kW rotary converters; two 750-kVA transformers; together with the necessary auxiliaries in pipework, condensers, circulating-water system, buildings, foundations, &c. It is also recommended that h.p. mains be laid to Wyke and Upwey, together with the laying of the l.p. mains in these areas. The total estimated cost of the proposed work is £52,185 for generating plant, &c., and £22,977 for mains and sub-stations.

Tramway and Railway Notes.

Australia.—WESTERN AUSTRALIA.—We have received from Mr. W. H. Taylor, general manager of the Government tramway undertaking, a copy of his report, together with the statement of accounts, for the year ended June 30th last. The total income amounted to £281,612, as compared with £274,583 in the preceding year, and the working expenses were £236,008, as against £231,895, leaving a gross profit of £45,604 (£42,688). Interest charges absorbed £44,835, and there was a net surplus of £769, as compared with a loss of £155 in 1923-24. The number of passengers carried increased from 27,893,315 to 28,894,525, and the car-mileage from 2,989,089 to 3,040,505.

Continental.—ITALY.—The Milan-Sarrono line and the Bovisa-Meda section of the Milan-Erba line of the North Milan Railway Co. are to be electrified.

A contract has been concluded for the construction of an electric tramway, passing along the Mediterranean coast between Leghorn, Pisa and Marina-di-Pisa. It is intended to begin work early in the new year.—*Reuter's Trade Service* (Pisa).

PORTUGAL.—According to the *Railway Gazette*, the first railway to be constructed in Portugal, Cascaes-Caes do Sodrè, is now being electrified and the scheme is nearing completion. It is expected that the electrical service will be ready early in 1926.

SWITZERLAND.—Good progress is being made with the electrification of the Zurich-Meilen-Rapperswil section of the Swiss Federal railways, and it is expected that the work will be completed by May next.

Edinburgh.—TRAMCAR EQUIPMENT.—A sub-committee of the Corporation Tramways Committee has recommended that 25 sets of air brakes be purchased at a cost of £3,875.

Glasgow.—THROUGH RUNNING.—The Tramways Committee has decided not to proceed further with the proposed arrangement with the Lanarkshire Tramways Co. for reciprocal running powers on its tramways.

London.—NEW TUBE SERVICES.—The new tube extensions from Clapham to Morden and from Charing Cross to Kennington, *via* Waterloo, are scheduled to be in service next midsummer, and it is expected that 5,577 trains a day will serve the various termini of the Hampstead and City lines, together with their extensions. The operation of these services will entail the employment of about 300 additional men.

Manchester.—NEW DEPOT.—The *Daily Dispatch* reports that the Tramways Committee has accepted a tender for the construction of a car shed in Birchfields Road, Rusholme, at a cost of £150,000. It is expected that the work will provide employment for about 100 men for nine months, and that the depôt will be completed before next winter.

Manchuria.—NEW TRAMWAY.—It is reported that the Siemens-Schuckertwerke, of Berlin, has secured the contract for the construction and equipment of an electric tramway in the town of Harbin, North Manchuria.

Stoke-on-Trent.—INQUIRY.—An inquiry was held on December 15th by Mr. R. Tolerton, on behalf of the Minister of Transport, into an appeal by the Potteries Electric Traction Co. against a decision of the Corporation attaching conditions with respect to the routes upon which thirteen omnibuses belonging to the company might ply for hire. According to the *Birmingham Post*, the company asked for an Order that the thirteen omnibuses which are now running on country routes only might also be allowed to run on the main route through the six Potteries towns. Opposition was offered by the Corporation. Mr. Rowand Harker, for the company, said the grounds of the application were that it would facilitate the working of the traffic and give the company a fairer share of the main route traffic than at present, and so assist it in meeting its present difficult financial situation. Mr. R. J. Howley, chairman of the company, gave evidence that the effect of omnibus competition on the tramway undertaking had been very serious, the tramcars being now worked at a considerable loss. The company had a statutory obligation to run tramcars. Mr. Ward, for the Corporation, submitted that the number of omnibuses and tramcars now being run by the company showed that it had been treated fairly, but the district had an ample and adequate service to-day only because the licences were granted to private persons in opposition to the company.

The Minister's decision will be given in due course.

Telegraph and Telephone Notes.

Jugo-Slavia.—NEW RADIO STATION.—The Ministry of Posts and Telegraphs has authorised the erection of a wireless transmitting station at Agram (Zagreb), which will probably be opened by the first of March.—*Reuter* (Belgrade).

Marine Radio Operators.—STRIKERS' DEPUTATION.—Acting upon the advice of members at a meeting at the House of Commons, representatives of marine wireless operators approached both the President of the Board of Trade and the Minister of Labour seeking a personal interview. The reply from the Ministry of Labour stated that the Minister of Labour "regrets that he is not able at present to arrange to receive a deputation personally. An officer of the Department will, however, be prepared to see your Executive on December 21st." The reply from the Board of Trade states that the President "would be glad if you could send him a detailed statement of the points which you wish to raise."

Rugby Radio Station.—NOVEL FEATURES.—Dr. W. H. Eccles, vice-chairman of the Wireless Telegraphy Commission, points out in *The Times* that the hub of the Imperial radio communication scheme is the station at Rugby, which was designed by the Commission and the Wireless Section of the Engineering Department of the Post Office. The masts, power plant, auxiliary machinery, and thermionic valves have all been supplied by British contractors; the buildings have been erected by the Office of Works; the high-frequency circuits have been made and installed by the Engineering Department of the Post Office. The Commission, being unfettered in its choice of methods and apparatus, has been able to break away from standard practice and therefore the station "is full of novel features." Thermionic valves solely are used for generating the electrical waves, the sum total of the valve power amounting to about 1,500 kilowatts, three times as great as that of any other valve station. Of this equipment two-thirds will be used for Morse telegraphy and one-third will be reserved during the coming year for experiments in long-range telephony. Telegraphy will be conducted on both long and short waves, so that several messages may be sent simultaneously to various parts of the globe. The telephony plant has a range of more than 5,000 miles.

A unique feature is the fact that the waves radiated from the aerial have their origin in the vibrations of a tuning fork, which are magnified by stages, by banks of thermionic valves, till they reach the total of over 700 h.p. and pass to the aerial circuits. The fork thus governs the wavelength and keeps it rigorously constant. "Rugby is the first great station absolutely free from involuntary variations of wavelength and will revolutionise the methods of preventing interference between wireless services." This new method has been developed within the Wireless Section of the Post Office. During the preliminary trials quarter power reached Java and Hong-kong; half-power was heard well in Australia and very strongly in America; still higher power gave good signals in New Zealand and was reported "stronger than any other station" by South Africa, and was stated to give signals of "amazing clarity" in Sydney. The tests made in Rugby town, two miles from the station, to ascertain how far the concerts from the B.B.C. station at Daventry, 12 miles away, are interfered with by the Morse transmission at Rugby, proved that although Rugby was, at the time, using in its aerial about 25 times the power used in the Daventry aerial, there was no interference at all.

The Rugby station will start upon its Imperial mission as soon as range tests are completed, within two or three months. This all-round service will be supplemented by a "beam" service to each of the four largest Dominions as soon as the "beam" stations have passed similar tests. In the meantime the long- and short-wave equipment at Rugby will ensure satisfactory transmission to every part of the Empire throughout the 24 hours, says Prof. Eccles.

Turkey.—SMYRNA TELEPHONE CONCESSION.—Under a contract signed by the Minister of the Interior on behalf of the Turkish Government, a concession has been granted to the municipality of Smyrna for the installation and operation of a telephone system for a period of 35 years. Service will be provided for 2,000 subscribers. The installation must be completed in the city itself within a year and three months after the capital is procured, and within two years in the suburbs.

Radio Notes.

Finland.—BROADCASTING COMPANY.—At a meeting held on December 12th a number of companies and private persons interested in broadcasting in Finland decided to form a joint stock company to make arrangements for broadcasting in Finland. The company will probably begin its activity on January 1st.—*Reuter's Trade Service* (Helsingfors).

Licences.—SCOTTISH PROSECUTIONS.—As a result of the "examination of suspected premises" 600 summonses have been issued against residents in Aberdeen who are suspected of possessing unlicensed broadcast receiving sets. According to the *Daily Express*, the prosecutions are based on the possession of aerials, either of the indoor or outside types, which are capable of reception.

LONDON CONVICTION.—Mr. Arthur Plowman, of Kentish Town, was fined 10s. at the St. Marylebone Police Court on December 18th for installing wireless apparatus without having purchased a licence. It was stated that the Postmaster General considered it necessary to prosecute in all such cases.

Radiophony Union.—BRUSSELS CONFERENCE.—The International Broadcasting Conference has decided to proceed with systematic tests based on a scheme submitted by the Technical Committee in order to ascertain the best method of lessening interference between the large number of European stations. In view of the urgency of the matter, a technical sub-committee has been appointed, of which Captain P. P. Eckersley is a member, which is to meet shortly and draw up a programme for the proposed tests.—*Reuter* (Brussels).

The congress sat under the presidency of Rear-Admiral C. D. Carpendale (Great Britain), France, Germany, Holland, Czecho-Slovakia, Spain, Norway, Sweden, Austria, Italy, and Belgium each sent delegates, while the International Radio Office was represented by Mr. A. Burrows.

Switzerland.—BERNE STATION.—The inaugural transmission from the Berne broadcasting station, which took place on November 19th, was successfully received in Great Britain, all over Switzerland, Italy, Portugal, Germany, France, Czecho-Slovakia, Belgium, and even as far away as Argentina, where the transmission was very good. In view of the fact that the country surrounding the Berne station is of a mountainous nature, the reports of reception are very satisfactory. The station has a Marconi 6-kW transmitter, similar to the apparatus used in the majority of British stations and the building also contains the two telegraph transmitters for services "*Via Marconi*" between Great Britain and Switzerland, but the close proximity of the sets produces no mutual interference. The two telegraph transmitters operate simultaneously at high speed on one aerial, and an independent aerial has been erected for the broadcast transmitter, which operates on 302 metres.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—April 12th, 1926. State Electricity Commission of Victoria. Plant for the Sugarloaf and Rubicon hydro-electric scheme, consisting of turbo-generators, transformers, switchgear, cranes, and accessory plant. (December 11th.)

Victorian State Railways. January 13th. Double recording wattmeter.* January 20. Automatic battery-charging equipment.*

Ayrshire.—December 31st. Education Authority. Electrically wiring the extension to Ochiltree school. Specifications from Mr. Wm. Reid, master of works, Education Offices, Ayr.

Beckenham. — January 14th. Electricity Department. Water-heating and softening plant. (December 18th.)

Birmingham.—January 9th. Tramways Committee. 50 tramcar bodies. Forms of tender (£2) from Mr. A. Baker, general manager, Tramways Offices, Birmingham.

Brentwood.—January 1st. Guardians of Billericay Union. Electrical wiring in conduit and installation of complete electric generating plant at the Institution, Billericay. (December 11th.)

Dublin.—December 29th. Commissioners of Public Works. Installation of electric lighting at the Irish Land Commission Offices, Upper Merrion Street, Dublin. Specification (20s.) from the Secretary, Office of Public Works, Dublin.

Dundee.—January 14th. Electricity Department. Two electrically-driven centrifugal drainage pumps controlled by float gear. (December 18th.)

Town Council. Electric lighting installation at day nursery, North George Street. Particulars from Mr. G. Baxter, city engineer.

Edinburgh.—January 4th, 1926. Electricity Supply. Two 1,200-b.h.p., 6,600-V, 3-ph. induction motors. (December 11th.)

Edmonton.—Education Committee. Wiring offices at Brettenham Road, Edmonton, for electric light. (December 11th.)

Egypt.—CAIRO.—February 20th. Director-General, Mechanical Department, P.W.M. Power Plant for Giza.

January 20th. Local Commissions Section. Elector motor and accessories at Manfalout waterworks.*

KHARTOUM.—March 15th. Inspector-General of Irrigation, Sudan. Travelling and overhead cranes, dynamos, motors, and storage batteries for the equipment of the irrigation dock at Rabak, on the White Nile. Specification from the Inspector-General of Irrigation, Sudan, Khartoum.—*Reuter's Trade Service* (Cairo).

London.—LONDON COUNTY COUNCIL.—December 31st. Renewal of the storage battery at Bexley Mental Hospital. (December 11th.)

CAMBERWELL.—January 11th, 1926. Borough Council. Stores, including electric lamps, for 12 months. Particulars from Borough Engineer, Town Hall, Camberwell.

METROPOLITAN ASYLUMS BOARD.—December 30th. Installation of fire-alarm system at Tooting Bec Hospital. (December 18th.)

LAMBETH.—January 5th. Board of Guardians. Twelve months' supply incandescent electric lamps. (See this issue.)

SHOREDITCH.—January 27th. Electricity Department. One 50,000-lb. water-tube boiler, with economiser, forced and induced draught, &c.; one 10,000-kW turbo-alternator, with condenser, pumps, &c. (See this issue.)

BETHNAL GREEN.—January 19th. Board of Guardians. Three Lancashire boilers for the Hospital, Cambridge Road. Specifications, &c., from Mr. C. F. Jones, clerk to the Guardians, Bishops Road, Bethnal Green, E.

Manchester.—December 30th. Electricity Committee. One single unit (or, alternatively, one double unit) three-phase induction regulator. (December 11th.)

Two 1,000-kW and seven 750-kW motor converters, or, alternatively, rotary converters and static transformers. (December 18th.)

January 12th. Tramways Committee. Steel girder tramway rails. Mr. H. Mattinson, general manager and chief engineer, 55, Piccadilly, Manchester.

January 6th. Board of Guardians. Electric lighting installation at the pathological and dispensing block, Crumpsall Infirmary. Specifications from Mr. A. J. Murgatroyd, architect, 23, Strutt Street, Manchester.

New Zealand.—WELLINGTON.—February 16th. Public Works Department. Outdoor switchgear for the Waikato electric power scheme.*

March 2nd. Synchronous condenser and transformers for the Arapuni electric power scheme.*

30,000-V switch and protective apparatus for Lake Coleridge electric power supply.*

AUCKLAND.—February 8th. Auckland Electric Power Board. Overhead cotton-covered triple-braided cable.*

February 22nd. 15-amp. cut-outs.*

DUNEDIN.—February 26th. Otago Harbour Board. Motors, control gear, and cable.*

Preston.—January 15th. Electricity Department. Supply and erection of approximately 15 miles of 33,000/45,000-V double transmission lines. (December 11th.)

Slaithwaite.—No date. Electric light installation at the Co-operative Hall, Carr Lane, for Slaithwaite and District Co-operative Society, Ltd. Specifications from the Society's offices.

South Africa.—JOHANNESBURG.—January 28th, 1926. S.A. Railways and Harbours. Eleven 4-ton electrically-driven wharf jib cranes and seven electric capstans for Durban Harbour. Secretary to the Tender Board, S.A.R. Headquarters, Johannesburg.*

January 21st. Municipal Council. 106 current transformers.*

February 26th. Motor-driven air compressor, with electrical equipment.*

CAPE TOWN.—January 27th. Electricity Department. Oil-cooled transformers.*

UNION TENDER BOARD.—January 28th. Miscellaneous telegraph and telephone materials for the Department of Posts and Telegraphs.*

Uruguay.—February 23rd, 1926. State Electricity Supply Works. Porcelain insulators and accessories.*

D.c. and a.c. meters.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Ashtead.—City of London Schools Committee. Recommended. Re-wiring at orphan school premises.

H. E. Keen & Co. (Recommended.)	**£757**
F. Polden & Co., Ltd.	783
V. G. Middleton & Co.	1,175
Higgins & Griffiths, Ltd.	1,219

Australia.—SYDNEY.—Electricity Supply Committee. Recommended :—

Fibre conduits (£4,934).—Western Electric Co. (Aust.), Ltd.
L.p. shackle insulators (£433).—New South Wales Insulator Works.

NEW SOUTH WALES.—Railways Department. Accepted:—
Equipment for Lakemba (Belmore) and Gordon sub-stations (£21,439).—Australian General Electric Co., Ltd.
Electric travelling jib crane for White Bay power house (£2,858).—Gibson, Battle & Co., Ltd.
72 D.K. traction motors (£19,586).—English Electric Co., Ltd.

MELBOURNE.—Victorian Railways. Accepted:—
Overhead electrical equipment, at rates.—British Insulated & Helsby Cables, Ltd.

State Electricity Commission of Victoria.
Switchgear and accessories (£870).—Ferguson, Pailin, Ltd.

Commonwealth Postmaster-General's Department, Victoria.
Insulators.—R. Fowler, Ltd. (£5,100); Firebrick Insulator & Pottery Co. Pty., Ltd. (£5,674); Calyx Porcelain Co., Ltd. (£3,921).
Telephones, all states (£22,733).—British L. M. Ericsson Tel. Mfg. Co., Ltd.
Transformers (£6,965).—Western Elec. Co. (Aust.), Ltd.
—*Tenders.*

Bexhill.—Electricity Committee.
Battery booster (£205).—Bruce Peebles & Co., Ltd. (accepted.)
500 yd. of 3-core cable (£94).—British Insulated & Helsby Cables, Ltd. (recommended).

China.—SHANGHAI.—Shanghai Electric Construction Co., Ltd. Accepted:—
50 motors for trackless trolley 'buses.—E. R. & F. Turner, Ltd.

Epsom.—Urban Council. Accepted:—
Renewal of battery, &c. (£794, less £50 for old material).—D. P. Battery Co., Ltd.

Lamp Contracts.—The British Thomson-Houston Co., Ltd., has received contracts for the supply of "Mazda" electric lamps from the Great Western Railway Co. and the Pacific Steam Navigation Co.

Leyton.—Electricity Committee. Accepted:—

	Two traction motor converters.		Two general supply motor converters.	
	Speed.	Amount.	Speed.	Amount.
		£		£
Ateliers de Constructions Electriques de Charleroi ...	600	6,460	600	6,960
British Thomson-Houston Co., Ltd. (Accepted.)	**750**	**6,753**	**750**	**7,732**
General Electric Co., Ltd. ...	750	6,753	600	8,581
			500	9,348
Bruce Peebles & Co., Ltd. ...	750	6,754	600	8,310
			500	9,132
English Electric Co., Ltd. ...	750	6,753	600	9,359

London.—ST. MARYLEBONE.—Electricity Committee.
Three integrating meters, with transformers, &c. (£195).—Chamberlain and Hookham, Ltd.

STEPNEY.—Electricity Committee.
2 tons plumber's solder, ½ ton tinman's solder, and ¼ ton blowpipe solder (£318).—G. W. Neale, Ltd. (accepted).
50 T C disconnecting boxes (£107).—Universal Electrical Mfg. Co., Ltd. (recommended).
50 single disconnecting boxes (£59).—W. Lucy & Co., Ltd. (recommended).
3 tons sheet lead (£146).—G. Farmiloe & Sons, Ltd. (accepted).
50 tons pitch (£134).—Smart's Tar Distillery, Ltd. (accepted).

Luton.—Offices Committee. Accepted:—
Internal telephone installation at Council offices (£200).—Standard Telephones & Cables, Ltd., London.

Peterborough.—Town Council. Accepted:—
Extensions to the generating station (£79,950).—Mitchell Conveyer and Transporter Co.

Housing Committee. Accepted:—
Wiring Council houses (£725).—Peterborough General Engineering Co.

Stoke-on-Trent.—Hospital Committee. Accepted:—
Electric lighting installation, Bucknall Hospital wards (£192).—Hawley and Ingram.

Electricity Committee. Accepted:—
Two air extractors (£491).—Metropolitan-Vickers Electrical Co., Ltd.

York.—THE TURBO-ALTERNATOR CONTRACT.—According to the *Yorkshire Herald*, the Electricity Committee is holding up the decision to purchase Swiss electrical plant. As mentioned in our issue of December 11th, page 942, the Council decided to approve of the recommendation of the Electricity Committee to purchase Swiss machinery for £19,000 in preference to British plant, the lowest tender for which was £24,000; the voting was 23 votes for and 16 against.

The *Yorkshire Herald* states that, with the exception of the Rev. G. S. Woods, who is the chairman of the York Labour Party, the whole of the Labour members present at the meeting voted with the majority in favour of the recommendation. The majority decision has roused opposition among the citizens, and it is believed the Electricity Committee, having concluded that it ought not to spend £19,000 on foreign machinery, unless it has the full approval of the Council, will seek to raise the whole question at a further meeting.

Forthcoming Events.

Salford Technical and Engineering Association.—Saturday, December 26th. At the Royal Technical College. From 5.30 to 11.45 p.m. Annual social.

Junior Institution of Engineers.—Friday, January 1st. At 39, Victoria Street, S.W. At 7.30 p.m. Kinematograph lecture, "The Manufacture of Ordnance" and the "Rolling Mills and Crucible Melting Department at the River Don Works of Vickers, Ltd."

Electrical Power Engineers' Association.—Friday, January 1st. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 7 p.m. Lecture on "Automatic Boiler Control," by Mr. H. W. Holland.

Notes.

The Electrical Industry and Exhibition Policy.—An important meeting was held in London last week to consider in a preliminary way the subject of future electrical exhibitions and exhibition policy. It was convened by Mr. J. W. Beauchamp, Director of the British Electrical Development Association, and every section of the industry was represented through the various organisations. About fifty gentlemen were present and the ground covered in the course of the discussion concerned such matters as large exhibitions (along B.E.A.M.A. lines) and the frequency with which they should be held; the value of the smaller exhibitions in connection with which the B.E.D.A. renders such valuable assistance in all parts of the country; and the need for giving electrical support to the British Industries Fair until it became as big an event as the Leipzig Fair.

While nothing particular was decided on any of these points, something definite emerged in the shape of a liaison committee, connecting up all organisations concerned, which is to meet and discuss general principles and report to later meetings.

Appointments Vacant.—Assistant engineer, for the Lyme Regis Borough Council; switchboard attendants for Newport Corporation electricity department; senior lecturer in engineering for Cape Town Technical College; rolling stock and works superintendent (£300+) for the Wallasey Corporation tramways and motors department; clerk (£149) for the Beckenham U.D.C. electricity department. (See our advertisement pages to-day.)

Electric Lighting Demonstrations.—The second meeting of the Illuminating Engineering Society was held at the E.L.M.A. Lighting Service Bureau on December 16th, when Mr. C. W. Sully, Director of the E.L.M.A., presided. The report of the committee on "Progress in Electric Lamps and Lighting Appliances" was read by Mr. Hughes. Reference was made to the most recent B.E.S.A. specification for electric lamps and to recent lighting progress founded upon the work of the E.L.M.A. Lighting Service Bureau and the national campaign carried out by it in favour of better shop lighting. It was recalled that new provincial centres of the Association had recently been established in the Glasgow and North-East Coast districts. Following the presentation of the report Mr. W. E. Bush and Miss F. Hodges gave demonstrations of the shop-lighting and domestic-lighting displays, features of the Lighting Service Bureau which were described in our issue of September 18th last. The demonstrations were well attended and an animated discussion followed. A vote of thanks to the E.L.M.A. and to Mr. Sully terminated the proceedings.

Local Societies.—At Nottingham, on November 23rd, Mr. M. A. Crosbie, O.B.E., delivered the third lecture of the 1925-26 session of the Nottingham Society of Engineers. His subject, "Factory Equipment," covered the handling and separation of materials, mixing and refining, plodding and extruding, and weighing and measuring of small quantities.

At the Engineering and Scientific Club, Wolverhampton, on December 11th, Mr. F. H. Rosencrants, B.Sc., lectured on the development of powdered fuel in America and this country for the generation of steam for power purposes. Whilst in this country there are few boiler units at work with a capacity of 100,000 lb. of steam per hour, Mr. Rosencrants gave particulars and illustrations of many units working in the United States having a capacity of 200,000 lb. and 300,000 lb. of steam per hour; at the Ford Car works there are several boilers of this size, which, after the completion of certain alterations now being effected, will have a steaming capacity of 500,000 lb. per hour. An important feature of these large units is the simplicity of control, only one man being required to control four of them. It is claimed that owing to the perfect combustion and refinements of powdered-fuel installations, efficiencies of 89 to 91 per cent. are being maintained in daily working.

Mr. S. T. Allen and Mr. J. Hargrove took part in the discussion, and Major S. J. Thompson, who presided, proposed a vote of thanks.

Contributions to Research.—The Swansea Town Council, on December 16th, approved of a contribution of £25 towards the expenses of the research work carried out by the I.M.E.A. Such payments fall within the scope of the powers of sanction conferred upon the Electricity Commissioners by the Act of 1919.

The Need for Salesmanship.—Writing in the current issue of the *Journal* of the Leeds Chamber of Commerce, Mr. A. M. Samuel, Parliamentary Secretary to the Department of Overseas Trade, emphasises the need for good salesmanship if export markets are to be found for our goods. Referring to the services offered by his Department, he says that, while the overseas officers could not act as commercial travellers, they can and do help in the appointment of suitable local agents. Adequate personal contact with customers is necessary, and principals of firms should make a point of visiting them. Where the expense of individual representation in a market cannot be justified, Mr. Samuel considers that co-operative representation should be considered.

Explosion at Barking Power Station.—Whilst going to Press we learn from the *Essex Weekly News* that a turbine at the Creeksmouth power station of the County of London Electric Supply Co., Ltd., exploded on Monday last week, and that three employés, named Reid, Leaford, and Higgins, were seriously injured and were removed to hospital.

Technical Films.—The South Midlands Students' Section of the Institution of Electrical Engineers is holding an exhibition of technical films on January 11th at the Birmingham Temperance Hall, Temple Street, Birmingham, at 7 p.m., when a selection from the following list will be shown: A History of Electricity, entitled "From Coal Heap to Consumer" (E.D.A.); The Manufacture of a 50,000-kW Turbo-Alternator (Parsons); The Manufacture of Telephone, Rubber and Submarine Cables (Siemens); Electricity in a Steel Works; "The Story of Cotton"; The Panama Canal; The Manufacture of Tin-plate (B.T.-H.); The Osram Lamp Works (G.E.C.); Telephone Inventors of To-day; "On the Air"; and The Audion (Western Electric). We are informed that the Committee offers a welcome to any of our readers who care to attend the exhibition.

Fatality.—At the Manor Colliery, Stirling, on December 15th, Fred Grieve (14), residing in Stirling, was killed by electric shock while working at a washer at the pithead.

The Institute of Transport.—EXAMINATIONS.—The Council of the Institute announces that the last date for the receipt of applications for partial exemption from the Graduateship and Associate Membership examinations is December 31st, 1925. Applications should be addressed to the Secretary of the Institute, 15, Savoy Street, London, W.C.2.

Electricity Supply Progress During 1925.—Whilst, as the Electricity Commissioners remarked in their fifth annual report, considerable delay has resulted from the postponement of the Cabinet decision with regard to the Weir Committee's report, it would be very far wide of the facts to infer that no progress had been made during the year. Such an impression may cause hesitation amongst individuals in relation to schemes for electricity supply, and therefore it is worth while to demonstrate that such hesitation has not been shared by all parties.

For instance, it is satisfactory that the London and Home Counties Joint Electricity Authority has been established, and also that we may look forward to the setting-up of the West Midlands Joint Electricity Authority early in 1926.

In addition to these two Electricity District Orders, Parliament has also approved during the year over 20 Electricity Special Orders creating new undertakers, as well as numerous Electricity (Extension) Special Orders for existing undertakers. Whilst these were being approved, further applications were lodged by various authorised undertakers for extensions of their areas; and certain local authorities, companies, and persons have applied for statutory powers for electricity supply.

Apart from the (Extension) Special Orders which have been confirmed, and applied for, during 1925, the following are some of the new undertakers who have been added to the list during the year:—The Corporations of Calne, Clitheroe, Lichfield and Newark; the Urban District Councils of Ashford, Ashton-in-Makerfield, Bredbury and Romiley, Crediton, Grange, Guisborough, Padiham, Preesall, Prestatyn, Stanley, Tanfield and Ulverston; and the Rural District Councils of Penybont and Wirral; as well as several new companies.

The following are some of the would-be undertakers who have applied for powers during 1925:—The Corporations of Brecon and Richmond; the Urban District Councils of Bolsover, East Dereham, Gainsborough, Millom, Porthcawl, and Spalding; and the Rural District Councils of East Preston and Wrexham.

Fire. — Early in the morning of December 18th, fire destroyed the wireless experimental station of Capt. P. P. Eckersley, chief engineer of the B.B.C., at Hendon. It contained many data and much valuable short-wave apparatus, but was not officially connected with the British Broadcasting Co., Ltd.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

Mr. PERCY HUNTER, Commonwealth Director of Immigration, has been appointed general manager in Sydney of the Pacific Cable Board. According to the *Daily Telegraph* "the staff have informed the Board that they possess complete confidence in Mr. Robert Sutherland Bain, who has been acting manager at the headquarters in Sydney for four years with conspicuous success."

Alderman Mrs. HAMMER, chairman of the Electrical Association for Women, has just been elected vice-chairman of the Hackney Electricity Committee. To her, therefore, belongs the distinction of being the first woman to hold such a position.

Mr. O. G. LEE, contract manager of the Liverpool telephone district, has been appointed district manager of telephones for the Southampton district.

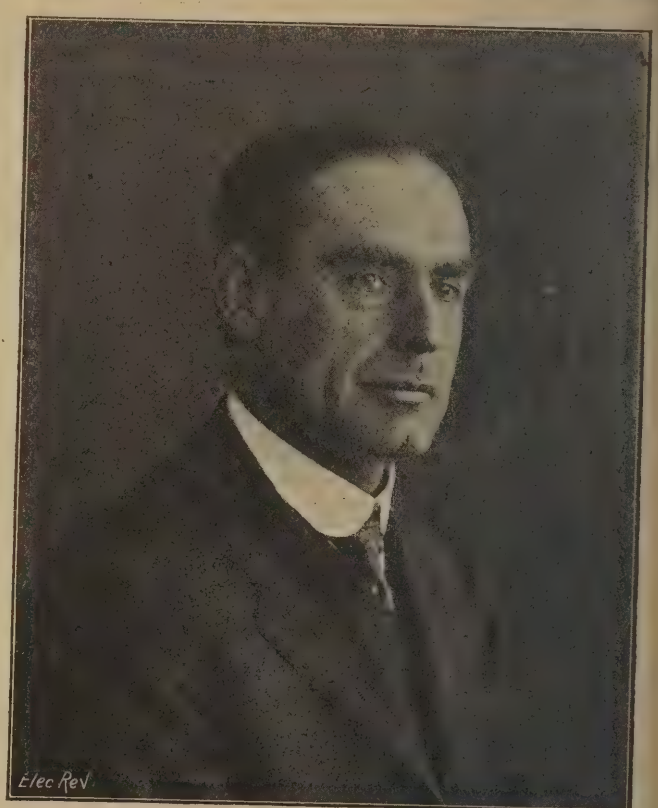
Mr. W. HOWE, telephone manager of the Southampton district, on retiring from the service has been presented by the district manager's staff of the Hants. and Dorset district with an inlaid mahogany combined barometer and thermometer and a set of books. Mr. Howe has spent 45 years in the telephone service.

Stoke Newington Borough Council Electricity Committee recommends the payment to Mr. H. LARGE, acting borough electrical engineer, of £125 for extra duty performed by him during the absence of the borough electrical engineer up to November 30th. The Committee has appointed Councillor J. LITTEN chairman and Councillor C. F. HELLIAR vice-chairman for the ensuing year.

We read in the *Electrical World* that Mr. JAMES M. WAKEMAN, who was for many years associated with that journal as vice-president and general manager, and subsequently spent from 1910 to 1913 in quest of health, after which he held for eight years the position of general manager of the Society for Electrical Development, has just returned to the United States after an absence of 16 months travelling in England, Scotland, France, and Italy.

Mr. W. H. COLLIS, on retiring from the position of deputy resident electrical engineer to the Liverpool Corporation, has been presented with a silver salver. Mr. Harold Dickinson, city electrical engineer, made the presentation. He has been connected with the Corporation Electric Supply Department for 37 years.

We reproduce herewith a portrait of Mr. E. EDWARDS, chairman of the Tees-side Sub-Centre of the Institution of Electrical Engineers. Mr. Edwards was educated at the Oswestry Grammar School and the Municipal College of Technology, Manchester. He served an apprenticeship with the British Westinghouse Co., Manchester, and then joined the Kent Elec-



M. Wright] [*Middlesbrough*

Mr. E. Edwards,

Chairman of the Tees-side Sub-Centre of the I.E.E.

tric Power Co. Subsequently, for a period of 12 years, he was connected with the Cleveland and Durham Electric Power Co. and the Newcastle-upon-Tyne Electric Supply Co. He was then appointed chief electrical engineer at the Acklam works of Messrs. Dorman, Long & Co., Ltd., a position which he still occupies.

Brevet-Colonel E. ROBINSON, who has just retired from the command of the Tyne Electrical Engineers (Territorial Army), was associated with that corps for many years. He was commissioned more than 20 years ago in the regiment, got his captaincy in 1903, majority in 1911, and from second in command was promoted lieutenant-colonel commanding in June, 1916, and received his brevet step in February, 1921. Colonel Robinson holds the Order of the British Empire for his services during the late war.

The command of the above-named corps has gone to Lieut.-Colonel N. H. FIRMIN, O.B.E., promoted from major and second in command. Lieut.-Colonel Firmin was commissioned in 1909, was promoted lieutenant in 1911, captain in 1915, and reached field rank in 1916. He rendered very valuable services during the late war, which were recognised by the King conferring on him the Order of the British Empire.

The Liverpool University Council last week appointed Associate-Professor F. J. TEAGO, D.Sc., M.I.E.E., to the Robert Rankin Chair of Electrical Machinery.

Mr. P. K. TURNER has retired from his position as Editor of *The Wireless Trader* in order to take up an important appointment in the research department of Burndept, Ltd.

Mr. A. S. BLACK, who opened the Edinburgh sub-branch of the General Electric Co., Ltd., in 1920, has recently been appointed assistant Scottish manager at the Glasgow branch. Mr. Black has now spent fifteen years with the company.

Obituary.—SIR GEORGE GIBB.—We regret to record the death of Sir George Stegmann Gibb, which occurred on

December 17th at the age of 75 years. Sir George, who was born in Aberdeen, was articled to a solicitor, and he was appointed solicitor in 1882 to the North-Eastern Railway, of which in 1891 he became general manager, a position which he held until 1906, following as a director for the next four years. In 1903 he was a member of the Royal Commission on London Traffic, and in 1906 when he left the N.E.R. he came to London as chairman of the Metropolitan Railway and managing director of the Underground Electric Railways Co. of London, Ltd. This occupied Sir George until the year 1910, when he became chairman of the Road Board, an office which he held until 1919. He served the railway and national interests in many excellent ways both as an arbitrator on wage matters and as an organiser. He was created a knight in 1904.

MR. ERNEST BENEDICT.—We have to record the death, at the age of 87 years, of Mr. Julius Felix Ernest Charles Benedict, M.Inst.C.E. Mr. Benedict was engaged in connection with railway engineering work in India and in this country for very many years. He was subsequently connected with technical journalistic work and was secretary of the Tramways and Light Railways Association from 1901-1906.

MR. G. A. MILLER.—Mr. George A. Miller, chairman of Messrs. W. H. Willcox & Co., Ltd., of Southwark, passed away on December 13th in his 76th year, at his residence in London. Mr. Miller joined the firm of W. H. Willcox & Co., Ltd., some 40 years ago, after having been previously connected with Sir W. H. Bailey & Co., Ltd., of Manchester.

Ald. W. F. COOKE, J.P., Mayor of Nelson, whose death took place on December 16th, was an assiduous chairman of the Electricity Committee. His services as representative on the Mid-Lancashire Electricity Committee and the Mid-Lancashire Advisory Board were much appreciated.

Wills.—The late Captain M. H. P. RIALL SANKEY left £12,538 gross and £1,087 net personalty.

COL. SIR ADAM BECK, of London and Ontario, left £6,139 presumably in this country.

New Companies Registered.

Power Auxiliaries Co., Ltd. (210,404).—Private company. Registered December 16th. Capital, £7,500 in £1 shares (3,750 "A" and 3,750 "B" ranking *pari passu* in all respects as to both capital and dividend). Objects: To acquire the goodwill and trade marks of the Power Plant Auxiliaries Company, with or without any of the other assets of that business, to adopt an agreement with W. S. A. Backhouse, and to carry on the business of engineers, specialists in boiler efficiency, boiler makers, iron and brass founders, millwrights, machinists, manufacturers of cotton, flax, and hemp, rope and twine, wire and wire rope, electric cables and wire, metallurgists, electrical engineers, &c. The first directors are:—W. S. A. Backhouse, 116, Cheadle Road, Cheadle Hulme, Cheshire, engineer (permanent); P. Backhouse, Glendarnel, Thorley Lane, Timperley, Cheshire, merchant; A. F. Walker, "Glenferry," Regent Road, Altrincham, Cheshire, secretary. The holders of the "A" shares are entitled to appoint two directors, and the holders of the "B" shares shall, so long as W. S. A. Backhouse is a permanent director, be entitled to appoint one director, but when W. S. A. Backhouse ceases to be a permanent director, then the "B" shareholders shall be entitled to appoint two directors. Qualification of permanent director, 1,000 shares; of other directors, £100. Remuneration as fixed by the company. Solicitors: Addleshaw, Sons and Latham, 15, Norfolk Street, Manchester. Registered office: 1a, Marsden Street, Manchester.

Unique Wireless Co., Ltd. (210,330).—Private company. Registered December 12th. Capital, £5,000 in 4,800 10 per cent. preference shares of £1 and 4,000 deferred shares of 1s. Objects:—To adopt an agreement with W. H. Sayers, L. S. Allen, and A. B. Ferguson, and to carry on the business of manufacturers of wireless or radio apparatus, component parts, complete sets, dry batteries, accumulators and wet batteries, static eliminators, wave-meters, wave traps, aerials, valves or thermionic tubes, &c. The first directors are:—W. H. Sayers, 209, Croxted Road, West Dulwich, S.E., engineer; L. Sandeman-Allen, "Goose Green Cottage," Pirbright, Surrey, insurance broker; A. B. Ferguson, 5, Catherine Road, Surbiton, insurance broker. Remuneration as fixed by the company. Secretary: S. C. Warren.

Maldon Electric Works, Ltd. (210,444). — Private company. Registered December 17th. Capital, £7,000 in 5,000 5 per cent. cumulative preference and 2,000 ordinary shares of £1 each. Objects: To acquire the business of electrical and other engineers carried on by Cooper and Smith, Ltd. The subscribers (each with one preference share) are:—T. Cooper, Spring Valley, St. Albans, chartered civil engineer; L. G. Cooper, Redcliffe, Orpington, Kent, member of London Stock Exchange. L. G. Cooper signs as a director. Solicitors: Mackrell & Co., 21, Cannon Street, E.C.4. Registered office: Station Road, Maldon, Essex.

Collinge & Corrigan, Ltd. (210,341).—Private company. Registered December 14th. Capital, £1,000 in £1 shares. Objects: To acquire the business of electrical engineers now carried on by F. Collinge and J. G. Corrigan at Leicester Street, Southport, as "Collinge and Corrigan," and to carry on the same and the business of motor engine makers and dealers in wireless receiving sets and apparatus, &c. The permanent directors are:—F. Collinge, 83, Tithebarn Road, Southport; J. G. Corrigan, "Rodona," Moss Road, Halsall, near Ormskirk. Qualification, 100 shares. Remuneration as fixed by the company. Registered office: 7, Tower Buildings, Leicester Street, Southport.

Vincent Switchgear Manufacturing Co., Ltd. (210,331).—Private company. Registered December 12th. Capital, £10,000 in £1 shares. Objects: To acquire the business now carried on by F. W. Abbott at Sampson Road North, Birmingham, as "Vincent Switchgear Manufacturing Co.," and to carry on the business of manufacturers of switchgear and electrical accessories, mechanical engineers, electricians, &c. The subscribers (each with one share) are:—F. W. Abbott, Sampson Road North, Birmingham, electrical engineer; Miss M. L. Abbott, "Rutherglen," Church Road, Yardley. F. W. Abbott is the permanent governing director. Solicitors: Huggins & Co., 63, Temple Row, Birmingham.

Watson Jones, Ltd. (210,435).—Private company. Registered December 17th. Capital, £10,000 in £1 shares. Objects: To adopt an agreement with H. R. Watson, A. E. Jones, and W. G. Bowditch, and to carry on the business of dealers in electrical, wireless and scientific goods and instruments as formerly carried on by the said parties at St. Stephen's House, Victoria Embankment, Westminster. The first directors are:—H. R. Watson, 33, Effra Road, Wimbledon, S.W., engineer (managing director); A. E. Jones, 33, Effra Road, Wimbledon, S.W., engineer; W. G. Bowditch, 1, Chatsworth Gardens, Acton Hill, W.3, merchant; F. C. Eckford, 39, Foulser Road, Tooting, S.W.17, engineer, each of whom may retain office for seven years. Qualification, £50. Remuneration, £5 per annum. Registered office: 22, St. Stephen's House, Westminster, S.W.1.

Passmore, Gilhome & Co., Ltd. (210,364).—Private company. Registered December 14th. Capital, £300 in £1 shares. Objects:—To contract for and undertake the erection of buildings of all kinds, to manufacture or supply electrical and mechanical plant, to act as constructional, electrical and mechanical engineers, builders, and agents or representatives of any British, Colonial, or foreign electrical, constructional, or general engineers, &c. The permanent directors are:—R. P. Steyther, 17, Elmers End Road, Anerley, S.E.20, gentleman; A. G. Spence, 7, Thicket Road, Anerley, S.E.20, electrical engineer. Solicitors: Macdonald & Stacey, 2, Norfolk Street, Strand, W.C.2.

Radio Valves, Ltd. (210,351).—Private company. Registered December 14th. Capital, £500 in £1 shares. Objects:—To carry on the business of manufacturers of, and dealers in wireless apparatus, accessories and appliances, electrical engineers, &c. The subscribers (each with one share) are:—R. Roots, 19, Holmesdale Avenue, East Sheen, S.W.14, solicitor: E. G. Hake, Hotel St. Kilda, Torrington Square, W.C. The first directors are to be appointed by the subscribers. Qualification, 1 share. Remuneration as fixed by the company. Solicitor: R. Roots, 19, Holmesdale Avenue, East Sheen, S.W.14. Registered office: 3, Cross Lane, Eastcheap, E.C.3.

Official Returns of Electrical Companies.

Wholesale Electrical Company (1922), Ltd. — G. Farquhar, of 64, Victoria Street, S.W.1, ceased to act as receiver or manager on March 26th, 1925. (Notice filed December 11th.)

Frome Engineering Co., Ltd.—S. M. Pettitt, of 16, Albemarle Street, W.1, C.A., was appointed receiver and manager on December 8th, 1925, under powers contained in debentures dated July 28th, 1923, and September 10th, 1925.

Herbert Ward, Ltd.—Mortgage dated June 15th, 1925, to secure £1,164, and further advances, charged on 61-73 (odd numbers), Fernlea Road, Tooting. Holders: Halifax Permanent Benefit Building Society. (Registered December 9th, by permission of the Court.)

Burton & Tweedy, Ltd.—Satisfaction in full on December 9th, 1925, of debentures dated July 31st, 1923, securing £1,000.

W. S. Laycock, Ltd. (in liquidation).—Satisfaction on or before November 28th of mortgage or charge dated May 5th, 1925, securing the remuneration of the receiver and manager and payment of all debts, liabilities and obligations, if any, properly incurred or undertaken by him.

Rural Electricity Supply Co., Ltd. (107,281).—Capital, £10,000 in 9,500 preferred shares of £1 each and 10,000 deferred shares of 1s. each. Return dated November 14th, 1925. 5,512 preference and 5,713 deferred shares taken up. £3,269 9s. 3d. paid on 2,871 preference and 5,713 deferred shares (including £112 16s. 3d. paid on 205 forfeited shares). £2,641 considered as paid on 2,641 preference shares. Mortgages and charges, nil.

Simplex Conduits, Ltd. (88,290).—Capital, £100,000 in 50,000 ordinary shares of £1 each and 10,000 preference shares of £5 each. Return dated November 3rd, 1925. 40,000 ordinary and 10,000 preference shares taken up. £50,000 paid on the preference. £40,000 considered as paid on the ordinary. Mortgages and charges, nil.

Electric Car and Accessories Co., Ltd.—A. V. Chetland, of 16, Portobello Road, W.11, was appointed receiver on December 7th, 1925, under powers contained in debenture dated November 21st, 1920.

General Electric Co., Ltd.—Satisfaction to the extent of £42,900 on November 5th, 1925, of debenture stock dated July 22nd, 1921, securing £3,500,000.

Montevideo Telephone Co., Ltd. (27,208).—Capital, £220,000 in £1 shares. Return dated November 9th, 1925. 217,135 shares taken up. £217,135 considered as paid. Mortgages and charges, nil.

Vactite Wire Co. (1919), Ltd. (156,012).—Capital, £25,000 in £1 shares. Return dated December 3rd, 1925. 15,000 shares taken up. £3 paid. £14,997 considered as paid. Mortgages and charges, nil.

Price's Electrical Supplies, Ltd. (175,260).—Capital, £3,000 in £1 shares. Return dated October 16th, 1925. 1,210 shares taken up. £1,210 paid. Mortgages and charges, nil.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Edison Swan Electric Co., Ltd.

The annual meeting was held on December 16th, Mr. C. F. Spencer (chairman) presiding. In presenting the report and accounts, which were reviewed in our issue of December 11th (p. 946), the chairman said that the authorised capital of the company was £432,565, of which £141,130 was in £1 shares. It was proposed to divide those shares into 4s. shares each, in order that all ordinary shares would be of one denomination. The articles of association also needed revision. There was outstanding on June 30th last £248,579 of first debenture stock and £55,034 of second debenture stock, whilst £200,000 of the latter stock was lodged with the company's bankers as security for a loan. During the current year the board would probably endeavour to consolidate the remaining first and second debenture stock and thus effect a reduction in loan charges. The debenture stock sinking fund showed a credit balance of £7,834, which would be appropriated to the redemption of debentures. Their bankers, the National Provincial Bank, Ltd., had been of great assistance to them during the three years in which they had been reorganising the company. The amount owing to the bankers was £110,000; when the present board took office a little over three years ago it was £314,150. They had reduced the long-term first and second debenture stock debt by £26,606. The reserve account was to be augmented to the extent of £50,000, making £130,000 in all. In pursuance of its aims, the board had in effect discharged debt to the extent of £230,756, which would be augmented shortly by further utilisation of sinking

funds; and it had created a reserve account of £130,000, which could not be considered entirely inadequate. The sum carried forward represented an increase of £11,701. In augmenting the reserve account and carry forward, they were endeavouring to consolidate the finances of the company. The reserve account was invested in the business, but the board would not be satisfied until it was invested in gilt-edged or other sound securities. The book value of patents, goodwill, &c., had been reduced by £26,606, and they hoped to pursue a consistent policy of reduction until it reached a figure of more reasonable dimensions. Their goodwill was sound. Their lamps were British made, and the quality was excellent. The glareless "Fullolite" lamp had become a favourite, and their radio sets and valves were well known. Regarding the trading position during the current year, the chairman said that their profits to November, 1925, were quite satisfactory, and they were getting a reasonable share of the trade available. What he had said indicated that the company was travelling along the road to prosperity, but he could not refrain from saying that there was a factor which might react unfavourably upon the company's fortunes, in common with those of others engaged in a similar class of business, with little chance at present of their being able to combat it. He referred to unrestricted and relentless foreign competition. Many of the products which they manufactured were subject to competition from abroad, against which they were almost powerless. Depreciated exchanges were in the nature of a bounty to the foreign producer; taxation in the countries of their foreign competitors was on a lower basis than national taxes and local rates in this country; we were paying the interest on our National Debt, which included the war debts due from foreign countries. German producers, owing to the policy of inflation, were almost compelled, in order to prevent their liquid resources and credit becoming valueless, to utilise them in the purchase of fixed assets, including plant and machinery of the latest type, and in this manner German producers had been able, at a small capital cost, to install the most modern methods of production, and were thus able to produce at very low prices; and the hours worked per week per operator in some foreign countries were greater than in this country, with a result that the weekly output was higher and the cost of labour in time per unit of product was less than ours, and lower wage rates were paid. Apart from those factors, the standing charges of the foreign manufacturer were much less per £100 of wages paid than those of the British manufacturer as general expenses abroad were on a much lower scale. There were many difficulties in trading with open doors and without retaliatory weapons. Turning to the brighter side, Mr. Spencer said that the Treaty of Locarno was bound to help in the restoration of confidence in Europe and confidence, after all, was the backbone of trade. The return to the gold standard and the subsequent raising of the ban on foreign issues of capital was also satisfactory, as part of our national products in pre-war days could only be sold abroad if the purchaser was lent the money to pay for them, and this was still a fact to-day. Thus there were signs of improvement, but he was apprehensive as to the nullifying effect of relentless foreign competition. The subject was one of increasing importance to the wage earner, who could not afford any more than the employer to have his livelihood so assailed, and he looked forward to the time when the worker and the employer would co-operate to prevent the entry of foreign goods, produced not on a commercial scale or basis, but on what one might term an ultra-subsidised production basis.

The report and accounts were adopted, and a resolution to grant the chairman a sum of £5,000 in recognition of his services was unanimously approved. At a subsequent extraordinary meeting resolutions were passed altering the articles of association and dividing the unissued ordinary shares, as mentioned by the chairman in his speech.

Cape Electric Tramways, Ltd.

Mr. L. Breitmeyer (chairman) presided at the annual meeting on December 16th, and in presenting the report and accounts (which were reviewed in our issue of December 11th, p. 946), he said that, although South Africa had suffered from general business depression, and the company's earnings had been affected, in the last four months of the year a decided improvement had taken place, so that upon the whole very little variation had resulted. In Cape Town there had been a slight decrease in the number of passengers carried, and a consequent decline in the revenue. In Port Elizabeth, although the number of passengers had increased, there was a slight decrease in the receipts. The profit brought into the accounts from South Africa was £94,222, as against £95,454. The 6 per cent. debenture debt had been wholly redeemed, relieving the company of an annual charge of £25,778. It had been decided, however, to extend the term of repayment of the outstanding 5 per cent. debentures over a period of ten years. As stated in the report, neither the Port Elizabeth nor the Cape Town Municipalities had decided to expropriate the company's systems in their towns. About £100,000 would have to be expended upon track renewals and the purchase of additional plant and rolling stock during the next two years, but this expenditure would eventually prove remunerative. Cape Town was undoubtedly growing and with normal trade conditions the company's business was likely to increase considerably. In Port Elizabeth the traffic had been maintained in spite of motor-bus competition.

A final dividend of 4 per cent., free of tax, has been declared, payable on January 1st, 1926.

British Columbia Electric Railway Co., Ltd.

Brief mention of the report of this company for the year ended June 30th last was made in our last issue. Supplementing this we may say that the profit of £360,792, after paying debenture interest, &c., plus £60,471 brought forward, making £421,263, was distributed as follows:—Preference and preferred ordinary dividends, the latter totalling £6 6s. 9d. per cent., free of tax, and a total dividend of £8 per cent., free of tax, on the deferred ordinary, absorbing together £320,373; £40,000 was transferred to the general reserve in respect of expenditure on underground cables; and £60,890 is carried forward. During the year the sum of $4,503,908 was expended on additions to the power-generating plant and transmission systems, on new rolling stock, and in extensions of the lighting, power, and gas systems. The work of installing the fifth set at the Stave Falls power house has now been completed and with the installation of the new switching apparatus now nearing completion the plant will be one of the most modern and efficient in the country. The construction at Alouette Lake is progressing satisfactorily, the tunnel connecting Alouette Lake with Stave Lake having been completed in May, 1925. On completion of the Alouette plant (13,400 h.p.), the total capacity of the company's stations will be 212,200 kW. The Bridge River Power Co., which owns water rights on Bridge River adjacent to the Pacific Great Eastern Railway and near the town of Lillooet, has been acquired. A favourable report on the property has been received but little will be done there before 1927. As the result of the establishment of new industries, house-building, and the increased use of electrical appliances, the energy sold during the year amounted to 322,656,645 kWh, as compared with 298,872,146 kWh in 1923-24. The number of consumers served rose from 80,793 to 84,587 and the motors connected from 96,815 h.p. to 99,990 h.p. A reduced rate based on the maximum demand principle has been instituted in Vancouver; this is expected to encourage the more liberal use of electricity. The contract with the Puget Sound Power & Light Co. expires next March, but although this will effect the company's revenue the general increase in business is expected to compensate for the loss. Street traffic continues to expand, the number of passengers carried having risen by 1,526,841 to 69,779,475. The amount of freight hauled rose from 355,384 tons to 371,634 tons, and there is a prospect of a further increase during the current year. Negotiations for the continuance of the present street railway fares came to a successful conclusion. The sales of gas and the number of consumers showed satisfactory increases. The properties of the company are stated to be in excellent condition. The annual meeting was to be held on Wednesday last (December 23rd).

Venezuela Telephone and Electrical Appliances Co., Ltd.

The annual meeting of this company (whose report was reviewed in our issue of December 4th, p. 909) was held on December 15th. Mr. J. S. Austin (chairman), who presided, said that there was reason for satisfaction at the result of the past year's working. Although they were paying the same dividend (8 per cent.), he felt that this was not large enough, but there was a reason for it. The company contemplated further capital expenditure and a further issue of capital. This expenditure for some time would be unremunerative, although dividends would have to be paid on the capital. The new section which was being added to the Caracas switchboard would be on the automatic system; this would be the first step in the conversion of the whole of Caracas to the automatic system. The new capital would be offered to the shareholders, and equal amounts of preference and ordinary shares would be offered at the same time, and the shareholders would be required to subscribe in equal amounts for the two classes, as there was such a very close connection between the two shares. The preference shares were entitled to a cumulative dividend of 8 per cent., and when that was paid the ordinary shares would receive 8 per cent., and after that the two shares would rank equally. The issue would probably be made either in June or December of next year. The report and the accounts were adopted, and at a subsequent extraordinary meeting the board was empowered to increase the capital to £280,000 by the issue of 70,000 each of £1 preference and ordinary shares. It was explained that the new capital would not all be issued at once; the first instalment would probably be £100,000.

The Vickers Reorganisation Scheme.

The proposals for reducing the ordinary capital, &c., outlined in our last issue, p. 989, came before an extraordinary general meeting at Sheffield on December 17th. Mr. Douglas Vickers, who presided, introduced the report of the company's advisers, and spoke at some length upon the circumstances which had led up to their appointment. He said that the losses were mainly due to the fact that after the war they had large armament factories upon their hands. Some of these had been successfully converted into producers of peace-time necessaries, but in some directions this policy had not been successful. In 1919 they had taken over the control of the British Westinghouse Co., in association with the Metropolitan Carriage, Wagon & Finance Co., hoping that the earnings of the electrical department would allow them to bridge over the period during which it was obvious that armament orders could only be small. Unfortunately for the company, the Washington Conference reduced programmes to a minimum, and restrictions of facilities for loans in this country led to orders being placed in France.

The electrical interests were doing reasonably well. The Metropolitan Carriage Co. and its subsidiaries had been, and were paying steady dividends, although not so large as they had anticipated. Mr. Vickers went on to deal with other branches of the group, and explained the resolutions. Mr. R. McKenna, one of the advisers, also addressed the meeting, and after some discussion, during which an amendment to defer consideration of the recommendations was proposed, the resolutions were adopted, the chairman agreeing that the shareholders should be represented on the Advisory Committee.

C. A. Vandervell & Co., Ltd.—The directors have issued a balance-sheet showing the results of the past two years' trading (to March 31st last). This shows a loss of £130,624 in 1923-24 (as compared with £18,111 in the preceding year) and a profit of £20,316 in 1924-25. It is considered that a drastic reorganisation is necessary. Since the date of the accounts, savings amounting to £118,768 have been effected by settlements in respect of outstanding loans. An offer has been made to the shareholders for the purchase of the whole of the preferred and deferred ordinary shares at the prices of 12s. 6d. and 2s. 6d. per share respectively. The directors advise the acceptance of the offer, stating that they are willing to dispose of their own holdings at these prices.

Marconi International Marine Communication Co., Ltd.—The directors state in a circular that it has been their practice to declare an interim dividend at about this period of the year. They do not feel, however, in view of the operators' strike, that they are justified in paying an interim dividend. As soon as the strike is ended they will reconsider the matter and, if possible, will pay an interim dividend of 2½ per cent. The circular says that British shipping has been passing through the most serious crisis in its history and the directors are confident that, before very long, the great majority of the wireless operators will realise that, in the interests of their industry, there is no alternative but for them to accept the reductions which are already in operation with every other class of seafarer.

Lima Light, Power and Tramways Co.—It is proposed to reorganise the capital of the company by the writing down of the ordinary shares from £P1,500,000 to £P750,000, and the issuing of new ordinary shares. The necessity for this action arises from the losses due to severe floods in the early part of the year. The preference shares and the 6 per cent. mortgage debentures issued in London a year or two ago are not affected by the scheme, being well secured.

Stock Exchange Notices.—The undermentioned have been ordered to be officially quoted :—

Brisbane Tramway Trust.—Stock and partly-paid scrip for £500,000 5½ per cent. Brisbane Tramway stock, 1944-1954.

Dealings in the following have been specially allowed by the Committee under Rule 159 :—

Foundation Co.—10,000 8 per cent. participating preference shares of £1 each, fully paid, Nos. 129,503 to 139,502.

A. J. Stevens & Co. (1914), Ltd.—At an extraordinary general meeting held on December 15th, it was decided to increase the company's capital to £600,000 by the creation of 100,000 cumulative preference and 150,000 ordinary shares of £1 each.

French Company.—*Société l'Electro-Câblé.*—The directors have declared a dividend of 8 per cent., and report that the great fluctuation during the year in the purchasing power of the franc had led buyers to restrict their orders to a marked extent.

Pinchin, Johnson & Co., Ltd.—A dividend at the rate of 6½ per cent. has been declared on the preference shares for the half-year ending December 31st.

Manila Electric Co.—A dividend of 50 cents per share has been declared on the common stock for the quarter ending December 31st.

Lisbon Electric Tramways, Ltd.—The dividend on the 6 per cent. cumulative preference shares has been declared for the year ending December 31st.

International Light and Power Co.—Dividend of 3 per cent., less British tax, on preference shares for six months to December 31st.

Shawinigan Water and Power Co.—A dividend of $2 per common share has been declared for the quarter ending December 31st.

Cawnpore Electric Supply Corporation, Ltd.—The dividend on the 7 per cent. preference shares for the current half-year is to be paid on December 31st.

Ferguson, Pailin, Ltd.—The directors have declared a final dividend of 9½ per cent. actual, making 13 per cent. for the year.

Canadian General Electric Co., Ltd.—A dividend of 1¾ per cent. on the preference shares for the quarter ending December 31st is announced.

Mackay Companies.—A quarterly dividend of 1¾ per cent. has been declared on the common stock.

Howard & Bullough, Ltd.—A quarterly dividend of 6d. per share is announced.

Bell Telephone Co. of Canada.—The usual quarterly dividend of 2 per cent. has been declared.

Stocks and Shares.

MONDAY MORNING.

STOCK Exchange markets enter with a bold and courageous air upon the Christmas week. Bargains are now being done for settlement on January 7th, 1926, and the knowledge that they need put up no money until the year has turned is a stimulus to purchasers. Nor is any fear now entertained, as it was last week, of a possible rise in the Bank rate. Money conditions have become easier, and the outlook, viewed with apprehension so recently, is regarded with composure. New issues attract favourable attention, and the Stock Exchange has a clear conscience in wishing its clients a merry Christmas, with a prosperous New Year to follow.

The same traditional good wishes may be offered by anyone who writes upon the course of prices and developments in connection with electrical companies' stocks and shares. It is unhappily true that the year has been a bad period for holders of Home Railway securities. But in most of the other sections with which these weekly letters deal, the year now ending has seen a notable addition of strength to share values, and the price lists of to-day maintain the general trend of the past twelve months.

Kensington Electric Supply shares have risen to 13¼. Metropolitans are a florin up, at 40s. 6d. St. James's and Pall Mall put on 2s. 6d., Westminsters 6d., and South Londons 1s. 3d. London Electric preference weakened to 5½, and County of London ordinary reacted to £3 after the vivid rise in the price last week. Richmond Electrics have advanced to 30s. Egham and Staines new ordinary are firmer at 22s. 6d. Midland Counties new ordinary are changing hands at 22s. 3d., and the 6 per cent. new preference mark 20s. 6d. New Lancashires are 2s. premium for the ordinary, and a slightly higher price is bid for the preference. Yorkshire Electric new ordinary are being dealt in on the basis of 29s. Electrical Distribution of Yorkshire stand at 35s., and the partly-paid new shares at 5s. 9d., a premium of 3s. 9d. Kensington 5 per cent. Second Preference were done the other day at 4⅞ and 4 5/16ths. County of London new preference remain at about 22s. 6d. The rubber market excitement aroused a little demand for Anglo-Dutch Utilities 6 per cent. guaranteed debenture stock, now priced at 102.

Barcelona Tractions continue to be a fairly active market: the price is 31. Brazilian Tractions yielded a couple of their last week's rise of 7 points, the current price being 83. Anglo-Argentine Tramways first and second preferences are both ex dividend, allowing for which the prices show ⅛ fall in each case. The outstanding feature in this department is a jump of 6½, to 121½, in British Columbia Electric Railway deferred stock. Some of the demand is reported to be for account of Canadian buyers. No alterations have taken place in British Electric Traction, or in the London traction issues.

The Marconi Marine Company has postponed payment of an interim dividend, owing to the recent strike of operators. The directors state, however, that they will consider the matter, and, if they feel justified in so doing, will pay an interim dividend of 2½ per cent., which would compare with 5 per cent. a year ago, the full dividend for the year being made up to 7½ per cent. The shares are a dull market at about 17s., and Marconis are 22s. 6d. sellers. Other wireless shares exhibit a tendency to droop.

Equipment shares keep steady. Cromptons are the best spot, with a rise to 16s. 3d. The company is said to be doing well, and to be well supplied with orders. English Electrics weakened to 18s. 6d. Johnson & Phillips have been well maintained, and the market is very firm as a whole. The engineering list, with iron and steel shares, is stronger, by reason of the speeches made at last week's meetings of the Vickers and the Dorman Long companies. Evidence of substantial savings upon this year's coal bills by the railway companies was given before the Coal Commission by Sir Ralph Wedgwood, and led to advances in Home Railway stocks. On balance, no net change has occurred in the Undergrounds, but the prices had been flat before Sir Ralph Wedgwood's statement, and the falls have been recovered. Metropolitans, for instance, had been down to nearly 68 before they rallied to 69.

Great Northern Telegraphs are £1 lower at 33. Western Telegraphs and Globe ordinary have risen 5s. apiece. Automatic Telephones are unchanged at 51s. 3d. United River Plates continue their advance, being now up to 7¾. The industrial list remains rather overshadowed by the activity of the rubber market, in which latter a shake out, due to an abrupt drop in the price of the product, was followed by sharp improvement in sympathy with a rise in raw rubber. Share prices are again on the mend, and the interest of the public in the popular market of the moment is as keen as ever.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Dec. 21, 1925.	Rise or fall.	Yield p.c.
Bournemouth and Poole	1	13	14	59/6	—	4 14 1
Brompton Ordinary	1	10	10	1⅝	—	*6 3 1
Charing Cross Ordinary	1	14½	15	2 7/16	—	6 3 1
do. do. 4½ Pref....	1	4	4½	17/6	—	5 2 10
Chelsea	1	12	12	2½	—	5 13 0
City of London	1	15	15	50/9	—	5 18 1
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	29/6	—	5 8 6
County of London	1	15	15	60/-	—9d.	5 0 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	24/-	—	5 16 8
do. 7% Pref.	1	6	7	21/6	—	6 10 8
Elec. Supply Corporation ...	1	10	10	32/6	—	6 3 0
Kensington Ordinary	5	14	15	13½	+¼	5 13 2
Lancs. Light and Power	1	7½	7½	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.... ...	5	6	6	5½	—⅛	5 9 1
Metropolitan	1	10	11	40/6	+1/-	5 8 7
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5⅝	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary ...	1	6	7	22/6	—	6 4 5
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	24/6	—	5 14 3
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref. ...	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	15⅝	+⅛	5 13 8
South London	1	15	15	2⅝	+1/16	5 18 1
South Metropolitan Pref. ...	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref. ...	1	6	6	18/9	—	6 8 1
Westminster Ordinary	1	15	15	46/-	+6d.	6 10 5
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	30/6	—	5 5 0

HOME RAILS.

Central London Ord. Assented	Stock	4	4	67	—	5 19 5
Metropolitan	,,	4	5	69	—	7 5 0
do. District	,,	3½	3½	47	—	7 9 4
Underground Electric Ordinary	10	Nil	Nil	2¼		Nil
do. do. "A" ...	1/-	Nil	Nil	7/-	—	Nil
do. do. Income	Bonds	6	6	98	—	*6 2 5

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	103	—	5 16 6
do. Def.	,,	1½	1½	24⅞	—	6 0 8
Automatic Telephone	1	8	6	51/3	—	2 6 10
Chili Telephone	5	6	5	6 5/16	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6¾	—	7 8 2
Eastern Extension	10	10	10	18	—	*5 9 7
Eastern Tel. Ord.	Stock	10	10	177½	—	*5 12 8
Globe Tel. and T. Ord.	10	10	10	18⅝	+¼	*5 6 8
do. do. Pref.	10	6	6	11	—	5 8 4
Great Northern Tel.	10	22	22	33	—1	6 13 4
Indo-European	25	7	8½	45½	—	*4 13 5
Marconi		10	10	1⅛	—	9 17 10
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord. ...	1	12	12	42/6	—	*5 12 11
United R. Plate Tel.	5	8	8	7¾	+ 1/16	5 3 3
Western Telegraph	10	10	10	18xd	+¼	*5 11 1

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	6½	8¼xd	—½	8 9 2
do. do. 2nd Pref. ...	5	6	6	8 3/16xd	—⅝	9 8 2
do. do. 5% Deb. ...	Stock	5	5	73½	—	6 16 3
British Electric Traction Ord. ...	,,	6	6	120	—	5 0 0
do. do. 6% Pref. ...	,,	6	6	105	—	5 14 3
Brazil Traction	100	4	4	83	—2	4 16 5
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	85½	—	5 17 0
do. do. Preferred	,,	96/-	96/-	101½	+5	*4 14 5
do. do. Deferred	,,	129/5	129/5	121½	+6	*5 6 7
do. do. Deb.	,,	4¼	4¼	76	—	5 11 10
Lond. & Sub. Trac. 5% Pref. ...	1	2½	Nil	4/-	—	Nil
London United Tram. Deb. ...	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds ...	—	5	5	62½	—	8 0 0
Mexican Light Common ...	100	Nil	Nil	31½	—	Nil
do. Pref.	100	Nil	Nil	61½	—	Nil
do. 1st Bonds ...	—	5	5	72	—	6 18 11
Yorkshire (West Riding) ...	1	5	—	18/9	—	5 6 8

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	12	51/3	—	*4 13 4
British Aluminium Ord.	1	5	10	38/-	—	5 5 3
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	2¾xr	—	5 9 1
Brush Ord.	1	10	10	26/3	—	7 12 4
Callenders	1	15	15	3½	—	4 12 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	16/3	+1/16	... ...
Edison-Swan	4/-	10	10	9/-	—	4 9 0
do. 5% Deb.	Stock	5	5	84	—	5 19 1
Electric Construction	1	10	10	32/6	—	6 3 0
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	18/6	—9d.	5 8 0
do. do. Pref.	1	6	6	21/-	—	5 14 3
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	5	7½	27/6	—	5 9 1
Henley	1	15	16	3½	—	4 11 5
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	1 1/16	—	*4 14 1
Johnson & Phillips	1	10	10	54/6	—	3 13 7
Met-Vickers, Ord.	1	8	8	27/6	—	5 16 5
do. Pref.	2	8	8	28	—	6 14 9
Siemens Ord.	1	—	7½	32/-	—	4 13 9
Telegraph Construction	12	20	20	27	—	4 9 0

*Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price December 21st.	Fortnight's Inc. or dec.
a Acid, Oxalic ... ... per lb.	5¾d.	...
a Ammoniac, Sal ... ... per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£25	...
a Copper Sulphate ... ... ,,	£25 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a ,, Perchlorate ... ... ,,	5½d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Commercial ... ... ,,	£8 10s.	...
a ,, Roll ... ... ,,	£8 10s.	...
a Soda, Chlorate ... ... per lb.	3¾d. to 3⅞d.	...
a ,, Crystals ... ... per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots ... ... per ton	£120 to £125	...
b ,, Wire ... ... per lb.	1/9 to 2/6*	...
b ,, Sheet	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		...
Grade I ... ... per ton net	£252	£4 dec.
Grade II ... ... ,, ,,	£179	£3 dec.
Grade III ... ... ,, ,,	£99	£1 dec.
c Brass (rolled metal 2" to 12" basis) per lb.	9¼d.	...
c ,, Tubes (solid drawn) ... ,,	1/- to 1/0½	...
c ,, Wire, basis ... ... ,,	10¾d.	...
c Copper Tubes (solid drawn) ... ,,	1/1	...
c ,, Bars (best selected) ... per ton	£90	£2 dec.
c ,, Sheet ... ... ,,	£90	£2 dec.
c ,, Rod ... ... ,,	£90	£2 dec.
d ,, (Electrolytic) Bars ... ,,	£66 5s.	...
d ,, ,, Sheets ... ,,	£143 10s.	...
d ,, ,, Wire Rods ...	£76 5s.	...
d ,, ,, H.C. Wire per lb.	9 7/8d.	...
f Ebonite Rod ... ... ,,	2/3 to 2/8	...
f ,, Sheet ... ... ,,	2/3 to 2/6	...
n German Silver Wire ... ... ,,	2/2	1d. dec.
b Gutta-percha, fine ... ... ,,	6/6	...
b India-rubber, Para fine ... ... ,,	4/-	6d. dec.
i Iron Pig (Cleveland Warrants) ... per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qual, ,,	£12	...
g Lead, English Pig ... ... ,,	£36	...
g Mercury ... ... per bot.	£15 to £15 10s.	...
c Mica (in original cases) small ... per lb.	8d. to 8/-	...
c ,, ,, medium ,,	4/- to 8/-	...
c ,, ,, large ... ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/8½	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/9½	...
p ,, ,, wire ... ... ,,	1/8¾	...
o Platinum ... ... per oz.	£26	...
d Silicium Bronze Wire ... ... per lb.	1/0¼	...
r Steel, Magnet, in bars ... ... ,,	7¾d.	...
a Tin, Block (English) ... ... per ton.	£285 to £286	£2 dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	2d. dec.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
o C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

The Coal Commission.—RAILWAY ELECTRIFICATION.—"I do not think, looking over the next ten years, that the Commission need seriously consider the question of main-line electrification," said Sir Ralph Wedgwood, chief general manager of the L. and N.E. Railway, and chairman of the General Managers' Conference, 1925, when giving evidence before the Coal Commission. Sir Ralph's remark was made *apropos* the railway's consumption of coal. He added, says the *Daily Mail*: "If the cost of power were reduced and the progress of invention in some way cheapened the price of generating electricity or of the plant required for the electrification of lines, then you might see some change." Sir Ralph said that, compared with the average pit-head prices paid in 1911, coal cost the four grouped companies approximately £9,250,000 more in 1924.

"The Times'" Time.—A new bracket clock has been erected on the Queen Victoria Street frontage of *The Times* building; it is a handsome reproduction in bronze, copper, and opal of the paper's well-known emblem, the open book, flanked by the closed volumes *Times Past*, *Times Future*. The clock, according to the *Horological Journal*, is operated on the Synchronome system; the hands are driven by an electromagnet applied to the motion work behind the centre of each dial, the simple movement being so small as to be concealed by the central bosses. The entire space between the dials is available for illumination, and by the device known as "detachable centres" the central opal panels which carry the movements and hands can be readily drawn inwards, thereby providing access to all parts of the clock. One can open the window and step on a platform between the brackets, open the door in the case, and walk into the space between the dials, when lamp changes and cleaning, inside and out, can be carried on in comfort. The work has been carried out by the Synchronome Company, Limited, under the supervision of Mr. F. Hope-Jones.

Exports and Imports of Electrical Goods and Machinery in November, 1925.

It will be seen from our table of last month's exports that there was a further decline, though not so large as that which occurred in October. Two items were mainly responsible for the decrease, *viz.*, "Other motors and generators" and submarine telegraph and telephone cable—the latter being the most variable of the items which make up the list. There were only six increases, and none of these was of great consequence, unless we except the rise of £11,005 in the value of exported glow lamps. As compared with November, 1924, the position is even less favourable. Five items show serious falls—railway and tramway motors, other motors and generators, the two telegraph and telephone cable sections, and telegraph and telephone instruments and apparatus—and these are only partly balanced by fairly substantial increases in insulated wires and cables, and glow lamps. Thus the excess of this year's over last year's imports has been further reduced, although it is now certain that the complete figure for 1925 will be higher than the 1924 total.

The imports also showed a decline as compared with October, although this amounted only to about 2 per cent., as against about 7 per cent. in the case of exports. The decrease was due to a large fall (£21,454) in imports of insulated wires and cables, which was partly offset by a rise of £12,992 in the case of unenumerated electrical machinery. In comparison with November, 1924, imports showed a rise of £46,904, the effects of a decline of £40,993 in telegraph and telephone instruments being nullified by large increases in unenumerated electrical goods and apparatus (£20,371), and batteries and accumulators (£44,118). There was only one decrease apart from that already mentioned.

The re-export section exhibits a series of decreases as compared with the previous month's figures, there being only two rises recorded. On the other hand, comparison with November, 1924, reveals principally increases.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Nov., 1925.	Inc. or dec. as compared with Oct., 1925.	Inc. or dec. as compared with Nov., 1924.	Electrical imports for Nov., 1925.	Inc. or dec. as compared with Oct., 1925.	Inc. or dec. as compared with Nov., 1924.	Electrical re-exports for Nov., 1925.	Inc. or dec. as compared with Oct., 1925.	Inc. or dec. as compared with Nov., 1924.
Electrical goods and apparatus (unenumerated)	£160,199	+ £1,404	− £7,118	£119,177	+ £2,190	+ £20,371	£6 718	− £1 912	+ £1,346
Insulated wires and cables ...	247 661	− 3,684	+ 45.835	47 792	− 21,454	− 2,179	573	− 231	+ 571
Glow lamps	61,552	+ 11,005	+ 21,353	33 210	− 471	+ 3 051	87	− 433	− 347
Arc lamps and parts	1,163	+ 89	+ 184	2,037	− 1,537	+ 406	5	− 20	− 37
Batteries and accumulators ...	78.481	+ 4.374	+ 6,6 8	101 314	+ 5.125	+ 44,118	509	− 1,438	+ 230
Meters and instruments ...	33,818	− 1,444	− 9,498	18,312	− 5,663	+ 5,114	567	− 20	− 19
Carbons	429	− 216	− 2,439	13,728	+ 2,882	+ 4,877	119	− 19	+ 71
Electrical Machinery—									
Electrical machinery (unenumerated)	223.205	− 4,217	+ 7.623	78,600	+ 12.992	+ 6.904	7,762	+ 988	− 680
Railway and tramway motors	43.878	+ 4,469	− 61.545	—	—	—	—	—	—
Other motors and generators ...	128,251	− 58,560	− 41,095	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	6 062	− 2,432	+ 810	376	+ 23	+ 346	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	53.975	+ 3,404	− 29,510	17.958	+ 4,005	+ 4,889	1,550	+ 1,550	+ 482
Submarine telegraph and telephone cable	442	− 12,651	− 21,540	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	225.083	− 3 824	− 56,680	71,744	− 9,386	− 40,993	3,440	− 179	+ 1,212
Totals	£1.264,199	− £99,283	− £147,002	£504.248	− £11,294	+ £46.904	£21,330	− £1,714	+ £7,829
Increases for eleven months ended November, 1925		Exports. + £1,918,718			Imports. + £975,817			Re-exports. + £38,334	

Electricity Supply Development.

SIR HARRY RENWICK, K.B.E., presided at the annual meeting of the Provincial Electric Supply Association of the United Kingdom on December 17th, and in reviewing the work of the past year said that considerable progress had been made in the re-organisation of electricity supply. The Association had taken an active part in the framing of legislation affecting the industry. He considered that there was an urgent need for a revision of the regulations governing the use of overhead lines, as only by this means would it be possible to supply cheap electricity in rural areas. The progress made since 1920 was very encouraging, the combined output of all generating stations in the United Kingdom having increased by 43 per cent. in four years. There was no doubt that future progress would be more rapid as new fields of development were being opened up, and there was a tendency to remove many restrictions which had hitherto hampered the industry. He regretted the long delay in the publication of the Weir Committee's report; this was holding up a number of schemes of development, but it was to be hoped that when the report was issued it would be found that it was of a helpful nature. With wider legislative and financial facilities to assist in opening up and developing new fields of supply, and the prospect of increased efficiency of generation, he considered that a still brighter and more prosperous future lay ahead for the industry. Sir Harry Renwick made reference to an article which had appeared that week in the daily Press, which, he said, created false and erroneous impressions. Electricity supply was a highly technical matter, and amateur critics who compared conditions here with those in America were liable to make many mistakes. It had been disproved that pit-head generating stations could possibly solve the problem of cheap electricity; there were many other things besides coal supplies which had to be taken into consideration. Many capital stations in this country operated at a much higher efficiency than similar undertakings in America, and we had even supplied some of America's most efficient plant. The rates for power in Great Britain compared very favourably with those prevailing in America; in many cases, indeed, they were even lower. In conclusion, the chairman paid a tribute to the work of the Electricity Commissioners, and said that the problem of electricity supply was fully understood by both engineers and industrial leaders in Great Britain.

The Electrical Exports of Sweden.

The Figures for 1923 and 1924 Compared.

The following figures showing the exports from Sweden of electrical goods, machinery, and apparatus in 1924 are extracted from the recently-issued official trade statistics. The figures for 1923 have been added, together with notes of increases and decreases :—

	1923. Kr.	1924. Kr.	Inc. or dec. Kr.
Accumulators and parts thereof—			
Unmounted cells :			
Total	183,000	91,000	− 92,000
To Netherlands	3,000	*	—
,, Great Britain	146,000	44,000	− 102,000
,, United States	1,000	*	—
Accumulator plates :			
Total	282,000	115,000	− 167,000
To Denmark	60,000	12,000	− 48,000
,, Netherlands	214,000	99,000	− 115,000
Cells and batteries :			
Total	571,000	1,030,000	+ 459,000
To Netherlands	22,000	19,000	− 3,000
,, Great Britain	367,000	386,000	+ 19,000
,, Japan	*	202,000	*
Switchboards, fitted—			
Total	407,000	286,000	− 121,000
To Denmark	48,000	24,000	− 24,000
,, Spain	40,000	14,000	− 26,000
,, British East Indies	130,000	50,000	− 80,000
Wireless telegraph and telephone apparatus—			
Total	450,000	692,000	+ 242,000
To Norway	45,000	43,000	− 2,000
,, Latvia	65,000	—	− 65,000
,, Spain	26,000	67,000	+ 41,000
,, Switzerland	173,000	233,000	+ 60,000
Panels for telephone switchboards—			
Total	144,000	63,000	− 81,000
To Denmark	10,000	14,000	+ 4,000
,, British South Africa	17,000	*	*
,, China	21,000	*	*
Generators and motors, each weighing not more than 50 kg.—			
Total	4,437,000	8,570,000	+4,133,000
To Denmark	342,000	498,000	+ 156,000
,, Netherlands	609,000	1,802,000	+1,193,000
,, Belgium	759,000	803,000	+ 44,000
,, Great Britain	706,000	2,064,000	+1,358,000
,, France	797,000	1,079,000	+ 282,000
Generators and motors weighing from 50 to 100 kg.—			
Total	339,000	394,000	+ 55,000
To Norway	41,000	25,000	− 16,000
,, Finland	39,000	29,000	− 10,000
,, Great Britain	66,000	33,000	− 33,000
,, Australia	57,000	28,000	− 29,000
Generators and motors weighing from 100 to 500 kg.—			
Total	1,835,000	1,774,000	− 61,000
To Norway	123,000	122,000	− 1,000
,, Finland	247,000	225,000	− 22,000
,, Great Britain	490,000	186,000	− 304,000
,, Spain	168,000	228,000	+ 60,000
,, Australia	267,000	140,000	− 127,000
Generators and motors weighing from 500 to 3,000 kg.—			
Total	1,769,000	1,320,000	− 449,000
To Finland	204,000	118,000	− 86,000
,, Belgium	135,000	184,000	+ 49,000
,, Great Britain	242,000	145,000	− 97,000
,, Spain	292,000	150,000	− 142,000
,, British East Indies	122,000	44,000	− 78,000
Generators and motors weighing more than 3,000 kg.—			
Total	1,700,000	3,000,000	+1,300,000
To Norway	250,000	25,000	− 225,000
,, Denmark	202,000	100,000	− 102,000
,, Finland	264,000	140,000	− 124,000
,, Great Britain	125,000	127,000	+ 2,000
,, Spain	242,000	176,000	− 66,000
Transformers weighing from 100 to 500 kg.—			
Total	507,000	460,000	− 47,000
To Finland	92,000	41,000	− 51,000
,, Belgium	76,000	97,000	+ 21,000
,, Spain	140,000	62,000	− 78,000
,, Australia	58,000	16,000	− 42,000
Transformers weighing from 500 to 3,000 kg.—			
Total	620,000	421,000	− 199,000
To Finland	102,000	52,000	− 50,000
,, Belgium	78,000	92,000	+ 14,000
,, Spain	140,000	47,000	− 93,000
Transformers weighing more than 3,000 kg.—			
Total	1,308,000	1,505,000	+ 197,000
To Finland	80,000	100,000	+ 20,000
,, Belgium	572,000	165,000	− 407,000
,, Great Britain	81,000	558,000	+ 477,000
,, France	140,000	*	*
,, Spain	135,000	84,000	− 51,000
,, Australia	172,000	*	*
Incandescent lamps : Metal filament—			
Total	181,000	73,000	− 108,000
To Norway	24,000	2,000	− 22,000
,, Denmark	11,000	3,000	− 8,000
,, Finland	90,000	52,000	− 38,000
,, Australia	20,000	6,000	− 14,000
Starting, regulating and reduction resistances, &c.—			
Total	531,000	520,000	− 11,000
To Finland	126,000	83,000	− 43,000
,, Spain	70,000	68,000	− 2,000
,, Australia	68,000	23,000	− 45,000
Stators, rotors, current collectors, magnet coils, &c., weighing each not more than 50 kg.—			
Total	73,000	94,000	+ 21,000
To Norway	19,000	16,000	− 3,000
,, Denmark	9,000	3,000	− 6,000
,, Finland	11,000	11,000	—
Oil break switches, hand-operated—			
Total	163,000	113,000	− 50,000
To Denmark	26,000	*	—
,, Finland	50,000	19,000	− 31,000
,, Spain	38,000	23,000	− 15,000
Switches, not specified—			
Total	101,000	189,000	+ 88,000
To Norway	26,000	9,000	− 17,000
,, Finland	28,000	35,000	+ 7,000
,, Spain	12,000	14,000	+ 2,000
Safety appliances, not specified—			
Total	676,000	289,000	− 387,000
To Netherlands	254,000	28,000	− 226,000
,, British South Africa	75,000	20,000	− 55,000
,, Finland	28,000	35,000	+ 7,000
,, Spain	69,000	24,000	− 45,000
,, Australia	34,000	49,000	+ 15,000
,, China	26,000	9,000	− 17,000
,, British East Indies	17,000	2,000	− 15,000
Telephone apparatus, weighing less than 5 kg. per article—			
Total	1,202,000	796,000	− 406,000
To Netherlands	160,000	96,000	− 64,000
,, Norway	121,000	8,000	− 113,000
,, Mexico	135,000	95,000	− 40,000
,, Spain	111,000	60,000	− 51,000
,, China	79,000	31,000	− 48,000
,, Finland	103,000	90,000	− 13,000
,, Poland	330,000	123,000	− 207,000
Ditto, weighing 5 kg. or more—			
Total	971,000	1,011,000	+ 40,000
To Finland	136,000	123,000	− 13,000
,, Poland	66,000	98,000	+ 32,000
,, Portugal	66,000	*	*
,, British South Africa	84,000	174,000	+ 90,000
,, China	223,000	214,000	− 9,000
,, Australia	100,000	28,000	− 72,000
Telegraph apparatus, telephone switches and switchboards and parts—			
Total	5,970,000	5,736,000	− 234,000
To Norway	225,000	36,000	− 189,000
,, Finland	318,000	308,000	− 10,000
,, Russia	514,000	20,000	− 494,000
,, Poland	498,000	211,000	− 287,000
,, Netherlands	2,235,000	2,626,000	+ 391,000
,, British South Africa	372,000	312,000	− 60,000
,, Mexico	591,000	647,000	+ 56,000
,, Australia	158,000	195,000	+ 37,000
,, China	132,000	166,000	+ 34,000
Cables and cords with sheath of lead or other metal; maximum diameter 25 mm.—			
Total	583,000	425,000	− 158,000
To Poland	160,000	107,000	− 53,000
,, Germany	3,000	*	*
,, Netherlands	208,000	89,000	− 119,000
Ditto, of greater diameter—			
Total	268,000	121,000	− 147,000
To Poland	179,000	*	*
,, Australia	29,000	*	*
,, Mexico	—	66,000	+ 66,000

	1923. Kr.	1924. Kr.	Inc. or dec. Kr.
Wires and cables insulated by paper, asbestos or varnish; maximum thickness of wire 0.5 mm.—			
Total	596,000	470,000	– 126,000
To Denmark	74,000	79,000	+ 5,000
,, Great Britain	240,000	251,000	+ 11,000
Ditto, thickness of wire greater than 0.5 mm.—			
Total	333,000	106,000	– 227,000
To Netherlands	134,000	13,000	– 121,000

* Not separately distinguished.

[£1 = about 17 kronor.]

Reviews.

Time Standardisation of Workshop Operations. By T. PILKINGTON, M.I.Mech.E. 8½ in. by 5⅝ in. by ⅞ in. Pp. x + 253; fully illustrated. London: Sir Isaac Pitman and Sons, Ltd. Price, 16s. net.

It has long been recognised that the system of wages still so extensively employed in the majority of industrial establishments, based merely upon the number of hours which a man spends in the works is unsatisfactory both from the point of view of the workman himself and that of his employer. To the former it means that he reaps no reward for either ability or hard work, while to the latter it involves the payment of wages often far in excess of those actually earned, with the result that manufacturing costs are too high and contracts are lost. Many systems have been proposed whereby these obvious evils can be eliminated, such as the piecework system and the premium bonus system, but all of these must fail unless an exact estimate is made of the actual work involved on any particular job and an accurate idea is formed of the time which a workman or a gang of average ability should take to perform it. It is on this question of "time setting" that many piecework systems break, since nothing is more unsatisfactory to the men than to feel that they are being called upon to do more than was originally intended or to do it in a shorter time, and from the works manager's point of view it is equally unsatisfactory to find that a job can be performed in considerably less than the estimated time. Thus, the whole problem of a rational system of wages, including the exact determination of the productive capacity of the workers and of the manufacturing plant, may be said to be based upon the correct determination of the time standards for the various operations and this in its turn involves the training of the *personnel* of the time setting department to determine such time standards with an exact knowledge of the amount of work involved on each job, the capacities of the various machines to which it will pass and the average capabilities of the men who will carry out the work. It must be at once admitted that the task of training the time setters to the efficient performance of their tasks is no easy one in view of the varied nature of the work involved.

In the book under review, an attempt has been made to lay down the scientific basis of the determination of time standards. It is based upon the author's experience of this kind of work both in the United States and in this country, and it is of interest to note that he has been engaged chiefly in electrical work, so that the examples chosen represent up-to-date practice in electrical shops. His aim, however, has been rather to state the principles underlying the fixing of time standards and to describe the methods whereby such standards are fixed so that, although the examples chosen refer particularly to electrical practice, they can be applied with confidence to any operations in other industries. The book is divided into twelve chapters, the first two of which may be regarded as introductory, dealing as they do with the general problems of time standardisation, its aim and objects, and so on. In the third chapter the problem of fixing the time standards is studied in detail, the question of the various forms and charts required is dealt with and the relationship of the system to the workmen is discussed. This point is of great importance since the sympathetic co-operation of the workers is essential to success. Thus we heartily endorse the suggestion of the author that in addition to instructing the workers in efficient methods, attention should always be paid to any suggestion or complaints. In the next four chapters the question of formulæ, instruction cards, fixing of speeds and feeds of machines and the general routine of the time standards department is discussed, including the final problem of fixing the bonus charts for the individual workmen, for the gang, or even for the department. The question of setting the limits of time for any particular job is dealt with and it is of interest to note as indicating that the principle of time standardisation does not necessarily tend to reduce the man almost to the level of the machine he operates as is so frequently urged against the system, that the ethics of the problem is referred to, the question of charging time rates is discussed and the means whereby both the exceptional and the incompetent workman may be dealt with to the complete satisfaction of both is dealt with. In the remainder of the volume, the author discusses such problems as cutting-tool data, grinding practice, assembling, &c., giving many useful tables and other valuable information in so doing. This part of the work may be necessary as indicating the method of fixing the time for various operations, but at best it can only give a comparative idea since the equipment and facilities of different shops may vary between wide limits. Finally, we have a long chapter on incentives which we suggest might well have been placed before the chapters on cutting-tool data, &c. After all, the justification of time standardisation may be said to be based upon the idea that if the incentive is strong enough, human nature is such that the men will be eager to put forth the greater effort required. Thus production is increased, costs are lowered, and the greatest drawback of our present wage system, its failure to yield any incentive or to reward merit, is eliminated. And once the time standard has been adequately determined, then the question of incentive must at once be faced. Nevertheless, the author is to be congratulated upon having put into the pages of a single book the accumulation of knowledge of this important subject which hitherto has only been more or less scantily dealt with from time to time in the commercial and technical Press. It is, we believe, the first book published in this country which deals with the time analysis of manufacturing operations in a scientific manner, and it should be studied by all works managers, estimators and production engineers who are anxious to increase the productivity of their works and at the same time to raise the status of the men whom they employ.

The Mechanical Design of Overhead Electrical Transmission Lines. By E. T. PAINTON, B.Sc. Hons. (Lond.), A.M.I.E.E. Pp. viii + 274; figs. 189. London: Chapman & Hall, Ltd. Price 21s. net.

This book is a companion volume to "The Electrical Design of Overhead Power Transmission Lines," by Messrs. William T. Taylor and R. E. Neale, and the two together form a complete treatment of the design of this class of apparatus.

The book opens with a discussion of the various materials employed both for plain and composite conductors, the first chapter being devoted to tensile strengths, moduli of elasticity, distribution of stress in composite conductors, and other similar problems in strengths of materials.

The two following chapters deal with problems in connection with sag and stress, and with the design of supports. The mathematical treatment of sag problems is somewhat complicated and the author has done well to include alternative graphical methods. In the case of the chapters on supports the mathematical treatment is somewhat less involved. This is perhaps justifiable as, in the case of steel supports, such treatment would be more applicable to a treatise on "Theory of Structures." It is, however, a pity that the author has not gone a little more fully into the choice of steel supports, although such a question is essentially of a controversial nature.

Chapters V and VI deal respectively with wood and steel supports. In passing, it is a little difficult to understand why these chapters have been separated from Chapter III, also on supports, by a chapter on insulators. These two chapters deal very effectively with the design of supports and the calculation of stresses. The question of foundations is also fully discussed.

Chapter IV deals with insulators, and gives a brief *résumé* of the various types employed. Methods of manufacture are described, together with the tests to which insulators should be subjected.

The two remaining chapters deal respectively with constructional details and erection. The former chapter gives various methods of attaching conductors to insulators, forming joints, guarding, and protecting against transient disturbances due to lightning, while the latter deals with the many practical problems involved in the erection of a line.

The book is excellently produced and well illustrated, and although dealing with a highly specialised subject, contains much that is of general interest.

To those directly interested in overhead line construction it should be of great service, and in conjunction with the companion volume it is a valuable addition to any technical library.

Wireless Questions and Answers. By P. J. RISDON, F.R.S.A. Pp. 92; figs. 40. London: W. Foulsham & Co., Ltd. Price 1s. net.

This little book consists of 288 questions with answers in wireless telegraphy and telephony, referring almost entirely to simple receiving circuits and the elementary theory of electricity.

It is especially suited to the needs of the amateur who so often gets rather "fogged" by trying to assimilate a great mass of new facts set forth in text-books and periodicals. In such cases a handy book of clear-cut simple questions and answers is most useful in directing attention to the main points which it is essential to understand, and Mr. Risdon has been successful in putting together just what is required.

An unusual, and commendable, feature of the book is the inclusion of a number of incorrect diagrams with explanations of why they are wrong, a scheme which should certainly help the beginner who is apt to accept even simple circuits without fully understanding the use of the various devices shown.

The answers given throughout are concise and clear, and with the possible exception of numbers 112, 215, 219, and 224, are sufficiently accurate for the needs of the beginner. No. 199, too, omits to state the units employed; but this rather meticulous criticism is hardly apposite in dealing with an elementary book, which, as we have indicated, fulfils well the purpose for which it was written.

A satisfactory index is included.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A "Fuse-Blown" Indicator.

With a view to saving time in locating "blown" fuses in large installations, the BRIGHTON LIGHTING & ELECTRICAL ENGINEERING CO., LTD., is placing on the market a switch-fuse combination, the "Telltale," fig. 1, in which is incorporated an indicating device for denoting when the fuse has blown.

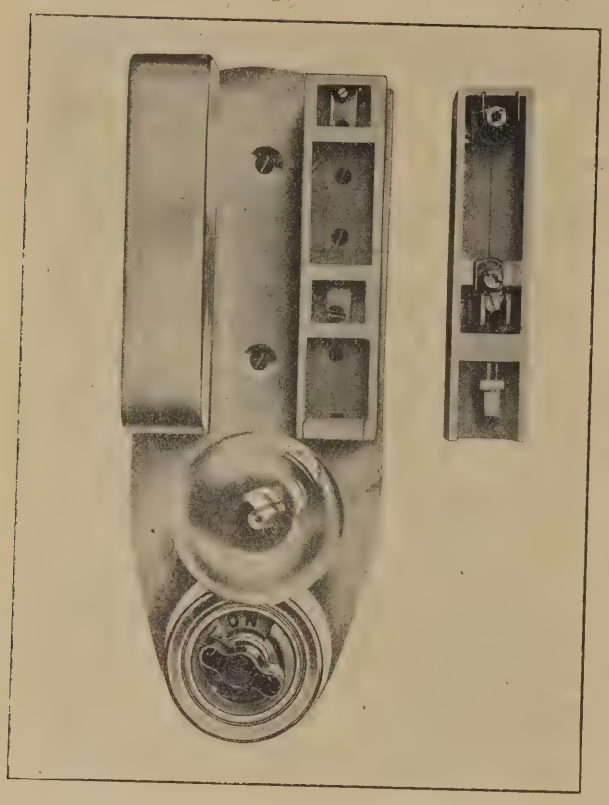


Fig. 1.—Switch-Fuse Unit with Indicator.

This consists of a small switch which is held open when the fuse is intact, and a small lamp. The latter is put in circuit when the fuse is broken by the small switch, which falls on to contacts and closes the lamp circuit. The unit can be supplied with any number of ways and is provided with 10 spare fuses.

A Novel Generating Set.

The accompanying illustration, fig. 2, is of a 42-kW generating set recently supplied by MESSRS. J. W. BROOKE & CO., LTD., Adrian Works, Lowestoft, for shipment abroad. It is of particular interest in that the engine is an example of the marine type of motors which are being built by this firm and adopted for industrial purposes. The motor is a "Brooke" 65-h.p., six-cylinder, heavy-duty unit, having a bore of 5½ in. and a stroke of 6 in., the pistons, connecting rods, bearings, valve guides and many other accessory parts being renewable and interchangeable. All parts are claimed to be accurately constructed of the best material, the cylinders and pistons being of hard, close-grained cast-iron, the camshaft of low-carbon steel and the crankshaft and valves of nickel-steel.

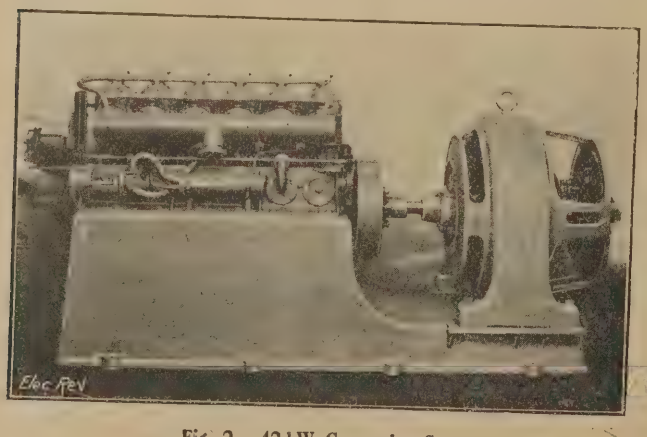


Fig. 2.—42-kW Generating Set.

Accurate grinding is a feature of the cams, crankshafts, pistons, &c. The engine runs at 1,000 r.p.m.

We understand that this type of unit follows closely the design of the first model produced, differing only in features which govern accessibility, silence and increased efficiency. The generator is a d.c. "Crompton" D.B. 60 model, directly coupled to the motor and having an output of 42 kW at 470 V, 1,000 r.p.m. It is compound wound, of the standard open bracket type, and conforms, it is claimed, with the requirements of the latest B.E.S.A. specification. The combination is mounted upon a cast-iron bedplate giving it adequate rigidity, and is an example of the British produced plant for which oversea demand is increasing.

"Mazda" Decorative Lamps.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2, has produced a convenient and safe means of decoration by small "Mazda" lamps. This consists of a plug adaptor from which issue eight or sixteen pairs of leads. To each pair a 14-V, 7-W "Mazda" lamp in an M.E.S. lamp-holder is attached. The lamps can be supplied in a variety of colours. The eight- and sixteen-pair sets are for use on 100/130-V and 200/260-V circuits respectively.

A Novel Electric Clock.

An electric turret clock with a detachable centre, fig. 3, is a recent production of the SYNCHRONOME CO., LTD., 19, Caxton House, Westminster, London, S.W.1. This construction is rendered possible by the installation of a one-wheel electrical impulse movement behind the centre of the dial, which is controlled from the master clock. The outer ring of the face



Fig. 3.—Electric Clock with Detachable Dial.

carries the hour figures and minute marks and is permanently attached to the building in the ordinary manner, while the centre panel is a separate construction buttoned into position; it can be hinged or altogether detached and drawn inwards, thereby providing access for attention to the movement, hands and clock face.

A New Pattern Flame-Proof Switch.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has made an interesting addition to its range of flame-proof switchgear by the production of the 10-ampere combination, illustrated in figs. 4 and 5, which embodies the "D.B. Junior" d.p. switch movement and Home Office pattern cut-out interiors, mounted in a heavy cast-iron case

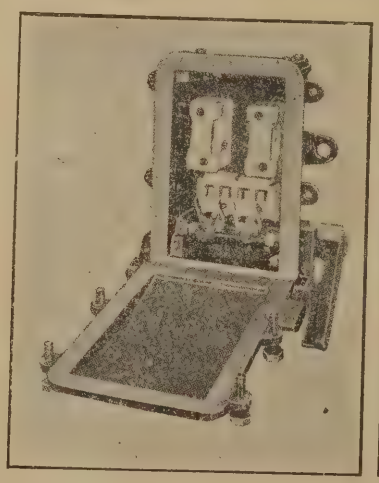


Fig. 4.—Flame-Proof Switch, open.

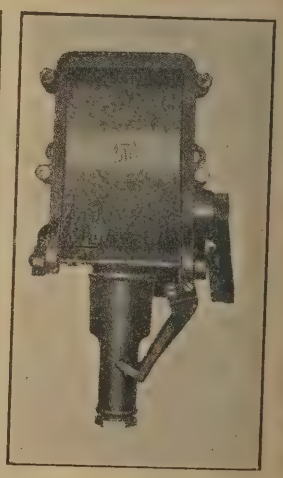


Fig. 5.—Flame-Proof Switch showing interlocked plug.

with wide machined flanges. It is provided with detachable top and bottom plates to accommodate standard flame-proof glands, and flame-proof cable-dividing boxes can also be fitted in place of these when required. It is of robust construction, and is specially designed for service in mines and other situations where explosive or inflammable gases are present. It is equipped with an interlocked plug combination suitable for connecting to portable apparatus.

The Need for Profitable Production.

The Financial Problems of Industrial Undertakings.

By J. S. HIGHFIELD, A.K.C., M.Inst.C.E., M.I.E.E.

(*Abstract of Presidential Address*: JUNIOR INSTITUTION OF ENGINEERS.)

THE times are difficult! How many of us have had to direct or manage a business which has fallen on evil times? Our talk, no matter what the starting point, drifts round to the general state of trade and the future of the Empire.

The problem can be solved only by steady, patient, unselfish work on the part of every individual who has the chance to help by providing useful work, if only for one man who lacks a job. Government cannot solve such a problem except by removing, when possible, restrictions which stand in the way of the citizens who elected it. One of the best ways for the ordinary man to help is by buying home-made goods.

The success of the country as a whole depends on the cumulative success of those who are engaged in producing food, clothing, housing, or the means of attaining these necessities, and so long as the average flourish, all is well with the State. Consequently, the difficulties which beset an individual producer in some small measure parallel the difficulties of the State of which that producer forms a tiny part. Considering the re-establishment of a business which has approached the state of bankruptcy, the first condition to be faced by those managing the business is that no one else will lend them money; their credit has gone; and since those who managed the business brought it to the state where the incoming revenue was less than the outgoing payments until its money and credit were exhausted, it is usually necessary to call in an outsider to try and put matters right. A manufacturing business selling its products all over the world consists of some hundreds of shareholders, which has borrowed as much capital as it was able to do in the form of debentures secured on the property. Assume that its sales are just sufficient to meet all charges for raw material, rent, rates, and management, with nothing for directors' fees or for interest on its borrowed capital, and that its sales are falling. Anyone called in to put matters straight must first find money enough to carry on. If neither the shareholders will subscribe for additional shares, nor the debenture holders lend more money to protect the sums they have already lent, he must apply to outside persons. These will certainly refuse to lend money unless they can have the right to the first proceeds of a sale of the plant in the event of the venture failing, and their terms will be onerous in proportion to the risk.

In these circumstances the factory and plant have ceased to provide any free money, they call for money to keep them going; the asset has become a liability. Assume that there exist contracts, or promises of contracts, sufficiently hopeful to persuade the debenture holders to advance further money as a first charge, conditionally on the shareholders giving up, say, four-fifths of their holding and that (until the sum borrowed be repaid) they are to receive 1 per cent. extra interest on their debentures; thus putting pressure on the management to repay the loan as soon as possible.

Having obtained working capital, the next move is to reduce costs so that the money may last as long as possible. Out of several processes one or more may have lost money for years; these must be closed down and men and staff paid off. Every source of waste must be stopped, and salaries may be reduced, or expensive men paid off to make way for less expensive ones; idle men must mend their ways, or go. This process involves hardships to individuals; it is sad and distressing, but it must be carried out, or the whole enterprise be abandoned.

On the revenue side strenuous efforts are made to complete outstanding work as speedily as possible in order to obtain payment quickly and to reduce cost. New orders must be obtained, even at low prices, but not at losing prices. Only when the business succeeds can it afford to face, for a time, losing prices.

This brings me to the human side of the difficulty. During the time that has elapsed since the dangerous position was faced, the new man and the directors have been working all hours, negotiating with difficult shareholders and debenture-holders, with bankers and others who might help; discussing difficulties with busy men whom they could only meet out of hours; anxious and difficult discussion with many overworked and harassed men. Such is the position of many men at the head of affairs, especially in these difficult times. Meanwhile, men on the staff have wondered how long their jobs would last, the best have wondered what they could do to help, filled with vague feelings of anxiety. A friend of the firm writes from Central Africa that if it can reduce the price of some article from, say, 1s. to 9d., he can sell many thousands to natives. Word comes from a large town at home that an order worth many thousand pounds can be gained at a certain price. These orders, if obtained, would ensure work for twelve months for all hands and more. The new man and his staff examine eagerly all possible means of bringing the estimate of cost to the needful figure, and, when all is weighed up, find that only if a greater output per £1 of wages is obtained can they make ends meet. They should then be free to explain the case to their men with confidence that they would be listened to and supported. I have known cases where this has been done and an order obtained. It should always be possible. Consider the situation: To obtain these orders means plenty of work for all, either at the same wages and hours if greater output be given, or at the same wages and more hours if the individual output is already at a maximum. The extra effort either way means that the business and the steady employment it has provided for years may, by the joint effort of all, not only continue, but increase. Without the extra output everyone will be out of a job.

I assume that the designers, before the men are approached, have done all they know to improve details of design and shop methods to save money in every way; that is the designer's job; also that those responsible for arranging the supply of raw material, the methods of packing, and the freight rates, equally have done their best. Further, that the men agree to satisfactory terms, and the orders are obtained. It is then that orders for raw material are placed and the works start to manufacture; wages have to be paid week by week, and the borrowed money drawn on to pay for raw material, wages, rent, rates, and all other charges. In due time the goods are shipped and payment is received. The margin of profit is narrow, and you can imagine the close watch that must be kept on expenditure to make sure that the work will be done so that at the end of the contract the money received exceeds the outgoings. Any delay in the shops, any delay in the delivery of raw material, any bad workmanship will add to the cost and so put the venture in jeopardy.

But this is only the first step for the new man; he has, I assume, secured work only for one year. The obtaining of new orders depends on the promptness and skill with which his first work is executed, and if the works have in the past borne a good name he is greatly helped. That is goodwill won by past honest efforts and has itself a market value; it is a source of credit. I assume all goes well, and that at the end of the year not only has the original sum borrowed not diminished, but that a considerable sum has been added to it. I assume that new orders have been obtained, that methods of reducing cost have been evolved, that the output per man has exceeded expectations, and thus that the same goods can be offered at a lower price, but with a better margin of profit.

If this margin continue year by year cash will accumulate. Interest on the old and new debt will be paid, but no dividends; all excess money will be conserved until the day arrives when the new money borrowed to keep the works running can be repaid. This step will at once lead to reduced cost. First, if further money be required, it can be borrowed at less interest than the onerous terms necessarily charged when the risk is great, and the added 1 per cent. is saved on the interest on the original debentures. If no further cash is required the whole interest is saved, and the annual amount added year by year to the cash resources. This money is used to buy new machinery to replace old, to provide new shops, which again produce added profits, so that another red letter day arrives when the cash surplus is so large that dividends on the share capital may be resumed.

A condition made by the lenders of the money that enabled the works to be restarted was that the ordinary shares were to be written down from £5 to £1 each. Prosperity is not restored to the shareholders until their shares can be put back to the original value by skill and hard work and saving, by keeping in hand more money than goes out.

The undistributed profits are added to the reserve fund, and on a later and still more glorious day these undistributed profits, really the savings of the shareholders, enable their losses to be restored, but after many days.

The next stage is that, with increasing dividends, the value of the shares increases until the time comes when, if more money is wanted, the shareholders will advance it, even to the extent of paying 30s. for a £1 share. At this stage the business is usually called a rich company. What does rich mean?

I assume the capital of my business to be in the form of ordinary shares and that it has borrowed £20,000, and that at the time when it may be described as rich the contents of its accounts are as shown in Table I on the following page.

Now observe that the real protection to the business is the amounts put aside to reserve and depreciation; in the above case they represent 15 per cent. of the gross income and one-half of the wages bill. This sum can be used to purchase new plant at least in part, for experimental purposes, or for any venture which may, if successful, lead to increased profit. There is no hard and fast rule by which to calculate the proper amount to place to reserve or depreciation. The calculations as to the life of the plant—to use accounts' jargon, "the physical life of the assets"—are useless, because invention by yourself, or, worse still, by your competitor, may at any time make much of your plant obsolete; that is to say, you cannot afford to run it. Only experience and complete knowledge of

every likely turn in your trade are of use, and prudent care is the best guide for settling the amount that should be put to reserve.

Table I.

Share Capital			£100,000
Debentures			20,000
Cash			5,000
Reserve			20,000
Gross receipts			£100,000
Costs :—			
(a) *Not wholly under control* :—			
Raw material	£25,000		
Rates and taxes	2,000		
Freight	2,000		
Power	2,000		
		31,000	
(b) *Under control* :—			
Wages	30,000		
Management and general charges	13,000	43,000	74,000
Surplus			£26,000
Application of Surplus :			
Interest		£1,000	
Depreciation		5,000	
Reserve		10,000	
Dividend on ordinary shares ...		8,000	
Carried forward		2,000	

So far we have been considering and admiring the forethought and skill of the new management, the accuracy of the designers, and the whole-hearted ability and industry of foremen and men, but of the total income of £100,000, £31,000 has been paid to outside people, £25,000 for raw material, £2,000 to rates and taxes, £2,000 to the railways and shippers for freight, £2,000 for power. These sums, more than the dividend and reserve, are all paid to outside servants of the producers. Are they giving full value for the money paid them? If they fail to work "all out," they are a drag on our business. At the present time these people receive too much for their services—wages more than the producers receive. The producers find the money to pay them; therefore the producers should see to it that they call the tune. Wages account for £30,000, and the shareholders have £8,000. The new manager sees his reserve ample; he is paying 8 per cent. to his ordinary shareholders, and profits grow. What should be done with the added profits? Prices, I assume, have already been reduced, and his own pay and that of his staff have already been increased. Foremen and men should also share; probably the former have already received bonuses, but the men should share also, and here sometimes comes the difficulty owing to the system of collective bargaining, which tends to make the wage rate equal for equal work, no matter if the business be failing or prosperous. This is a most unnatural arrangement. It prevents a man ever enjoying good fortune; he may also suffer bad luck, which comes to all, even if it were possible to secure to all a regular income. Therefore, surely to deny to man the enjoyment of good fortune is to take away from him the chief incentment to effort! No, when the works prosper, the men who have helped to its prosperity should be rewarded with a share of the surplus, but if they enjoy a surplus, another time of danger is reached. What will they all do with it—the new managers, his staff, his men, and the shareholders? The answer is clear. The surplus they enjoy is due, apart from hard work and skill, to prudent use of profit when it was gained. Therefore, let every man enjoying a surplus preserve it in the same prudent way, invest it in something that is productive. Thus each man in the works becomes a capitalist. The elements of success are determination, courage, daring, steady application, skill, faith, and thrift. Very few men possess all these qualities and characteristics, and far fewer still have the capacity to impart them to others. If you find a true experienced leader, follow him.

The few figures I give show how small is the margin which separates the successful from the unsuccessful business. In the early stages of the business I describe the slightest accident would have resulted in the works being no longer a source of livelihood to many men, a source of prosperity to its environment with rate collectors, road menders, railwaymen, sailors, and government officials receiving payment from its production. Faulty designs, a strike of its own men, or a slowing up of their work, would have made those first contracts unprofitable; a stoppage in the works supplying raw material, a stoppage involving delay in railways or shipping would have prevented the contracts being completed in due time, and would have added to costs. Any of these causes would have brought the venture to ruin. Thus does each man depend for his daily bread on the constant efforts of his fellows.

Who builds a works or a ship? Why, those who have enjoyed a surplus above what they require for their living expenses. And how is the works or ship built? First, with accommodation for the men who work them, and in a ship living accommodation is also provided. And the accommodation is provided and the works built in the belief that men with sufficient skill will work and use works or ship for various other men who will pay for the service rendered; in the faith that the men who work will do so in such wise that in due course the cost will be repaid with profit. Destroy this faith and ordered civilisation falls to the ground, and we go back to the days when each man grew just as much food as he needed and with such difficulty that when his precarious crop failed he robbed, if he were able, his neighbour.

Civilisation started when the average man in a working day began to grow more food than he required. He then fed the other man while he forged him a new plough, again increasing his output in the same time, and so leading to a greater surplus. All trade is built on the output of the farmer and the fisherman, and on trade rests the ordered life of civilisation. But to-day we suffer from a sad demoralisation of values caused by the war. Some of our old markets have gone; some of our old customers are bankrupt. In time, but only in time, by the methods of my new man will they restore their prosperity, and with their help ours: but only if we render them service at reasonable prices.

I think there is a growing understanding of the relative values of different classes of work. I believe there is a better knowledge of the absolute necessity of successful production of everything that may be grown, or won, or manufactured. Those engaged in these trades are the basis of all. The carriers, the railways and shipping and other forms of transport all depend on production. Electricity is one great means to this end. Consequently the welfare of the producer should be the care of all. It should be the first business of government to see that the man who ventures into the field of direct production has a fair chance to succeed. The man who seeks a large salary with a pension is a greater man than he who seeks a small salary and a pension; both, however, can enjoy their salary and pension only if the direct producer provides the wherewithal. I am not despising the salary earner. I only want him to remember that he is secondary to our producer, and that his job is to give loyal and skilful help to the man who provides the foundation on which his salary and pension rest.

Figures are a dull subject, but they reveal subjects of moving moment to every engineer. I have analysed the essential figures of various industries, taking the revenue to be 100, and worked out the other figures as percentages. The Table II subdivision is only approximate: for instance, the management can determine the quantity of raw material purchased depending on economical use, such as the quantity of coal used in a power station. Again, the rate of wages is but little under control, though the number of men employed is, but the broad division, despite some overlapping, is useful. Eight per cent. would generally represent 6 per cent. on the preference, and 10 per cent. on the ordinary, shares. The shareable profit is all that is available for profit-sharing schemes.

The figures of the electricity supply undertakings show that in all cases the costs in division A exceed those in B; that the total working expenses are about one-half the revenue, and that the capital expended on works is from three to five times the amount of revenue; in other words, the rate of turnover is small. Nos. 1, 2, 3, 4, mainly supply urban lighting; about one-half the revenue is derived from this source. Nos. 5 and 6 derive 90 per cent. of the revenue from power, that is why the percentage payment for coal is high.

From the coal figures it follows that more capital can be spent on means to economise in the cost of coal in 5 and 6 than in the others. Note that the wages are always less than 15 per cent. of the revenue, and that rates and taxes are a very important item of cost. The most important part of the cost, however, is the payment on capital in the third division, nearly one-half the total. For this reason the greatest care must be exercised in its expenditure, and in the equally important question of finding the money cheaply. The cheapest method is, first, to make ample provision for reserve, to use a large portion of profits to buy new plant; this will aid the next important matter, to provide for paying a sufficient dividend to attract the investor who will always invest his money where it is secure, and the best test of security is ample reserve and dividend.

Let us now study the figures for works and mines :—

No. 1 produces heavy machinery, and the ratio of capital to revenue is much less than for the electricity supply undertakings. The ratio of (*a*) to (*b*) costs is much higher and the balance of revenue over costs is negligible. In other words, there is no profit, and this unfortunately is the position of many heavy engineering works to-day.

No. 2 produces light apparatus in large demand; the capital is only 19 per cent. of the revenue and the surplus of revenue over costs is nearly 75 per cent. of the capital. The small capital and large turnover indicate that the plant is very fully employed, and a large sum is required to write off the value of the plant in a very few years, because it will be worn out quickly. The figures are typical of works producing cheap articles by mass production, articles in large and common demand. If the articles are made by a patented process prices can be for a time maintained. If not every year, it will be found that prices must be reduced owing to competition in various forms, and, consequently, very large sums must be put to reserve to provide for new machinery, either to reduce cost, or increase output, or both. The rate of dividend will generally be high in good years, but usually cannot be long maintained.

In both works, wages and salaries are nearly 35 per cent. of the total costs. The rate of turnover is an important figure that has a great effect on the cost of the product; if the ratio to capital is one, then, if each article carries a clear 10 per cent. profit, the profit on the whole capital is 10 per cent.; if the turnover can be increased to two, the profit per article can be reduced to 5 per cent. and still yield 10 per cent. on the capital. Consequently, a high rate of profit where the turnover is large usually exists side by side with the production of articles each carrying a very small rate of profit. In this case the costs are 86 per cent. of the revenue, leaving 14 per cent. surplus, and

since the turnover is about five, it follows that the surplus per article is less than 3 per cent. In these conditions the closest watch over costs is necessary to prevent the small rate of profit per article turning into a small loss, which would involve a large total loss.

Now turn to the figures for mines. Nos. 3 and 4 represent colliery figures for 1913 and 1924. I cannot say whether they are typical, but at any rate they are illuminating. Whereas in 1913 a capital of 39.8 produced a revenue of 100, in 1924, 56 was required to produce the same percentage revenue, showing a decline of turnover. Wages were 54 in 1913, and 70 in 1924. Management declined from 10.8 in 1913 to 7.3 in 1924. In 1913 the total costs were 90.8 per cent. of the gross revenue, the surplus of 9.2 per cent. being placed to reserve or carried to next year. In 1924 there was a deficit of 6.8 per cent. of the gross revenue. Since prices had already been increased, the result was clearly due to reduced output, and it is obvious that, if this condition continue, the colliery must soon shut down.

Note the varying profit-earning capacity of these few examples. There is no sure way of maintaining profit at constant value, although it is more easy to do so in one business than another; but no matter what care be taken at some time or another a business must face a loss, when it can only be kept going by the owners finding money to meet the losses. The profits, therefore, must belong to those who are able and willing to shoulder the losses. I include in this category shareholders who put up with reduced dividends without unreasonable grumbling—they are few; directors who forego fees and often assist the finance; also men on the staff or in the works who either put in more work for the same money, or take less money in order to keep the enterprise going. All are in their several ways shouldering the losses.

Finally, there are no shareable profits in some of my examples; in the best a reduction of only 5 per cent. in the selling price would wipe out this item. The amount can be increased, either by increasing the selling price, or reducing some item of cost, but in any event experience shows that this amount can be attained only with most excellent and wholehearted endeavour on the part of all who work the enterprise.

Apart from any payment depending on direct work, many men will save money. It is well if the men employed in any business invest at least a part of their savings in the buisness.

There is, I think fortunately, a growing tendency to facilitate such investment. I am not inclined to believe in creating any special form of security for the purpose; the employés should stand, in this respect, on an equal footing with other shareholders; however, facilities could be readily provided to make it easy for any employés to acquire either ordinary or preference shares, or to take a part in providing capital in the form of loans. The value of each class of capital should be made clear, and a scheme enabling shares to be acquired by weekly contributions would help. A limited liability company was for long regarded as a bad invention, and no doubt the change from private firms involved much hardship. There was the loss of a clear undertanding of the joint interest of all concerned in working the company. The master was not personally known to his men.

Modern production has, however, been built up on the company system and could not exist without it, and there has grown up a better knowledge of how to govern and work these great organisations. The constitution of a company is fully democratic, every shareholder has votes in proportion to the number of shares he holds. If everyone in the country, and especially men in their own works, held shares, then it would be to the common interest to care for the welfare of the business as an owner. It is for this reason that the wider holding of shares in producing works should be encouraged.

I have chosen a dry subject, but one which engineers should consider; it is one which all managing engineers must consider. It is important and the main elements are, or can be made, relatively simple; it is merely the difficulty of seeing the wood rather than individual trees. There are too few businesses involving engineering managed by engineers, but unless they learn the elements of money management, and above all the supreme necessity of managing them profitably, they are unqualified for the job.

I am sure that there are many engineers with the natural qualification for management who could usefully give their close attention to the study of business essentials.

I am directing your attention essentially to the problem of improving trade, to the duty of facing the present difficulties as our forefathers faced them in 1816. At that time engineers had a great hand in restoring prosperity. Their inventions were important, but equally important were the results on the minds of the men who in rapidly increasing numbers were drawn into the work of manufacturing and improving these inventions. The great fruitfulness of new ideas is in stimulating the minds of lesser men to think a little in terms of the unknown, and to forget the shibboleths of their normal work. Trained engineers will give the best service in inventing and scheming new designs and methods aimed at greater efficiency and less cost. There is any amount of work in these directions, and British brains are as good as any.

Manufacturers might help young men with ideas to develop their talent. A surprising number of firms manufacture plant under foreign patents for which they have paid large sums.

TABLE showing the proportions of the gross receipts required to meet the several items of costs, including capital for various manufacturing and other businesses. All the figures in this table, except the figure for gross receipts, are percentages of the gross receipts.

	Electricity Supply Undertakings.								Manufacturing Works.			Colliery.	
	Company.					Municipal.							
Capital :—Loans	—	141·1	221·5	18·1	325·4	448·4	302·4	503·6	—	—	23·0	—	—
Shares	261·8	172·9	213·5	180·0	252·5	—	—	—	128·2	19·0	113·0	39·8	56·0
Total	261·8	314·0	435·0	198·1	577·9	448·4	302·4	503·6	128·2	19·0	136·0	39·8	56·0
Capital expended	318·2	384·2	555·2	263·0	461·8	438·8	368·4	539·6	—	—	135	—	—
Gross receipts	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
Costs :—													
(*a*) Not wholly under control—													
Raw material	20·0	20·3	19·8	52·0	36·6	22·6	57·8	26·9	62·5	54·2	17·4	16·0	16·3
Freight	—	—	—	—	—	—	—	—	0·8	0·4	17·3	8·2	9·1
Rates and taxes	12·0	11·2	7·7	2·3	3·2	8·3	8·9	10·3	0·8	0·2	9·4	1·7	4·1
Total	32·0	31·5	27·5	54·3	39·8	30·9	46·7	37·2	64·1	54·8	44·1	25·9	29·5
(*b*) Under control—													
Wages	12·2	12·5	15·6	5·8	14·6	14·9	11·9	10·1	20·5	24·2	23·2	54·1	70·0
General charges, designing, sales, H.O. expenses legal directors' fees, and management	9·7	7·7	5·5	7·4	9·2	11·8	8·0	5·1	15·0	7·6	7·8	10·8	7·3
Total	21·9	20·2	21·1	13·2	23·8	26·7	19·9	15·2	35·5	31·8	31·0	64·9	77·3
Total of (*a*) and (*b*)	53·9	51·7	48·6	67·5	63·6	57·6	66·6	52·4	99·6	86·6	75·1	90·8	106·8
Surplus of revenue over costs	46·1	48·3	51·4	32·5	36·4	42·4	33·4	47·6	00·4	13·4	24·9	9·2	6·8
(*c*) Charges relating to capital—													
Interest on borrowed money	—	10·2	13·7	0·9	20·1	14·7	7·1	15·0	—	—	0·5	—	—
Sinking funds, depreciation, and reserve	21·5	20·8	18·7	17·2	15·4	27·7	19·7	32·6	—	9·6	12·7	9·2	—
Balance, being amount available for dividends on share capital or other purposes	24·6	17·3	19·0	14·4	0·9	—	6·6	—	—	3·8	11·7	—	—
Amount required to provide 8 per cent. dividend on share capital	21·2	13·8	17·1	14·4	20·2	—	—	—	10·2	1·5	9·0	3·2	4·5
Sharable profit	3·4	3·5	1·9	—	—	—	6·6	—	—	2·3	2·7	—	—

NOTE.—The method adopted in preparing this table is to take 100 to represent the gross receipts from all sources, the amount of capital and costs under their various headings being shown as percentages of these gross receipts. The costs are divided into three parts:—
(*a*) The sums paid to outside parties for raw material, freight, rates, &c., over which the management has little or no control;
(*b*) Costs, such as wages, management and overhead charges, over which more or less control can by exercised by the management;
(*c*) Capital costs, being interest on borrowed money, sinking funds, depreciation, and reserve; and amounts paid to shareholders in the way of dividends.

Many of these inventions have required great modification before they would work, sometimes until little of the original was left, and often far less sums spent on home-made designs would produce at least equal results in less time and with the great advantage of encouraging native talent.

One other requirement of paramount importance is leadership, and in pressing the importance of working for profitable production, I wish to make it quite clear that profit is only a means to an end. Profit is the simplest and surest means of measuring efficiency of production, always provided that the total sum of profit as well as the rate of profit is used as the unit of measurement. A high rate of profit on small production is usually attained only when some restriction of output, or use, can be set up. This method may be described as profiteering.

Production may relate to true luxuries, such as diamonds, or it may relate to articles which should be sufficiently cheap to be in common use, but which, for a time, are made luxuries by restricted output. Houses are necessities; motor cars were luxuries, but owing to restrictive action, on the one hand, and to the use of sound business principles, on the other, the position has been reversed. Small houses are almost a luxury, and small cars almost a necessity. Had the same skill and effort been applied to the construction of small houses as to the construction of small cars, the housing problem would have been solved, and the builders would have realised a large profit rather than a high rate of profit. Profit is a rough standard of measurement of efficiency in the conduct of business, and without efficiency no surplus can be gained.

I have dwelt on the importance of all concerned in industry working together for a surplus, not as an end in itself, but as a means to an end. Having gained the surplus, its proper use will enable us to progress in all the things really worth doing: refinements of artists, both in industry and in art, and in all the things really worth having; those enduring possessions necessary to good fellowship, which are the joy of life.

Electrical Development in New Zealand.

Opportunities for British Manufacturers.

By "HOMIE."

THE electrical development of New Zealand is proceeding at a rapid pace, and there are now eighty-seven Power Boards or distributing authorities supplying various areas in the country. The total population included in those areas of electric power supply is 930,980, or over 70 per cent. of the total population of the Dominion, so that the ideal of a supply being available to every home in the Dominion is well on the way to realisation. In the past year the number of consumers supplied has increased from 124,705 to 148,699, an increase of 19 per cent. Out of the eighty-seven distributing authorities, fifty-nine showed a profit for the year amounting to £162,376, and twenty-eight showed a loss amounting to £36,492. The general result was a net profit for the whole Dominion of £125,884, after paying working costs (£780,826) and capital charges (£732,086) at the rate of 7.6 per cent. on the total capital outlay of £9,566,589. This shows a net profit of 1.31 per cent., as compared with 1.85 per cent. last year. The business on the whole is thus a thoroughly sound and remunerative one, as well as supplying a public necessity to 70 per cent. of the population of the Dominion.

Mr. F. T. M. Kissell, the Chief Government Electrical Engineer, in his annual report, after stating that negotiations are taking place with the authorities concerned with the revision of the rules for wiring which will shortly be reissued, says that another matter somewhat allied with the regulations is the question of testing and approving all kinds of apparatus brought into the country for use by consumers. A certain amount of this inspection is being done by the local authorities and by the fire underwriters; but the electrical development in the past few years has been so great that it is extremely doubtful if this important matter has been receiving the attention that is necessary to maintain a high standard of installation throughout the country. Consideration is being given to the establishment of a central testing laboratory, and approval board, specially to deal with all types of appliances imported into the country, to carry out tests on plant and apparatus for local authorities, and at the same time to do a certain amount of experimental and research work on problems peculiar to electrical development in the country.

It will be seen from the above statement that all imported goods have to be of substantial construction and a high standard of efficiency; and manufacturers in Great Britain should make note of this when offering their goods for sale in this country.

There is great scope in the Dominion for British manufacturers, especially of domestic appliances, and it strikes one as being very strange that there are so few of them represented here. Most of the material for installation work is British made, but it is in the hands of a very few firms, and regarding domestic appliances, they are almost wholly of American manufacture. There is no duty on material, apparatus, or machinery used in electrical development, or for installation work, but all domestic appliances imported are liable to 20 per cent. duty for British goods and 30 per cent. for foreign goods. Taking into consideration the extra cost of freight from Great Britain, the British manufacturer ought to be able to export goods to New Zealand to compete with American products, as he has less duty to pay. Even if he did not want to take the risk of exporting goods, or the expense of opening a branch in the Dominion, if he would only advertise his wares and send catalogues and price lists, with shipping dimensions and prices f.o.b. to the wholesale factors and electrical contractors, I am sure he would be amply repaid for his trouble. The manufacture of goods in the Dominion is absolutely prohibited by the high cost of labour, and the British manufacturer's only rival is the American.

The writer is of the opinion that it would be a very good idea if British manufacturers would state the prices of the various parts of their appliances and the shipping dimensions, as a number of the firms in the Dominion would be keen on manufacturing some of the parts themselves that could be economically produced, importing the other parts from Britain and assembling the appliances. There are various parts of electrical appliances that could be imported duty free, such as stampings, enamelled ware, mica, resistance wire, &c. The number of duty-free parts is far too numerous to be detailed in this article, but the Dominion manufacturer could easily find out which parts it would be cheaper to produce and which it would be cheaper to import, and combine them for the finished article.

The following extract from the report by Mr. Kissell will show that there is an enormous field for domestic appliances throughout the whole Dominion:—

"Most of the newly-formed boards are building up their loads at a faster rate than was contemplated, and the loads will considerably exceed the amounts they have guaranteed. It is anticipated that there will be a considerable increase in the domestic loading, particularly in electric ranges and hot water heaters. Returns have been obtained of the electric ranges in service in the areas of the different electric supply authorities. The total number of ranges connected is 1,526, which means that 1.02 per cent. of the total number of consumers are enjoying the advantages of electric cooking. The total number of supply authorities is eighty-seven, and of these fifty-five, or 62.5 per cent., have electric ranges connected to their systems. One supply authority has no fewer than 475 ranges connected. The total number of consumers in this district is 22,491, which gives a figure slightly in excess of two ranges to every 100 consumers. Three other supply authorities, however, have figures corresponding to over five ranges to every 100 consumers. When it is realised that some of the largest percentages are being obtained in districts in which the power has only been available for a few months, it is evident that a large increase in demand can be looked for when the authorities embark on an active canvass for this type of load. It is also particularly gratifying to see that the advent of electric power is bringing conveniences to the rural districts which should greatly improve the conditions of living therein."

There are no statistics available for other types of domestic appliances, but there are very few appliances such as vacuum cleaners, kettles, washing machines, fans, &c.; and as for that most indispensable article, the electric iron, the writer is certain that not more than 30 to 40 per cent. of the consumers have one. As the weather is never very cold except in some parts of the South Island, the demand for radiators is not very great, apart from a call for some of the smaller portable types. All that remains, then, is for British manufacturers to get into touch with some of the electrical firms in the Dominion and commence a great advertising campaign which will create a demand for British-made electrical goods and appliances, and now is the time to do it while the industry is still in its infancy. The writer's advice is: Get into it now and oust the American article from the market before Americans get the complete monopoly of the industry.

Electro-metallurgy in Norway.—The report for 1924-5 of the Porsgrund Elektrometallurgiske A.S. states that sale conditions were better than in the previous year, and prices were also good when considered in Norwegian kronen. The reorganisation of working which was commenced two years ago had yielded very satisfactory results. The net profit for the year is returned at 200,056 kr., and it has been applied partly to wiping out former losses. The prospects are said not to be bright owing to the confused power situation and the appreciation of the krone.

Electricity Supply Standards in France.—The French Government has recently issued regulations setting forth the standards to be adopted in connection with electricity distribution in France. The order provides that the standard type of current shall be three-phase a.c. with a frequency of 50 cycles per second. The use of d.c. or single-phase 50-cycle a.c. may, however, be authorised for important transmission lines, for traction purposes, and in certain rural areas. The standard voltages are as follows:—For d.c., 115, 230, and 460 V; for single-phase a.c., 115 and 230 V; for three-phase a.c., 115-200, 230-400, 1,000, 3,200, 5,500, 10,000, 15,000, 22,000, 30,000, 45,000, 60,000, 75,000, 90,000, 110,000, 150,000, 220,000 and 300,000 V. It is further provided that the Minister of Public Works may, after consultation with the Government Comité d'Electricité, permit variations from any of the standards.

The Faraday Society.

Two papers of electrical interest were contributed to the November meeting.

An Electric Vacuum Furnace.

Prof. J. R. PARTINGTON and Mr. W. L. ANFILOGOFF described an improved form of furnace of the Ruff type which they have found highly satisfactory for studying reactions at temperatures approaching the volatilisation of carbon. The furnace consists essentially of a graphite hot-tube surrounded by a radiation case to prevent loss of heat and enclosed in an air-tight water-cooled cast bronze casing. The graphite tube is sufficiently thick at the ends to allow the passage of the maximum current without getting hot, and sufficiently thin in the middle to give the necessary resistance to the current to obtain the requisite temperature. The radiation case consists of two cylindrical concentric graphite tubes, held in position by two graphite plates and supported by four magnesite cubes. The reacting substances, if solids, are placed in a graphite crucible set in the hot-tube, the inside of which may either be maintained as a vacuum or as an atmosphere of an inert or reacting gas. The paper contains a full description of the method of making and setting up the furnace, with complete working drawings.

The Correlation of the Permanent Magnetism and Specific Resistance of Some Pure Iron-Carbon Alloys.

This was the subject of a paper presented only a few weeks before his death by the late Prof. E. D. CAMPBELL, of the University of Michigan. This author had long been carrying out systematic work on the correlation of chemical constitution and magnetic properties, based on the idea that the latter might be partly due to solutes in solid solution and partly to the solvent iron. To reduce the problem to its simplest form a pure series of iron-carbon alloys had to be made, in order to eliminate the influence of other elements. In the present paper are described the magnetic properties of a freshly hardened and a slightly tempered series of alloys as measured by means of a special magnetic balance. These values are compared with the specific resistance of the hardened bars and with similar magnetic properties and specific resistance of very pure electrolytic iron. The tests, in the case of the alloys, were made on round bars 6.3 mm. in diameter and 15 cm. long, the carbon content of which varied from 0.05 to 1.50 per cent. The heat treatment was such that the carbides were as completely as possible in solution.

The experimental results show that increase of specific resistance of the alloys is almost proportional to the carbide concentration. The magnetic resistance increases more slowly than the specific resistance up to the eutectoid concentration, but more rapidly in the hypereutectoid alloys. This would appear to indicate that in order to keep magnetic resistance low it is necessary to have structurally free ferrite. The internal magneto-motive potential, to the presence of which is due the maintenance of a permanent field of force, increases rapidly with increase of carbide concentration to a maximum at about 0.60 per cent., after which there is little further increase. The considerable difference between the magneto-motive potential required to demagnetise the system and the internal magneto-motive potential would seem to indicate that while a considerable amount of energy is required to magnetise or polarise the solvent iron, the internal magneto-motive potential of this iron is quite small compared with that due to dissolved carbides whose force-fields have been brought into serial alignment by magnetisation. The maintenance of a permanent field of force at each end of a bar magnet is due to the presence of an internal magnetic resistance in the system, and it would seem to necessitate a continuous supply of energy to the magnet equal to that lost by open force fields.

No other solutes in iron seem to possess a magneto-motive potential comparable with that of dissolved carbides, although both the magneto-motive potential and the magnetic resistance may be modified by the presence of elements other than iron which have a stronger affinity for carbon than has iron.

Legal.

Extension of a G.E.C. Electric Fan Patent.

MR. JUSTICE TOMLIN, in the Chancery Division on December 16th, heard the petition of the General Electric Co., Ltd., for the prolongation of a patent for improvements in electric ceiling fans, of which it was assignee from Mr. P. S. Given. The ground of the petition was that the company had been deprived of the benefit of exploiting the patent owing to the intervention of the war.

MR. MORITZ, K.C., for the petitioners, said the patent related to electric motors designed to drive fans in a perpendicular position, such as ceiling fans. In that position there was a difficulty about lubrication, and the patent provided for the fixing of an oil-tight reservoir below connecting with a similar reservoir in the bearing above, which obviated the difficulty. Until the war the fans were making rapid headway with the public.

His Lordship granted an extension of the patent for three years.

B.T.-H. Litigation.

MR. JUSTICE TOMLIN, in the Chancery Division on December 15th, had mentioned to him the motion by the British Thomson-Houston Co., Ltd., for interim injunctions restraining alleged infringements of its electric lamp patents by E. A. Siderman, of Grafton Street, Tottenham Court Road, R. H. Wood, and W. T. Smith, Ltd.

MR. TREVOR WATSON, for the plaintiffs, said that on December 4th they obtained the injunctions *ex parte*. Messrs. W. T. Smith, Ltd., had now put in an affidavit to say that they had sub-let the wharf at Redhill Street, Albany Street, N.W., and therefore he was not asking for the injunction to be continued against them, and there would be no order against them, except that the costs would be costs in the action. Mr. Lavington, for R. & H. Wood, had asked for time to answer the plaintiffs' evidence. It was therefore agreed that the motion should be adjourned until the first motion day next term, the injunction being continued in the meantime. As to Siderman, he was to have been present, but had not appeared, and Mr. Watson asked for the same order against him as against Wood.

His Lordship assented, and made the orders asked for.

Weber v. Birkett.

IN the King's Bench Division on December 17th this case came up for re-trial before Mr. Justice Horridge and a special jury. The plaintiff was Major W. V. Weber, a Southend borough councillor, who alleged that the defendant, Mr. R. Birkett, borough electrical engineer of Southend, had libelled and slandered him. In the original action the jury awarded the plaintiff damages, but as they were unable to apportion the sum as between the issues of libel and slander, the judge would not accept the verdict.

Mr. E. CHARLES, K.C., on December 17th, said that the words complained of had characterised Major Weber as a hypocrite, guilty of treachery and unable to be trusted.

SIR HENRY MADDOCKS, K.C., for the defendant, said that his client had expressed his sorrow for what he had done. Mr. Birkett also appeared and repeated his apology. The jury awarded Major Weber £300 damages in respect of the slander and £450 for the libel. His Lordship accordingly entered judgment for £750 and costs.

An Electrical Trades Union Dispute.

MR. JUSTICE TOMLIN, in the Chancery Division, on December 18th, had mentioned to him two motions, Dennis and Others *v.* Cox, Arnold and Others, which related to the affairs of the London (East) Branch of the Electrical Trades Union.

Mr. GALBRAITH, K.C., for plaintiffs, said that the motions were before his Lordship on December 11th (*vide* our last issue, p. 970), and stood over for arrangements to be made to pay urgent benefits to members of the branch and to settle the actions, if possible. It had not been possible to settle the actions, but the benefits would be paid to the persons entitled to them. By arrangement, and subject to his Lordship's sanction, there would be no order in the motion except that the costs would be costs in the action.

HIS LORDSHIP assented.

Correspondence.

Correspondents should forward their communications at the earliest possible moment. *No letter can be published unless we have the writer's name and address in our possession.*

Overhead Distribution.

In reply to my letter in your issue of December 11th, Mr. Redgment is at some pains to claim that the residents of Brundall, near Norwich, thoroughly appreciate the electric power supplied from his pole-line down the village street. I have no wish to deny this, and, in fact, mentioned it in my letter, though the misplacement of a comma in the printing made the meaning perhaps somewhat obscure. Speaking of the present residents I said :—

"Though there is no doubt of their appreciation of electricity, for similar prospective owners a system of distribution which would look ugly in the outskirts of Manchester can hardly be classed as an attraction."

I do not suppose the residents now notice the poles, while Mr. Redgment, looking on them with the indulgent eye of a father, may by this time regard them as quite beautiful and a good substitute for the mangled trees.

It is possible to get used to anything, and one sees as a rule least of one's ordinary surroundings. Few people, for example, can describe accurately the pictures on their own dining-room wall, and I can even imagine nursemaids and their charges, in their daily perambulations in Hyde Park, passing "Rima" without a shudder.

But an ugly thing is not less ugly because certain people do not consciously see it, and the sub-conscious effect on them is probably equally unsatisfactory.

For long-distance transmission across country an overhead line is, of course, often the only commercial possibility. But I would suggest that we should recognise that it is ugly, keep it well away from the road (say, two fields off), give preference

to inconspicuous runs, and possibly go in for a little judicious planting of trees, as in the case of a recent gas-works scheme.

For local distribution in a fairly well populated area the overhead system has less to justify it from the point of view of capital cost, and much against it from other considerations.

Now, curiously enough, in the case of Brundall, the 6-mile transmission from Norwich is all underground, and it is only the distribution for about a mile each way that is overhead.

In the original article it was said that if the underground system had been adopted the cost to Brundall would have been something like four times as much. In his letter Mr. Redgment makes the definite statement that the cost of electricity would have been over double. This means that the interest on the *difference* in capital expenditure between the two systems on, say, a couple of miles, would have been greater than the interest on the whole of the present system (including long underground transmission and sub-station) plus the generating costs of the energy used.

Of course, one does not want to extract data from a consultant without fee, but in view of the importance to other villages I think actual figures would be appreciated in support of these statements.

S. E. Glendenning.

Norwich, *December 19th*, 1925.

The Metering of Three-phase Power.

As a meter engineer, I consider Mr. Malcolm is to be congratulated upon his very excellent article which appeared recently in your columns.

It is an indisputable fact that the importance of accuracy in respect of the methods employed for metering supplies of energy does not in general receive the amount of attention it should do, neither is it as yet universally recognised that meter work has become a "science of its own" and calls for more than the average amount of skill and intelligence if reliable results are to be looked for, or if the meter department of a supply undertaking is to be run on efficient and satisfactory lines.

The writer has himself at various times conducted a number of investigations with a view to determining to what extent the suspected sources of error in high-pressure metering equipment actually exist, and where they are found to exist in any appreciable degree, their exact influence upon the overall efficiency of the combined apparatus. The following is a brief survey of the conclusions arrived at.

In the first place, the question of "interaction" between the elements of a polyphase induction meter cannot, as Mr. H. H. Jaques asserts, be treated as a negligible quantity. It is true that the errors arising from this cause do not as a rule in themselves constitute any serious complication; it is only when they are acting in combination with other errors (either in the meters themselves or their auxiliary transformers, or both) that they have to be taken into serious consideration as affecting the accuracy of the combined equipment.

It is the writer's experience that the more likely source from which errors in registration are liable to accrue is from badly designed or inadequately rated auxiliary transformers used with the meters, or where such transformers in addition to operating the meters proper are called upon to supply current to indicating and recording instruments, trip coils, &c., or other apparatus capable of setting up induction in the circuit. For this reason it seems desirable that each meter or set of meters should be given its own transformers, and the connecting of devices other than the meters to them be strictly avoided.

Meters should always be calibrated together with their transformers, and very definite observations should be made at different points of the curve with the whole apparatus connected as for actual service conditions. If subsequent tests are taken *at the same points* but *without* the transformers, not only is information obtained as to the characteristics of the transformers themselves, but the data so obtained provide a very useful means of effecting any future adjustments to the meters more or less accurately, without the necessity of removing the transformers with the meters, which procedure is often inconvenient and troublesome.

The introduction of "check" or standard meters upon consumers' premises for the purpose of ascertaining the accuracy of the existing meters has been known to influence the characteristics of the secondary circuits of transformers, especially where these have not been over liberally rated. This condition is somewhat aggravated by the fact that where meters have been designed to function as "standards" they are usually, in order to obtain a good and permanent torque, constructed without regard to "shunt" or "series" losses; and whilst such meters are undoubtedly admirably suited to checking "straight-through" meters, they possess obvious disadvantages when employed for testing "on site" meters of the transformer pattern.

Other sources of error have been traced to the use of long and small-diameter conductors in the secondaries of current transformers. The effect is to "overburden" the transformer by increasing the resistance in this circuit, which results in bringing about an excessive ratio error.

Yet another cause of trouble, often met with, is the deterioration of the dielectric of these conductors, due often to leaking or spilled transformer or switch oil attacking it and creating the possibility of a portion of the current to be measured finding its way back to the transformers by paths other than through the meter. The same remarks apply of course if the meter itself has a low insulation resistance between its current-carrying parts and the metal case (provided this is earthed, as it should be). Slight or intermittent leakages of this description may go undetected for considerable periods.

The writer has in mind a typical case of this sort where for some apparently unexplainable reason there was always a large discrepancy between the readings of a pair of meters working together in series off a set of common current transformers having one pole of their secondaries connected to earth. Laboratory tests on the meters themselves having failed to reveal the cause, it was felt that there existed very strong grounds for serious investigation. It was subsequently discovered that owing to the vibration set up by a certain piece of machinery, one of the incoming leads to one of the meters periodically "earthed" to a piece of protruding metal. Previous tests applied to the wiring with a Megger over a week-end (when the machinery was idle) of course failed to reveal this, and the incident is quoted merely to show how, if only the one meter had been installed, the matter may have escaped detection indefinitely. The writer strongly advocates the use of tough rubber-sheathed cables of not less than 7/.036 for all such connections, making these as short as possible and using lugs to ensure good contact at the points of connection.

Tests have also been carried out with a view to determining the effects of changing wave form upon induction type meters, and while the writer has owing to lack of the necessary facilities been so far unable to deduce exactly to what degree the wave has been distorted from the true sine curve, he has succeeded by artificial means in bringing about a variety of conditions and changes.

The conclusion arrived at in respect of these tests is to the effect that the behaviour of the meter approximates very closely to that observed when testing for the effects of varying frequency, and it would be interesting if any of your readers could supply us with data of any similar tests they may have made under ideal conditions with the object of confirming this. In my opinion the question of price should always receive secondary consideration where energy is to be metered in any quantity, and more advantage should be taken of the capabilities of those engineers who specialise in this particular branch of the industry when schemes for metering such supplies are being mooted or carried into effect.

Meter Engineer.

December 14th, 1925.

All-Electric Houses.

With reference to Dr. S. Parker Smith's interesting paper on the "All Electric House" and the cost to run it, perhaps my experience over the past twelve years will help to popularise the use of electricity in the ordinary home.

I am connected to the Woolwich B.C.'s mains under a 4-year contract dated 1913 in the district of Eltham, Kent, and it is open to any householder to take up the same arrangement.

The terms are as follows:—£1 5s. less 20 per cent. per quarter for 434 units based on the wattage lamps connected when the house was wired. Any units over this amount per quarter, no matter for what purpose, whether heating, cooking, or lighting, are charged at 1d., less 20 per cent. The contract is also obtainable for 1, 2, 3, or 4 years at 5, 10, 15, or 20 per cent. respectively.

I use electricity for everything, with the exception of one coal fire in a large drawing room lit only in mid-winter, and a gas califont for hot water throughout the house.

The conservatory is warmed electrically by means of immersion heaters screwed into the bottom plugs of ordinary radiators. The bells are worked through a transformer off the mains and the number on the street door is done in Neon tube. The house is 7-roomed, with bath, &c.

The energy consumed and cost for the last three years are as follows:—1922, 8,532 u., £34 7s. 5d.; 1923, 9,797, £39 5s. 1d.; 1924, 6,661, £28 15s. 11d. There are two meters, but the readings are simply added.

I have induced several neighbours to adopt the contract, but they do not get the full benefit because they do not go far enough in the use of electricity. Several rooms have never been re-decorated since I entered the house.

I am often asked who supplies our meat; my answer is as follows: Take on electric cooking and never mind who the butcher is. Or, again, how do you manage to get such perfect toast, and the bacon done to a turn without being dried up?

I have found it very difficult to get householders to give consideration to the heating circuits in every room, and they dread the expense of the cooking apparatus and the handing-over to servants of the full care and charge of the various electrical apparatus in the kitchen.

They are full of admiration for the cleanliness and ease obtainable by using electrical appliances in the house. The final remark made to the wife is usually to the effect that "you see your husband is in the line."

B. J. Palmer.

London, *December 16th*, 1925.

The Risk of Lightning.—A survey made by Dr. A. W. Gilbert, Massachusetts Commissioner of Agriculture, shows that the chance of death by lightning in that State is only one in more than a million per annum. A man on the farm is 10½ times as likely to be struck by lightning as his city brother, due to the scarcity in rural communities of steel-framed buildings, trolley wires, &c.

National Health, Pensions and Unemployment Insurance.

By JOS. J. H. STANSFIELD.

THE Ministers of Health and Labour call attention to the changes in the rates of contributions for National Health and Pensions Insurance, and for Unemployment Insurance which come into effect from January 4th, 1926.

All persons insurable under the National Insurance Act are also insurable under the Widows', Orphans', and Old Age Contributory Pensions Act, 1925, and the contributions payable under both Acts will be paid on the same card by means of combined health and pensions stamps, cards being, as heretofore, issued to insured persons by their approved societies or obtainable from any Post Office. Employers must stamp the workers' cards for weeks of employment from January 4th, 1926, which date is the commencement of the first half-yearly period of 1926. Combined health and pensions insurance stamps of the values required will be purchaseable at any Post Office. As stocks of National Health and Unemployment Insurance stamps of the old denominations will be withdrawn from Post Offices after January 4th, it is essential that immediate steps should be taken to ensure that Health Insurance cards and Unemployment books are stamped up-to-date at the proper time.

In consequence of the new Act there have been substantial alterations in the weekly rates of contribution, and it may be of convenience to set out in detail the old and new rates.

RATES PAYABLE PRIOR TO JANUARY 4TH, 1926.

Health Insurance.—

	Total rate.	Employer's share.	Worker's share.
	d.	d.	d.
Men	10	5	5
Women	9	5	4
Exempt persons ...	5	5	—

If a worker aged 18 or upwards is not in receipt of board and lodging from the employer and the rate of remuneration does not exceed 4s. a working day the amount to be recovered will be less, as follows:—

(*a*) Where the wage is not over 3s. per day—

	d.	d.	d.
Men	10	10	—
Women	9	9	—

(*b*) Where the wage is over 3s. but not over 4s. per day—

	d.	d.	d.
Men	10	6	4
Women	9	6	3

Unemployment Insurance.—

	Total rate.	Employer's share.	Worker's share.
	s. d.	d.	d.
Men	1 7	10	9
Women	1 3	8	7
Boys, 16-18 ...	9½	5	4½
Girls ,, ...	8½	4½	4

In the case of exempt persons the employer is liable to pay the employer's share only.

RATES PAYABLE FROM JANUARY 4TH, 1926.

Health and Pensions.—

	Total rate.	Employer's share.	Worker's share.
	s. d.	d.	d.
Men	1 6	9	9
Women	1 1	7	6
Exempt persons—			
Men	11½	9	2½
Women	7	7	—

It will be noted that the new Act establishes the principle of a deduction in the case of exempt persons who are males.

A worker aged 18 and upwards under the circumstances before-mentioned pays a smaller contribution as follows:—

(*a*) Where the wage is not over 3s. per day—

	Total rate.	Employer's share.	Worker's share.
	s. d.	s. d.	d.
Men	1 6	1 1½	4½
Women	1 1	11	2

(*b*) Where the wage is over 3s., but not over 4s. per day:—

	s. d.	d.	d.
Men	1 6	10	8
Women	1 1	8	5

Unemployment—

	Total rate.	Employer's share.	Worker's share.
	s. d.	d.	d.
Men	1 3	8	7
Women	1 1	7	6
Boys, 16-18	7½	4	3½
Girls ,, ...	6½	3½	3

As before, in the case of exempt persons the employer will pay the employer's share only.

It will be seen that whilst there is a reduction in the rates for unemployment, there is an increase if health, pensions and unemployment are taken together.

Parliamentary News.

(By Our Special Parliamentary Reporter.)

The Horley Special Order.—Much discussion has recently taken place in the House of Lords on the Horley and District Electricity Special Order, 1925. On December 8th Lord Peel moved that the Order be approved, but Lord Clarendon moved an amendment to the effect that, "having regard to the decision of a Select Committee of this House upon the Horley District Gas Company (Electricity Supply) Bill, the Special Order be not approved." He explained that the Order was promoted by a small electricity company in the district of Horley, whereas the Gas Company's Bill would provide for a materially larger area. Other advantages of the Bill were that capital would be much more easily and more cheaply raised, dividends would be limited, and thus cheaper electricity could be generated. Further, the Gas Company would begin the electricity business with an established *clientèle*. The authorised capital of the electricity company was only £20,000, and the consulting engineer had guaranteed of this amount a total of £5,000 on the understanding that he was to secure a management agreement for seven years. The House of Commons Committee rejected the Gas Company's Bill, which had been passed by the Lords, but the company was again concentrating on that Bill. If the Order were rejected, he could promise the House that the Gas Company would promote a measure on the same lines next Session.

LORD GAINFORD urged the House to agree to the Order and not to deprive Horley of electricity. The Barking 800,000 h.p. station with its production up to 100,000 kW, had got adequate mains within four miles of the Horley area of supply. The Order would enable the Horley Electricity Company to become distributors. The district would then get electricity as cheaply as it could possibly be generated in this country.

In the course of further debate, LORD DONOUGHMORE, Chairman of Committees, suggested that the Order, and the new Bill, when introduced, should be referred to a Joint Committee of both Houses in the early spring.

Later, LORD SALISBURY, on behalf of the Government, suggested that the debate should be adjourned for a week in order that further consideration might be given to the matter. This was agreed to, and, on the resumption of the debate on December 15th, Lord Salisbury moved that the debate be further adjourned until the Special Orders Committee had reported whether any further Parliamentary inquiry was desirable before the House proceeded to a decision on the amendment, and, if so, what form that inquiry should take.

The motion was then agreed to, and the debate adjourned.

Electrification of Indian Barracks.—On December 14th, EARL WINTERTON informed Mr. Attlee that the question of the improvement of the barrack accommodation and amenities in India was one that had been engaging the close attention of the Secretary for India. As regarded electrification a large programme had been approved under which all barracks for British troops would eventually be electrified, and progress had been made annually. The Government of India was now considering what steps could be taken to accelerate the completion of that programme. According to the latest information received from the Government of India the barracks at Cawnpore had already been completely electrified.

Capitalisation of Industry.—On December 14th, Mr. ATTLEE asked the Prime Minister, whether, in view of the recent example of over capitalisation in the engineering industry, he would consider appointing a Royal Commission to inquire into the whole subject of the capitalisation of industry.

Mr. BALDWIN said that that was one of the subjects which was being considered by the Committee on Industry and Trade and he did not think the appointment of another body would serve any useful purpose.

Wireless in Ships.—On December 15th, in reply to Mr. W. Baker, SIR P. CUNLIFFE-LISTER said that the sailing of each boat without wireless operators was considered separately, and where compliance with the law was rendered impossible by operators declining to sail owing to a strike, and by this alone,

the ship was not detained. It would be impracticable to distinguish between different classes of ships and different classes of cargo.

Electrical Development.—On December 15th, Captain BOURNE asked the Minister of Transport if the report of the special commission appointed to inquire into and report upon the future development and control of electricity had yet been presented; if so, was he in a position to make any statement on the subject; and could he say whether it was proposed to publish the report.

Colonel ASHLEY said that he was not in a position to add anything to the previous statements which had been made to the effect that the report had been received and was under consideration.

Government Electricity Proposals.—On December 16th, Mr. R. MORRISON asked the Prime Minister if he was in a position to state whether the Government had come to a decision with reference to its electricity proposals.

Mr. BALDWIN said he was not yet in a position to make a statement on this subject.

Mr. SNOWDEN asked the Prime Minister whether he was aware that it was more than six months since he said that this important matter was receiving the attention of the Government, and that shortly after that the Minister of Transport said that the report of the committee of experts had been received and was receiving the attention of the Special Committee.

Mr. BALDWIN said all that was quite true, and he hoped to have a Bill ready for next Session, but the preparation of such a Bill and the examination of the points which would be raised required many months' work.

Electricity Orders.—In the House of Lords on December 16th, the Barnsley Corporation Electricity Extension Special Order, 1925; the Preston Corporation Electricity Extension Special Order, 1925; and the Blackburn, Burnley, and Clitheroe Rural Districts Electricity Special Order were approved.

Adjournment.—The House of Commons adjourned on Tuesday last, and will re-assemble early in February.

Trade-mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 16th. In the case of foreign applications, the names and addresses of the British representatives are also given.

Batwin (lettering and design). No. 463,708. Class 6. Electrical machinery.—Power Contracts, Ltd., 138-140, Southwark Street, S.E.1.

Ellipso. No. 460,597. Class 6. Electric fans.—Giljay Patents, Ltd., King's Road, Hay Mills, Birmingham.

Nuk (lettering and design). No. 449,325. Class 8. Radio-telephonic apparatus.—Neufeldt & Kuhnke, Kiel, Germany. (J. L. Hydleman & Co., 32, Queen Victoria Street, E.C.4.)

Ella-Varic. No. 461,076. Class 8. Radio-telegraphic apparatus.—George Kent, Ltd., 199-201, High Holborn, W.C.1.

Kathoxyd (lettering and design). No. 461,686. Class 8. Detectors for use in radio-telephony.—O. M. Seemann, 133, Wilhelmstrasse, Berlin. (Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

Thothmic. No. 462,320. Class 8. Automatic telephones, telegraphic apparatus, &c.—A. H. Development Syndicate, Ltd., Iliffe Street, Walworth, S.E.17.

Nillos, No. 463,700, and Nonmic, No. 464,063. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—Igranic Electric Co., Ltd.

Sferavox. No. 462,973 and 462,974. All goods in Classes 8 and 9, and Sferophone, No. 462,976. All goods in Class 9.—Société Française Radio-Electrique, 79, Boulevard Haussmann, Paris. (Marks & Clark, 57-58, Lincoln's Inn Fields, W.C.2.)

Compactum. No. 463,900. Class 8. Instruments, apparatus and parts thereof for use in radio-telephony and telegraphy.—Edison Swan Electric Co., Ltd.

Trickle. No. 463,994. Class 4. Electrolytic rectifiers.—Radio Accessories, Ltd.

Employment and Wages.—Col. F. V. Willey, C.M.G., president of the Federation of British Industries, recently delivered an address to the Glasgow branch of the Federation. In the course of this he referred to the fluctuations of the trade cycle—"booms" followed by periods of depression—and said that some attempt at scientific modification was necessary. There was a belief that larger units in industry should be considered as a means of decreasing working costs, instead of the lowering of wages. The rise in the value of the currency should have raised the real value of wages, but many factors, like the disproportion between sheltered and unsheltered trades, the result of internal distribution on social services, had retarded or prevented the normal economic process. It was therefore the more necessary to scrutinise other possible objects of attack before being finally forced to the course of wage reductions. The elimination of waste, the installation of more efficient machinery, and standardisation, would contribute largely to a saving in the national turnover. Col. Willey thought that payment by results, bonuses, &c., would stimulate the interest of the worker in his employment and would lead to a larger production. Higher earnings could often accompany a lower unit cost. Mentioning the growth of the deferred payment system in the United States, the speaker considered that it contributed towards an increase of commercial turnover and accelerated the improvement of the standard of living. Col. Willey also touched upon emigration, and said that there was a need for a bold Empire-settlement scheme which would develop the Empire and increase our trade.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

12,824. "Diaphragms and methods of vibrating the same applicable to the sound boxes of phonographs or the like." A. F. Sykes. May 24th, 1924. (Cognate application, 6,331/25.) (243,395.)

12,938. "Loud-speaking telephonic receivers." E. A. Graham. May 26th, 1924. (243,396.)

15,149. "Telegraph typewriters." Kleinschmidt Electric Co., Inc. August 11th, 1923. (220,280.)

17,528. "Employment of thermionic valve circuits." S. Brydon and D. B. Fletcher. July 22nd, 1924. (243,407.)

17,650. "Shock-absorbing devices for thermionic valves." Benjamin Electric, Ltd. September 17th, 1923. (222,086.)

18,183. "Method and apparatus for generating, relaying, rectifying, transforming, and amplifying alternating or pulsating currents." E. T. Fisk. August 9th, 1923. (220,297.)

20,038. "Frame aerials." W. Plumbridge and F. O. Helliwell. August 25th, 1924. (243,427.)

20,074. "Energisation and control of thermionic valves, particularly for use in wireless reception." Sabin Electrical Products Corporation. April 7th, 1924. (231,819.)

20,168. "Telephonic receivers." A. H. Midgley. August 26th, 1924. (243,431.)

20,169. "Adjustments for the magnets in telephone receivers and the like." A. H. Midgley. August 26th, 1924. (243,432.)

20,289. "Inductance coils."—J. W. Combe. August 27th, 1924. (243,440.)

20,447. "Wireless direction-finding systems." R. T. Smith. August 29th, 1924. (243,448.)

20,448. "Wireless direction-finding systems." R. T. Smith. August 29th, 1924. (243,449.)

20,515. "Oil-immersed electric switches." A. Reyrolle & Co., Ltd., F. Coates, and J. Mirrey. August 30th, 1924. (243,452.)

20,607. "Means for eliminating magnetic coupling between coils." Hazeltine Corporation. April 7th, 1924. (231,820.)

21,143. "Electric lamps for illuminating motor-vehicle dash boards and for like purposes." D. McGregor. September 8th, 1924. (Cognate application, 1,944/25.) (243,467.)

21,312. "Electric switches." E. C. R. Marks (Hart Manufacturing Co.). September 9th, 1924. (243,471.)

24,428. "Terminal electrical connections suitable for the sparking plugs of internal-combustion engines." M. L. Williams. October 15th, 1924. (Addition to 160,375.) (243,493.)

25,394. "Gas detector for miners' electric safety lamps." A. G. Gulliford. October 25th, 1924. (243,496.)

25,664. "Telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). December 24th, 1923. (226,782.)

25,948. "Coil holders for wireless apparatus." W. S. Worthington. October 31st, 1924. (243,502.)

27,550. "Electromagnetic sound transmitters and receivers." British Thomson-Houston Co., Ltd., and J. Hutt. November 18th, 1924. (243,515.)

27,667. "Leading-in means for wireless aerials." A. H. Guinness. November 19th, 1924. (243,517.)

29,089. "Amplifying units for use in wireless systems." G. A. Mitchell. December 4th, 1924. (243,530.)

29,524. "Electrolyte for accumulators." V. L. Williams and L. L. Williams. December 9th, 1924. (243,537.)

29,545. "Automatic telephone systems and the like." Siemens Bros. and Co., Ltd., W. G. Patterson, and E. J. C. Rousseau. December 9th, 1924. (243,538.)

30,634. "Apparatus for the supervision and control of the stoppages and diminutions of speed of railway trains, tramways, and the like." E. Rodolausse. December 19th, 1924. (Addition to 162,617.) (243,547.)

31,158. "Electric hand lamps." National Carbon Co., Inc. December 26th, 1923. (226,840.)

1925.

1,187. "Illuminating appliances." W. A. Dorey. January 14th, 1925. (243,559.)

1,259. "Compensated asynchronous motors." Deutsche Werke Akt.-Ges. January 21st, 1924. (228,150.)

2,431. "Apparatus for improving the power factor in an electrical network." Akt.-Ges. Brown, Boveri et Cie. February 2nd, 1924. (228,546.)

3,352. "Electric terminal connection." S. W. Cole. February 6th, 1925. (243,571.)

6,636. "Squirrel-cage armatures for dynamo-electric machines." Deutsche Werke Akt.-Ges. March 25th, 1924. (231,462.)

9,046. "Compensated alternating-current machines." Sachsenwerk Licht- Und- Kraft-Akt.-Ges. April 4th, 1924. (231,895.)

10,486. "Receiving apparatus for high-frequency signals." British Thomson-Houston Co., Ltd. April 25th, 1924. (232,961.)

13,323. "Electrical variable condensers." G. Lombardi. December 10th, 1924. (243,618.)

13,598. "Sparking plugs for internal-combustion engines." A. Lang. May 24th, 1924. (234,522.)

14,031. "Single-axle bogies for rail and tramway cars." A. Kamp. May 28th, 1925. (Addition to 209,593.) (243,624.)

15,514. "Head-lamp control devices." G. H. Soldani. June 15th, 1925. (243,631.)

16,776. "Glass bulbs for electric incandescent lamps or the like and a process for repairing them." Naamlooze Vennootschap Philips Gloeilampenfabrieken. July 23rd, 1924. (237,579.)

17,659. "Variable resistors." A. K. Croad (Amsco Products Inc.). July 9th, 1925. (243,278.)

19,469. "Supports for lamps, particularly for use in street lighting." Benjamin Electric, Ltd., and R. A. Ives. July 31st, 1925. (243,646.)

18,491. "Electrolytic separation of metallic chromium." E. Liebreich. July 21st, 1924. (237,288.)

18,956. "Protective relays." British Thomson-Houston Co., Ltd. August 8th, 1924. (239,216.)

20,266. "Thermionic amplifying apparatus." British Thomson-Houston Co., Ltd. August 15th, 1924. (238,550.)

21,381. "Tanks for electrical transformers and the like." Metropolitan-Vickers Electrical Co., Ltd. September 10th, 1924. (239,845.)

22,150. "Electric discharge devices and means for operating the same." British Thomson-Houston Co., Ltd. September 18th, 1924. (240,149.)

22,757. "Toy electric lamp." I. M. Bennett. September 11th, 1925. (243,291.)

25,247. "Filament supports for vacuum tubes." British Thomson-Houston Co., Ltd. October 9th, 1924. (241,215.)

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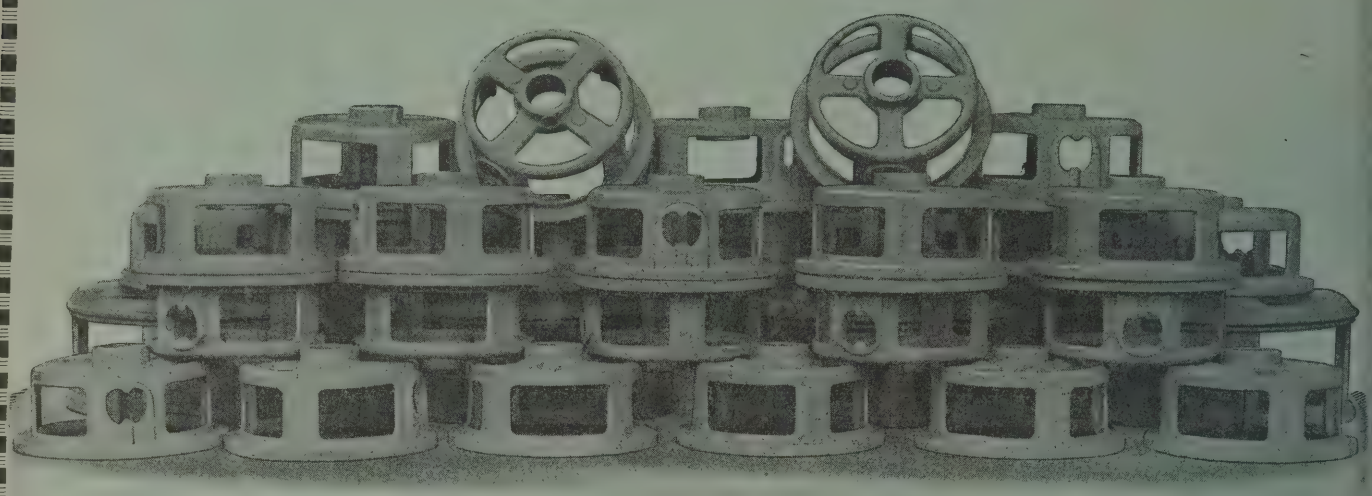
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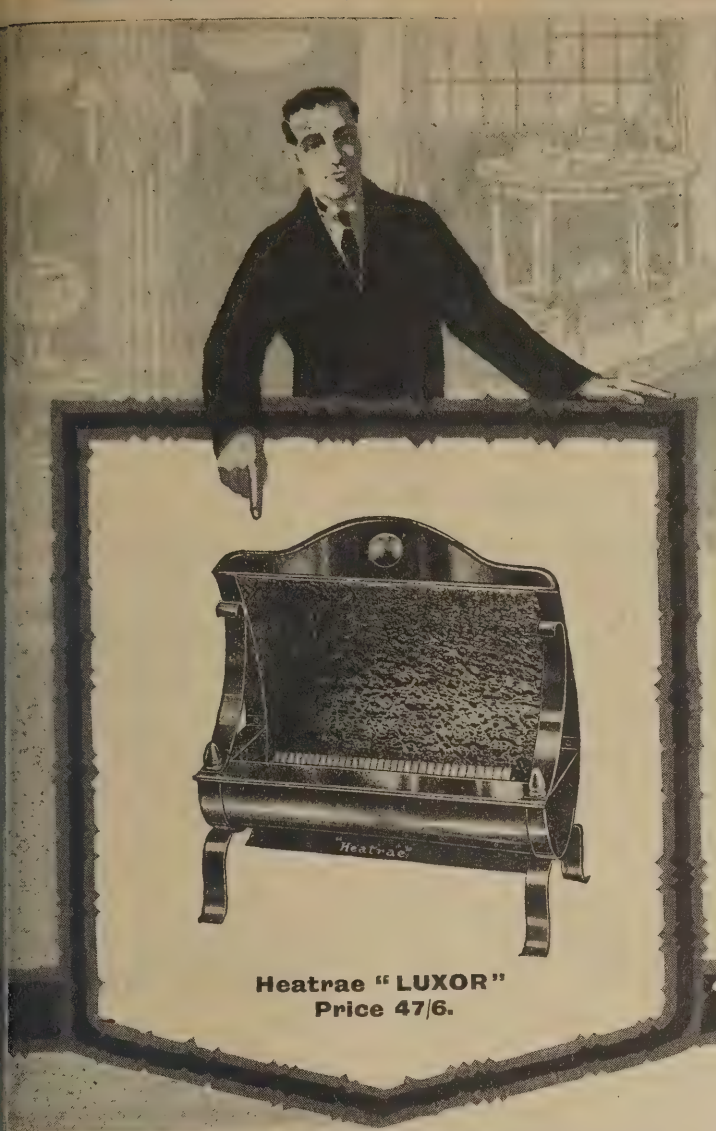
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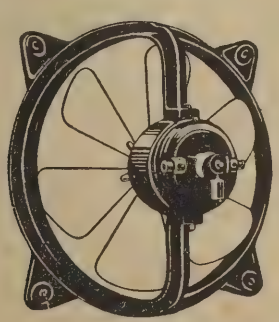
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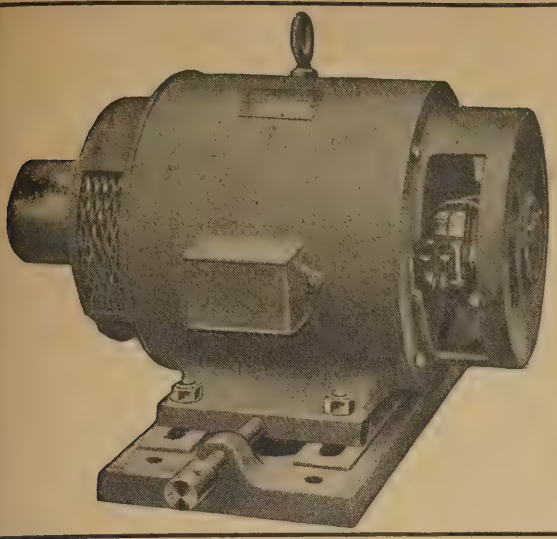
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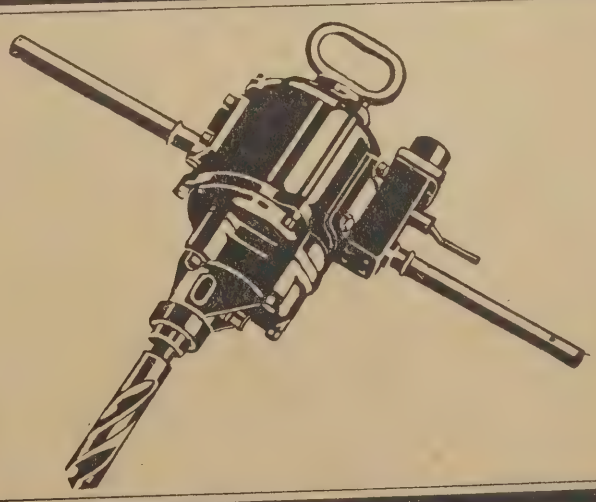
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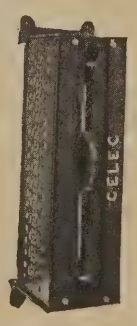
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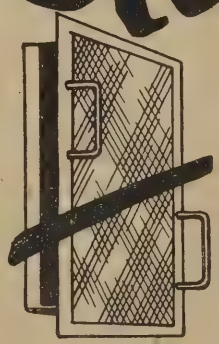
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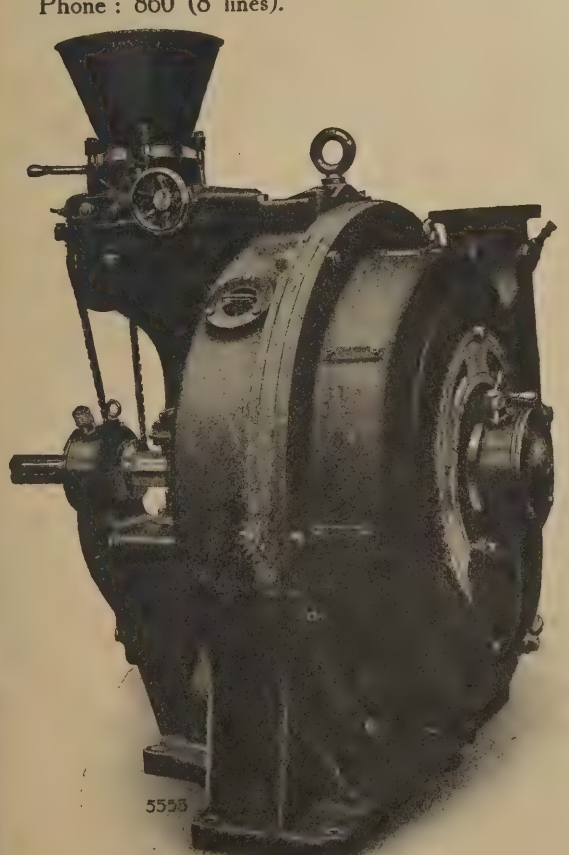
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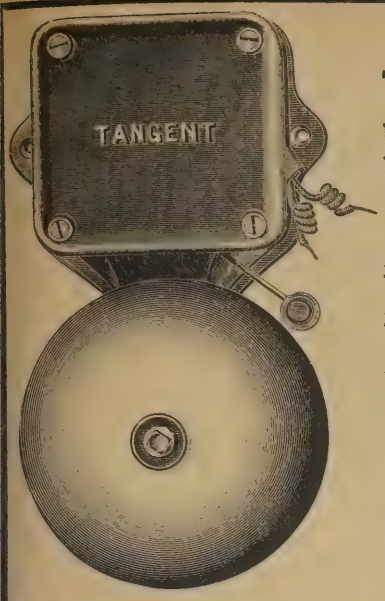
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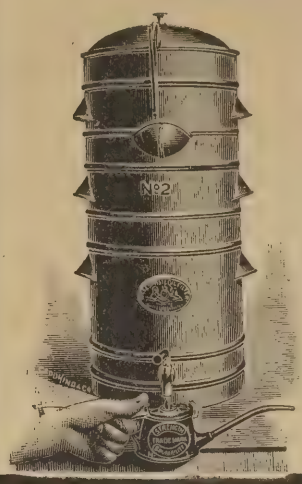
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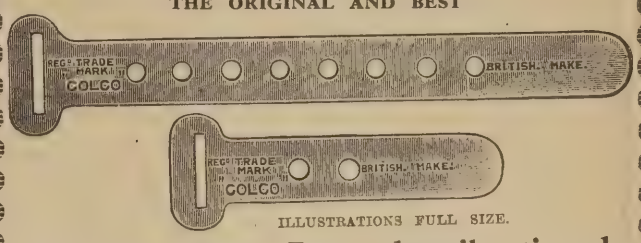
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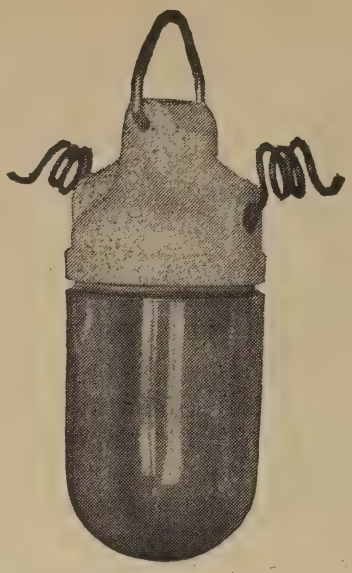
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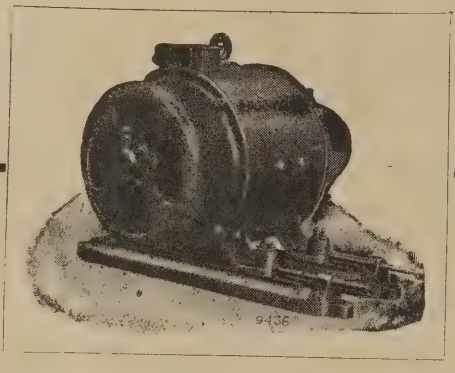
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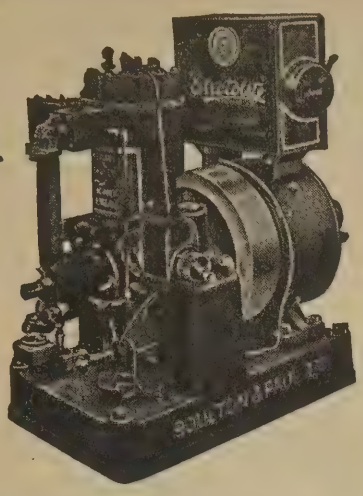
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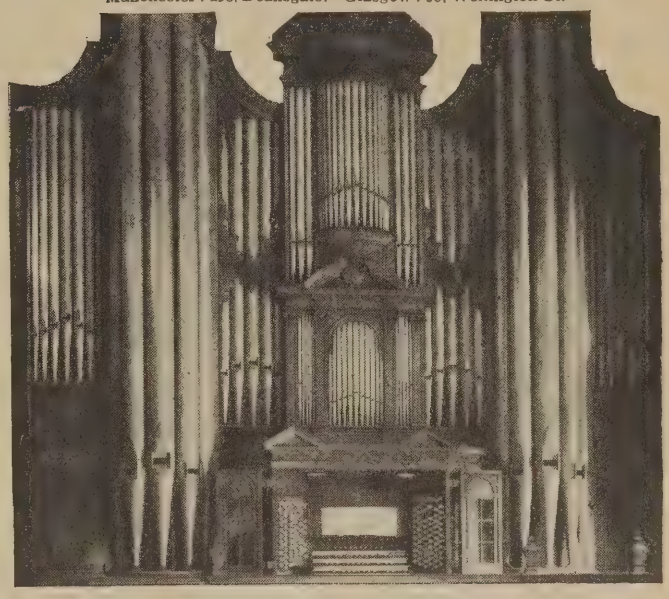
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Oil Engine Installations (Example No. 5)

By Test the BEST.

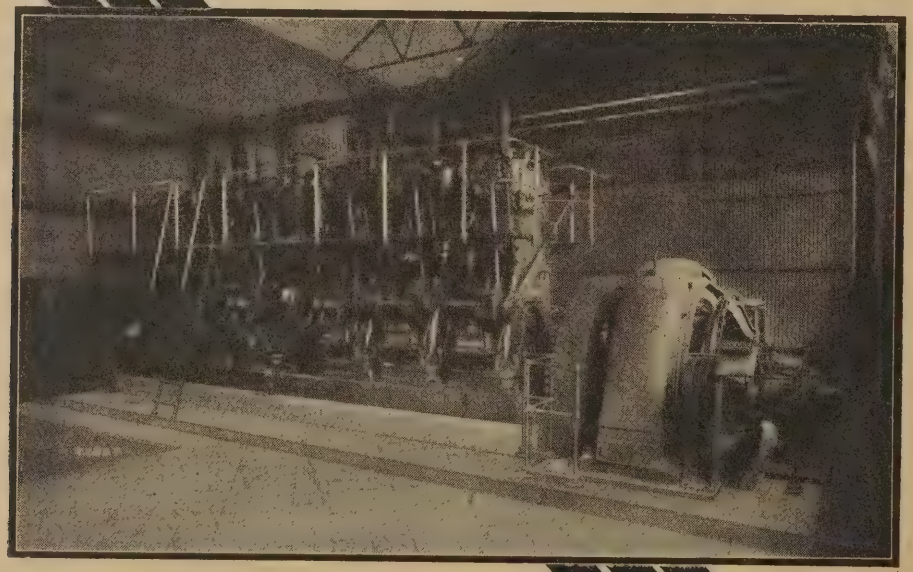


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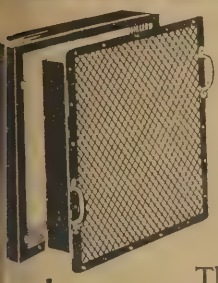
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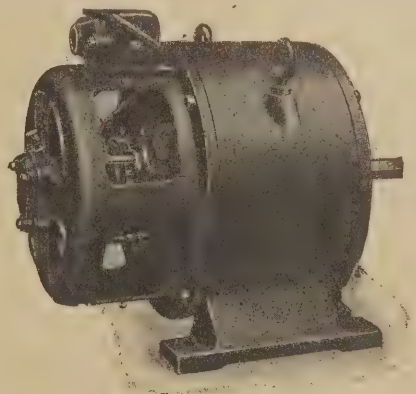
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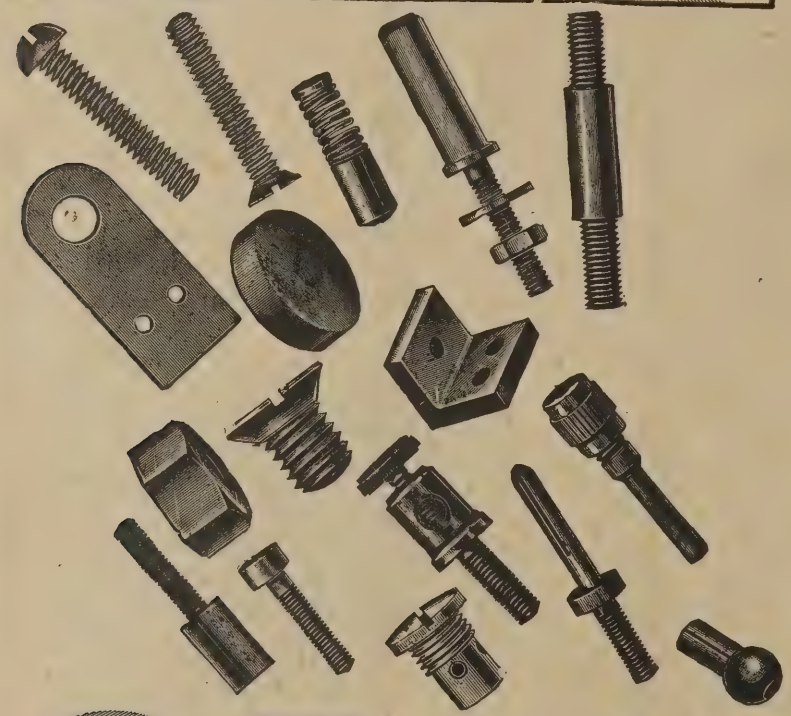
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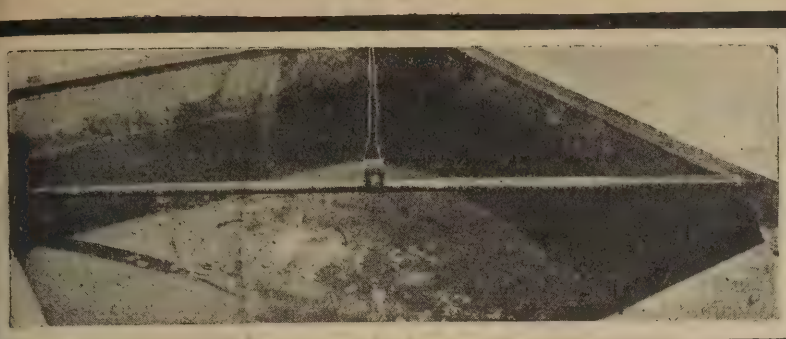
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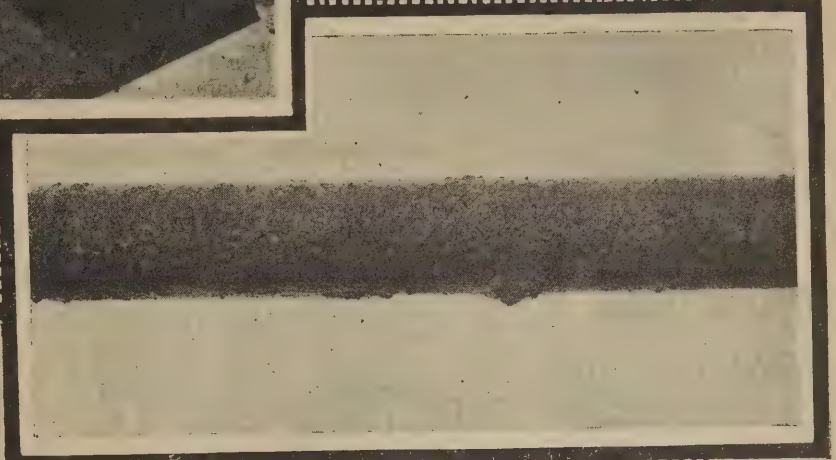
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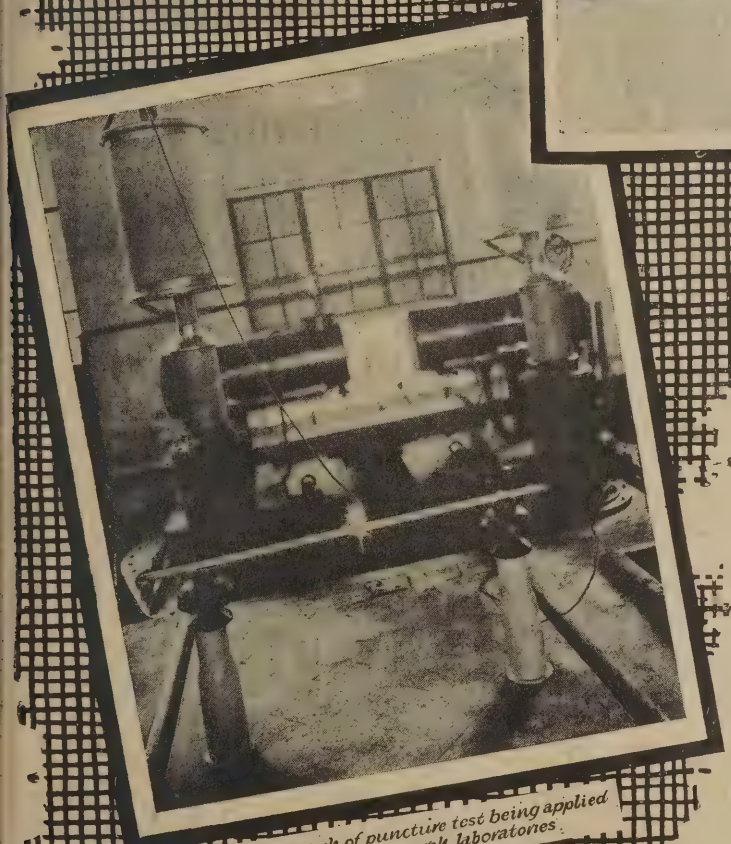
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Deposit from water on tube



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TWO YEARS UNDER WATER

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After superficial drying electrical pressure was applied until breakdown occurred at 17·5 K.V. This remarkable result demonstrates the excellent insulation properties of the Henley Unit even under most unfavourable conditions and helps to explain the continued and increasing demand for such apparatus.

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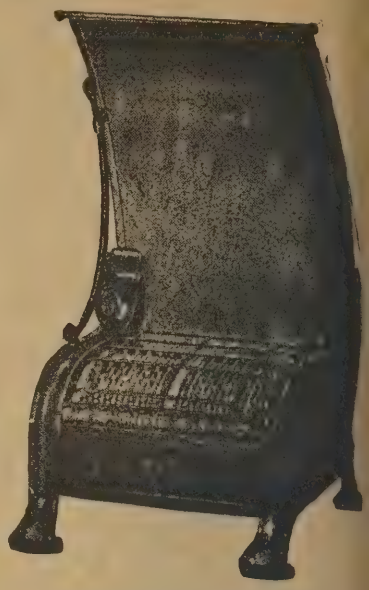
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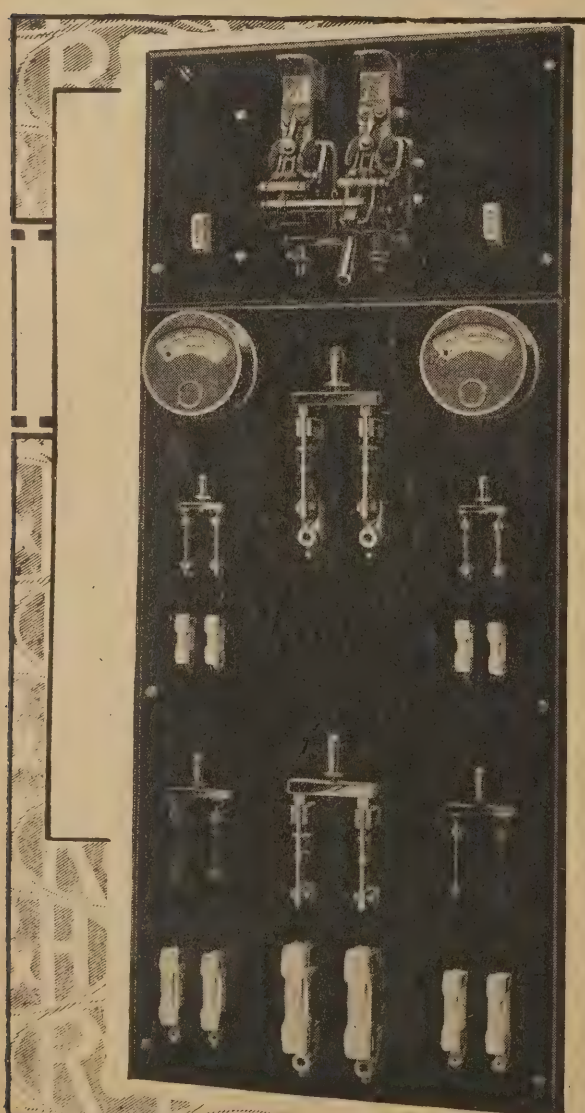
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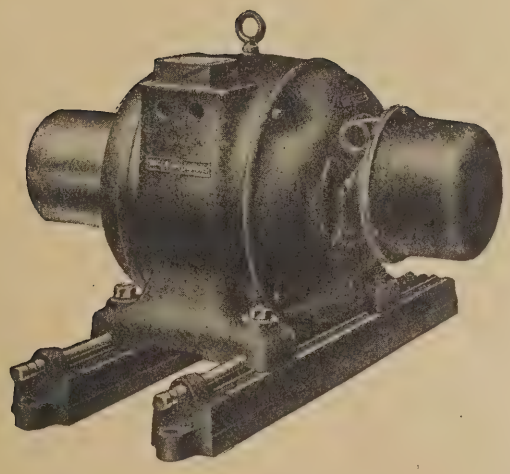
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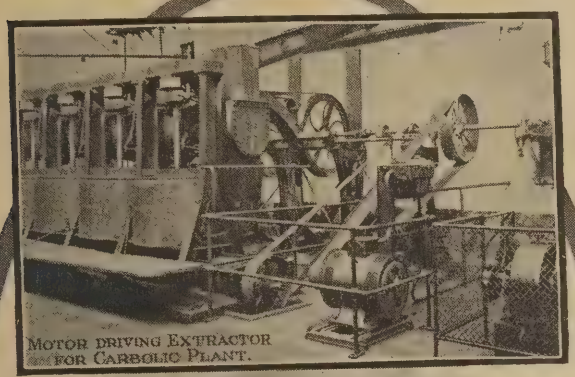
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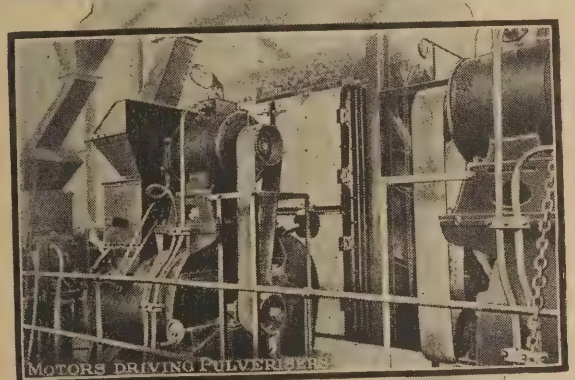
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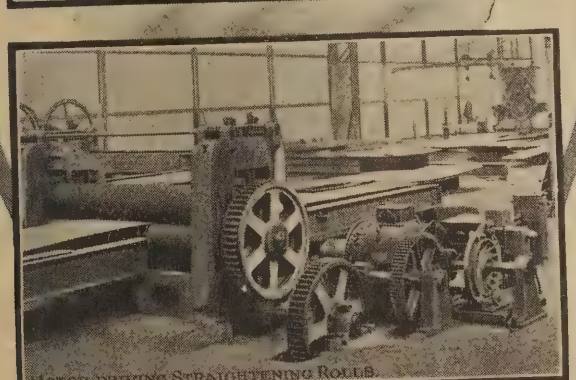
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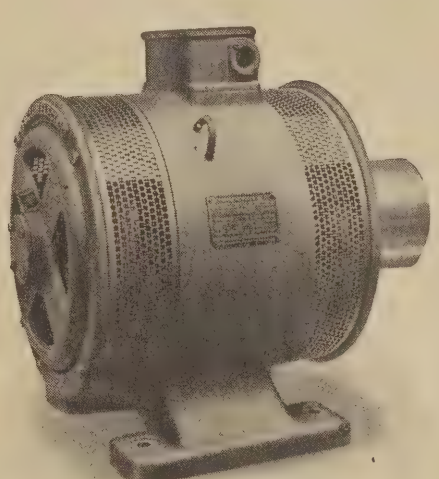

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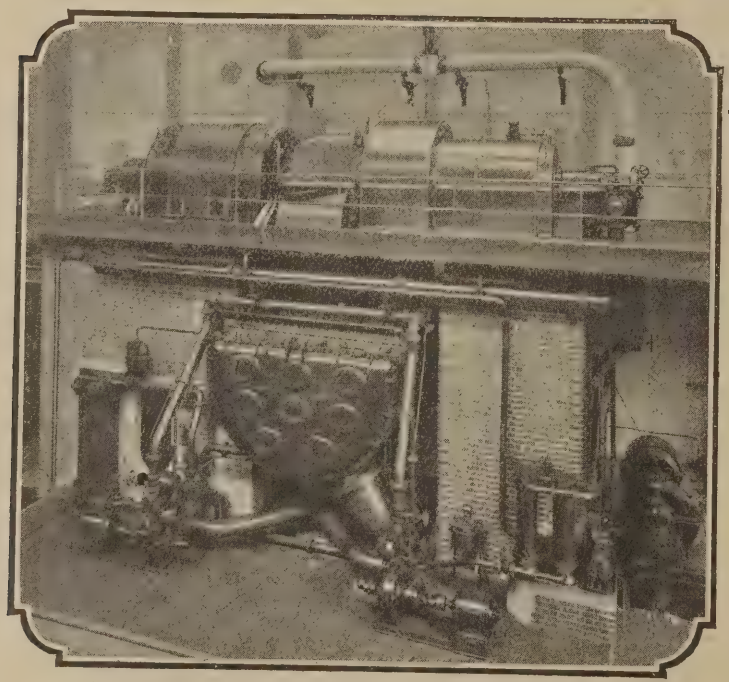
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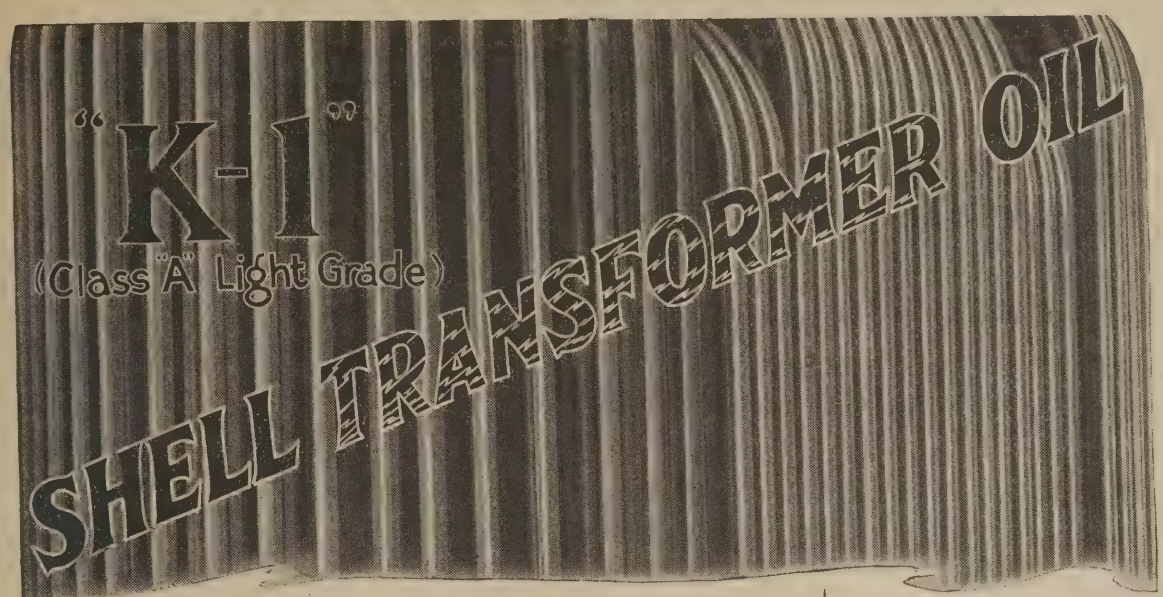
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The more sluggish the oil, the slower will be the circulation around the windings and cooling surfaces. Viscosity determines circulation.

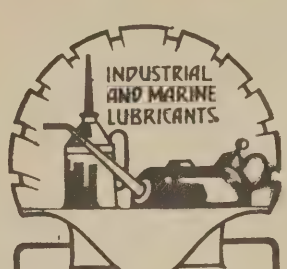
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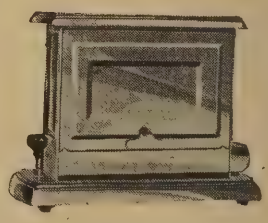
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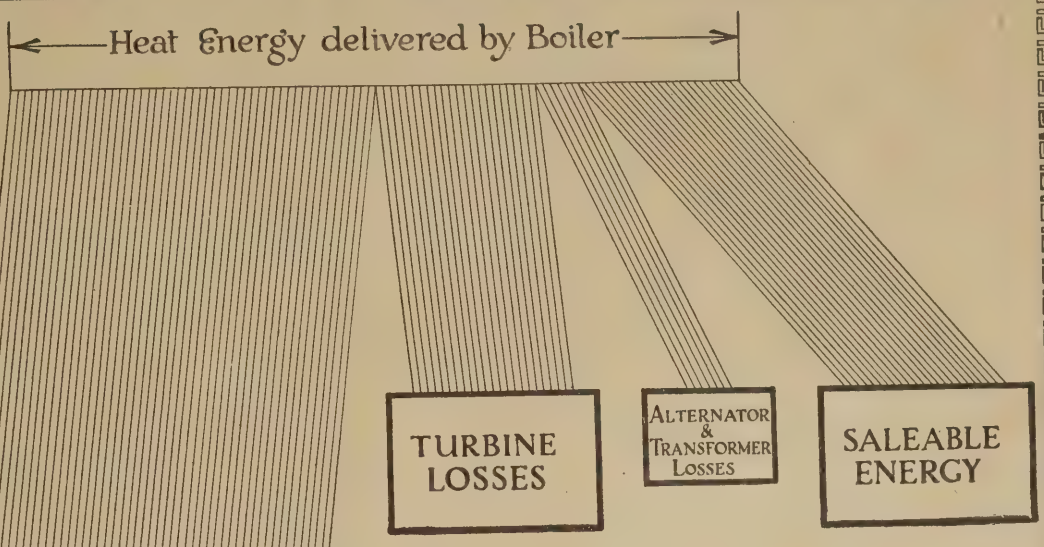
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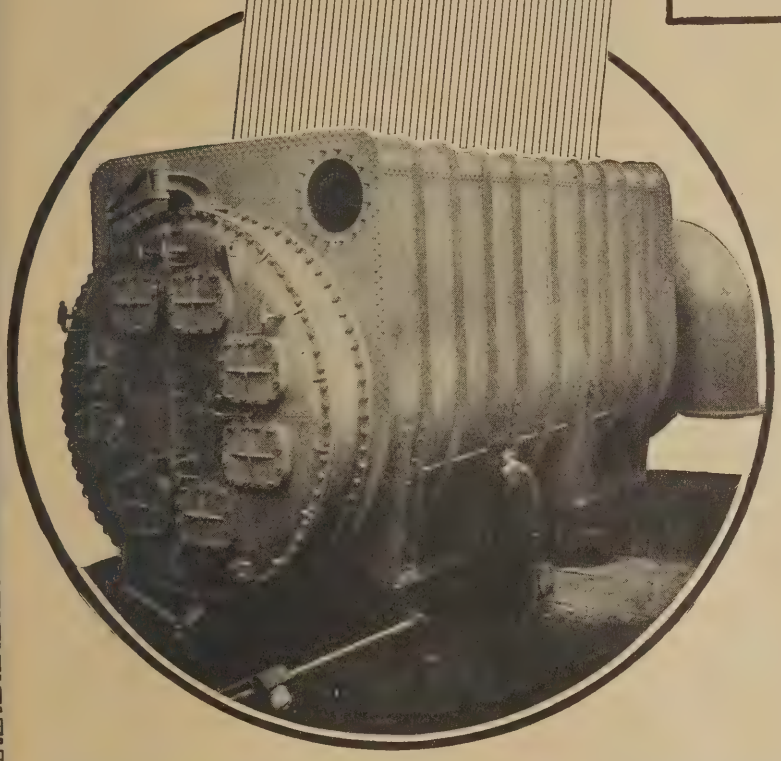
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It must lose quickly and at the lowest economical temperature the latent heat of the steam exhausted into it.

And it must conserve to the maximum degree the heat in the condensate returned to the boilers.

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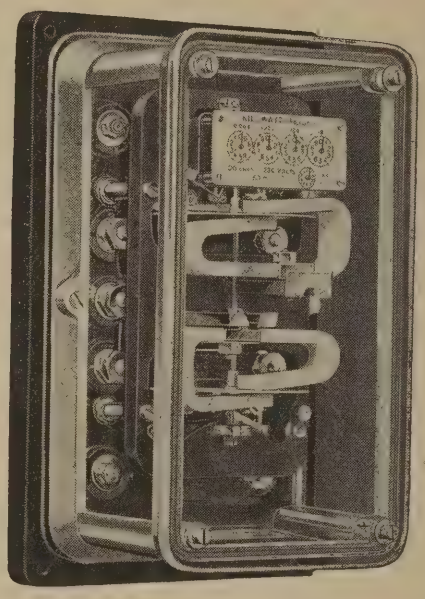
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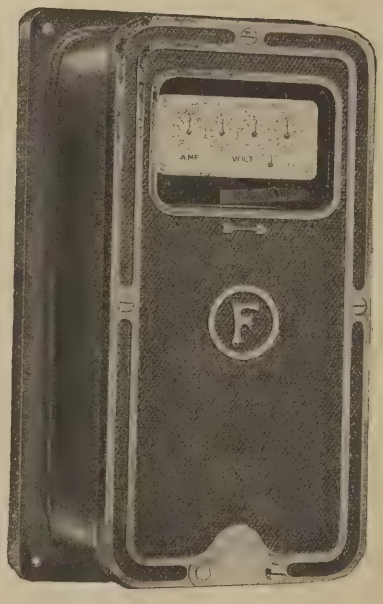
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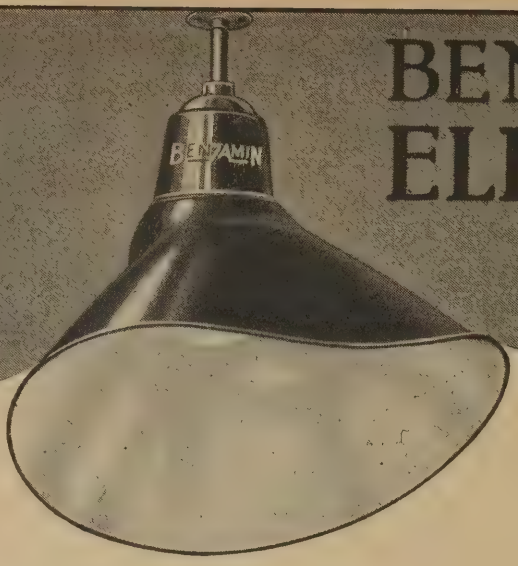
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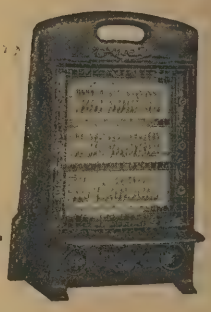
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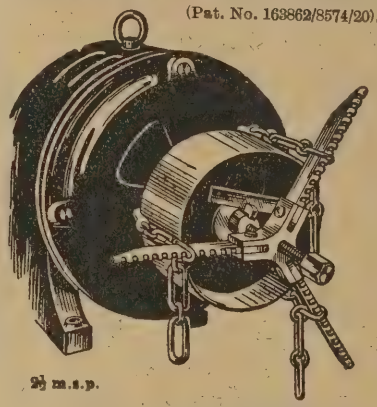
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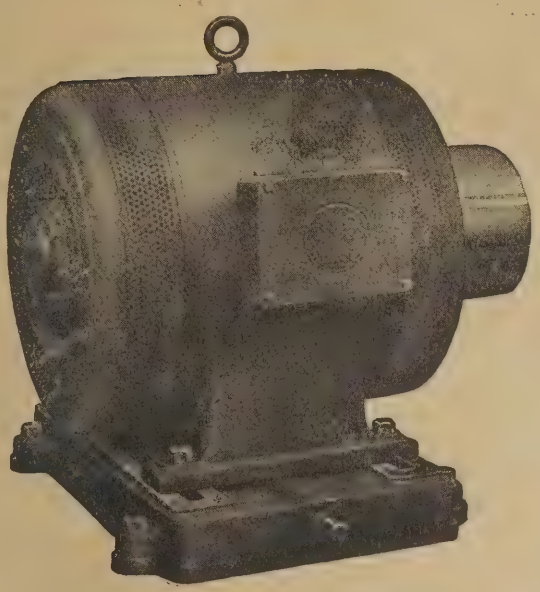
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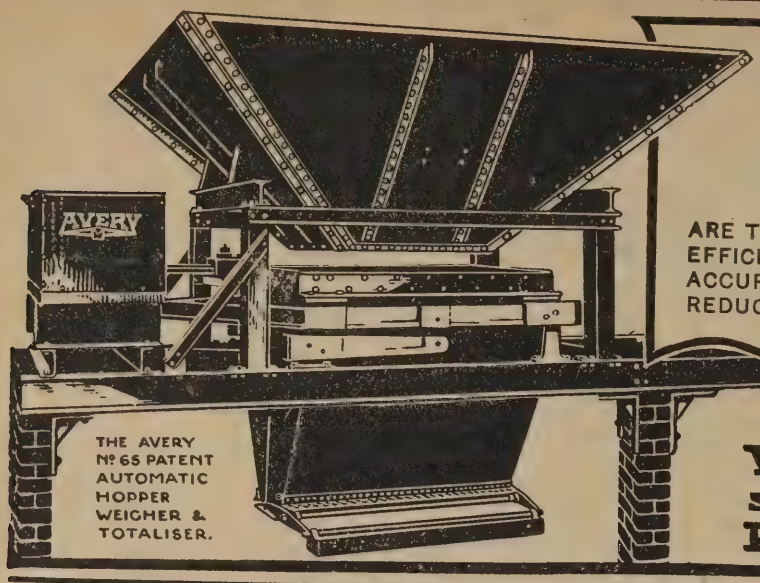
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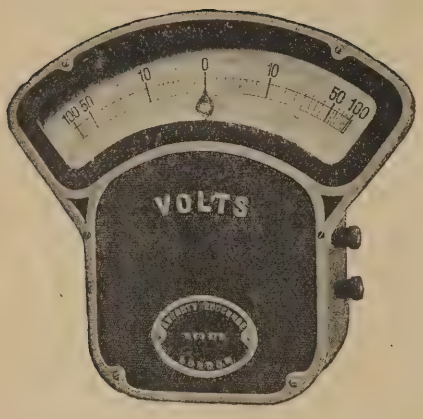
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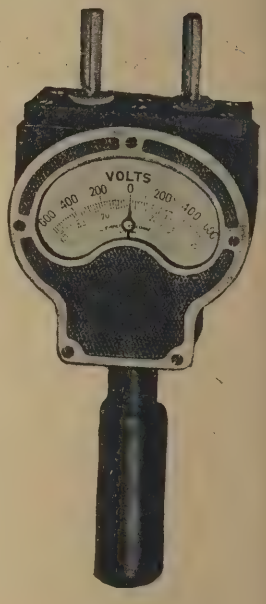
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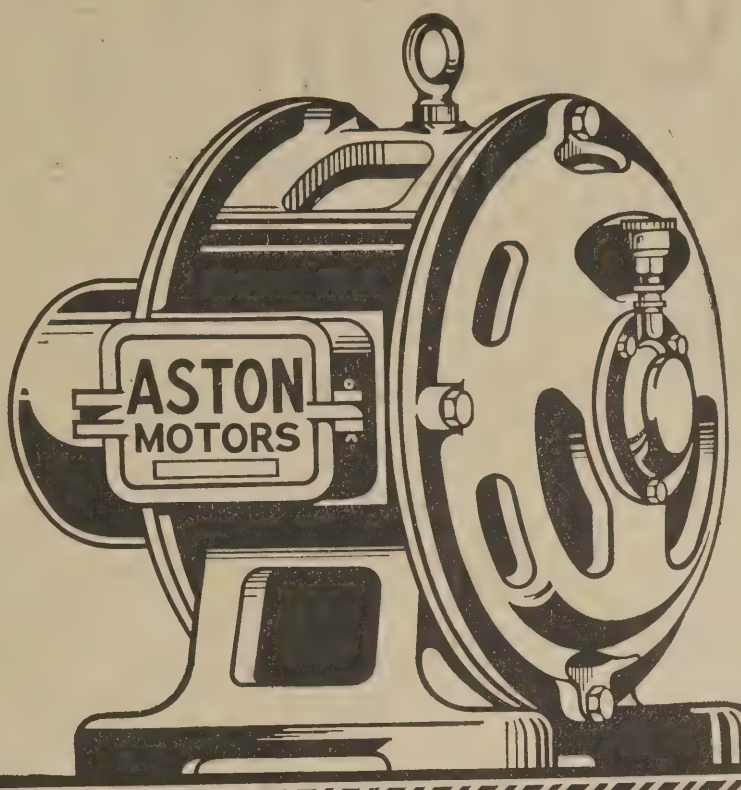
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Squirrel Cage Machines ensure economy in upkeep, control gear, wiring and upkeep.

Veritys Squirrel Cage motors are well known for easy running, long life and heavy duty without fear of breakdown. They are made with either ball or roller bearings according to size of machine, and conform to the British Engineering Standard Specifications.

They have accessible connections with good solid lugs for wiring and are easily mounted. They reduce those "Little wiring troubles" to a minimum. Write for specifications and catalogues.

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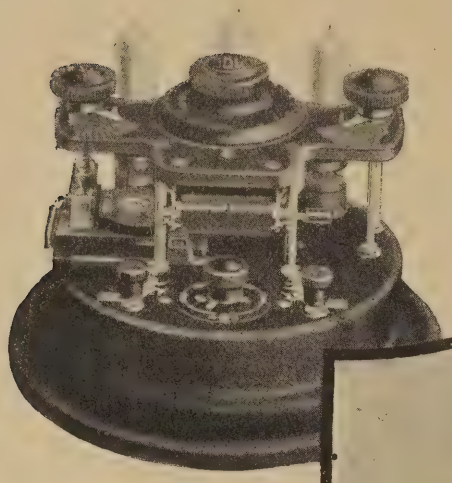
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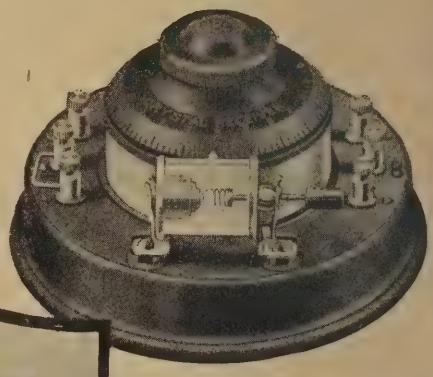
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Accidents caused through the use of badly designed Hand Lamps, some of which have resulted fatally, prompted us among the first to introduce a thoroughly safe Hand Lamp. A feature of these Hand Lamps is their strength and safety and particularly massive galvanised guard.

"GUARDIAN," Type G1 (as illustrated). Complete with massive Galvanised Guard and Holder. **7/6** each.
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Lighter Patt., **The "CHALLENGE" 5/-** each.
Complete with Guard and Holder.

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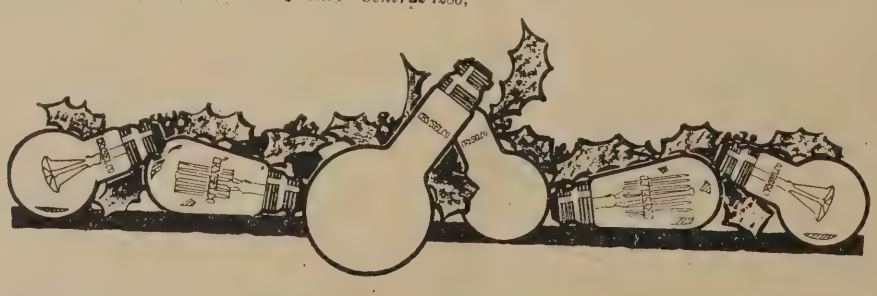
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To-day, the results of that plan are being felt. One in every four A.C. industrial motors sold in this country is made at our works.

No better motor than the Parkinson is made, yet it cannot be approached within 30% for price.

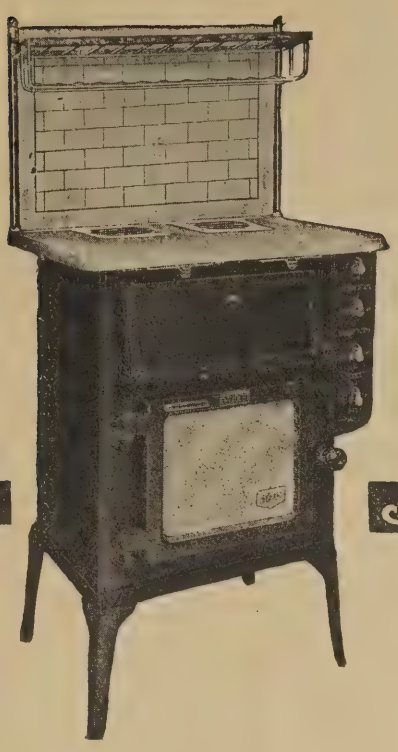
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SIMPLE, RELIABLE, THOROUGH THROUGHOUT.

Another "Revo" Success.



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The FAMILY COOKER

Suitable for a family of 6 to 8 persons.

SPECIAL FEATURES.

BOILING PLATES.—These are the new "Revotherm" (Prov. Patt.) protected open type plates, immediately removed by loosening three nuts. They are exceedingly efficient, accident proof, quick boiling and entirely reliable.

HOTCUPBOARD.—The space between the oven and boiling top is provided with a drop door, forming an excellent warning chamber.

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THE WHOLE is a sound engineering job, electrically and mechanically.

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All controls are 3-heat.

PRICE.

Including grill pan, oven racks, oven browning sheet and drip pan,

£19 : 5 : 0

Size.	Overall	Oven Cooking Space	Hot Cupboard	Grill	Boiling Plates (2)
Width	26 ins.	15 ins.	17 ins.	8 ins.	7½ ins.
Depth	18 ins.	13 ins.	15 ins.	7 ins.	7½ ins.
Height	36 ins.	13 ins.	6 ins.	—	—
Loading in Watts	5000	1500	—	1500	1500 each

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Telephone : 9028-9029 Central.
Telegrams : "Revoliteco, Lud., London."

NEWCASTLE-ON-TYNE : 22 Oxford Street.
Telephone : 3688 Central.
Telegrams : "Revo, Newcastle-on-Tyne."

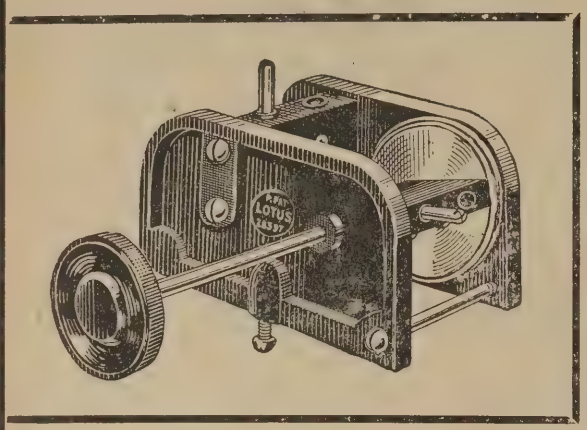
GLASGOW : 67 Hope Street.
Telephone : 5219 Central.
Telegrams : "Revo, Glasgow."

DUBLIN : 8 Anglesea Street.
Telegrams : "Revo, Dublin."

THE CABLE ACCESSORIES Co. Ltd. TIPTON, STAFFS.

"LOTUS" COIL HOLDERS
MEAN MORE SALES

for the Dealer, because more satisfaction for the user. That is why the sale of "LOTUS" exceeds that of any Vernier Coil Holder.



Note.—**"LOTUS" Coil Holders are extensively advertised to the Public, they are easy to sell, safe to recommend, and pay a handsome profit.**

RETAIL SELLING PRICES:

There are two types of "Lotus" Coil Holders.

For Outside Panel Mounting, two-way **7/-**, three-way **10/6.**

For Inside Baseboard Mounting, with 6-inch handle, two-way **8/-**, three-way **12/6.**

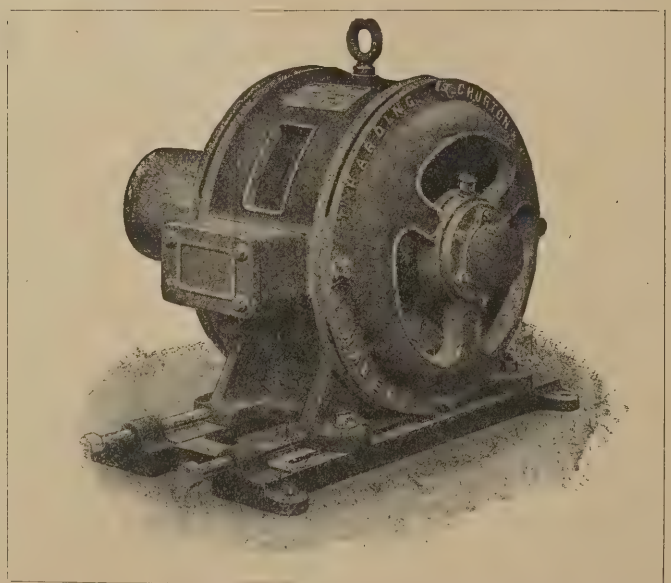
The Vernier Movement is actuated by three sets of encased Precision Cut Gears, representing a reduction of 8 to 1.

Moving block cannot fall.

GARNETT, WHITELEY & Co., Ltd.,
Lotus Works, Broadgreen Road, Liverpool.

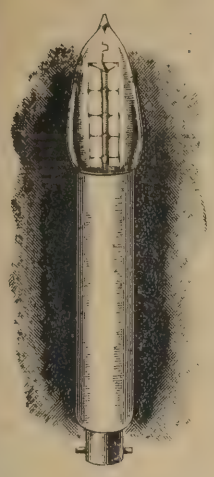
HIGH-EFFICIENCY A.C. MOTORS
AT COMPETITIVE PRICES.

Write for New Circular No. 670:



"The Value of High Efficiency."

T. HARDING CHURTON & Co., LTD.
LEEDS :: ENGLAND.



CANDLE LIGHTING.

HUNTALITE

CANDLES.

STOCKED IN ALL VOLTAGES.

20 WATTS 6/6 ea.
40 WATTS 7/6 ea.

With white and yellow opals in all sizes.
Also carbon filament lamps 16 c.p.

Send us your enquiries for :—

TELESCOPIC CANDLE FITTINGS.
OPAL TUBES, white and yellow (all sizes).
S.B.C. and S.E.S. HOLDERS (all types).

HUNTALITE LTD.,
25, NEWMAN ST., W.
Telephone—MUSEUM 6207

TELEPHONE: EALING 1983.



LUG GRIP
PIN GRIP
SCREWED

CONDUIT FITTINGS

BRITISH CASTINGS FINISH AND THE BEST.

PELICAN ELECTRIC LTD., BRENTFORD.

Buy British Products

BRIGHTRAY & GLOWRAY

NICKEL CHROME

WIRES & TAPES

are prepared by special melting and refining processes and are the purest alloys on the market. They are rolled and drawn **BRIGHT** but are sent out to customers with a firmly adherent black oxide coating. This oxide film which forms when ***bright*** wire is heated in air or pure oxygen is highly refractory and acts as a protecting and insulating covering.

BRIGHTRAY and **GLOWRAY** wires and tapes can be supplied **BRIGHT,** but we strongly advise the normal treatment described above since all nickel-chromes turn black on first heating to redness and in so doing alter their electrical properties thus introducing a factor of error in design calculations. Manufactured from the raw material by

HENRY WIGGIN & CO., LTD.,
BIRMINGHAM.

LONDON OFFICE:
VICTORIA STATION HOUSE, S.W. 1.

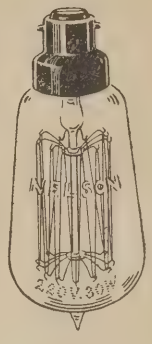
MANCHESTER AGENTS:
J. MACKIE & SON, 1, North Parade.

NELSON LAMPS

For All Lighting Purposes

"ALL-BRITISH."

Excel in Strength and Durability.



DRAWN WIRE,
HALF-WATT TYPE,
CARBON,
TRACTION,
TUBULAR,
CANDLE,
TRAIN-LIGHTING,
MOTOR-CAR BULBS,
OPAL LAMPS, Etc.



Excellent Terms to the Trade.

FOR LISTS AND ALL PARTICULARS WRITE—

THE NELSON ELECTRIC CO., LTD.,
MERTON PARK, LONDON, S.W.19.

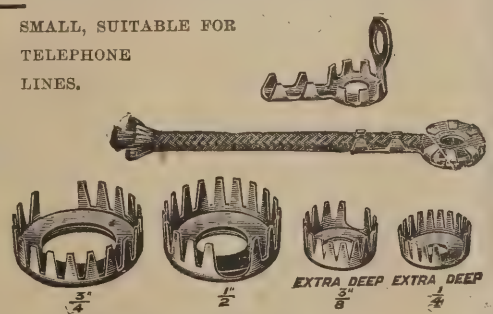
Telegrams: Valvenelso, Wimble, London. 'Phone: Wimbledon 172.

A SOUND ELECTRICAL TERMINAL.

WITHOUT **SOLDER**

USED FOR **FUSE WIRES, CABLES,** AND **WIRES** of all Descriptions.

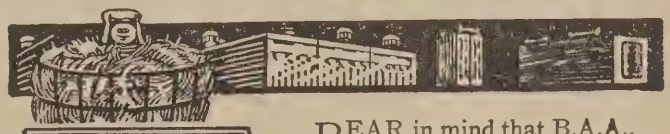
SMALL, SUITABLE FOR TELEPHONE LINES.



OTHER SIZES FROM $\frac{1}{8}$" TO $\frac{3}{8}$".

Send for List and Full Particulars.

ROSS COURTNEY & CO., LTD.,
ASHBROOK WORKS, LONDON, N.



B.A.A.
REG.
MEDAL AWARDED ST LOUIS 1904

BEAR in mind that B.A.A., the *tested* accumulator acid, is prepared at our own works, under expert control —and that we have been making acids for over half a century.

F. W. BERK & CO., LTD., London, E.C.3. Wks. Stratford, E.
Makers of acids since 1870.

The purest & best accumulator acid the world produces

TAS/ba91

The One of J&P Pages

IN these days of rapid movement and strenuous endeavour it is well that we should call a halt occasionally and renew acquaintance with the customs of less exacting years.

In all the year no better opportunity presents itself than the coming of that festival we know as

Christmas

The mark that means that "little more" in quality

The One of J&P Pages

WHEN does the spirit that is old but ever new inspire us – then is the golden rule ever in our minds and its fulfilment reflected in our speech and actions – then the things that really matter in "the everyday" become subordinate and we rejoice not in the business we are doing but – in the friendships which we make in doing it.

We have made many such friends, and to one and all to-day would broadcast our message of goodwill in those old familiar words –

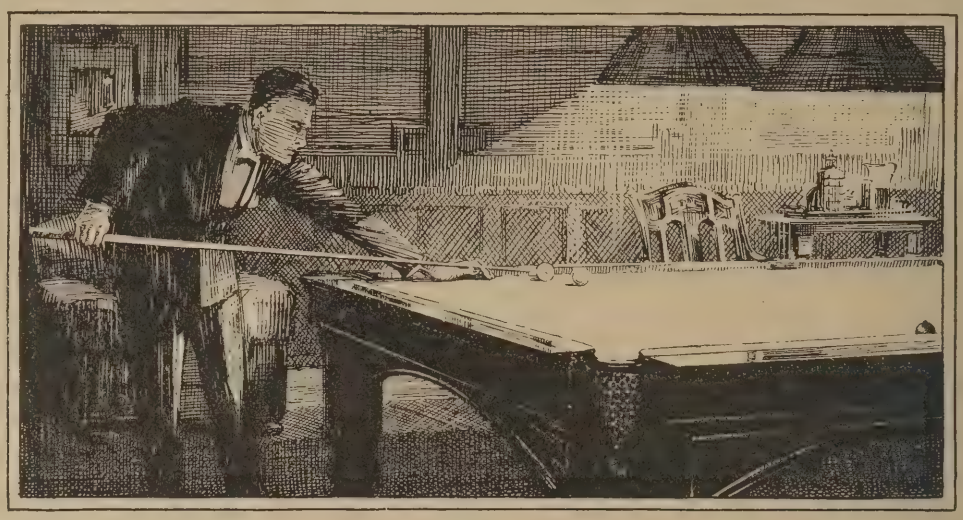
A Merry Xmas and a Prosperous New Year

Johnson & Phillips, Ltd
SPECIALISTS IN THE TRANSMISSION, TRANSFORMATION AND CONTROL OF ELECTRICITY
Charlton, London, S. E. 7
City Office & Stores:
12, UNION COURT, OLD BROAD STREET, E.C.2

The mark that means that "little more" in quality

ARMSTRONG·WHITWORTH

SHIPS
MARINE ENGINES
LOCOMOTIVES
MACHINE TOOLS
FORGINGS CASTINGS
NON FERROUS PRODUCTS
DROP STAMPINGS
HIGH SPEED STEELS
SMALL TOOLS GAUGES
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ELECTRIC LIGHTING SETS
ROAD MAKING MACHINERY
HYDRAULIC MACHINERY
HYDRO ELECTRIC PLANT
CIVIL ENGINEERING
GENERAL ENGINEERING



Light on a dark subject

PRACTICAL POINTS ON COUNTRY HOUSE LIGHTING.

Fair Trading?

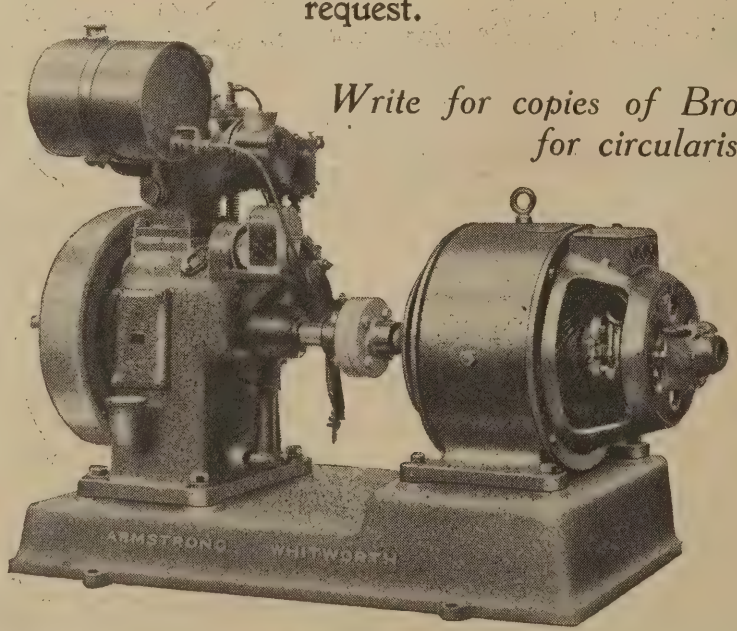
WE have signed the N.E.C.T.A. agreement under which we allow trade discounts only to recognised contractors.

We do not encourage direct retail sales, but make a practice of forwarding private enquiries to suitably situated firms.

If you order A.W. plants you will receive your share of such enquiries.

Our Catalogue gives full details of standard engines and sets, and will be forwarded on request.

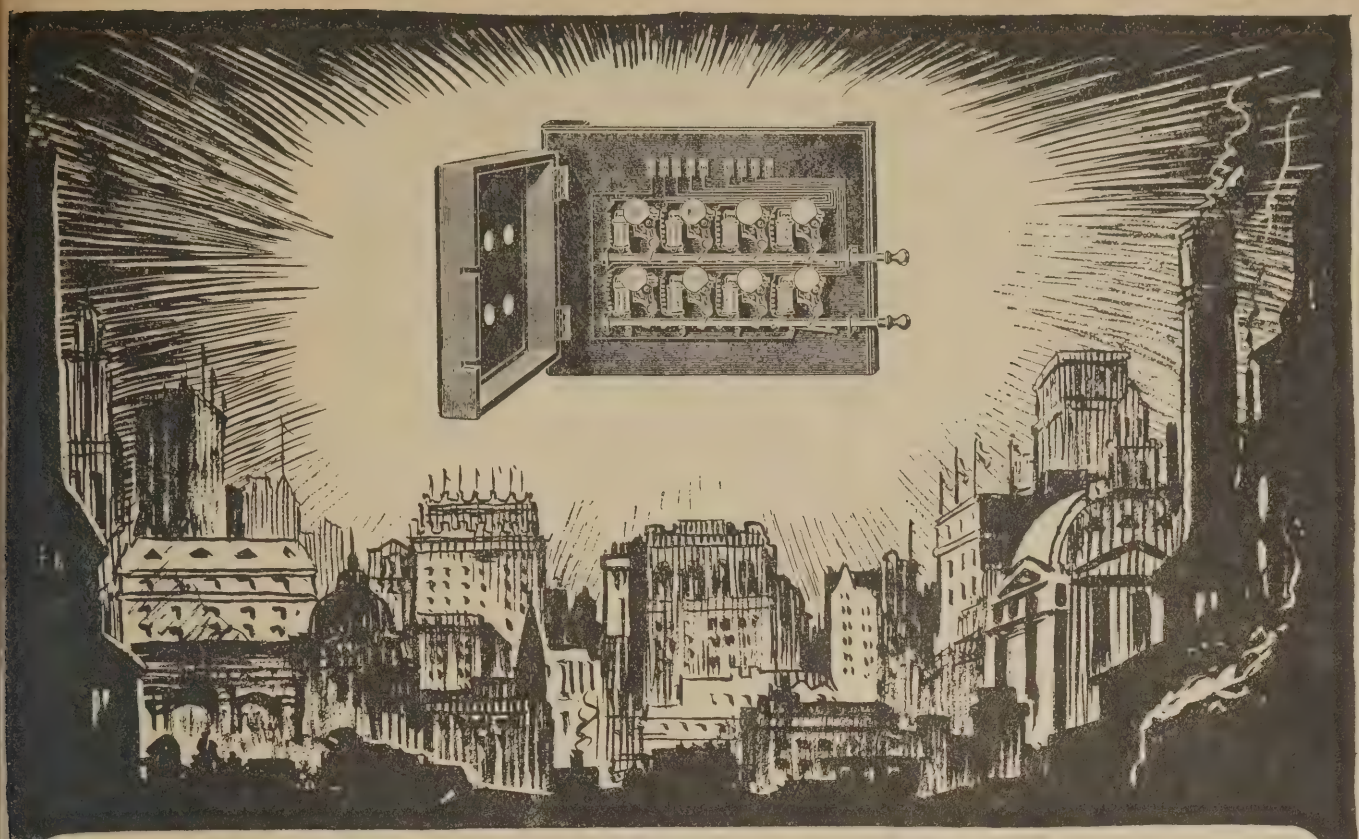
Write for copies of Brochure No. 338 for circularising.



A Direct Coupled 4-Stroke Paraffin Set.

SIR·W·G ARMSTRONG·WHITWORTH & Co LTD
8·Great George Street·Westminster·London·SW·1
Telephone·Victoria 4010

P.S 336.



SAX INDICATORS —

for Hotels, Offices, Mansions, Works, Shops

HAVE GIVEN PERMANENT SERVICE
AND ENTIRE SATISFACTION
FOR OVER 50 YEARS.

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Contractors to the
ADMIRALTY, WAR OFFICE, POST OFFICE, INDIA OFFICE, ETC ETC

Telegrams:
SAXATILE, PHONE, LONDON.

HIGH GRADE BELL ACCESSORIES
Specialists in
ELECTRIC BELLS.
RELAYS
INDICATORS
FIRE ALARMS
BURGLAR ALARMS
BATTERIES

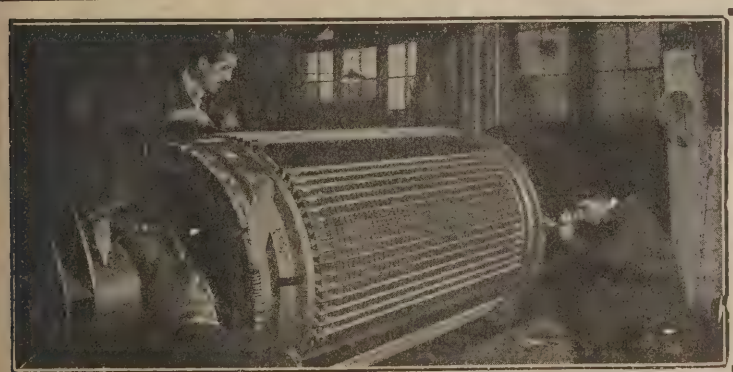
ESTABLISHED 1855

JULIUS SAX & COMPANY
LIMITED

WHOLESALE ELECTRICAL
MANUFACTURERS,

24 High Street, New Oxford Street, London, W.C.2.

HIGH GRADE LIGHT ACCESSORIES
Specialists in
WALL PLUGS.
PLUG ADAPTORS.
LAMP HOLDERS.
CANDLE FITTINGS.
HOLOPHANE GLASS AND FITTINGS.



Electrical Repair Work of Every Description.

REWINDING OF MOTORS and GENERATORS
OF ANY SIZE OR TYPE.
← *(Illustration shows large Rotor under Reconstruction.)*
COMMUTATORS & SLIP-RINGS SUPPLIED & FITTED.
ELECTRICAL MAINTENANCE.

WHITE, JACOBY & CO., Ltd.,

Bayham Place, CAMDEN TOWN, LONDON, N.W.1.
ESTABLISHED 1893.
Telephone: **NORTH 2066.** Telegrams: "Saturation, Norwest, London."

HART BROS., *Specialise in the manufacture of*

Queensway, Ponders End, Middx.

SILK & COTTON COVERED WIRES.

Telephone: Enfield 920.

Enamelled Bell Wires, Flexibles, Braiding, etc.

A SALES HELP!

THE Retailer who illuminates his own shop window and shop with the latest types of electric lamps is helping himself to sales. The lamps, however, must be right in performance and appearance. Therefore he should use

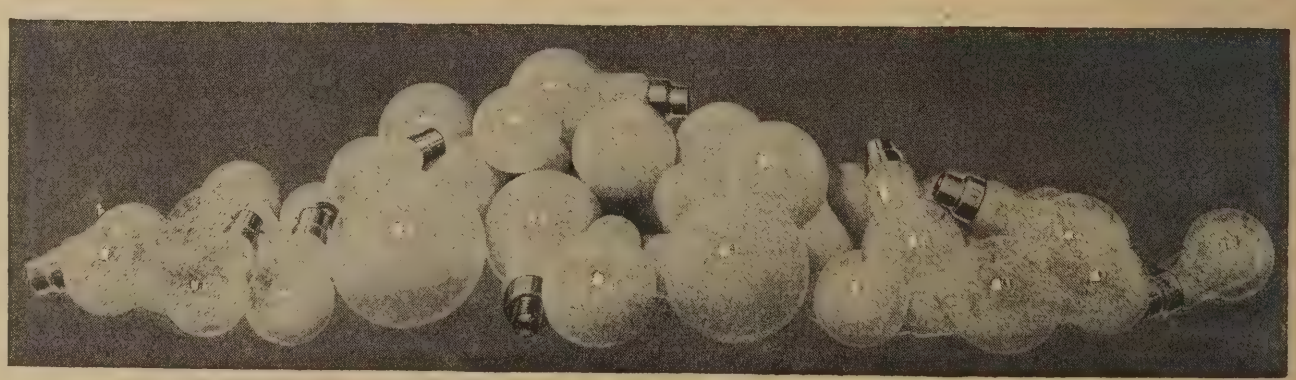
ROYAL

"EDISWAN" FULLOLITE

The lamp in the opal glass bulb, with the inner lining of clear glass. No glare, no harsh shadows—perfect light diffusion. Royal "Ediswan" Lamps command a ready sale. Stock them and sell them.

The Edison Swan Electric Company, Ltd.,

123/5, Queen Victoria Street, E.C. 4.



Everything for Wireless!

WIRELESS should be a profitable side line in the electrical contracting business. But the goods should be reliable, well-designed and British.

EDISWAN

WIRELESS SETS AND PARTS

are soundly designed and carefully manufactured and can be relied upon to give the greatest possible satisfaction to your customers.

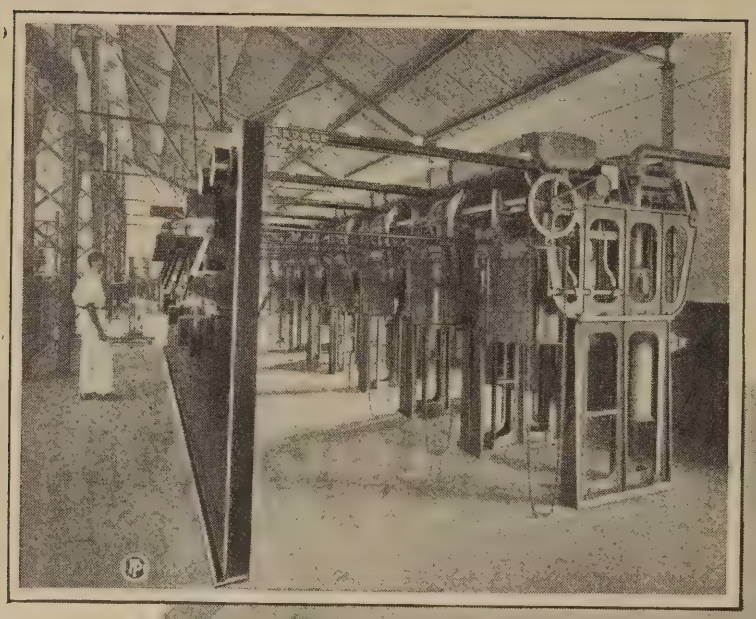
Complete Sets.
Components.
Headphones.
Loud Speakers.

H.T. Accumulators.
L.T. Accumulators.
Dry Batteries.
Ediswan Valves.



The Edison Swan Electric Co., Ltd.,
123/5, Queen Victoria Street, E.C.4.

SWITCHGEAR SPECIALISTS



All over the world

OUR policy of specialising exclusively in Switchgear of all types has amply justified itself. Throughout the world the word "Ferguson-Pailin" is synonymous with "Switchgear Specialists," and whenever a new installation is being laid down, the robustness and excellent design of our products compel attention.

We illustrate a remote mechanically operated switchboard supplied to the Great Indian Peninsula Railway for controlling the main power supply at a pressure of 22,000 volts. The gear is of the metal-clad "vertical" pattern, a type which has received our particular attention in recent years.

We shall be glad to answer enquiries which may be sent to any of our Branch Offices, or to our Head Office at Manchester.

Ferguson Pailin Ltd.

HIGHER OPENSHAW · MANCHESTER

Telephone - Openshaw 329 (Three lines) Telegrams Tension Manchester

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E.P.S. 135



TUNGSRAM

TUNGSRAM OPAL LAMP

SOFT SNOW-WHITE LIGHT.

NO GLARE——NO EYESTRAIN.

DISPLAY AND SELL.

Advt. of "Tungsram" Electric Lamp Works (Great Britain), Ltd., Commerce House, 72, Oxford St., W.1.

G.E.C.

XMAS 1925

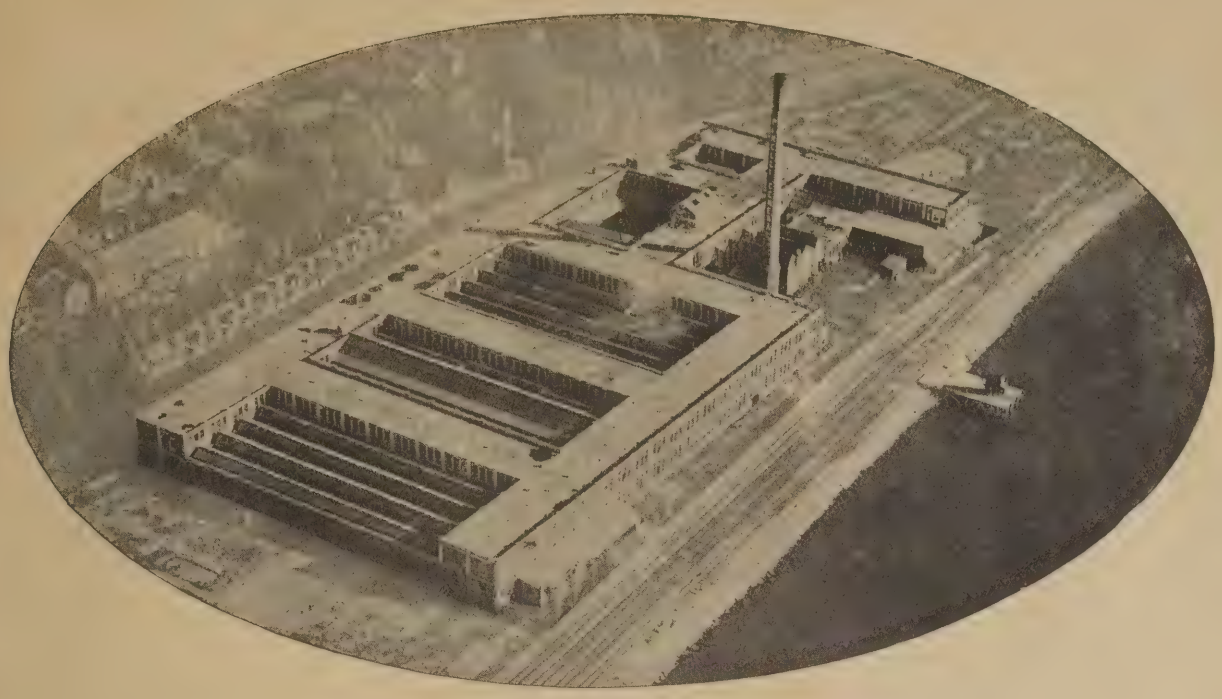
NEW YEAR 1926

To all our friends in the Electrical and allied Industries we extend our most Cordial Greetings

THE GENERAL ELECTRIC CO., LTD.

Head Office: Magnet House, Kingsway, London, W.C. 2.

BRANCHES THROUGHOUT GREAT BRITAIN AND IN ALL THE PRINCIPAL MARKETS OF THE WORLD.



Aerial view of the Pirelli-General Cable Works, Southampton.

Now that Christmas is with us once more, we take the opportunity this space affords to wish all our customers

A very happy Xmas

and

A Bright & Prosperous New Year.

TELEPHONE: SOUTHAMPTON 2141 (3 LINES).

PIRELLI-GENERAL

CABLE WORKS LTD.

Southampton.

TELEGRAMS: "PIGEKAYBEL SOUTHAMPTON."



For strong, brilliant illumination entirely free from glare and hard shadows, sell white-sprayed OSRAM Gasfilled Lamps —White OSRAMS for fittings where the filaments of the lamps are exposed to the eyes, and Bowl-sprayed OSRAMS (75 watts to 500 watts) for use with top reflectors.

WHITE-SPRAYED

Osram
G.E.C

GASFILLED LAMPS

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C. 2.

DISPLAYED ADVERTISEMENTS

ADVERTISERS will please note that NEW COPY and ALTERATIONS to existing Advertisements (with Blocks) should reach here not later than

THURSDAY MORNING

OF THE WEEK PREVIOUS TO ISSUE.

OFFICIAL NOTICES, PATENT NOTICES, SITUATIONS VACANT, SITUATIONS WANTED, PARTNERSHIPS, AGENCIES, ARTICLES FOR SALE, ARTICLES WANTED, ETC.

Latest Time 5 p.m. TUESDAY.

The ELECTRICAL REVIEW is the recognised Medium of the Electrical Trades, and has BY FAR THE LARGEST CIRCULATION of any Electrical Industrial Paper in Great Britain.

FOREIGN AGENTS for the "ELECTRICAL REVIEW."

AUCKLAND, N.Z: Gordon & Gotch, Albert Street; Tait Book Co., P.O. Box 892; R. Hill & Son, Matlock House, 33/34, Quay Street; Trade Publications Co., 302, N.Z. Insurance Buildings, Queen Street.

BERLIN: Hubert Hermanns, Friedrichstr. 218. S.W.48; "Kniga" Kurfurstenstr. 79. W.62; Uberseeverlagsanstalt. G.m.b.H. Leipziger Strasse 101/102. W.8.

BOSTON, MASS., U.S.A.: F. W. Faxon Co., 83, Francis Street, Back Bay; Herman Goldberger, 110, High Street; W. H. Guild & Co., 120, Tremont Street.

BRISBANE: Gordon & Gotch, Queen Street.

CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.

DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.

HELSINGFORS (Finland): Akademiska Bokhandeln.

GOETTINGEN (Germany): A. R. Pillai & Co.

JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.

LAUNCESTON: Gordon & Gotch, Cimitiere Street.

MADRID: Editorial "Voluntad" S.A. Serrano 48.

MELBOURNE: Tait Book Co., 39, Queen Street; Gordon & Gotch, Queen Street; "Australasian Electrical Times," 312 Flinders Street; Commonwealth Magazine Agency, 294, Little Collins Street; G. Jervis Manton, 420, Little Collins Street.

MILAN: Fratelli Treves.

NANCY: Librarie Berger Leviaul. 18, Rue des Glacis.

NAPLES: Libreria Fratelli Treves, Via Roma, 258.

NEW YORK: D. Van Nostrand, 8, Warren Street; Crowley, The Magazine Man, Inc., 511, E.164th Street.

PARIS: Boyveau & Chevillet, 22, Rue de la Banque; E. Le Francois, 91, Boulevard St. Germain.

PERTH, W.A.: Gordon & Gotch, William Street.

PRAGUE (Czechoslovakia): Fr. Rivnac, Librarie, Na Prikope 21; F. Topic.

ROME: Ditta P. Maglione & C. Strini, 88, Via Due Macelli.

SYDNEY: Tait Book Co., 273, George Street; Gordon & Gotch, Pitt St.; Commonwealth Magazine Agency, 183, Pitt Street; H. A. Goddard, 255a, George Street.

STOCKHOLM: Allmanna Tidningskontoret, Gustav Adolfs Torg.

TOKYO: Maruzen Co., Ltd., 11-16, Nihonbashi-Tori-Sanchome.

TORONTO, ONT.: Wm. Dawson and Sons, Ltd., Manning Chambers; Gordon & Gotch, 132, Bay Street.

WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

ZURICH: E. Rascher & Cie, Rathausquai 20.

THE

ELECTRIC TRAMCAR HAND-BOOK,

for Motormen, Inspectors and Depot Workers.

By W. A. AGNEW.

Eighth Edition. ***3s. 6d.*** net. Post Free ***3s. 8d.***

THE ELECTRICAL REVIEW, Ltd., 4, Ludgate Hill, London, E.C.4.

ILLUSTRATIONS!

BLOCKS intended for use in the advertisement pages of the "Electrical Review" should not exceed 100 screen.

ELECTRICAL

PARTNERS and PARTNERSHIPS

can be obtained through

WHEATLEY KIRK, PRICE & CO.

(Established 1850).

46, Watling Street, London, E.C. 4.

16, Albert Square, Manchester.

26, Collingwood Street, Newcastle-on-Tyne.

SITUATIONS VACANT.

Latest time for receiving, 5 p.m. Tuesday.

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

Original Testimonials should never be sent.

COUNTY BOROUGH OF WALLASEY.
Tramways and Motors Department.

ROLLING STOCK AND WORKS SUPERINTENDENT.

THE Tramways Committee are prepared to receive applications for the position of Rolling Stock and Works Superintendent.

Applicants must be thoroughly qualified engineers with experience in a similar capacity, and be fully conversant with all details of electric tramcar building and repairs. Commencing salary £300 with house and light, rising to £350, subject to a reduction of 3 per cent. in accordance with the provisions of the Council's Superannuation Scheme.

The person appointed will be required to pass a medical examination, and to devote the whole of his time to the duties of the office.

Applications must state full particulars of qualifications, present position, past experience, and enclose copies of not more than three recent testimonials.

Applications to be endorsed "Rolling Stock Superintendent," addressed to the undersigned, and forwarded through the post so as to be received not later than Monday, the 11th January, 1926.

By Order,
GEO. LIVSEY,
Town Clerk.

Town Hall, Wallasey.
December 16th, 1925. 3802

PETERBOROUGH CORPORATION.
Electricity Department.

THE services of an Engineer Clerk-of-Works are desired to superintend the construction of the new electrical power station at Peterborough. Only applications from candidates having considerable experience in the actual construction of modern power stations will be considered, and the application should state fully the qualifications and experience in this particular class of work of the candidate. It should also state the salary required.

The appointment will be for approximately twelve months, and the selected candidate will act as an assistant to and under the control of the City Electrical Engineer.

Applications, endorsed "Clerk-of-Works," should be addressed to the City Electrical Engineer, Albert Place, Peterborough, and will be considered on approximately January 1st.

3752

COUNTY BOROUGH OF NEWPORT.
Electricity Department.

REQUIRED immediately, Switchboard Attendants for power station. Wages, £3 6s. 7½d. per week of 48 hours and subject to adjustment under the D.J.I.C. (Electricity Supply) Schedule. Only experienced operators who have been employed on d.c. and extra high tension three-phase switchboards need apply. Applications with testimonials (copies only) should be sent in at once to the undersigned.

A. NICHOLS MOORE, M.I.E.E.,
Borough Electrical and Tramways Engineer.

Town Hall,
Newport, Mon.
December 18th, 1925. 3808

SITUATIONS VACANT.—*Continued.*

BECKENHAM URBAN DISTRICT COUNCIL.

Electricity Department.

APPOINTMENT OF ASSISTANT CLERK (MALE).

APPLICATIONS are invited for a Clerk in the Offices of the above Department at a commencing salary of £85, rising by annual increments of £10 to £125, plus temporary bonus on the Civil Service scale, at present amounting to £63 15s.

Candidates, who should be approximately 22 to 30 years of age, must hold a certificate of one of the recognised Examination Boards, must be shorthand typists, and have had experience either in a similar electric supply office, or in that of a wiring contractor.

The successful candidate will be required to pass a medical examination, and must contribute towards the Council's Superannuation Scheme, now under consideration, should such come into being.

Applications, in the candidates' own handwriting and accompanied by copies of recent testimonials, should be delivered to the undersigned not later than Saturday, January 2nd, 1926.

J. E. TAPPER,
3820 Engineer and Manager.

LYME REGIS BOROUGH COUNCIL.

ASSISTANT Engineer required in Electricity Department. Must be capable of taking "Shift" duty in a semi-Diesel three-wire station; must also have some mains experience and be capable of jointing l.t. cables.

Reply, stating age, wages required, and enclosing copies of testimonials to

A. BROWN, A.M.I.E.E.,
Borough Electrical Engineer.
Lyme Regis. 3807

CAPE TECHNICAL COLLEGE, CAPE TOWN.

APPLICATIONS are invited for the post of Senior Lecturer in Engineering at the above College. Commencing salary according to experience.

Applications in duplicate on the prescribed forms (to be obtained from the undersigned) will be received up to the 10th January. They should be accompanied by certified copies of testimonials of practical and teaching experience, and should state age of applicant. The appointment will be subject to Conditions of Service, a copy of which will be supplied on application.

Applications and enquiries should be addressed to Messrs. Chalmers, Guthrie & Co., Ltd., 9, Idol Lane, London, E.C.3. 3801

ELECTRICAL TRADES UNION.

Hackney Borough Council.

THE Hackney Borough Council has been declared "Black." Before any member of the Electrical Trades Union can accept any employment, either directly or indirectly, for this Council he must first obtain permission from the London District Committee of the Electrical Trades Union.

W. J. WEBB,
3121 London District Secretary.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

ACCUMULATORS.—Wanted, an Inspector with indoor and outdoor experience with stationary and portable accumulators. One willing to make himself generally useful in test room and workshops.—State age, experience and salary, to 3768, Electrical Review, 4, Ludgate Hill, London.

APPLICATIONS in writing are invited for the post of Clerk of the Works to supervise the installation of d.c. electric lighting in a London Workhouse, work commencing immediately. Applicants should state age, experience, and salary required, and give names of three references.—A. H. S. Waters, M.Inst.C.E., M.I.Mech.E., Consulting Engineer, 63, Temple Row, Birmingham. 3822

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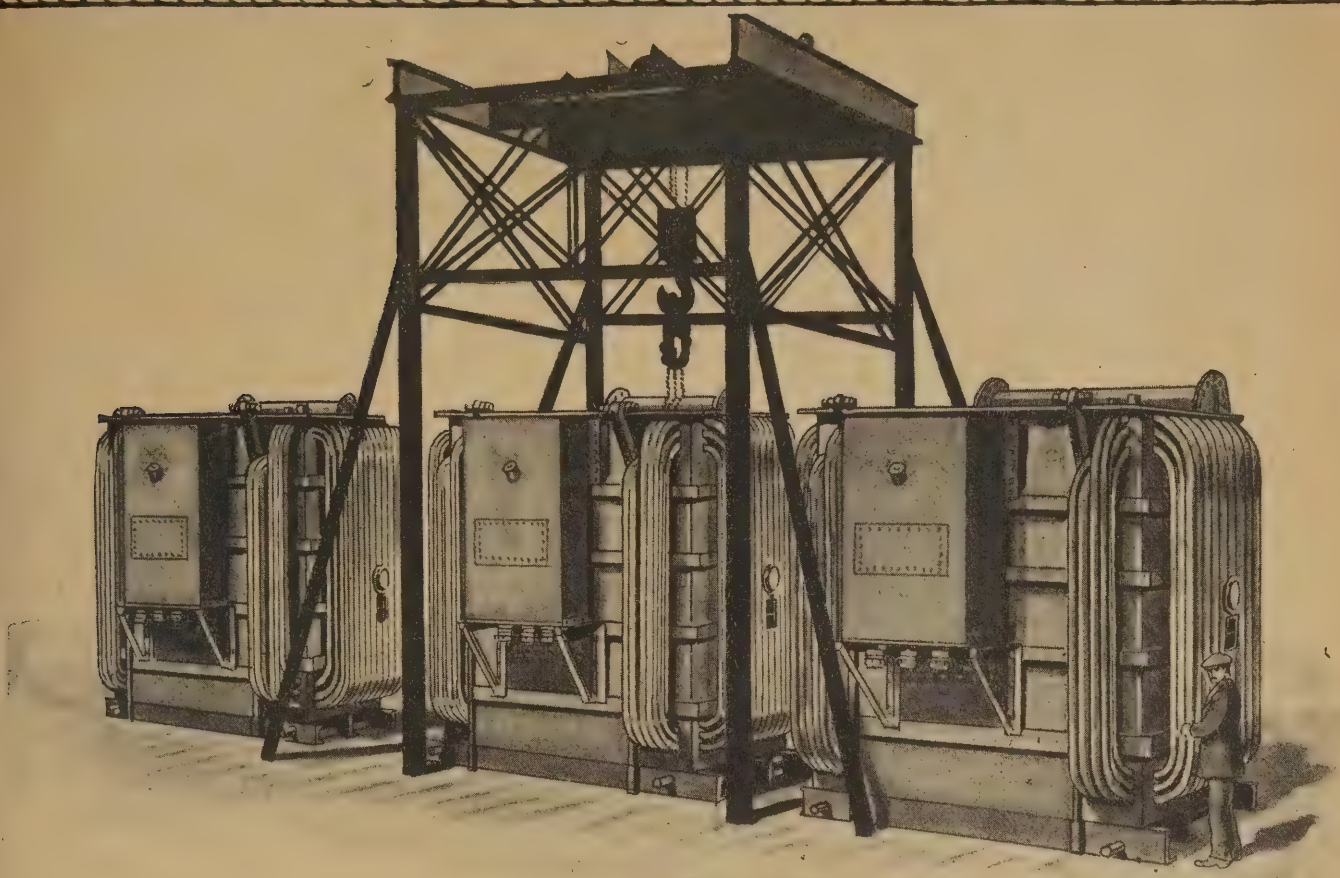


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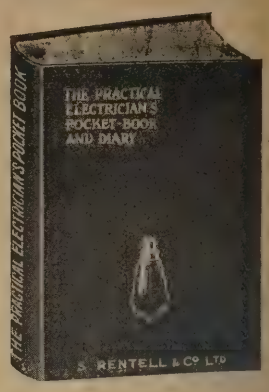
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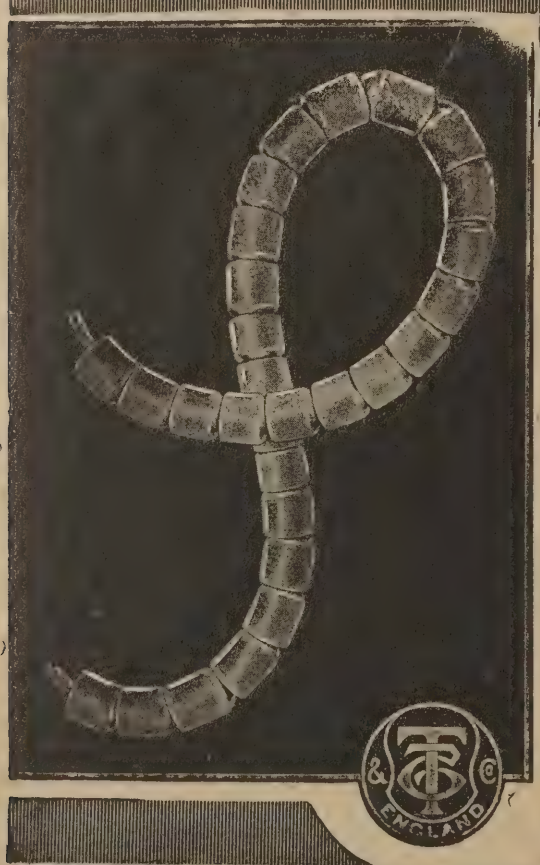
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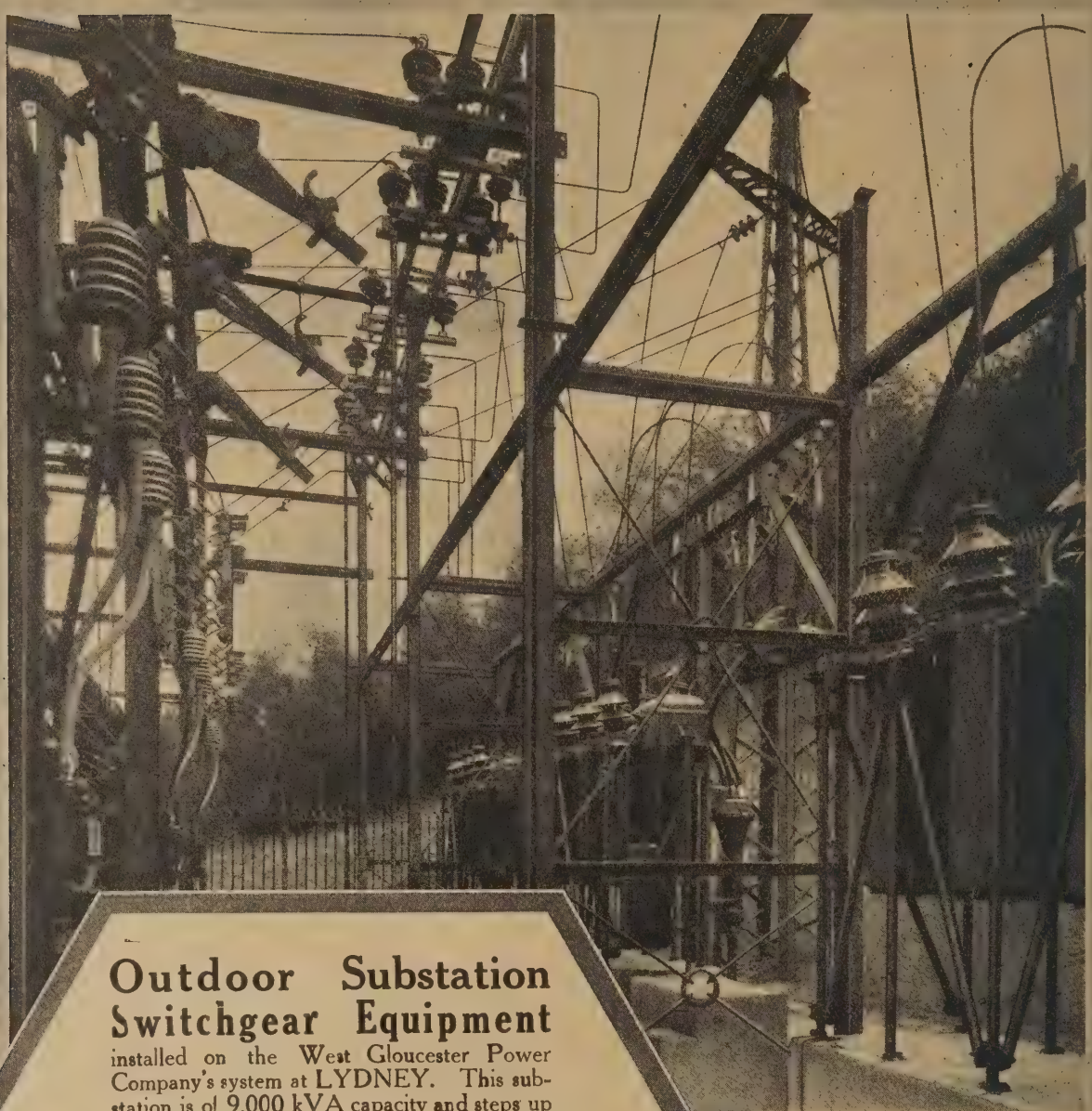
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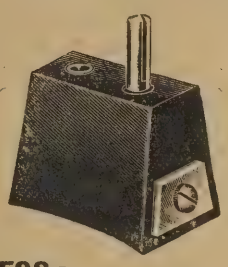
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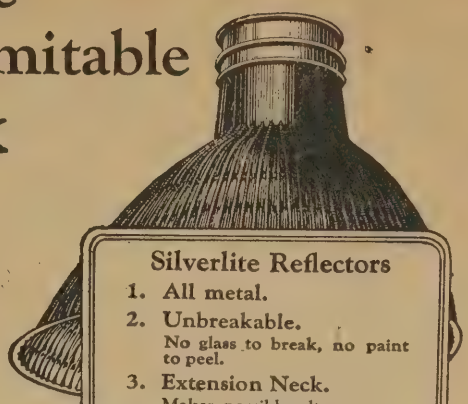
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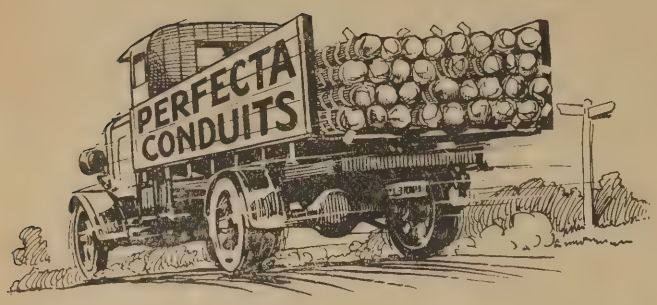
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EDISON SWAN ELECTRIC CO., LTD.

Forty-second Annual Meeting.

THE 42nd ordinary general meeting of the company was held on December 16th at the Cannon Street Hotel, E.C., the Chairman of the Company (Mr. C. F. Spencer) presiding. The Secretary having read the notice convening the meeting, the Chairman rose to move the adoption of the directors' report and accounts. In the course of his speech Mr. SPENCER said that there were two meetings to be held, but he would deal with the whole of the business at once. The authorised capital of the company was £432,565 8s. 0d., of which £141,130 was in shares of £1. It was proposed to convert these shares into 4s. shares to have the whole of the ordinary shares of the same denomination. It was also intended to modernise the Articles of Association. There were two classes of debenture stock and of this £248,579 of the first debentures was outstanding, as well as £55,034 of second debentures, apart from £200,000 of second debenture stock which was lodged with their bankers as security for a loan. It was quite likely that under a scheme of arrangement between the debenture holders, the Board would endeavour during the current year to consolidate the then outstanding debenture stock of both classes, and thus effect a reduction of loan charges. Their bankers, the National Provincial Bank, Ltd., had been a tower of strength to them during the past three years. The amount owing to the Bank had been reduced from £314,150 to £110,000, since November, 1922, when the present Board took office. In addition to decreasing the floating debt they had reduced the long-term first and second debenture stock by £26,606. Sundry creditors and credit balances showed an increase reflecting the increased trade enjoyed by the company during the year. The reserve account stood at £80,000 at the close of the last year and it was proposed to add a further sum of £50,000. The aims of the Board had been to rapidly discharge the loan obligations and to build up an adequate reserve fund. Debt had been discharged to the extent of £230,756, and this would be further augmented shortly by further utilisation of the sinking funds. The reserve, amounting to £130,000, could not be considered entirely inadequate. After paying the preference dividends and one of 10 per cent. on the ordinary shares, and transferring £50,000 to reserve, there remained £11,700 18s. 9d. to be carried forward as compared with £17,575 1s. brought in. In augmenting the reserve and carry forward they were endeavouring to consolidate the finances of the company. The item "Patents, goodwill, &c.," had been written down by the amount of the debentures redeemed during the year, *viz.*, £26,606, and it was hoped to further reduce the item. Referring to the company's products, the Chairman said that the "Fullolite" glareless lamp had become very popular, as had their radio sets and valves. He asked shareholders to use and recommend "Ediswan" goods. The investments at cost included at least one item, shares in another company, which was worth twice the amount set down. The fixed assets showed little change except that motor vehicles had been purchased to strengthen the company's distribution system. The amount set down for sundry debtors (£194,158 16s. 8d.) might be considered as wholly collectible. With regard to the current year, Mr. Spencer said that the profits to November last were quite satisfactory, and they were getting a satisfactory share of the available trade. They had continued their policy of reviewing the company's activities and economies had been effected by reducing both productive and non-productive expenditure. Although the company was on the road to prosperity there was one factor which might react unfavourably upon its business, in common with that of other concerns; that was the subsidised competition of foreign manufacturers. The subsidy took the form of depreciated exchanges; lower taxation; the evasion of payment of war debts on which we had to pay interest; the installation of machinery and plant at low capital cost; and the longer hours worked by their operators. The foreign manufacturer's standing charges were lower than ours. These were stubborn facts which had to be faced. There was, however, some reason for hope. The Treaty of Locarno was bound to help in the restoration of confidence in Europe, and confidence was the backbone of trade. The return to the Gold Standard and the raising of the ban upon foreign loans were also of assistance. Many of our purchasers required a loan before they could buy our goods. The subject of foreign competition was one on which employers and workers should co-operate to combat, for both were equally affected by it. In conclusion, the Chairman paid a tribute to the zeal and interest manifested by the staff. The report and accounts were adopted.

Mr. A. F. BERRY (Vice-Chairman) moved that the Chairman be granted £5,000 in recognition of his exceptional services, stating that his work had been enormous. Mr. Spencer, he said, had become actually obsessed with the company's affairs, and this was but a small tribute to his energies. Mr. JOHN CROSS (director) seconded the resolution, which was carried unanimously. Mr. SPENCER briefly acknowledged his thanks. The retiring directors, Messrs. Berry and Cross, and the auditors, Messrs. Broads, Paterson & Co., were re-elected.

At the subsequent extraordinary meeting resolutions were approved for dividing the unissued £1 shares into five shares of 4s. each; and for altering the Articles of Association. The meeting concluded with a vote of thanks to the Chairman.

3799

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(a) One 50,000 lb. Water Tube Boiler, complete with Economiser, forced and induced draught, &c.
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Tenders enclosed in a sealed envelope endorsed "Tender for Boiler Plant" or "Tender for Generating Plant," as the case may be, and addressed to the Chairman and Members, Electricity Committee, must be delivered at the offices of the Electricity Supply Department, Coronet Street, Shoreditch, N.1, not later than noon on Wednesday, January 27th, 1926.

Only tenders from British firms will be considered.

The Council do not bind themselves to accept the lowest or any tender.

W. WEEKES,
Borough Electrical Engineer.

Electricity Department,
Coronet Street, Shoreditch, N.1.
December 21st, 1925. 3804

PARISH OF LAMBETH BOARD OF GUARDIANS.

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THE Guardians of the Poor of the Parish of Lambeth desire to receive tenders for the supply from time to time, as wanted, of Incandescent Electric Lamps during the twelve months commencing on the 1st January next.

Printed forms of tender (with conditions annexed, which alone will be received) may be obtained at these offices any day (except Saturday) between the hours of ten and five. Tenders must be sent by post or placed in the box provided for their reception in the office of the Clerk to the Guardians on or before Tuesday, the 5th January.

The Guardians do not pledge themselves to accept the lowest or any tender.

By order of the Guardians,
JAMES L. GOLDSPINK,
Clerk.

Board Room and Offices,
Brook Street, Kennington Road, S.E.11.
December 16th, 1925. 3811

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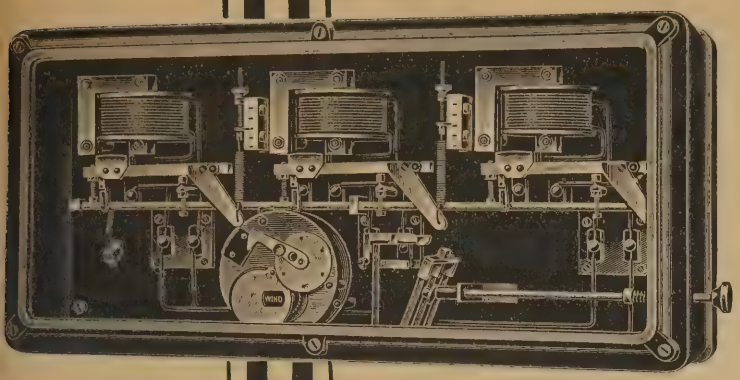
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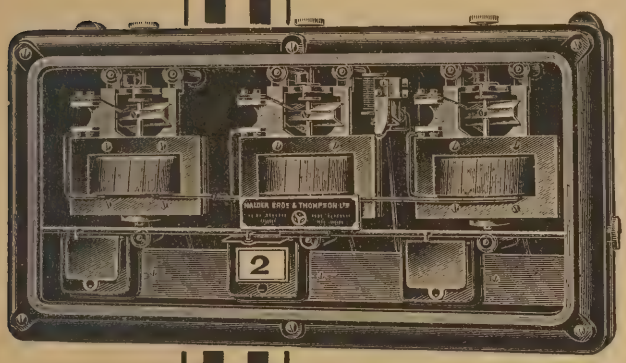
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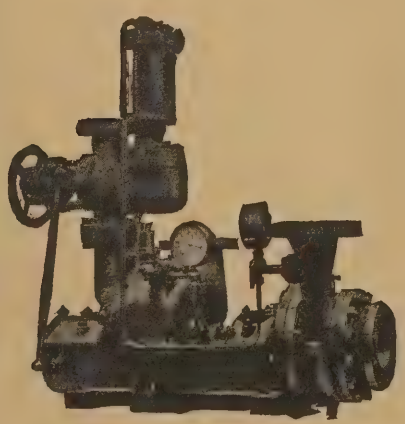
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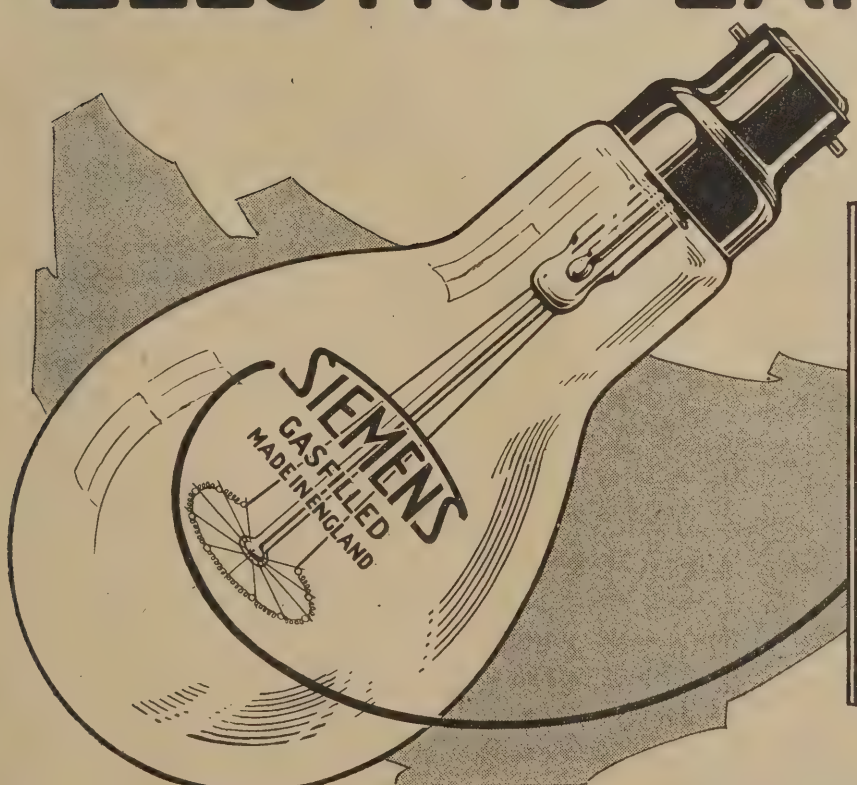
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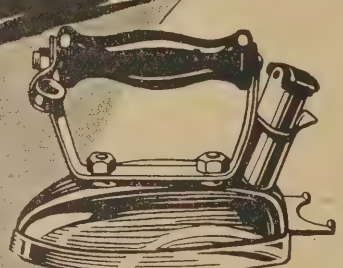
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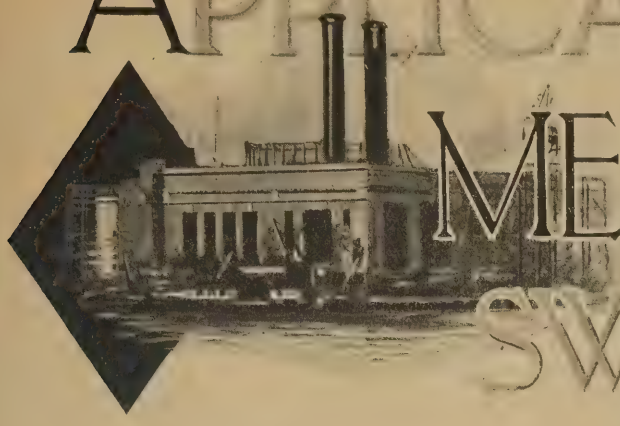
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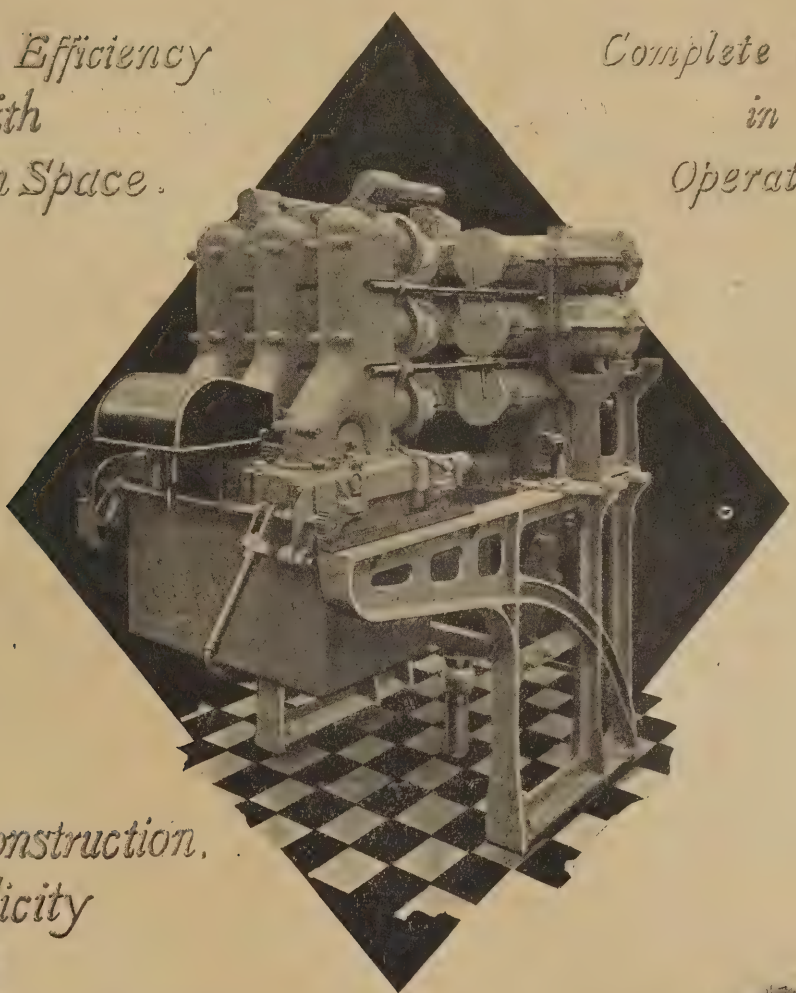
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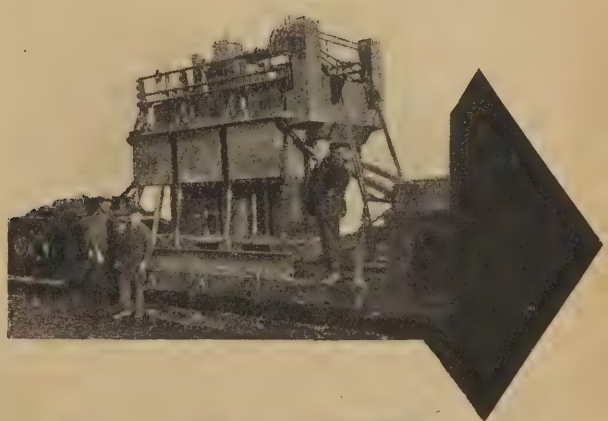


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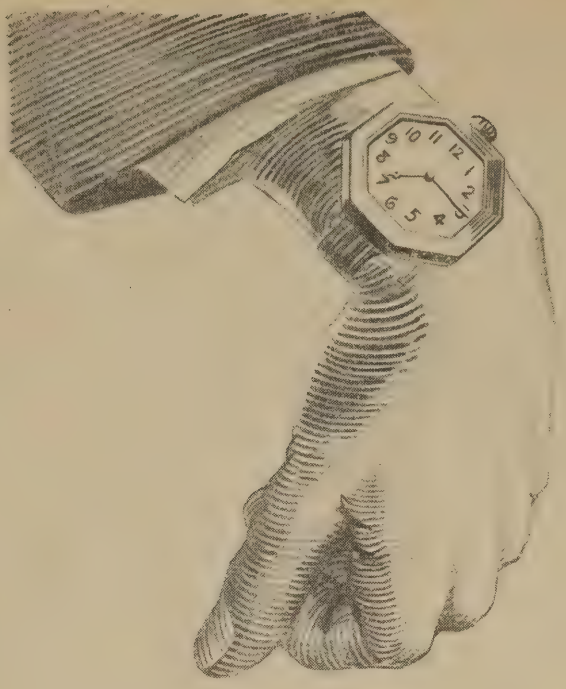
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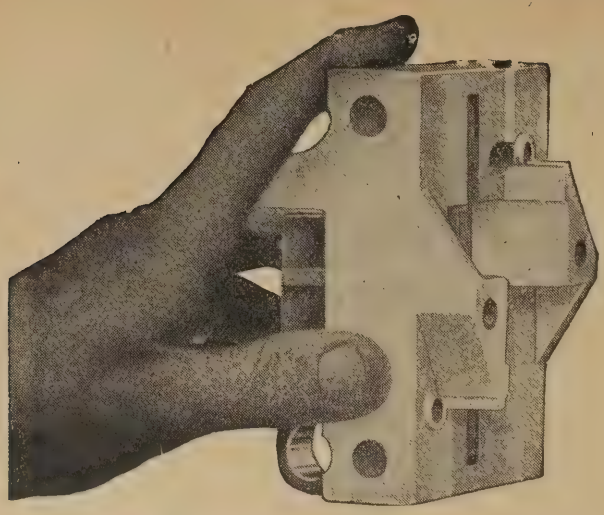
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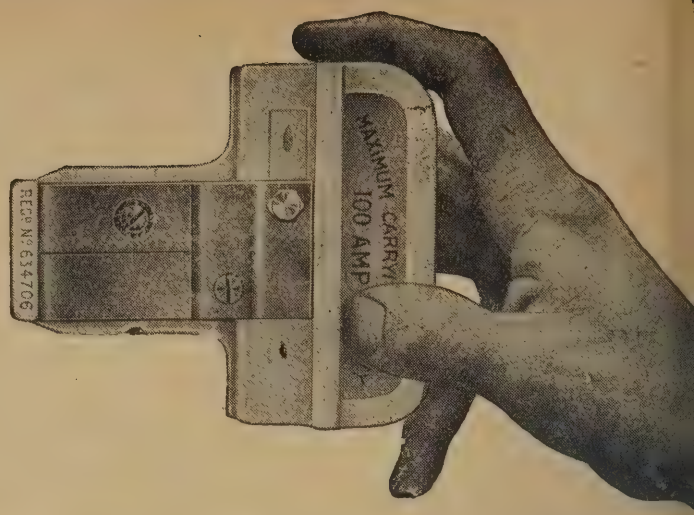
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N.B. Every part of the "Fluvent" Fuse and base is accurately manufactured to gauge. Any "Fluvent" Fuse bridge will make perfect contact in any "Fluvent" base.

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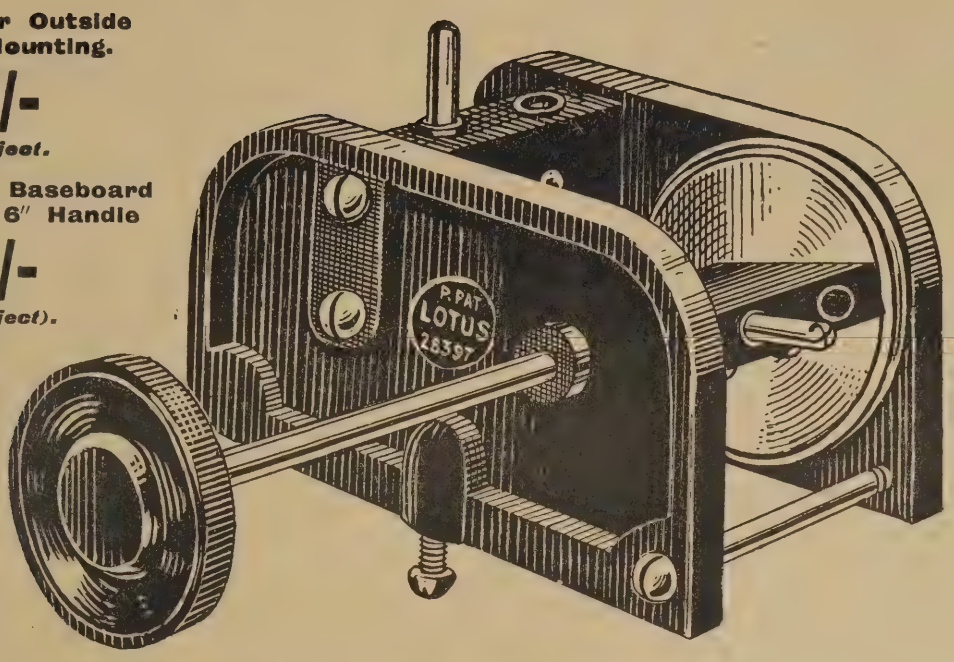
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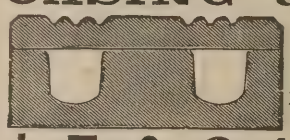
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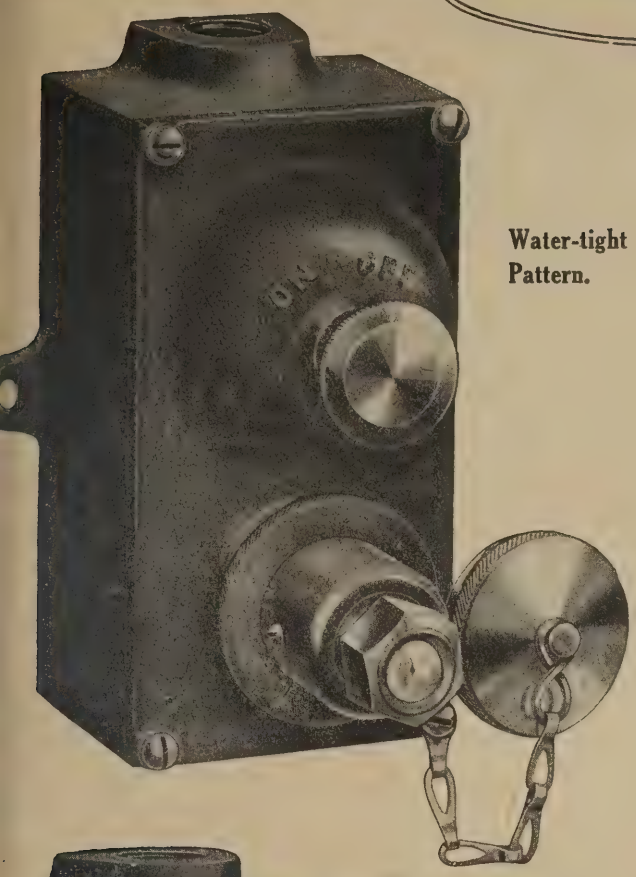
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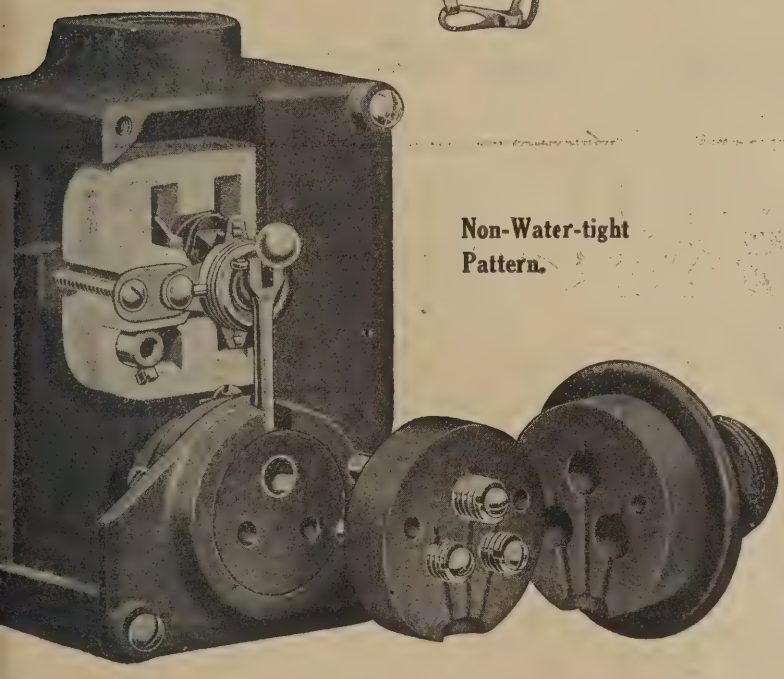
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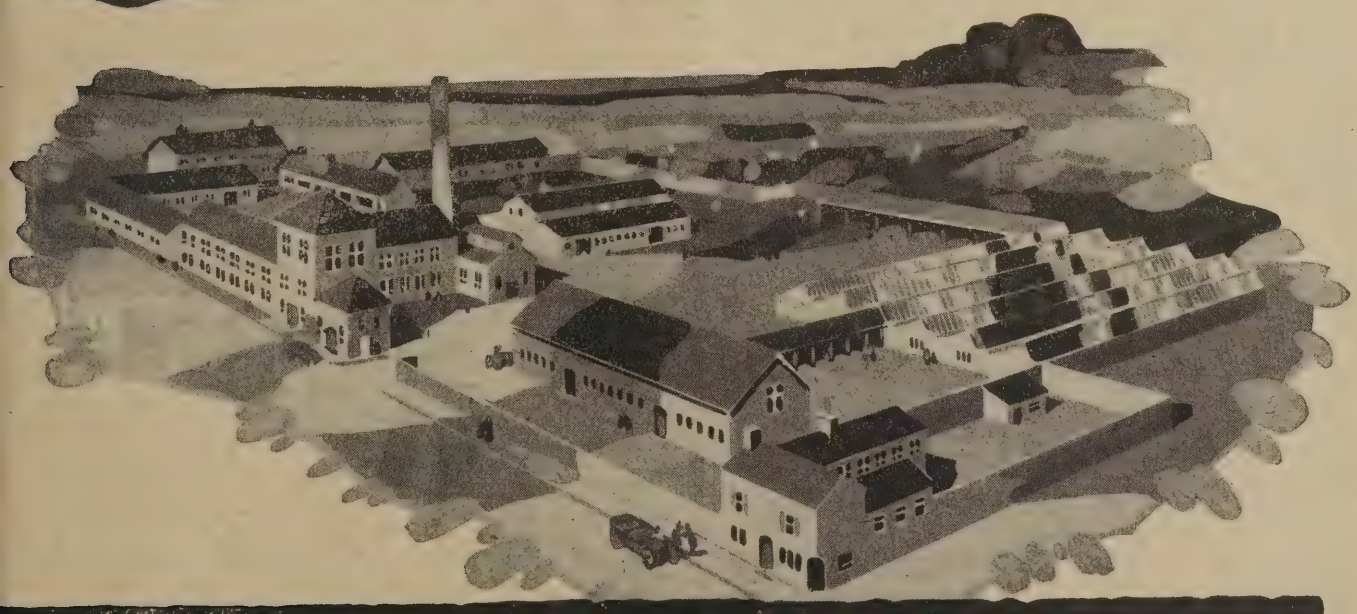
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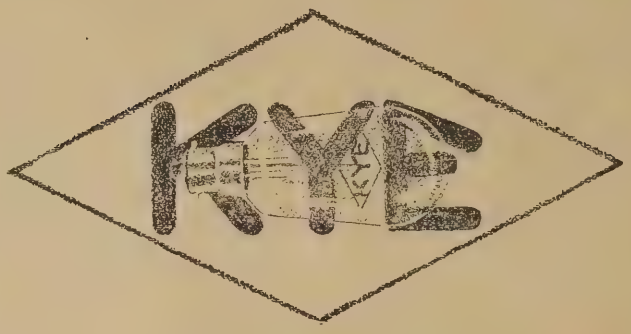
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For both IN and OUTDOOR USE

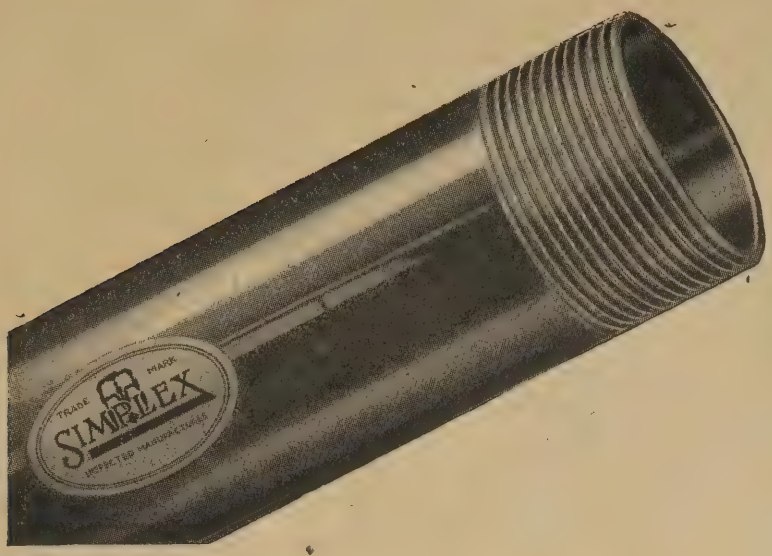
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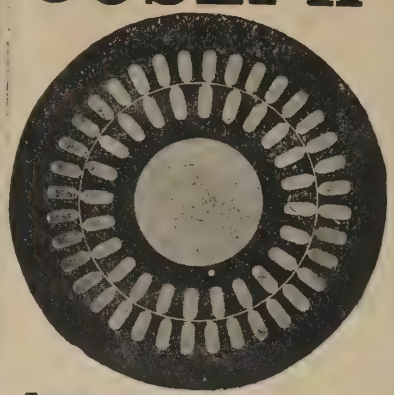
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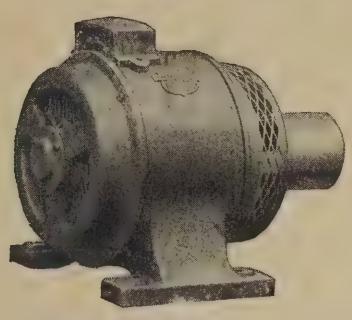
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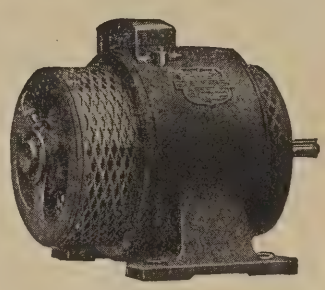


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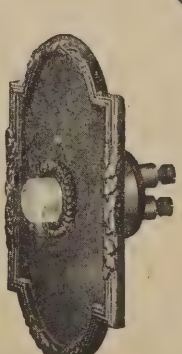
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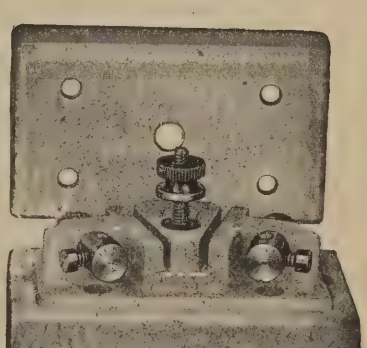
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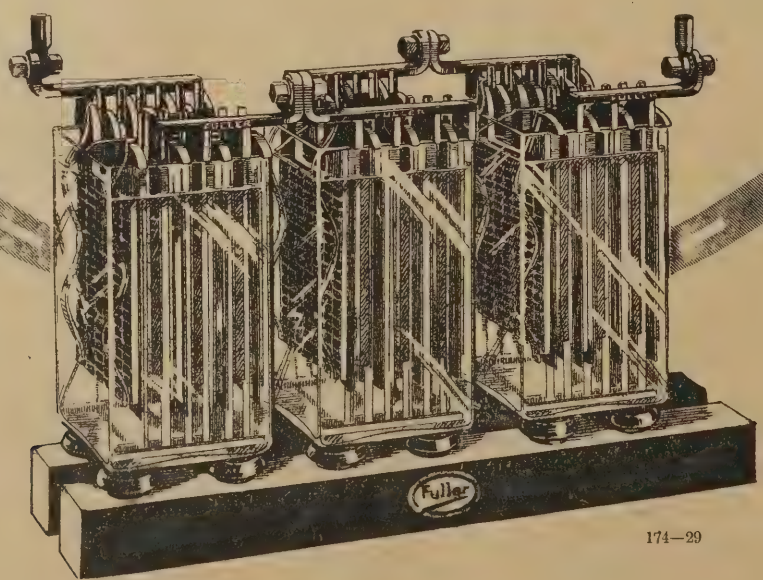
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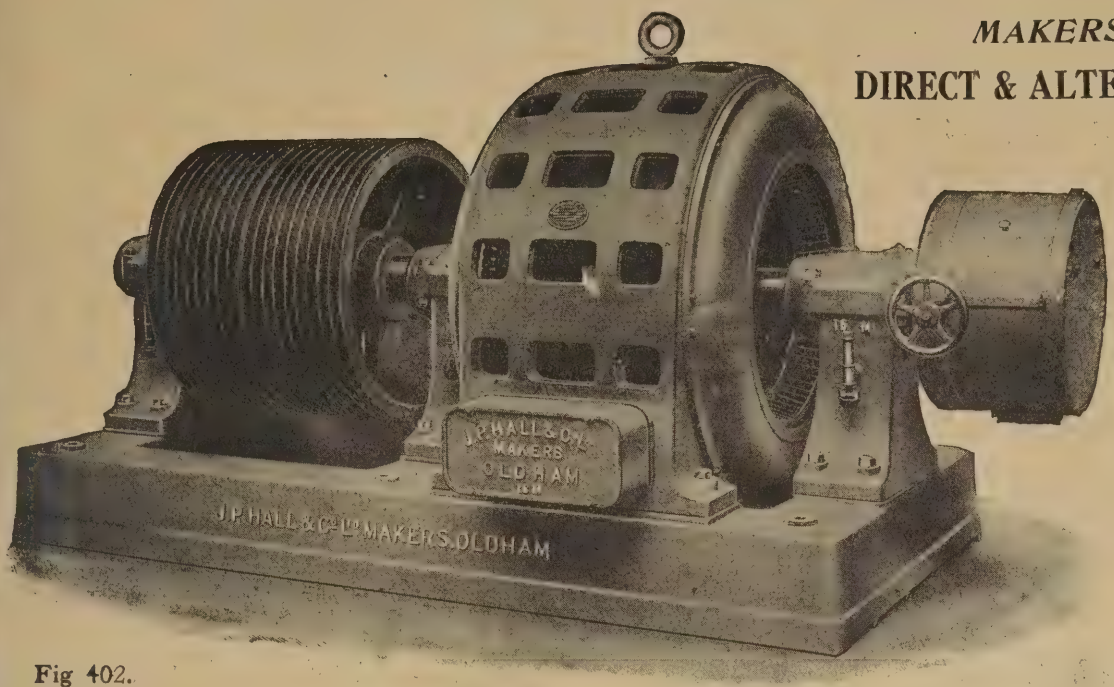


Fig 402.

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Special Motors for Crane Service.

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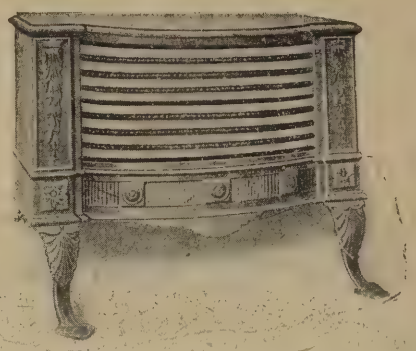
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SUNCO ELECTRIC FIRES

The extraordinary demand has severely strained our manufacturing resources, and in the case of certain models we are unfortunately behind in delivery. We are glad to advise the trade that all models illustrated and described in this advertisement can be supplied in any standard voltage

from stock

In addition to the increasingly popular Sunco Electric Fires we can also supply all listed Bowl Fires and many of the fires manufactured by Cosmos, Belling, Magicoal, Heatrae, Premier, also from stock.



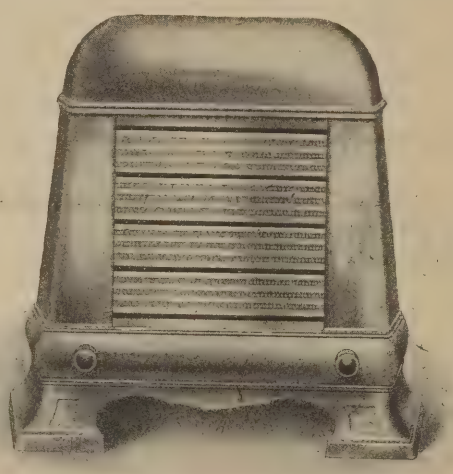
SUNCO FIRE
Adam 2 Bar.

A one kilowatt fire of pleasing design, with applied ornaments. The finish and workmanship is exceptional. Two heat control.

Ref. No. H 3060. Black Enamel.
£2 : 0 : 0 (3x).

¶ A fire of similar size but designed on Jacobean lines, without applied ornaments.

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SUNCO FIRE
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A vitreous enamelled fire, designed to prevent the harbouring of dust. Has four heat control. Colours: Chocolate, Dark Green, Grey or Blue.

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SUNCO FIRE
Adam 4 Bar.

The most remarkable fire value this season. Two kilowatt with four heat control. Finished best black enamel with antique silver ornaments.

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THE SUN ELECTRICAL Co. LTD.

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Telephone—Gerrard 9626 *(8 lines).* *Telegrams—Secabilis, Westcent, London.*

BRANCHES—**112, Pilgrim Street, Newcastle-on-Tyne. 29, Park Place Leeds.**

Printed by the PREMIER LINOTYPING AND PRINTING CO., LTD., 21-26, Dean Street, Fetter Lane, E.C.4, and Published by THE ELECTRICAL REVIEW, LTD., 4. Ludgate Hill London, E.C.4.

The "Super" Box

saves the time and temper of the wireman

The "Super" Box is the most efficient wiring system box produced. It has no loose screws or nuts, requires no special tools for fixing, cannot possibly be fitted up incorrectly, *and makes a perfect automatic bond.* The cover is held in position by one unloseable self-centreing screw. Efficient bonding is automatically produced, and there is no subsequent loosening by vibration.

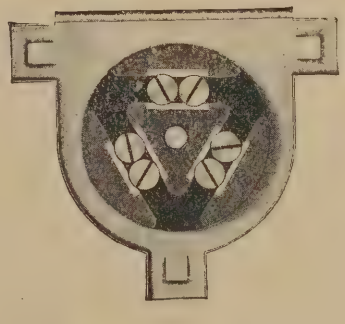
The "Super" Box looks a good box, and it is a good box.

Use it in conjunction with the

HENLEY Wiring System



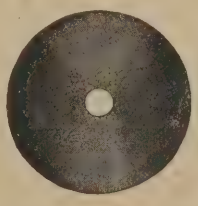
Lid of box, which has unloseable screw permanently attached. The screw is the only thing necessary for closing down the box and bonding the sheathing of the H.W.S. wires.



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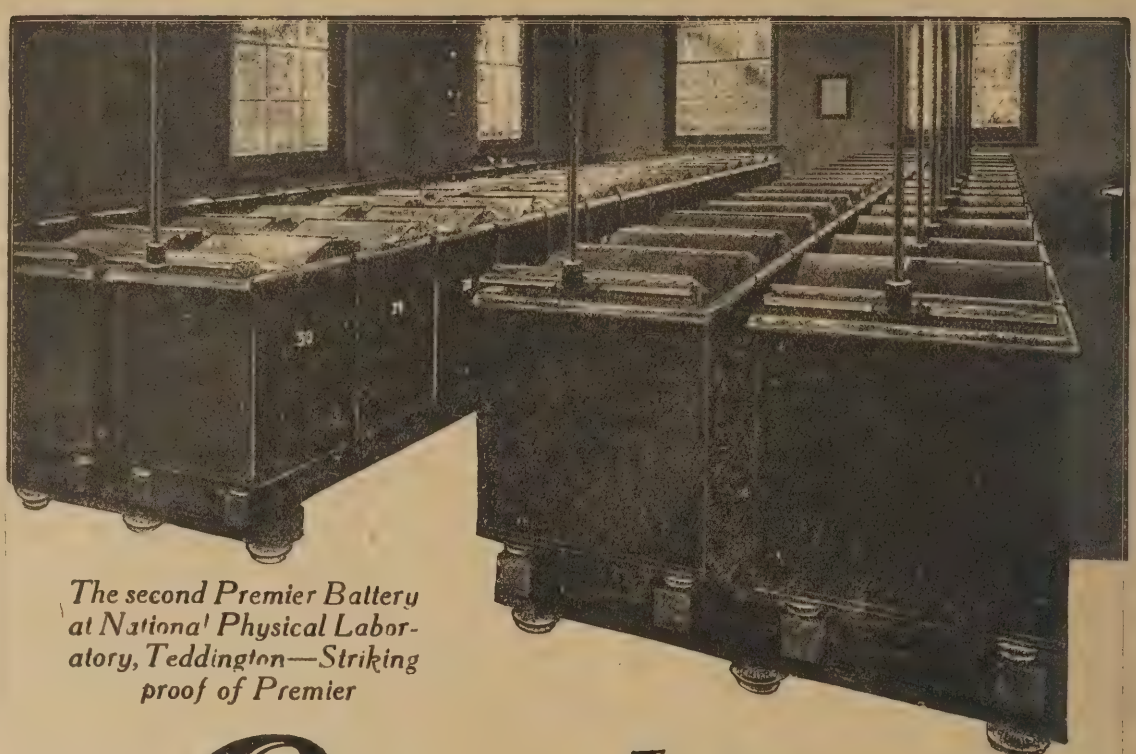
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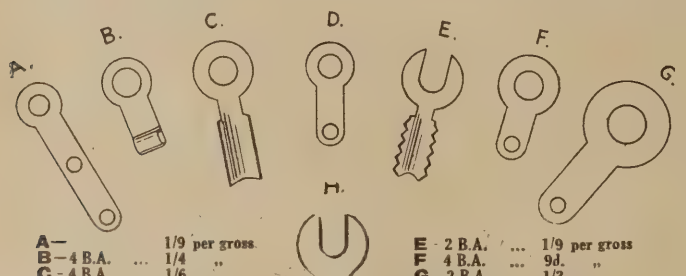
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CONTRACTORS' COLUMN.

[These particulars of new building schemes are published for the use of contractors and others in search of possible electrical business. Every care is taken by our correspondents to ensure accuracy; if alleged errors are reported to the Editors they will be fully investigated.]

AIRDRIE.—Housing scheme (32), Cairnhill; burgh surveyor.
ALTON (HANTS.).—Infirmary; Board of Guardians.
BANSTEAD.—Modernisation of mental hospital; L.C.C. architect.
BATLEY.—40 houses; borough surveyor, Town Hall.
BECKENHAM.—Roman Catholic school, Beckenham Hill; Rev. C. P. Dolman.
BRADFORD.—Shops, Thornton Estate; Mr. W. Goldthorpe.
BRAMPTON BIERLOW (YORKS.).—Housing scheme (57), for Rotherham R.D.C.; surveyor.
BRIDLINGTON.—Bank; secretary, Yorkshire Penny Bank Ltd., Leeds.
BRIGHTON.—Houses on Queen's Park site; Drever & Son. Housing scheme, Beershop Fields site; Mr. Fredk. Musto.
BUXTON.—Housing scheme (40), Heath Grove estate; F. Langley, borough engineer and architect.
CARSHALTON.—Housing scheme, 8,000 houses; L.C.C. architect.
CHESTERFIELD.—Extensions, Portland Works, Goir Side Road; Robinson and Sons, Ltd. Housing scheme, St. Augustine's estate; borough engineer.
CLAYGATE (SURREY).—Bank premises, The Parade, for Barclay's Bank, Ltd.
CLITHEROE.—School, Brownlow Street; Secretary to the Education Committee.
COLCHESTER.—Extensions, with shopping arcade, High Street, for John Southern, Ltd., Westcliff, Southend-on-Sea.
COOKSTOWN (ULSTER).—Central school; Secretary, Cookstown Regional Education Committee.
COVENTRY.—Works, Leicester Causeway, for W. Montgomery & Co.
DARTFORD.—Housing scheme (118), Lowfield Street estate, for the U.D.C.; surveyor.
DARWEN.—Secondary school; Clerk to the Governors.
DEWSBURY.—Infirmary; T. W. Sharpe, architect.
DUMFRIES.—Housing scheme (28), Clerkhill site, for the T.C.; John Barker, burgh surveyor.
EASTRY (KENT).—Houses (66), Snowdown Colliery, for Pearson & Dorman Long, Ltd.
ECCLESFIELD (SHEFFIELD).—Church and lecture hall (£6,000), for trustees, United Methodist Church.
FAREHAM (HANTS.).—110 houses, Earl's Farm estate; Mr. F. Draper.
GODSTONE (SURREY).—Additional 100 houses, for the R.D.C.; surveyor.
GRAYS (ESSEX).—Houses (68), for the U.D.C.; Triangular Construction Co., Ltd., builders.
HAMILTON.—Housing scheme (72), for the T.C.; burgh surveyor. Municipal slaughterhouse (£16,000), for the T.C.; burgh surveyor.
HARPENDEN (HERTS.).—Church and schools, High Street, for the Wesleyan trustees; the secretary.
HARROGATE.—30 houses, Crab Lane estate; C. E. Rivers, borough engineer, Municipal Offices.
HEREFORD.—Factory; Secretary, Hereford Chamber of Commerce.
HOLBEACH (LINCS.).—Housing scheme (20), for the U.D.C.; S. S. Mossop, jun., clerk.
HORLEY (SURREY).—Works and stores, Thorns Road, for the Economic Filling Stations.
HORWICH.—Housing scheme (50); surveyor to U.D.C.
ILFRACOMBE.—Extensions to secondary schools, for Devon E.C.; county architect, Exeter.
ISLE OF WIGHT.—Housing schemes, Carisbrooke, Freshwater and Shalfleet, for the R.D.C.; R. Jolliffe, architect, Cowes.
KINGSLEY AND NEWTON.—Schools (£10,209), for Cheshire E.C.; H. Beswick, county architect, Newgate Street, Chester.
KNUTSFORD.—Roman Catholic Church; Rev. J. J. Ryan, rector.
LANGOLD (WORKSOP).—Houses (358), for the Firbeck Main Colliery Co.
LEEDS.—Factory extensions, for Heatons (Leeds), Ltd., New York Road and North Street; G. Fredk. Bowman & Sons, architects, Park Row. Housing scheme, Homestead estate, Roundhay; Mr. Henry Lax.
LEXDEN (ESSEX).—Housing scheme, for the Lexden Garden Village, Ltd.; the secretary.
LINCOLN.—Housing scheme (28), St. Giles' estate, for the T.C.; S. C. Baggott, city engineer.
LONDON (WILLESDEN, N.).—Secondary school; Middlesex Education Committee.
(BERMONDSEY, S.E.).—32 houses, Salisbury Street area; borough engineer.
(CATFORD, S.E.).—Buildings, Park Hospital, Hither Green Lane; Mr. T. Cooper, Metropolitan Asylums Board engineer.
(KENNINGTON, S.E.).—Tenements for 900 persons, White Hart Street; L.C.C. architect.
(HAMMERSMITH, W.).—800 houses, Wormholt estate; L.C.C. architect.
(CLAPHAM, S.W.).—34 houses, Poynders Road; Collett Building Co., Ltd.
(STREATHAM, S.W.).—Hospital, Nimrod Road; Wandsworth borough engineer. 35 houses, Budgwood Avenue; Wates, Ltd.
LONGTON (NEAR PRESTON).—Church (£10,000); Rev. L. Evans, incumbent.
MANSFIELD.—Housing scheme (92), Eakring Road site, for the T.C.; Waude Thompson, borough engineer.
MARGATE.—Cottage hospital; borough surveyor.
NUNEATON.—Schools, Manor Park, for the borough E.C.; education architect.
ORPINGTON (KENT).—Offices (£12,500), for Bromley R.D.C.; F. Danby Smith, architect.
OXFORD.—136 houses; city engineer.
PENRITH.—Kinema, Princess Street; J. E. Irving.
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PORTSMOUTH.—Additional 200 houses, for the T.C.; borough engineer.
REIGATE.—Extensions to works, for the Lanston Monotype Corporation, Ltd.
ROCHDALE.—Housing scheme (68), Turf Hill estate; S. H. Morgan, borough surveyor, Town Hall.
SHEFFIELD.—54 houses on Wybourn estate; F. E. P. Edwards, city architect, Town Hall.
SHIPLEY.—Housing scheme (about 280), Windhill; surveyor to U.D.C.
SWANSEA.—150 houses, Maesteg estate; borough architect.
THATCHAM (BERKS.).—Houses (20), for the R.D.C.; House & Denness, builders.
TRURO.—Housing schemes (90), for the R.D.C.; surveyor.
WALTON-LE-DALE.—Housing scheme (100); surveyor to U.D.C.
WARRINGTON.—Housing scheme (58), Salisbury Street, for the T.C.; A. M. Ker, borough engineer.
WATH-ON-DEARNE (YORKS.).—96 Council houses; Tennant & Smith, architects, Ropergate, Pontefract.
WEYMOUTH.—Housing scheme (200); borough engineer.
WINCHESTER.—Housing scheme (42), Bar End site, for the T.C.; borough surveyor.
WOMBWELL (YORKS.).—76 houses, King's Road; D. H. Roberts, architect, Park Street.



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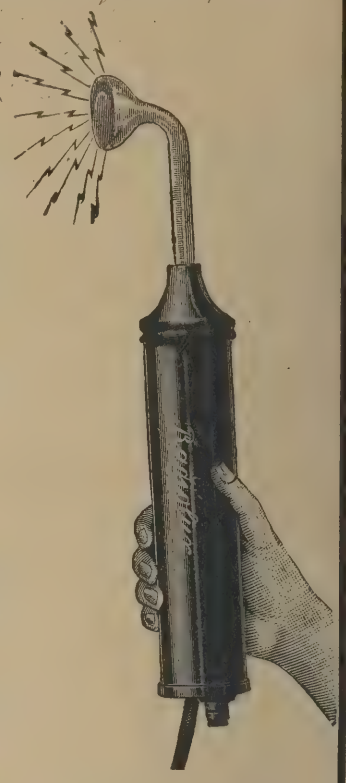
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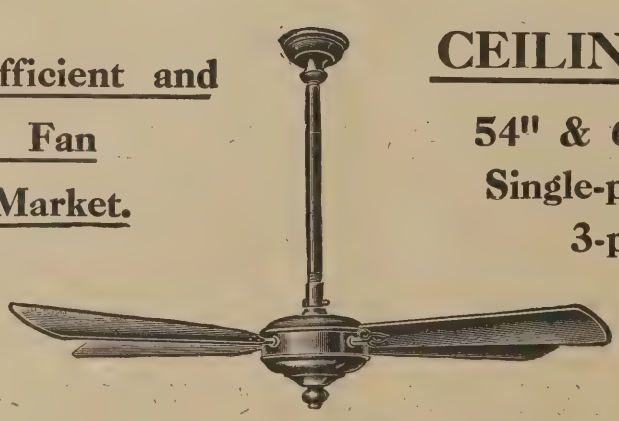
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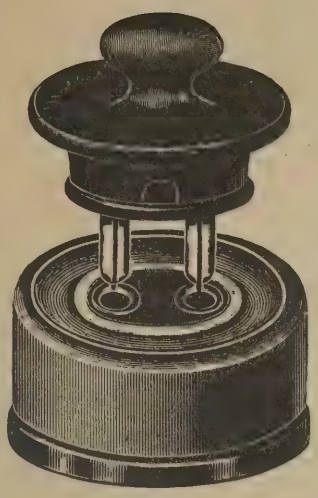
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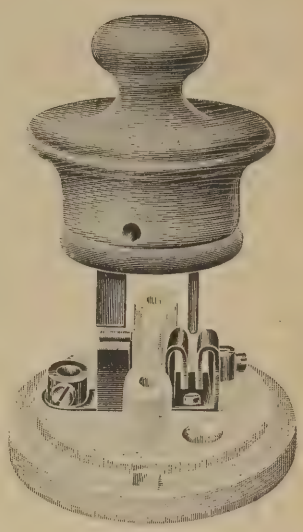
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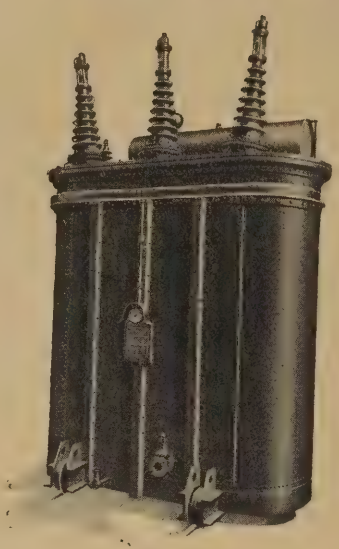
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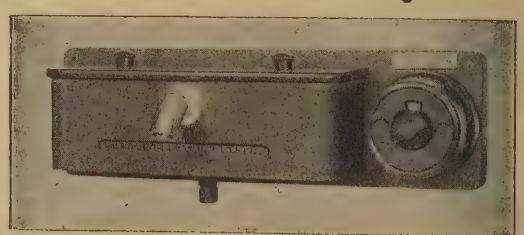
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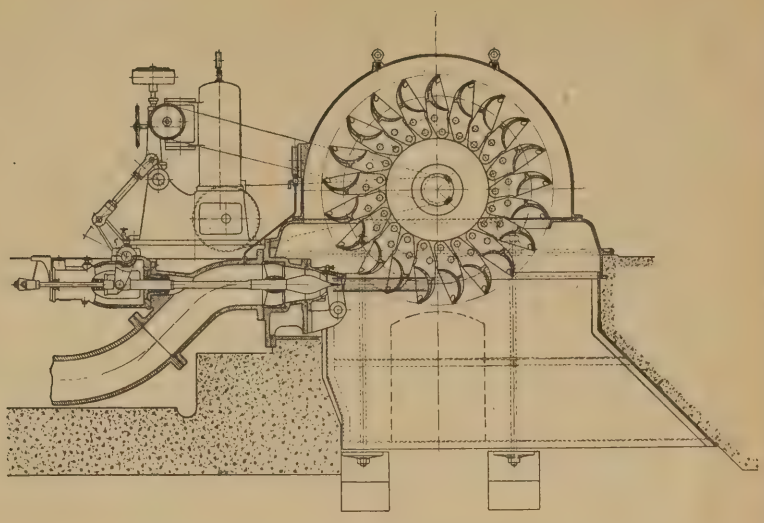
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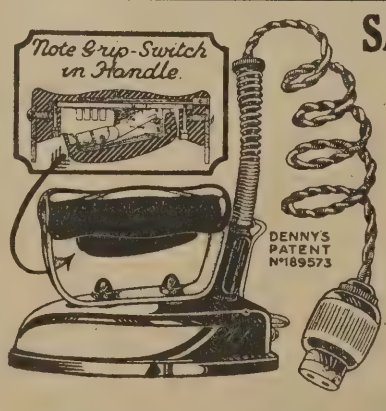
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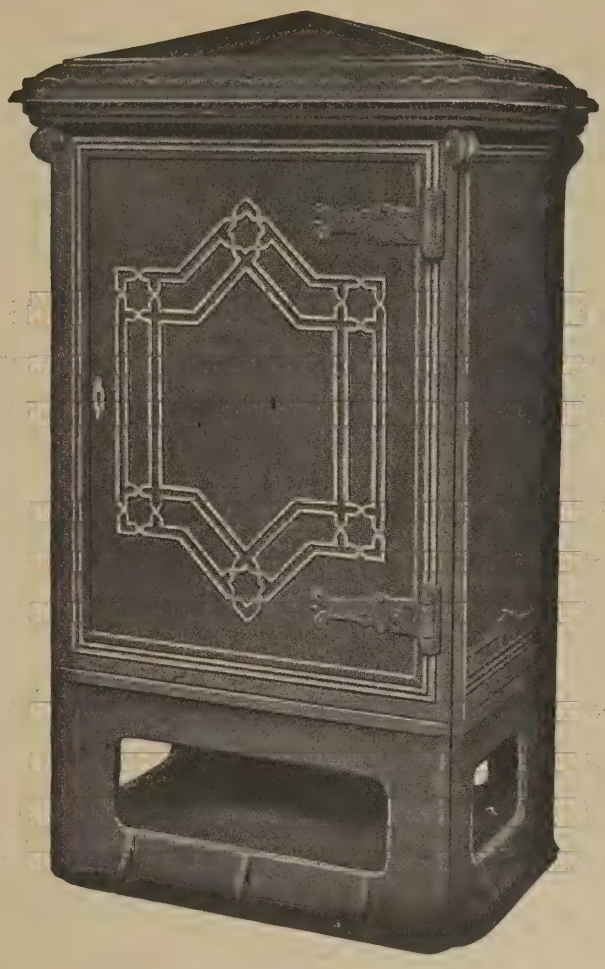
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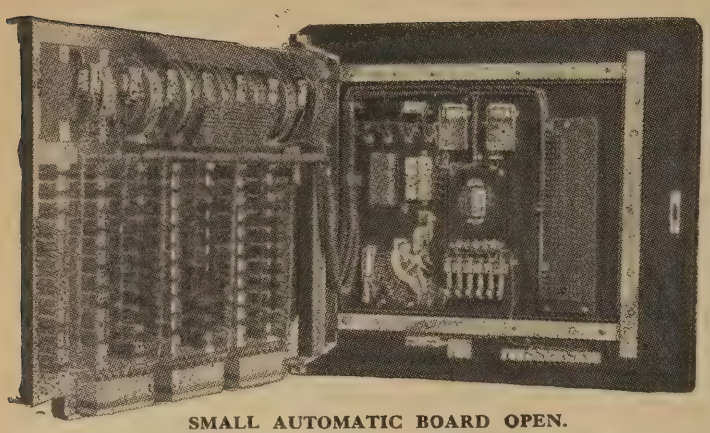
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„ 2a ...	21 × 16 ins. ...	33 × 17 ins.	
„ 2c ...	21 × 18 ins. ...	33 × 17 ins.	$46\frac{1}{2}$ ins.
„ 2b ...	25 × 14 ins. ...	36 × 21 ins.	49 ins.
„ 3 ...	25 × 16 ins. ...	36 × 21 ins.	
„ 3a ...	25 × 20 ins. ...	36 × 21 ins.	
„ 3b ...	31 × 16 ins. ...	36 × 27 ins.	$49\frac{1}{2}$ ins.
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„ 6 ...	42 × 24 ins. ...	61 × 38 ins.	$74\frac{1}{2}$ ins.
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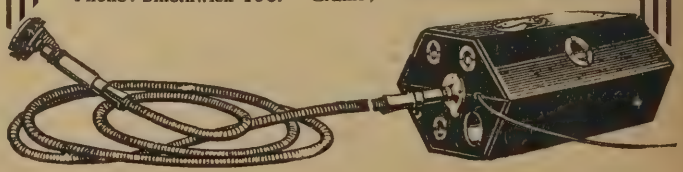
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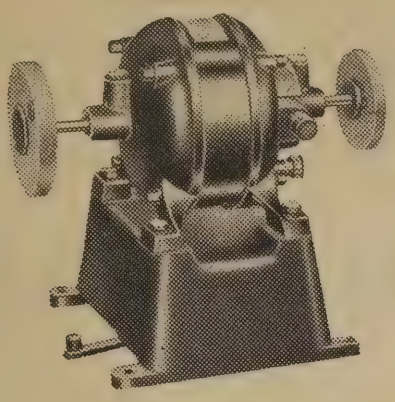
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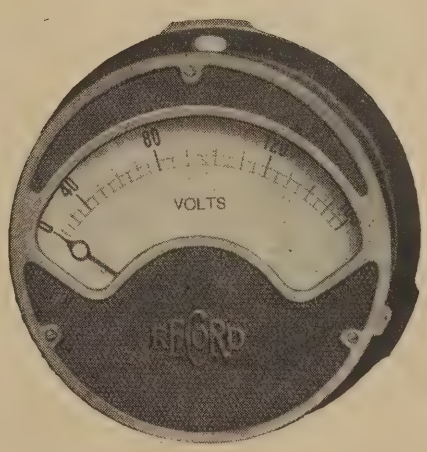
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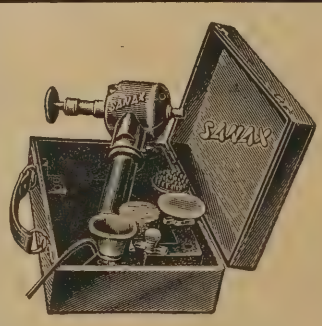


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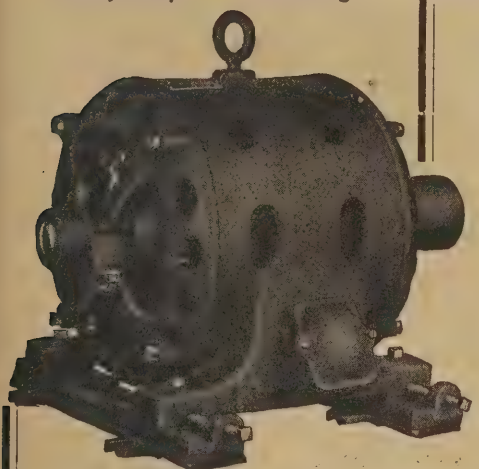
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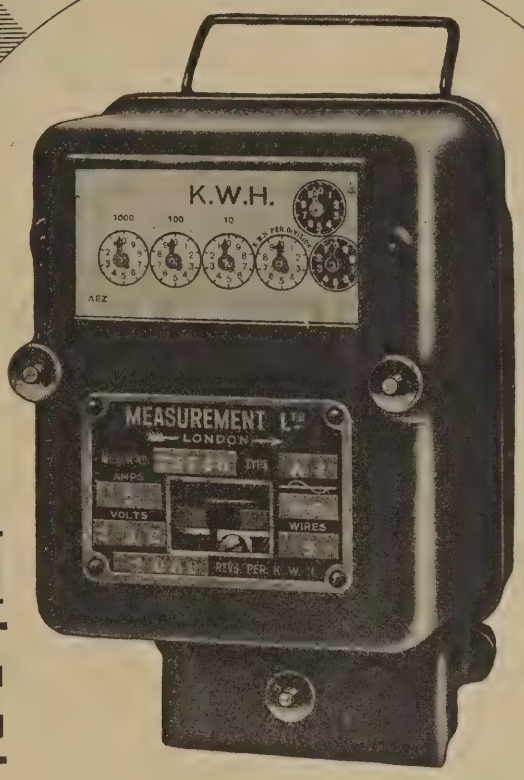
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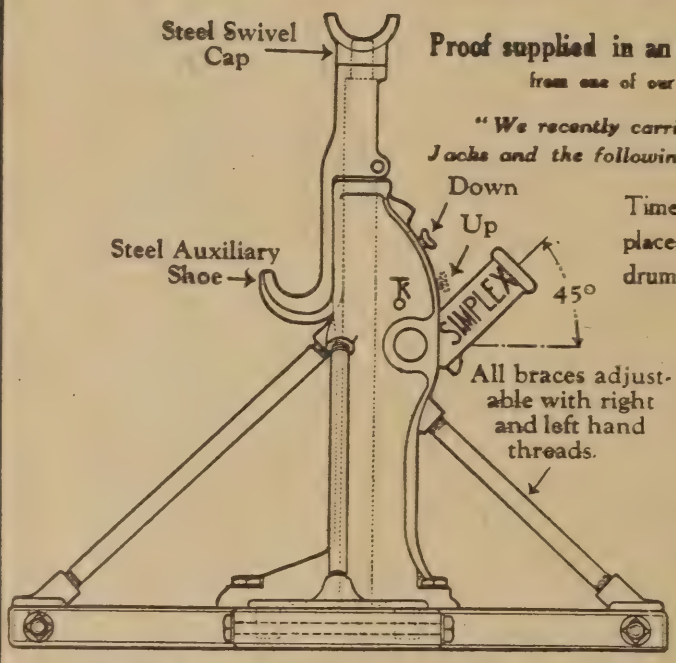
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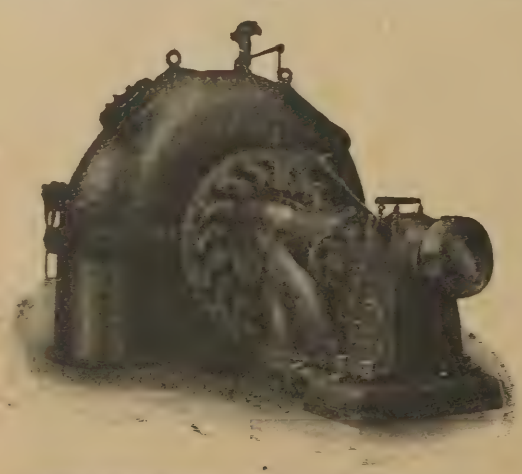
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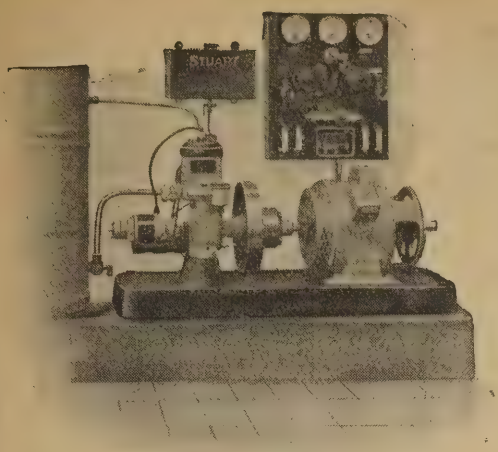


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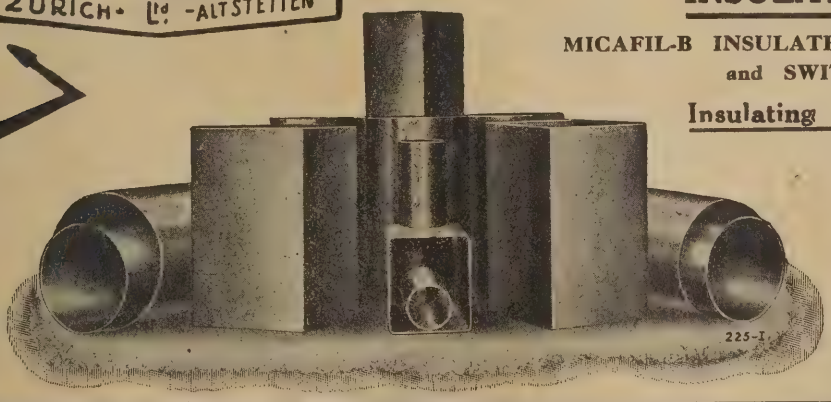
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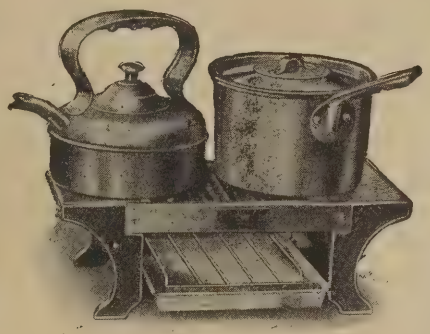
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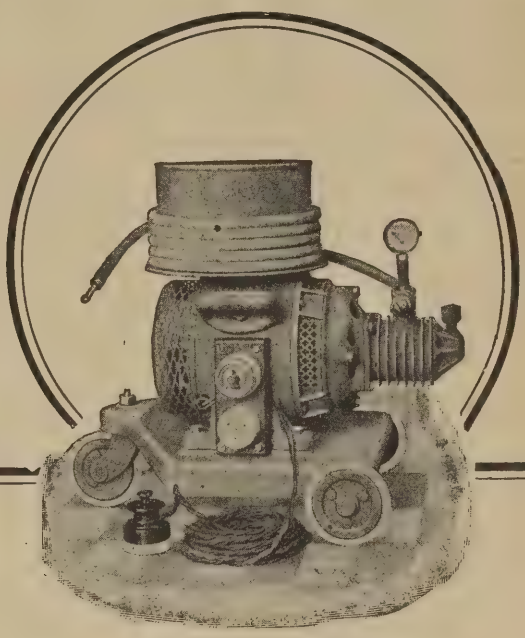
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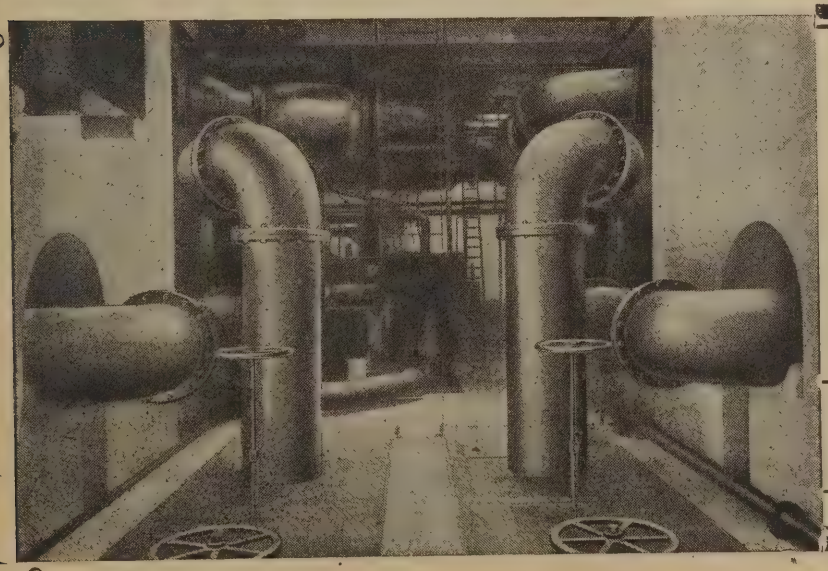
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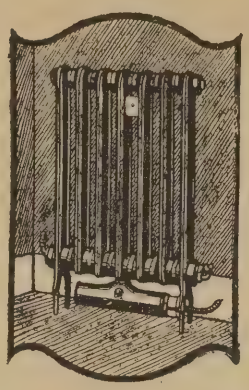
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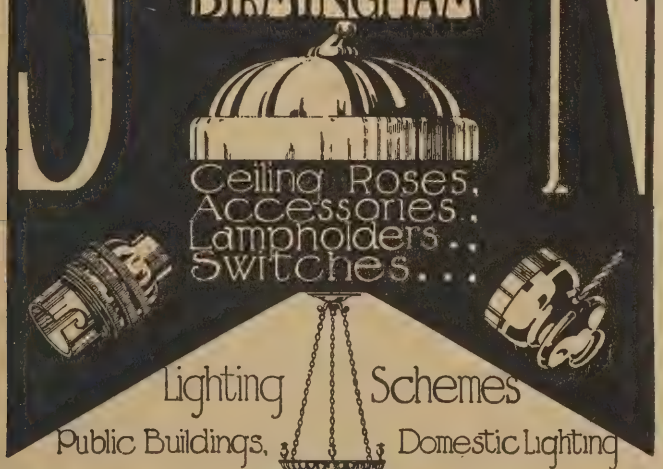
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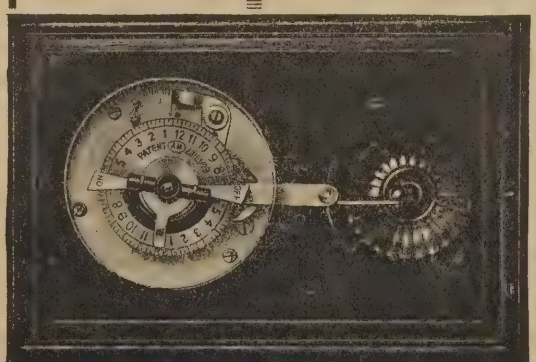
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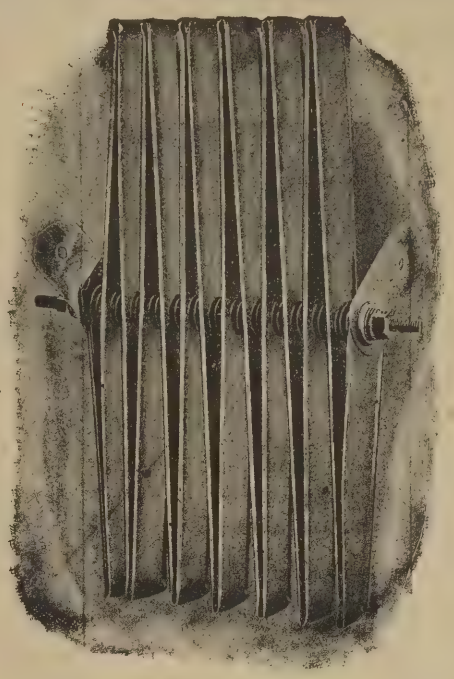
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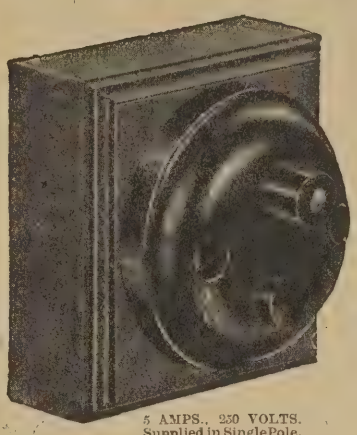
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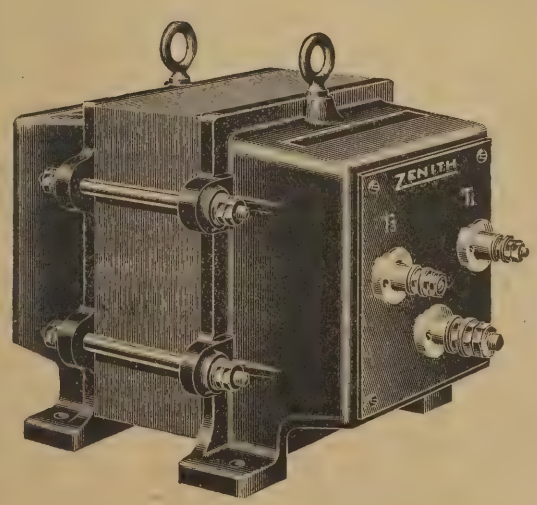
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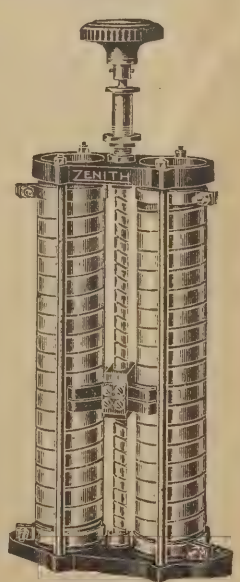
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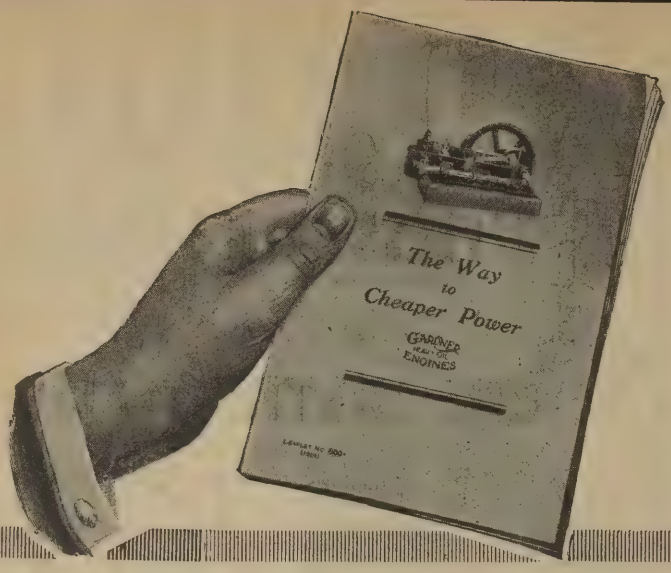
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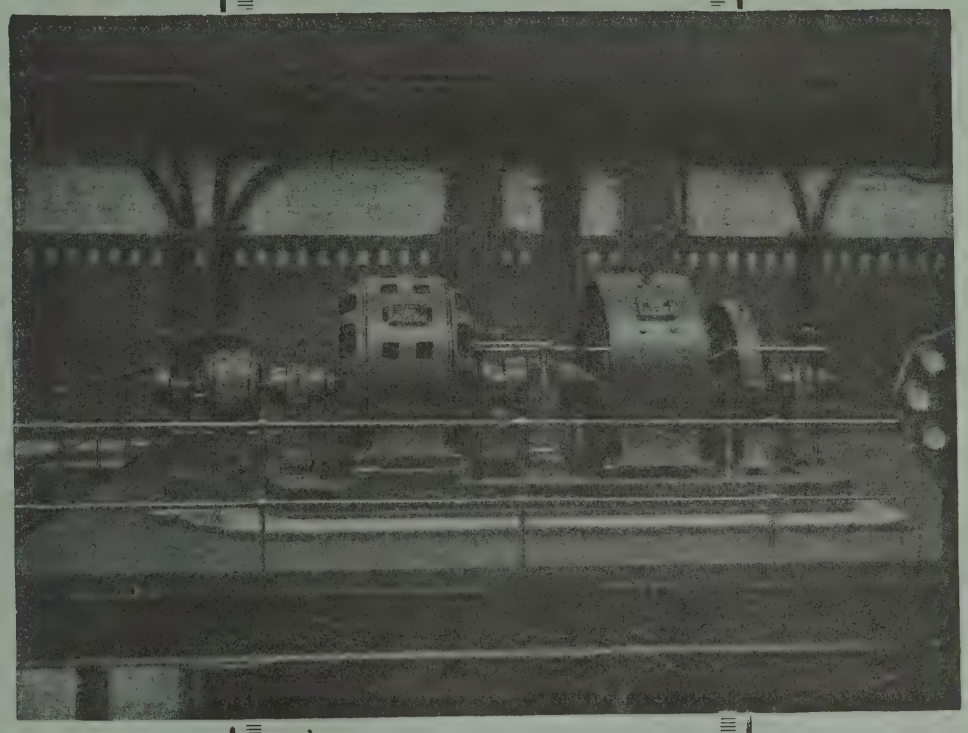
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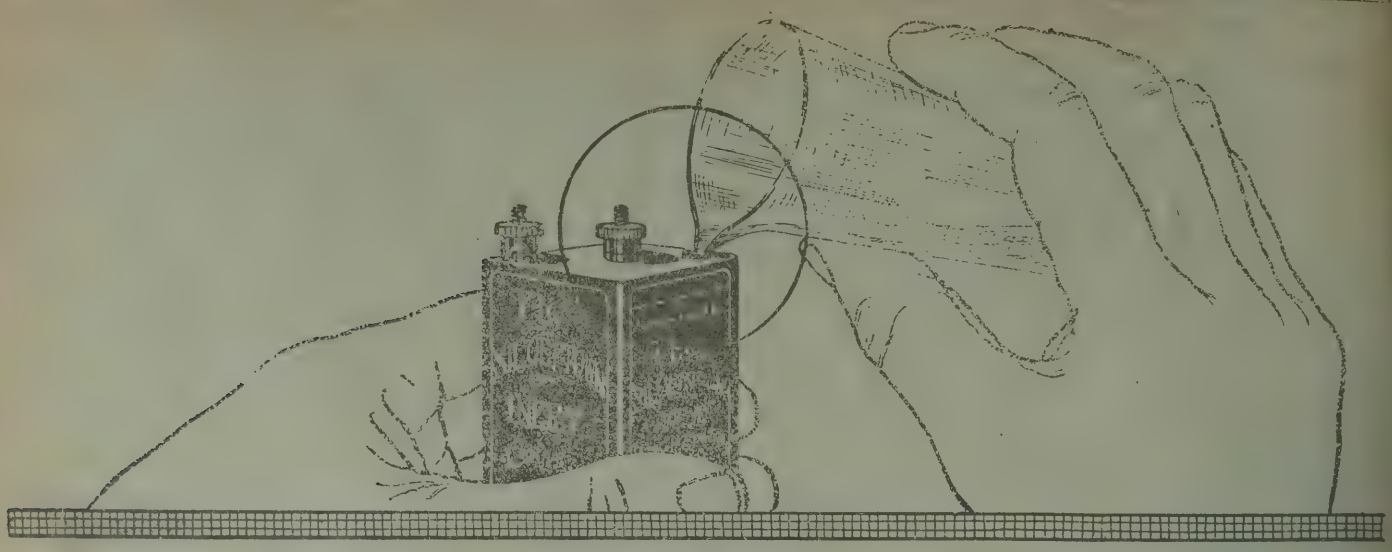
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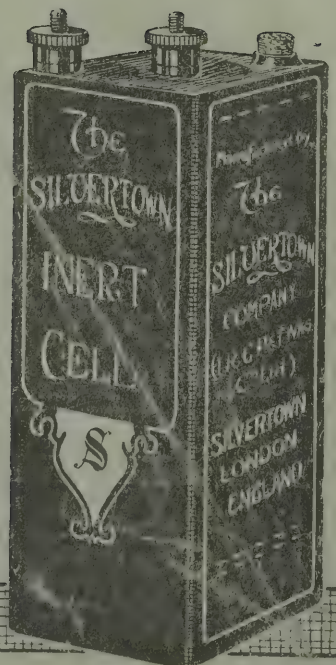
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